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TRANSITION TO INFLATION TARGETING IN UKRAINE: NEW TOOLS FOR MONETARY POLICY

Positive experience of inflation targeting in many countries influenced the decision to implement this framework in Ukraine. Authors consider the appropriateness of retaining inflation target under conditions of deteriorating currency market. Uncertainty of forecasts is aggravated by fragile impact of monetary policy on Ukrainian economy in conditions of growing nonlinearity of macroeconomic processes. The authors suggest the possibility of using two channels of transmission mechanism, namely, exchange rate and interest rate, and recommend additional tools to specify targets of monetary policy for the National Bank of Ukraine.

Keywords: central banks; inflation targeting; monetary policy, monetary conditions index, monetary instruments.

INTRODUCTION. Inflation targeting regime traditionally is regarded as the most effective in transition and emerging economies. It is well-known that a common feature in the inflation targeting regime is the target inflation rates which are managed on the basis of the usage of changes in interest rates and other monetary instruments.

It is envisaged that Ukraine should transit to inflation targeting in the second half of 2015. Given this, the question is whether there are necessary preconditions for the implementation of this framework in Ukraine, where national financial system is weak in terms of powerful geopolitical challenges, devaluation effects, industrial output decline and worsening structural imbalances. How in these conditions to ensure the orderly and systematic use of monetary instruments for the maintenance of inflation target, taking into account the imbalance of Ukrainian money market and possible external and internal shocks?

In the study of characteristics of transition to inflation targeting in Ukraine, we have taken into account the effect of several adverse factors, which include the following:

• increase in external debt of Ukraine against the background of decline in international reserves, due to the monetary policy of the National Bank, aimed at keeping fixed exchange rate of national currency recent years;

• increase in refinancing commercial banks to maintain liquidity of banking system;

• rapid increase in private debt of Ukraine in foreign currency due to difference in borrowing rates on domestic and foreign markets;

• lack of complementarity in the set of tools and methods in managing inflation, budget deficit and public debt sustainability. The National Bank of Ukraine (NBU) purchases significant amounts of government debt securities in the secondary market (such as debt securities placed by the Government in the share capital of recapitalized banks, and 'Naftogaz Ukraine' Corporation). NBU officials called this phenomenon "quasi-monetization", while Government officials – "quasi-fiscal" operations;

• insufficient level of NBU operational independence on the choice of instruments to achieve policy targets; inability to fully abandon the principle of fiscal dominance subject to government borrowing and due to underdeveloped domestic financial market in terms of capability to absorb additional volumes of government securities issuances;

• opacity of the financial market in Ukraine which is not effectively perform the functions to redistribute financial resources in the national economy. Thus, in terms of access to finance, Ukraine during 2009-2012 dropped from 45 to 56 position among 62 countries, according to estimates by Davos Economic Forum (World Economic Forum: The Financial Development Report, 2009, 2010, 2011, 2012).

To date, Ukraine has no adequate model that would describe the mechanism of influence of interest rate channel on inflation expectations of market. The complexity of situation is explained by the nonlinearity of macroeconomic processes, when on one and the same regulatory measure the system may demonstrate totally disproportional and unexpected reaction depending on time and date and imbalances. This reinforces urgency of search for new appropriate tools of monetary policy operational structure and improving efficiency of transmission mechanism main channels.

Main attention of this article is paid, firstly, to evaluating impact of monetary and non-monetary factors on inflation; secondly, clarification of approaches to formation of central bank targets of monetary policy in terms of money market imbalances; and thirdly, definition of monetary instruments for the National Bank of Ukraine, which in deployment would more fully meets the transition period conditions.

Chapter 2 provides an overview of literature on inflation targeting in developing countries, and devoted to overcome problems of transition period. We developed a hypothesis about the necessity to identify "currency comfort" zone for countries with open economies. In Chapter 3 we describe an empirical analysis and proposed a formula for calculating the index of Ukrainian monetary conditions index for tools of inflation targeting in Ukraine I in view of money market imbalance. Chapter 4 includes conclusions.

An overview of literature. Experience of emerging economies shows positive effect of inflation targeting on macroeconomic indicators, while in advanced economies, the differences between countries with and without inflation targets are smaller according to economists Berg, Hallsten, Queijo von Heideken and Söderström (2013). Growing number of central banks use this framework, however, there are some differences in mechanisms of inflation targeting, which highlighted by Hammond (2012), Lyziak (2012), Mehrotra and Yetman (2014), Svensson (2013). This prompted us to consider peculiarities of inflation targeting mechanism for Ukraine.

Known that main elements of inflation targeting are strictly defined target for inflation, central bank independence, transparency and availability of appropriate accountability mechanisms, as described by Mishkin (2000), Truman (2003), Hammond (2012).

The introduction of inflation targeting in developing countries promotes decrease inflation, strengthening central bank real independence, transparency and credibility of monetary policy. It is interesting in this regard to mention Roger (2009), which shows results of inverse influence of inflation on the real rate of GDP.

We performed comparative analysis of banking systems development in Ukraine with Poland and Hungary during the transition to full inflation targeting (Table 1). In particular, the development of Ukraine's banking system is comparable with banking system in Poland during transitional period, which was started in the country in 1998.

However, it is advisable to pay attention to high level of financial dollarization of Ukrainian economy: total amount of loans and deposits in foreign currency explicitly exceeds analog indicator in banking systems of Hungary and Poland's during transition to targeting inflation.

Table 1. **Some indicators of banking systems development in Poland, Hungary and Ukraine**
before the introduction of inflation targeting, %

Indicator	The three-year period before the introduction of inflation targeting						Ukraine		
	Poland			Hungary					
	1996	1997	1998	1999	2000	2001	2011	2012	2013
Banking sector assets to GDP	80.6	77.49	92.98	67.09	67.0	66.35	94.39	88.62	99.92
Gross loans to GDP	53.78	54.62	66.13	43.06	45.81	42.81	65.82	58.83	65.11
Volume of central bank lending to the Government / Budget deficit	16.69	19.6	11.63	71.7	68.6	34.08	13.47	5.69	4.58
Share of foreign currency loans in total loans	38.08	40.34	37.06	28.54	32.29	29.27	38.24	35.65	33.47
Share of foreign currency deposits in total deposits	20.92	20.72	17.48	21.87	23.29	22.09	42.97	44.04	38.37
Volume of international reserves to external debt	21.76	20.69	27.63	37.32	43.38	38.84	58.1	35.1	26.4
Central bank discount rate	22.0	24.5	18.25	16.0	13.25	11.0	7.75	7.5	7.5
Growth rate of Central Bank refinancing to commercial banks	5.38	13.74	-7.75	-29.02	-25.9	-50.05	458.5	238.4	-26.7
Growth rate of Monetary aggregate M2	29.29	30.85	25.16	15.75	12.09	16.78	14.23	13.10	13.74
Growth rate of open market operations with short-term government obligations	11.22	27.25	13.85	-8.27	-0.13	-52.6	49.69	55.08	-12.11

Source: Calculated by the authors according to National Bank of Ukraine, National Bank of Poland, and the Hungarian National Bank data

Inflation targeting regime is characterized by greater influence of monetary policy on the economy, even in a crisis. This is evidenced by changes in indices of monetary policy in Ukraine and neighboring countries that use inflation targeting[18].

After introduction of inflation targeting regime in Poland (1998), Hungary (2001), Romania (2005), monetary policy in these countries was characterized as stable, and the index approached 1 even during the global crisis of 2008 (Fig. 1).
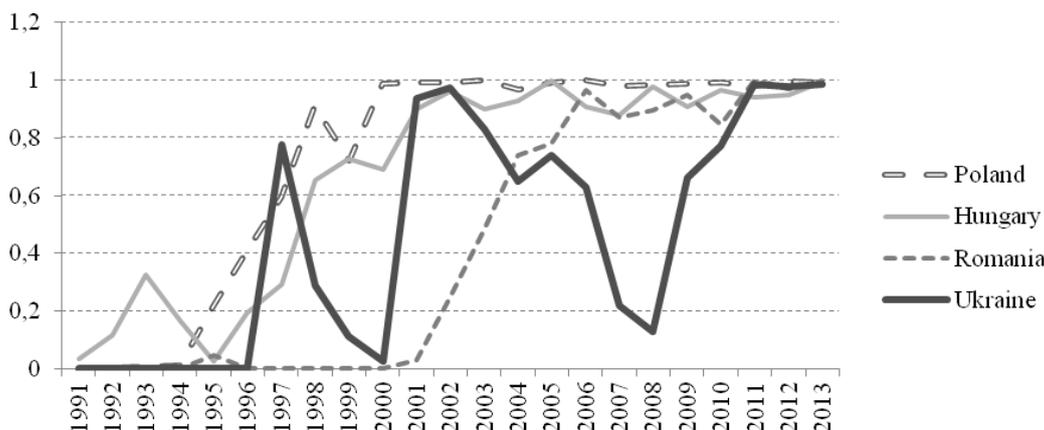
Fig. 1. Monetary conditions index of Ukraine and neighboring countries, which deployed inflation targeting in 1991-2013

Source: own calculations of authors

Unlike these countries, the Monetary condition index for Ukraine indicates fragile impact of monetary policy on national economy, and the most significant decline of this index was observed in crisis year 2008.

Therefore, the effectiveness of monetary policy in countries with inflation targeting compared with other countries, is undeniable. Nevertheless, Svensson (2007) emphasizes the importance of ensuring financial stability in inflation targeting. Key measures to ensure the proper level of consistency of monetary and fiscal policies for Ukrainian conditions were considered by Naumenkova and Mishchenko

(2012). This is especially important in view of the fact that under co-regulation and setting inflation targets both by the government and central bank provides the least number of deviation in target indicator.

With the deterioration of foreign exchange market, central banks of countries with emerging markets, often find themselves faced with a choice: whether to maintain a fixed exchange rate and give up inflation targets, or to maintain inflation target, neglecting fixed exchange rate.

Covas and Zhang (2008) consider that the accuracy of achieving inflation targets is determined by exogenous

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[18] Monetary conditions index consists of weighted average of nominal short-term and long-term interest rates and the nominal effective exchange rate. The index reaches its maximum value of "1", and calculated using formula $\exp[-0.05*(\text{Inflation} - 2\%)^2]$.

factors that are influenced by world prices of basic resources and in view of demand and supply in domestic market. Considering this, Mason et al. (1997) are quite cautious about efficiency of inflation targeting regime in developing countries. Wagner (1998) concluded that direct inflation targeting strategy in developing countries was ineffective, at the present stage of their development. More optimistic estimations on implementation of inflation targeting regime in transition economies are provided in study by Czech National Bank (Czech National Bank, 2000).

Our view coincides with findings from studies of Ball (1998), Faia and Monacelli (2008) on necessity to use by central bank targeting two main channels of transmission mechanism on transition to inflation, namely, foreign exchange and interest rate. In our opinion, in developing countries, to prevent economic shocks, the central bank should monitor the dynamics of exchange rates for possible smoothing fluctuations that can destabilize the economic situation.

This is confirmed by the study of Parrado (2004), which emphasizes the need to central bank adherence of free exchange rate policy in real economic shocks or managed float – under nominal shocks. This position is certainly justified for countries with open economies where real interest rate should be established, based on inflation rate and real exchange rate, as evidenced by the results obtained by Bousrih (2012).

Ghosh (2013), Petreski (2012), Odrïa et al. (2013), Beckmann et al. (2011) stress the need to control exchange rate with introduction of inflation targeting regime in developing countries. Pourroy (2013) also emphasizes the need for the specification of monetary policy flexibility exchange rates in developing countries, and importance of its perception not only as a tool, but as an intermediate target. Levy-Yeyati et al. (2013) made similar findings with regards to recognizing importance of currency channel in implementing inflation targeting regime in developing countries.

A review of scientific literature indicates the absence of common position in treatment of possible deployment of such tool as exchange rate, in implementation of inflation targeting. The reason for this is complexity of developing adequate macroeconomic models that incorporate simultaneous usage of interest rate and exchange rate.

However, the relevance of composing equilibrium market exchange rate is growing, as evidenced by appearance of publications dedicated to these issues. For instance, Blanchard (2012) advocates the need for FX interventions under inflation targeting. Jaromir et al. (2013) note the importance of foreign exchange intervention in medium horizon of inflation targeting. Noteworthy are results obtained by Canzoneri and Cumby (2014) with regards to significance of FX intervention impact on inflation and usage of interest rates as a monetary policy tool.

Inflation targeting regime implies that central bank's actions should be based on quantitative estimates of impact level on interest rates on inflation, which are the main tool for maintenance of inflation target. We believe that the National Bank of Ukraine should specify targets of monetary policy in terms of money market imbalance. In such circumstances the approach deserves attention that focuses on providing low volatility of exchange rate and maintains established inflation rate target that allows us to formulate a hypothesis about the need to establish as operating objective of monetary policy the monetary

conditions index, which takes into account changes in interest and currency course.

Principles of composing index of monetary conditions and its implementation for the purpose to regulate monetary market were thoroughly addressed in scientific studies of Ericsson et al. (1998), Guender (2005), Osborne-Kinch and Holton (2001). Monetary conditions – is the combined effect of interest rate and exchange rate. This index was developed by the Bank of Canada in the late 1980s.

Monetary conditions index, which characterizes the state of money market can be used by National Bank of Ukraine over period of transition to inflation targeting. This index is widely deployed in practice by central banks of Canada, New Zealand, Norway, Sweden and many others.

Practical usage of Monetary Conditions Index will be characterized by constraints that are in peculiarities of connection between monetary conditions and monetary instruments as well as in possible changes in discount interest rate and exchange rate over time. Introduction of Monetary Conditions Index in domestic practice shall convince financial market participants that activity of the National Bank of Ukraine is focused on inflation targeting.

3. Empirical analysis

In our view, monetary condition index for Ukraine should be determined taking into account exchange rate and key interest rate. The need for consideration of exchange rate is determined by its importance in implementing monetary policy in countries with emerging markets. Percent component of the index is a tool of influence on the volumes of money through the level of refinancing rate. On the other hand, the interest rate will be informative Indicator liquidity of banking system. Thus, both components of proposed index are important for assessing impact on inflationary pressure.

In general terms, the index is represented by the equation (1):

$$MCI_t = A_r (r_t - r_b) + A_s (q_t - q_b), \qquad (1)$$

where MCI_t – Monetary condition index on time t; A_r and A_s – shares of index components impact; r_t – short-term interest rate at time t; q_t – logarithm of exchange rate at time t; r_b and q_b – variables of interest rate and exchange rate in base period.

In academic literature we can identify common approaches to formation of the index, which provide assessing proportional influence of changes in exchange rate and interest rate to inflation, which together equal to "1", as well as calculation on the basis of weighted average change in short-term interest rates and exchange rate.

We conducted our empirical analysis on an annual basis since 2008, when Ukrainian economy was under stress of crisis. The data in Table 2 shows the overwhelming contribution of monetary factors in overall inflation in Ukraine until 2011. Dynamics of monetary base and exchange rate represent monetary factors influencing inflation. In 2013 the contribution of these factors significantly decreased and reached only 20%.

National Bank of Ukraine used monetary instruments that contributed to prevent losses from deflation. Some experts believe that range of inflation level for developed countries should be 1-3%, and for developing countries to be higher (Hammond, 2012). Nevertheless, only such inflation does not bother people and has advantages over the probable gain from inflation below 2%.

T a b l e 2. Inflation in Ukraine, monetary and non-monetary factors in 2008-2013, %

	2008	2009	2010	2011	2012	2013
Inflation, December of reporting year to December of previous year	22.3	12.3	9.1	4.6	-0.2	0.5
Monetary factors	95.5	85.1	86.8	75.0	44.4	20.0
Non-monetary factors	4.5	14.9	13.2	25.0	55.6	80.0

Source: author's calculations based on NBU data

The main instrument of keeping optimal inflation rate is the interest rate. At present in Ukraine due to the lack of reliable quantitative estimates of interest rate policy impact on inflation there is no composed model that adequately describes this causality.

Scientific papers devoted to interest rate channel of transmission mechanism in Ukraine, always pay attention to its lack of effectiveness, as well as restricted capabilities of Ukrainian central bank to influence inflation through the use of interest rate policy instruments (Mishchenko, Petryk, 2008).

Under these conditions, liquidity of banking system may be intermediate reference point to achieve main goal – keeping inflation range. National Bank of Ukraine, depending on the situation, can apply refinancing operations, repurchase operations with its own debt obligations, and operations with Ukrainian Government bonds to regulate liquidity.

Unpredictable increase of liquidity in the market without appropriate action by regulator could trigger inflationary pressures in economy. Therefore, it is advisable, that National Bank of Ukraine could apply measures to regulate the proportion of mandatory reserves, as well as ordering bank requests for refinancing loans. The introduction of these mechanisms will allow the National Bank of Ukraine to form an additional buffer of liquidity for banking system and stimulate economic growth while respecting the established target inflation.

It is predicted, that in 2015 the Ukraine shall increase monetary base by 20% (National Bank of Ukraine, 2014). According to theory and practice of monetary circulation, growth of monetary base leads with corresponding lag to accelerate increase in commodity prices, which will definitely affect the rate of inflation. Graphically, the gap in time between increase in money supply and prices are not clearly traced, that is not relevant to exchange rate and prices (Fig. 2).
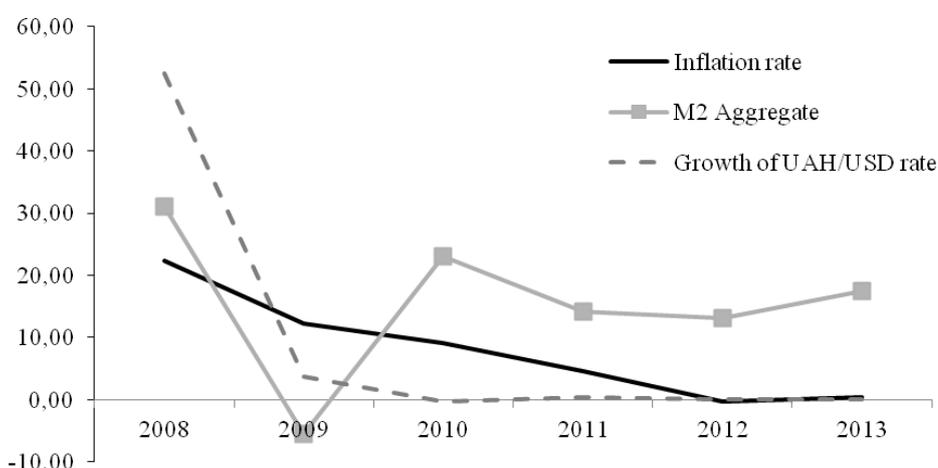
Fig. 2. Dynamics of Monetary aggregate M2, UAH/USD Exchange rate, and inflation rate in Ukraine, 2008-2014, %

Source: author's calculations based on NBU data

According to results of correlation analysis, we obtained evidence that monetary aggregate M2 had greatest impact on inflation with lag of 5 months (Table 3). Changes in exchange rates during studied period had immediate direct impact on inflation, where greatest manifestation of this factor was observed with a delay by 2-3 months.

In our opinion, monetary condition index for Ukraine should be determined taking into account exchange rate and interest rates. Exchange rate, as evidenced by the

analysis, should be included in this indicator because of its importance as main instrument of National Bank of Ukraine monetary policy in recent years. Percent component of the index will be a tool to influence the money supply through refinancing rate level. Thus, both components of proposed index for Ukrainian realities, as well as for introduced world indices, are important from the standpoint of assessing impact on inflationary pressures.

Table 3. Correlation of monetary aggregate M2 and exchange rate with consumer price index in Ukraine, 2008-2013

Time lag, months	Monetary aggregate M2	Exchange rate
1	0.015193767	0.336453
2	0.077551424	0.436694
3	0.064414422	0.420032
4	-0.112429356	0.215889
5	0.218961537	0.133253
6	0.029273144	0.092024
7	-0.193447522	-0.0135
8	-0.023248937	-0.15474
9	-0.035093624	-0.15474
10	0.029484856	-0.05932
11	-0.182897496	0.110366
12	-0.029801281	0.204736

Source: author's calculations based on NBU data

Thus, using the index of monetary conditions, we must firstly figure out approaches to inclusion of currency and interest components in calculation of the index.

First, regarding exchange rate component, we propose to use nominal weighted index of exchange rate of national

currency (NWERI). This Indicator takes into account the nominal rate of hryvnia against currencies of countries that are major trade partners of Ukraine.

For base period of measuring NWERI in Ukraine we selected May 2008 as date of accession to the World Trade

Organization, which was the beginning of process to ensure stable functioning of international trade system, liberalization and transparency of trade procedures.

Proceeding from trade turnover of Ukraine with countries around the world, we consider that nominal weighted index of hryvnia should incorporate the following currencies: USD, EUR, Polish Zloty, the Belarusian ruble, the Russian ruble, Turkish lira, Chinese yuan, Kazakhstan Tenge (Table 4).

Table 4. Input data for calculating nominal weighted index of Hryvnia (UAH) exchange rate in 2008-2013 years

		Russia	USA	China	Kazakhstan	Belarus	Poland	Turkey	Euro-zone
2008	Foreign trade turnover, US$ million	35149.4	4757.4	6149.1	4951.4	4915.2	6618.6	6583.4	27468.9
	Export, US$ million	15735.6	1949.2	547.6	1832.6	2105.6	2338.3	4633.3	10151.9
	Import, US$ million	19414.2	2808.3	5601.6	3118.9	2809.7	4280.3	1950.1	17317.1
	Exchange rate*, UAH	20.5	485.2	69.9	4.0	0.20	222.9	396.3	754.5
	Share in total foreign trade turnover	0.3639	0.0493	0.0637	0.0513	0.0509	0.0685	0.0686	0.2844
2009	Foreign trade turnover, US$ million	21730.9	1536.9	4168.7	3452.4	2951.8	3383.4	3078.8	15132.1
	Export, US$ million	8495.1	250.7	1434.4	1418.5	1258.9	1213.1	2126.5	5631.3
	Import, US$ million	13235.8	1286.3	2734.3	2033.9	1692.9	2170.3	952.3	9500.8
	Exchange rate*, UAH	20.6	784.2	114.8	5.8	0.30	269.6	515.1	1115.2
	Share in total foreign trade turnover	0.2553	0.0181	0.0489	0.0406	0.0347	0.0397	0.03616	0.1777
2010	Foreign trade turnover, US$ million	35629.9	2578.9	6016.9	2066.8	4466.8	4576.1	4324.9	18781.6
	Export, US$ million	13431.9	812.2	1316.6	1300.6	1899.2	1787.2	3026.7	7482.6
	Import, US$ million	22198.1	1766.8	4700.4	766.2	2567.6	2788.8	1298.3	11299.1
	Exchange rate*, UAH	20.6	797.3	118.8	5.3	0.20	272.1	520.1	1101.1
	Share in total foreign trade turnover	0.3177	0.0229	0.0537	0.0184	0.0399	0.0408	0.0386	0.1674
2011	Foreign trade turnover, US$ million	48951.9	3704.9	8448.4	3533.5	6134.1	5977.5	5229.9	25660.5
	Export, US$ million	19819.6	1113.8	2180.1	1857.6	1922.4	2794.1	3748.6	10071.4
	Import, US$ million	29132.2	2591.2	6268.3	1675.9	4211.8	3183.4	1481.3	15589.1
	Exchange rate*, UAH	22.7	797.5	123.5	5.4	0.10	249.2	465.0	1043.5
	Share in total foreign trade turnover	0.3242	0.0246	0.0556	0.0234	0.0406	0.0396	0.0347	0.1699
2012	Foreign trade turnover, US$ million	45050.1	3919.9	9676.8	3954.1	7319.7	6143.3	5636.9	25964.9
	Export, US$ million	17631.8	1014.7	1777.2	2459.2	2251.2	2576.2	3685.1	9959.8
	Import, US$ million	27418.3	2905.2	7899.7	1494.9	5068.6	3567.1	1951.9	16005.8
	Exchange rate*, UAH	25.6	799.1	127.3	5.3	0.10	245.0	432.2	1041.7
	Share in total foreign trade turnover	0.2936	0.0256	0.0631	0.0258	0.0477	0.0401	0.0367	0.1692
2013	Foreign trade turnover, US$ million	38299.3	3647.7	10627.4	2803.1	5588.9	6616.5	5658.2	25746.8
	Export, US$ million	15065.1	888.3	2726.7	2120.1	1983.7	2547.9	3805.5	9376.5
	Import, US$ million	23234.2	2759.4	7900.8	683.1	3605.3	4068.7	1852.7	16370.3
	Exchange rate*, UAH	25.4	799.3	129.9	5.2	0.08	262.08	408.3	1078.9
	Share in total foreign trade turnover	0.2731	0.0260	0.0758	0.0199	0.0399	0.0472	0.0404	0.1836

Note.
for 100 national currency units

Source: author's calculations based on NBU data and information from State service on statistics of Ukraine

To calculate NWERI we propose the formula of average weighted geometric value of abovementioned indices. The weight of each exchange rate as part of NWERI index should be determined by proportion of country in foreign trade structure of Ukraine. Change of NWERI during 2009-2013 is shown in Fig. 3.
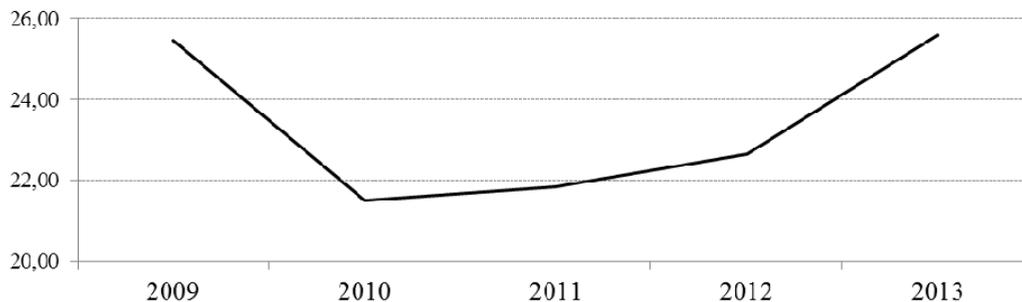
Fig. 3. Nominal weighted index of hryvnia exchange rate in 2009-2013, %

Source: composed by authors' calculations

The five-year observation testifies, that change of nominal weighted index of hryvnia exchange rate by 1% results changing consumer prices 0.125% (Table 5).

Table 5. Dynamics of nominal weighted UAH exchange rate index change and consumer price index in 2009-2013, %

Indicator	2009	2010	2011	2012	2013
NWERI	25.4	21.5	21.8	22.6	25.5
CPI	112.3	109.1	104.6	99.8	100.5

Source: author's calculations based on State service on statistics of Ukraine data

Second, we identified approaches to take account of interest rate component in calculating index of monetary conditions.

It should be noted that in Ukraine in implementing inflation targeting the NBU can more actively use interest rate band, setting restrictions on minimum and maximum short-term interest rates, through which the central bank would change volume of monetary base, and provide or absorb liquidity in relevant volumes.

In Ukraine, interest rate band only just occurs. Since 2010, interest rate on overnight loans performs the role of maximum price of resources, available on interbank market, while interest rate for quantitative tender of NBU deposit certificates placement restricts lower level of money market rates fluctuations (Fig. 4).

- - - Discount (key) rate
——— Central bank (NBU) overnight rate
- - - - Interest rate on NBU deposit certificate tender funding
▭ ▭ Average weighted rate on all instruments
—▫— Interest rate on NBU lending tender
— — Interest rate on NBU repurchase operations
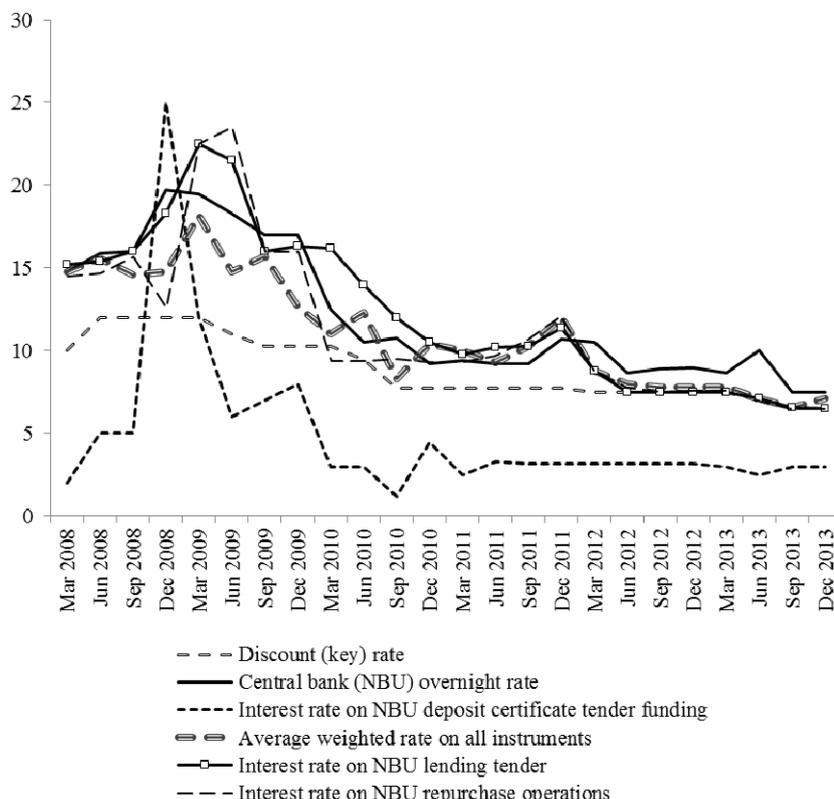
Fig. 4. The dynamics of interest rates on NBU placement and borrowing transactions in 2008-2013, %

Source: author's calculations based on NBU data

Using symmetric changes in the boundaries of interest rate band, the NBU has opportunity to conduct hard or soft monetary policy. According to data obtained (Fig. 4), we concluded that difference between maximum and minimum boundaries of the band is about 5%, but beginning of 2014 showed actual gap 9%. Certainly, such difference between rates of band is rather large for proper management of money market. In financially-stable countries, as experience shows, this gap should not exceed 2%. Moreover, with rather wide corridor of interest rates observed in Ukraine, domestic banks accumulate excess liquidity.

Mistakes in framing interest rate band with active absorption of excess liquidity by central bank could lead to 'interest arbitration' in view of interest of external market, and with active refinancing – to increasing credit risk in interbank market.

For this purpose we analyzed possible usage of interest rates (Fig. 4). Thus, repurchase rate is the most representative, but cannot be used in the mechanism of liquidity support to banking sector. It is caused by refusal of the National Bank of Ukraine from repurchase transactions in March 2014 and transfer to weekly refinancing tenders. We consider that calculation of the index should include rate on loans granted through NBU tenders. Subject to the central bank tender, banks could form independently this rate at which they agree to obtain facility. We believe that this rate is the most representative for deployment in monetary policy in Ukraine.

This pattern can be used in the transition to inflation targeting until authorized bodies elaborate more effective interest rate policy levers. Thus, volume of bank liquidity and 'comfort zone' of exchange rate, which we determines, can serve as main instruments for achieving target indicator of inflation. Global experience shows in countries with inflation targeting further weakening relationship between exchange rate and inflation, which requires appropriate upgrade of approaches.

Further, in practical usage of monetary conditions index, it is expedient to determinate weights of each instrument (interest rate and exchange rate) to achieve expected results of its operating objectives.

Values of A_r and A_s in Equation (2) reflect relative impact of real interest rates and exchange rate on aggregate demand. Both parameters (interest rate and exchange rate) are important components in composing monetary conditions index for Ukrainian economy:

$$ukrMCI_t = (r_t - r_b) + \frac{A_s}{A_r}\ (q_t - q_b), \qquad (2)$$

Specific weights of exchange rate and interest rate impact on proposed index can be calculated based on regression equations of impact for these two indicators on aggregate demand in Ukraine. Our observations of 2008-2013 found that aggregate demand in Ukraine had large impact on changes in interest rates (Fig. 5).
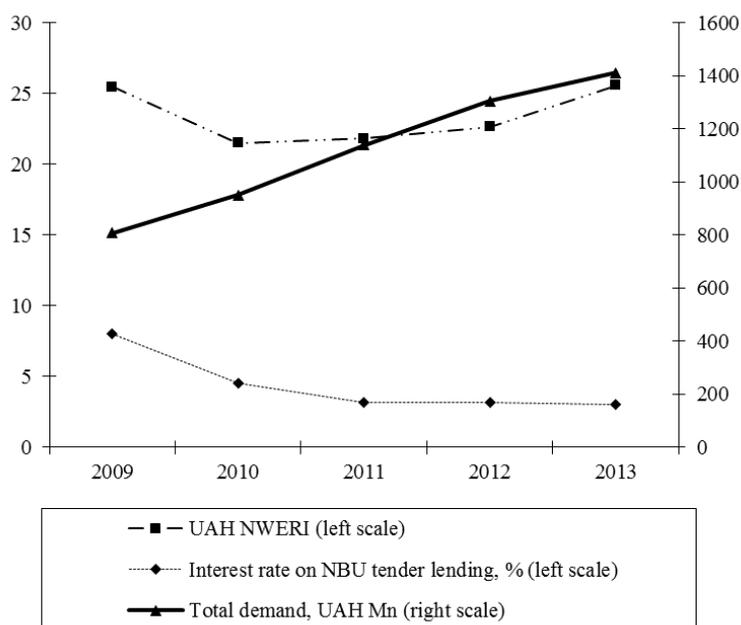
Fig. 5. Changes in aggregate demand, interest rates on loans granted through tender and nominal weighted index UAH exchange rate in Ukraine in 2009-2013, %

Source: author's calculations based on NBU data

Results of estimating influence of interest rate and exchange rate on aggregate demand are represented by the following regression equations:

$$y = 65.36\ q - 126.06\ r + 145.36, \qquad (3)$$

$R^2 = 0.96$, F-*statistic* = 24.04, p-*value* = 0.04, where y – aggregated demand, UAH Billion.

In this way, we found that increase in aggregate demand is negatively related with interest rate and positively – with exchange rate. Analysis of variables in formula (3) shows that total value of aggregate demand in Ukraine would be based on 65% of impact of interest rate and 35% – exchange rate. Thus, changes in interest rates by 1% will cause such effect as change of exchange rate to 1.93%. In view of this: $A_s/A_r = 65.36/126.06 = 1/1.93 = 0.518.$.

Therefore, above mentioned equation of monetary conditions index in Ukrainian context will be as follows:

$$ukrMCI_t = (IRCT - 6.5) +$$
$$0{,}518\ (\log_n \text{NWERI} - \log_n 25.5857) * 100, \qquad (5)$$

where: $ukrMCI_t$ – Ukrainian monetary condition index at time t; $IRCT$ – short-term lending through tenders; 6.5 – interest rate on loans through NBU tenders arranged in December 2013; NWERI – nominal weighted UAH exchange rate index; 25.5857 – value of nominal weighted UAH exchange rate index in December 2013; 0.518 – coefficient, which offsets the impact of exchange rate in case of changing interest rate.

4. Conclusions

The article lists factors that characterize the transition to inflation targeting in Ukraine. We identified, that contribution of monetary factors in overall inflation in Ukraine until 2011 was superior and reached 75-95% over 2008-2011. It seems expedient, that the National Bank of Ukraine would be able to use two channels of transmission mechanism, namely, interest rate and currency rate frameworks – for the period of transition to inflation targeting. Changes in exchange rate regime in 2008-2013 had immediate direct impact on inflation, where the greatest manifestation of impact was observed with a delay of 2-3 months. It is necessary to take account of exchange rate due to its importance in the implementation of monetary policy in emerging economies.

We concluded that for the Ukraine would be most appropriate to deploy approach that focuses on insuring low volatility of exchange rate and maintaining established target level of inflation. We clarified some approaches to consideration of interest rate and exchange rate components, and presented the calculation of Ukrainian monetary conditions index.

The article describes methodological approach to calculating index of monetary conditions for Ukraine, which incorporates both interest rate and exchange rate. We calculated specific components of this index, composed band of interest rates fluctuation, received data on upper and lower levels of Ukrainian money market rates volatility in 2008–2013. Based on data analysis, our findings are that since 2010 interest rate on overnight loans determined maximum cost of resources on interbank market, while interest rate on tender placement of NBU deposit certificates restricted lower level of money market rates fluctuations.

We designed the formula for calculating Ukrainian monetary conditions index ($ukrMCI_t$), which describes the state of money market and may be used by the National Bank of Ukraine under the transition to inflation targeting. Using this formula, we calculated that in 2013 change in interest rates by 1% had same effect as change in exchange rate at 1.93%, where in this period change in total value of aggregate demand by 65% was caused by influence of interest rates movements, and 35% – by exchange rate.

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ПЕРЕХІД ДО ІНФЛЯЦІЙНОГО ТАРГЕТУВАННЯ В УКРАЇНІ:
НОВІ ІНСТРУМЕНТИ ДЛЯ МОНЕТАРНОЇ ПРАКТИКИ

У статті досліджено особливості переходу до інфляційного таргетування в Україні. Основну увагу приділено впорядкованому та системному використанню інструментів монетарної політики в умовах розбалансованості грошового ринку в Україні. Отримано висновки щодо необхідності уточнення цільових орієнтирів грошово-кредитної політики. Визначено "зону комфорту" валютного курсу при переході до таргету інфляції. Запропоновано формулу для обчислення українського індексу грошово-кредитних умов (ukrMCI₁) для посилення ефективності грошово-кредитної політики на етапі переходу до інфляційного таргетування в Україні.

Ключові слова: центральні банки, таргетування інфляції, монетарна політика, індекс грошово-кредитних умов, монетарні інструменти.

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ПЕРЕХОД К ИНФЛЯЦИОННОМУ ТАРГЕТИРОВАНИЮ В УКРАИНЕ:
НОВЫЕ ИНСТРУМЕНТЫ ДЛЯ МОНЕТАРНОЙ ПРАКТИКИ

В статье исследованы особенности перехода к инфляционному таргетированию в Украине. Основное внимание уделено упорядоченному и системному использованию инструментов монетарной политики в условиях разбалансированности денежного рынка в Украине. Сделан вывод о необходимости уточнения целевых ориентиров денежно-кредитной политики. Определена "зона комфорта"

валютного курса при переходе к таргетированию инфляции. Предложена формула для вычисления украинского индекса денежно-кредитных условий (ukrMCIt) для усиления эффективности денежно-кредитной политики на этапе перехода к инфляционному таргетированию в Украине.

Ключевые слова: центральные банки, таргетирование инфляции, монетарная политика, индекс денежно-кредитных условий, монетарные инструменты.

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LIFE CYCLE ASSESSMENT IN HEALTHCARE SYSTEM OPTIMIZATION. INTRODUCTION

Article describes the life cycle assessment method and introduces opportunities for method performance in healthcare system settings. LSA draws attention to careful use of resources, environmental, human and social responsibility. Modelling of environmental and technological inputs allows optimizing performance of the system. Various factors and parameters that may influence effectiveness of different sectors in healthcare system are detected. Performance optimization of detected parameters could lead to better system functioning, higher patient safety, economic sustainability and reduce resources consumption.

Keywords: life cycle assessment, holistic approach, healthcare management, social responsibility, modelling.

Introduction. The fast industrial development, active population growth, the extremely high level of consumption of resources with the following air, water, soil pollution induced increasing interest to new eco – friendly tools and technologies. In modern science so far so often a rising awareness paid to the concept of social responsibility, which means the obligation to act benefiting society at large and a duty for every individual to perform maintaining a balance between the economy and environment [4]. Forming the basis patterns for a modern science, researchers solved many problems of humanity. Nevertheless, it is necessary to emphasize that since Democritus' reductionist approach was ideologically preferred in the western science, much effort has been directed to the excessive value of details and analysing of processes from the point of view of their decomposition into constituent elements, parts, or small particles. It caused the underestimation of the interrelations and interdependence of system components and respectively led to the loss of understanding of the systems "holistically". Holism was an idea firstly introduced by Plato, later developed by anthropologists stated that all the properties of a given system could not be determined and explained by its component parts alone [5]. The different aspects of humanity were taken into account. There were the physical (biology) and cultural (archeology, linguistics), the cross-cultural, looking at what it meant to be human. Therefore, the system as a whole determined how the parts behaved. Thus, the holistic approach was the examination of all the aspects of humanity. According to Merriam-Webster dictionary – "Holistic means relating to or concerned with wholes or with complete systems rather than with the analysis of, treatment of, or dissection into parts. Hereby, holistic ecology views humans and the environment as a single system" [34]. In course of time the concept migrated to medicine and in 40's was actively popularized by the prominent public health leader Andrija Stampar. He wrote the introductory declaration of the Statute for just established World Health Organization and defined the health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [6. p.697-708]. Inasmuch our fast developing society requires quick responses to problems and challenges, the modern managerial systems have to be not just well structured, that exactly facilitate the studying of main subjects, but also integral, fast performing, adaptable,

sustainable and with ability to be holistically analyzed. The reference frame should be structurally expanded with preservation of objectivity and scientifically reliable conclusions. Thus, through the application of new outstanding tools and technologies inside the boundaries of proposed enhanced framework appropriate new effective methods should been introduced. Among such numerous approaches of a complex analysis this article draws attention to the Life Cycle Assessment (LCA). While been scientifically proven it allows quantifying environmental damages caused by the lifecycle activity of a product. The method developed with purpose to achieve maximum quantification of entire life cycle of a product [7]. A comparatively short history of its emergence began with Harold Smith's report of a calculation of cumulative energy requirements for the production of chemical intermediates and products in 1960's [8]. In 70's the process of quantifying the use of resources and environmental releases of products became known as a Resource and Environmental Profile Analysis, as practiced mainly in the United States. In Europe, it was called an Eco balance. From 1975 through the early 1980's, as interest in these topics waned because of the fading influence of the oil crisis, environmental concerns shifted to issues of hazardous and household waste management. Through this period, sincere efforts to create a protocol or standard research methodology for conducting such works have been made. The multi – step methodology involves a number of assumptions. During these years, the assumptions and techniques used underwent considerable review by US Environmental Protection Agency and major industry representatives, with the result of evolving of the most reasonable methodologies. After years of development in connection with these events, first databases have been created. A broad range of practitioners and researchers across the globe have been further refining and expanding the methodology. The need to move beyond the inventory to impact assessment has brought LCA methodology to another point of evolution and from 1997 to 2002 led to the development of the LCA standards formalized by the International Standards Organization 14000 series [3]. In 2002, the United Nations Environment Programme joined forces with the Society of Environmental Toxicology and Chemistry to launch the Life Cycle Initiative, which now is a welknown international partnership on a subject [9]. The topics like raw materials extraction, energy demand, emis-