

## Optimal Instruments of Monetary Policy Under the Regime of Inflation Targeting In Belarus

*The choice of monetary policy instruments under inflation targeting as a rule bases on the monetary transmission mechanism channels. In this paper we estimate a number of transmission channels in Belarus and thus stress the challenges for shifting to the inflation targeting regime in Belarus. Assessment of the existing channels of monetary transmission shows a substantial role of the exchange rate channel for Belarus. In this context we stress the following obstacles for adoption inflation targeting in Belarus: dollarization, openness of the economy and transition context. We analyze the experience of switching to the new regime by other transitional and emerging countries, which shows that evolutionary approach through the forms of inflation targeting lite may be reasonable in Belarus. Taking all these in mind we suggest our vision of IT regime parameters for Belarus. Furthermore in this paper we deal with the impact of new monetary policy regime for the long-term agenda. In this paper we propose a number of theoretical arguments in favour of this vision. We show that besides providing low and stable inflation successful inflation targeting regime might favourably influence the financial system, which in turn spurs economic growth. We propose a methodology of testing this hypothesis, which is the goal for the further research.*

### 1. Introduction

During the last decade an increasing amount of countries accepted inflation targeting (IT) as the regime of their monetary policy. In recent years the tendency touched a number of transition and emerging countries, including Belarus, which announced possible shift to the IT regime closer to 2010. Inflation targeting regime of monetary policy is based on the unique theoretical concept that determines its advantages. But in practice the IT regime can be interpreted in different manner and the monetary policy strategy under the IT can differ among countries (e.g. see Daianu, Lungu (2005) and Mishkin, Schmidt-Hebbel (2001)). The core in this regime is the balance between commitment and discretion in a central bank's policy, basing on which classifications of monetary policy regimes are made (Stone, Bhundia (2004)). Because of the number of specific obstacles a country faces with, a substantial amount of the transition and emerging countries actually tend to so called IT Lite (Stone (2002)). Deviations from the theoretical concept of the IT may limit possibilities of exploiting its theoretical advantages. But nevertheless it might be the optimal practical choice due to country specific economic condition that supposes accepting big risks due to strong commitment under the IT.

The analysis of the expediency of the IT regime for the individual country should start with possible challenges to the theoretical concept of IT. In some cases these specific features may determine ineffectiveness of the IT, thus making questionable an overall expediency of implementing to this regime. For instance a range of peculiarities is stressed for the IT regime in small open economy (e.g. see Gali, Manacelli (2002) and Svensson (1998)), in dollarized economies (e.g. see (Leiderman et al (2006)), in transition agenda (e.g. see Jonas, Mishkin (2003)). All these features are peculiar to Belarus and one cannot state per se that the classic IT regime is the best choice for Belarus. Hence potential challenges for the Belarusian IT should be thoroughly analyzed. This analysis should also emphasize the structure of the monetary transmission mechanism in an individual country, which is crucial for the monetary policy under the IT regime.

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IT concept requires a range of rules to be followed at the operational level as well. So the second step of the analysis for Belarus is the one that considers the structure of monetary policy instruments. Verifying either existing practice of using monetary policy instruments coincides with IT concept is vital, while wrong monetary policy mix may undermine the success of IT.

Furthermore we suppose that while IT theoretical concept supposes creating preconditions for optimal long-term growth, the long-term agenda should be also treated. In this context possible channels of monetary policy impact on the long-term growth are of interest. In Kruk (2006) the relationship of financial system and growth is considered. Moreover it is shown that a range of specific issues in transition countries may lead to very weak impact of finance on growth, which might be the case of Belarus. So here we deal with impact of changing monetary policy regime of the financial system and its further impact of long-term growth. We stress the possible channels of these relationships and thus make background for further empirical research.

The paper is structured as follows. In Part 2 we deal with challenges for the Belarusian IT regime. In Part 3 we assess the channels of monetary transmission that are of interest in the context of IT. In Part 4 operational level of the Belarusian monetary policy is analyzed. In Part 5 we consider linkages between shifting to IT regime and possible change in the relationship between finance and growth. Further conclusions and directions of further research are provided.

## 2. Challenges for Implementation of Inflation Targeting in Belarus

### 2.1. Dollarization and Inflation Targeting

The first potential threat to the IT regime in Belarus to be mentioned is the high level of dollarization peculiar to Belarusian economy. One can argue that IT regime is generally not appropriate for the dollarized economy. First, the difference in monetary transmission mechanism should be taken in mind. IT regime by definition supposes “an information inclusive strategy in which many variables, not just monetary aggregates or exchange rates are used for deciding the setting policy instruments<sup>1</sup>”. On practice it means that central bank as a rule uses interest rate as a dominant instrument of monetary policy, while other monetary indicators (including exchange rate) are maintained as indicative ones, which may be shock absorbers. At the same time pass-through effect from the exchange rate to prices is much higher in dollarized economies rather than in non-dollarized ones. Thus it might be argued that the “classic” design of IT does not work properly in condition of high dollarization, leading to high vulnerability of inflation trend. Second, the balance sheet effect should be taken in mind in regard to dollarized economies<sup>2</sup>. It assumes that while substantial part of banks’ and firms’ liabilities are nominated in foreign currency and assets are nominated in national currency allowing exchange rate to be the shock absorber may lead to significant negative outcomes. For instance, substantial depreciation of the exchange rate may cause the banks run because of currency mismatching. Moreover it may lead to substantial decline in money demand that may cause reflation notwithstanding the policy instruments used for meeting the target trend. These outcomes are totally opposite to the expected results of depreciation in non-dollarized economy. However, IT under the condition of dollarization has chances to be successful. For instance, Leiderman et al (2006) argue that despite different pass-through effects in dollarized economy, implementing IT regime informs positive signals to the economic agents. More transparent and predictable monetary policy provides lower inflationary expectations and facilitates to inflation

<sup>1</sup> Mishkin (2000).

<sup>2</sup> Leiderman et al (2006)

decline. Moreover they argue that IT regime itself causes the reduction of dollarization thus converging the MTM to the “benchmark” one and mitigating possible negative balance sheet effects.

In Belarus in 2001-2006 the level of dollarization<sup>1</sup> had substantial decreasing trend and decreased from about 65% in 2001 down to about 35% in 2006. In early 2007 a small jump took place and still than the level of dollarization is fluctuating at the level of 32%. But nevertheless the level of dollarization in Belarus is definitely very high according to international norms. So both the obstacles for IT implementing connected with dollarization is likely to be valid for Belarus. However despite these obstacles we may argue that implementing IT is possible in Belarus and just through it an additional incentive for decline of dollarization may be created. It should be emphasized that a disinflation and a real exchange rate appreciation might have been substantial factors of dollarization decline in 2001-2006 despite lack of statistical support of this fact<sup>2</sup>. Thus taking in mind all the issues that dollarization implies on the IT monetary policy regime we suppose that high dollarization does not mean that IT implementing is inexpedient in Belarus in overall, but the exchange rate should not be treated as the only absorber of shocks during IT at least at the beginning of the shift towards the new regime.

Therefore, the first steps of the transition process to an IT regime should be done in such a manner that sharp and large fluctuations of the exchange rate are limited as well. The concrete framework of gradually allowing more flexibility may be a (widening) exchange rate band, a crawling band or a managed float, depending on the factors mentioned above.

## 2.2. Open Economy and Inflation Targeting

The second potential threat for the IT regime in Belarus is high extent of the economy dependence on the external sector (external trade is about 113% from Belarusian GDP). Thus Belarus can be recognized as 100% small open economy. In this case external competitiveness plays a severe role for the national economy. From the point of view of MTM it determines a relatively high effectiveness of exchange rate channel and as well as in case of dollarization the pass-through from the exchange rate to prices is the dominant one in the economy. Hence rather often countries that may be classified as small open economy exploit exchange rate targeting as a regime of monetary policy or at least exchange rate (i.e. external competitiveness) is considered as the secondary final target. The “classic” design of IT regime for small open economy with inflation as the goal and exchange rate as shock absorber actually provides goals ambiguity and may lead to unfavorable outcomes. In regard to Belarus the following scenario might be a threat. Rigid policy under the IT regime may cause an appreciation of real exchange rate and correspondently to decline of external competitiveness. In longer-term perspective it may cause pressure on the exchange rate and further depreciation (in case if the exchange rate treated as shock absorber). While the pass-through effect from exchange rate to prices is likely to be most powerful, it may lead to substantial deviation from the target inflation trend. Moreover in Belarusian conditions there is a high probability of growing trade deficit due to energy trade. In this environment allowed and non-restricted fluctuations of exchange rate are likely to affect the price level significantly. Moreover in last years just due to exchange rate peg that at the same time took in mind external competitiveness<sup>3</sup>, there has been a success in inflation decline.

<sup>1</sup> We calculate dollarisation level as the share of deposits nominated in foreign currency in the total volume of all deposits.

<sup>2</sup> See Horvath, Maino (2006).

<sup>3</sup> Estimation of the NBB reaction function by Horvath, Maino (2006) shows that 1% innovation of the real effective exchange rate lead to inverse 0.73% change in nominal exchange rate.

Thus, under the condition of Belarus being a small open economy there is an identical to dollarization factor requirement, i.e. the goal within the IT regime and its pursuing should coincide with preventing high vulnerability of exchange rate<sup>1</sup>.

### 2.3. Transition Agenda and Inflation Targeting

The third potential threat for IT in is the fact that Belarus is the transition economy. Major concern in regard to transition economies is unstable relationships among economic indicators representing the behavior of economic agents. One can argue that in transition economies reaction functions of economic agents are sensitive to economic conditions and policies being carried out. Through this the commonly recognized problem of identifying these relationships is emphasized. It means that as a rule quantitative identification of MTM channels in transition economies is problematic<sup>2</sup>. This problem is strengthened due to the lack of statistics available, low range of statistical samples and at last sometimes non-reliable data in transition countries. All these problems are more or less valid for Belarus<sup>3</sup>. At the same time inflation forecast is the core of inflation targeting, in other words inflation targeting may be interpreted as “targeting the forecast of inflation<sup>4</sup>”. So if the central bank is inefficient in forecasting inflation, i.e. it cannot provide consistent and reliable forecast for a medium-term perspective, it can hardly carry out the IT regime. First, it will not have enough grounds for using this or that monetary policy tools or managing this tool might be contradictory to the declared target. Hence it will mean that a central bank is unable to fulfill the own forecast, i.e. to carry out IT regime effectively. Second, impossibility and/or inability of central bank to provide reliable forecast will undermine public trust, which is the severe factor of successful IT regime maintaining. Thus it may lead to changing behavior of economic agents notwithstanding with those considered by the central bank. It will lead to the necessity of the escape from IT regime as well. Nevertheless these threats are not rigid obstacles for implementing the IT regime, while the thesis of forming more stable and evident behavior of economic agents under the IT may be argues in analogy with dollarization case.

Thus, the main requirement to the strategic issues of IT from this point of view is that the goal of monetary policy should be formulated in a way to be obviously achieved during medium-term perspective.

## 3. Assessment of Monetary Transmission Channels in Belarus

### 3.1. Existing Empirical Evidence of the MTM Channels in Belarus

Alongside with a range of problems for estimating MTM channels in Belarus due to instable relationships of economic agents' behavior and sometimes missing and/or low reliability of the statistical data there are few papers trying to identify MTM in Belarus. In this subsection we provide a brief analysis of existing findings.

One of the first papers devoted to this subject was by Kallaur, Komkov and Chernookiy (2005). In this paper the approach of unrestricted VARs is used for testing the MTM channels. They analyze impulse responses from the VARs that include money aggregates, the output gap and industrial production gap (derived through Hodrick-Prescott filter) and overnight interbank and refinancing interest rates. They argue that the output gap and industrial production gap have a negative re-

<sup>1</sup> However it should be mentioned here that the context of small open economy should analyzed in one row with capital flows. It means that in case of predictable capital inflows the focus of monetary authorities on the external competitiveness may be weakened.

<sup>2</sup> See Ganev et al (2003).

<sup>3</sup> See Horvath, Maino (2006); Kruk (2005); Kallaur, Komkov, Chernookiy (2005).

<sup>4</sup> See Svensson (1997).

sponse on both the innovation in the refinancing rate and interbank rate. Furthermore, they show the negative significant response of the real refinancing rate on the change in the money supply (M1). According to them, these findings support the validity of the interest rate channel in Belarus. But nevertheless they stress the weakness of this channel. Moreover, they argue about identification of credit channel in Belarusian economy. Such a conclusion is empowered by the positive impulse of industrial production gap on the innovation in the ratio between ruble loans to ruble money (M2). At last, a positive and significant response of inflation on the innovation in the nominal exchange rate proves a strong existing exchange-rate pass-through. In addition there is a strong relationship between changes in the nominal exchange rate and real exchange rate. The latter returns to its equilibrium level when the effect of the nominal exchange rate on prices is over.

The next contribution was made by Horvath and Maino (2006). They exploit the methodology of unrestricted VAR as well and also state the strong pass-through effect from the exchange rate to prices. The positive significant impulse response of prices to the innovation in the exchange rate continues during five periods (months) after the shock. Besides they argue that this effect implies a substantial cumulative impact on prices. Further they find rather weak relationships between money and inflation (positive significant but weak) and between money and output (insignificant), which stipulates obstacles of the second transmission step. The most valuable findings in our context are those connected with Granger causality between the interbank rate and the NBB refinancing rate and estimation of the NBB reaction function. First, the formal test shows that NBB adjust its policy rate (refinancing rate) to the interbank rate, which runs strange to what one would expect in standard monetary policy frameworks. However, this conclusion coincides with theoretical expectations on the operational framework, where the exchange rate is treated as the dominant target, while the interest rate is accepted from its market value. Second, their estimation of a linear NBB reaction function shows that NBB depreciates the nominal exchange rate reacting to the deviation from the inflation target (through lagged values of inflation level), appreciation of the real exchange rate and increase in the US Federal Funds rate that is taken as a proxy for interest rate parity. It supports the vision that the actual regime of the monetary policy carried out currently is rather close to FFCT regime where external competitiveness plays a crucial role.

The results of the recent study by Bogetic and Mladenovic (2006) mostly contrast to the previous findings. They exploit the VAR methodology as well but at the same time testing it for cointegration, developing a Vector Error Correction Model. On the one hand they also support the strong pass-through from the exchange rate to prices. They find cointegration between prices and exchange rate, stating that prices are determined by a long-run relationship with the exchange rate. There the same relationship with Granger-causality from exchange rate to prices is valid in the short-run as well. Furthermore the exchange rate generates the strongest response of prices during the short-term. On the other hand, they state the Belarusian monetary policy has got a strong accommodating effect, i.e. changes in wages are crucial for generating changes in prices. Thus they conclude that the Belarusian monetary authority reacts on the shocks in the real sector, thus weakening their own impulses sending to the economy. The practical use of these results is less valuable, since the sample size was limited to the period of 1996-2001 and since then monetary policy framework has substantially changed.

## **3.2. New Evidence about the Belarusian MTM**

### **3.2.1. VAR Methodology**

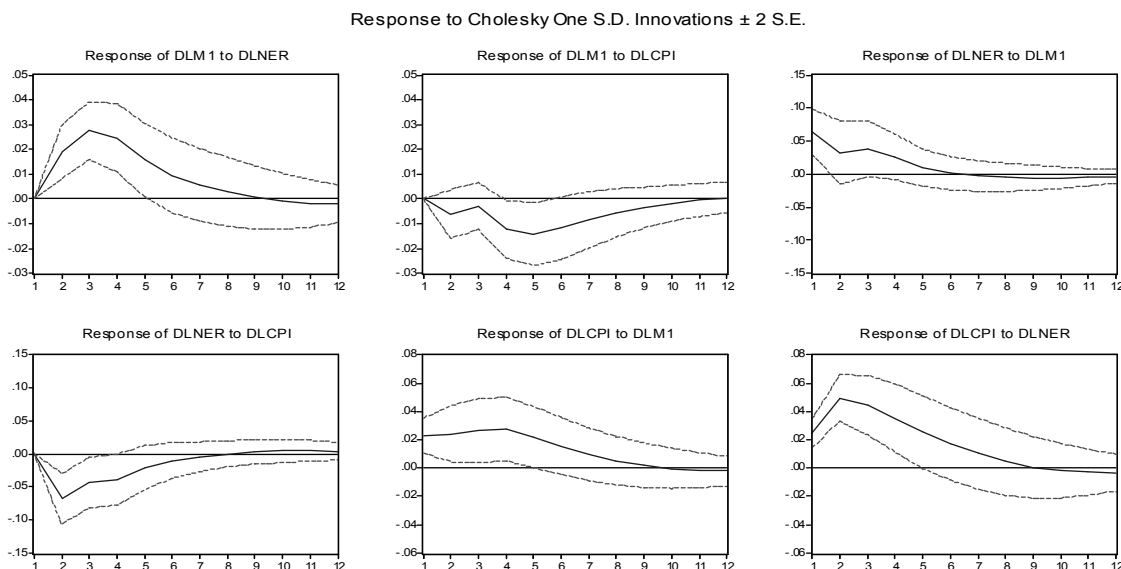
In our opinion the use of VAR methodology for estimating monetary transmission channels exhibits some limitations in general and in application to Belarus as a transition country specifically. First, when analyzing the MTM channels using VARs the division for two transmission steps is

worthwhile. As there might be obstacles for transmitting central bank impulses (e.g. through the interest rate) to the intermediate variables (e.g. to the market interest rate), then testing direct response of either inflation or output (output gap) might include relationships from other channels rather than tested interest rate channel. In the same manner, the economic meaning of impulse response from monetary base (aggregate M1) to inflation and output may be ambiguous<sup>1</sup>. At the same time, the mentioned features of dollarization and the small open economy status give enough theoretical grounds for interpreting responses from innovations in the exchange rate to prices as a proof of the exchange rate channel.

In the context of our discussion we emphasize the following issues regarding the architecture of the MTM in Belarus: (i) the strong pass-through between exchange rate and prices and the role of money within this channel, (ii) relationships and causality among nominal exchange rate, real exchange rate<sup>2</sup> and inflation rate, which both characterize the exchange rate channel, (iii) the possibility of NBB to transmit the desired impulses to the interbank, deposit and loan rates, which will characterize the first step of transmission within the interest rate channel.

For the first issue we analyze impulse responses in unrestricted VAR of first differences of logged values of nominal exchange rate<sup>3</sup>, cumulative CPI and M1 stock based on quarterly data 1995q1-2007q2 (four lags). The results show that (1) there is a strong direct pass-through from the exchange rate to prices (response of dlcp1 to dlner), (2) besides the innovation in exchange rate influences M1 (dlm1 to dlner), which may demonstrate specific effect for a dollarized economy and has a further pass-through (weaker) to prices (dlcp1 to dlm1) (see Figure 1).

**Figure 1: Responses of prices, M1 and nominal exchange rate to correspondent shocks.**



Furthermore, VAR Granger causality tests show that the nominal exchange rate is the key cause variable for inflation and M1, while the exchange rate itself may be caused only by inflation. These results coincide with those in Horvath and Maino (2006) and stress the supreme role of the exchange rate channel in the Belarusian economy.

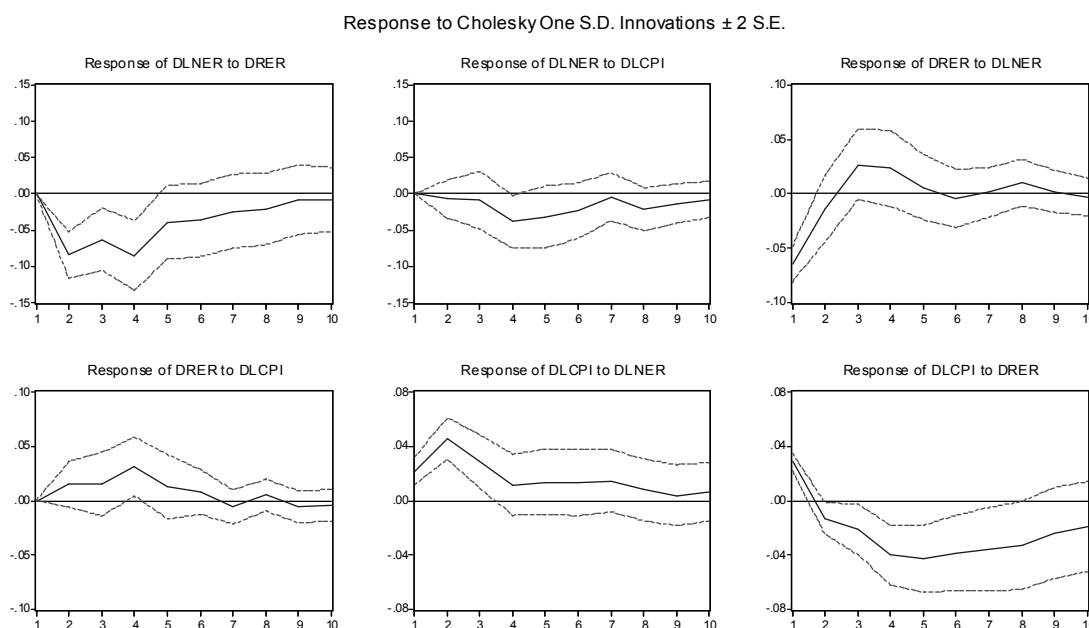
<sup>1</sup> As shown in Kruk (2005) there is no empirical support of the first step of transmission in interest rate channel, i.e. NBB rates cannot send statistically significant impulses to the deposit and credit market rates. Some relationships between declared level of the refinancing rate (not actual level) and market rates (on deposits and loans) are significant and NBB declared rate is a Granger cause for the market rates. But nevertheless these relationships are very weak and in our opinion are witnessing the direct measures that are connecting declared refinancing rate with deposit and loan rates.

<sup>2</sup> In regard to both the nominal exchange rate and real exchange rate we consider the bilateral rate vs. US dollar.

<sup>3</sup> Cumulative index.

Analyzing the relationship and causality among nominal exchange rate, real exchange rate and inflation we again consider an unrestricted VAR of the first differences of the correspondent logged variables (see Figure 2). This analysis shows significant responses of nominal exchange rate (real appreciation causes nominal appreciation) and inflation (real appreciation causes disinflation) to the shock in real exchange rate. Thus the adjusting mechanism runs as follows: real appreciation causes nominal appreciation, which in turn causes more substantial disinflation and thus enforcing the real exchange rate to the equilibrium level. Granger test in VAR shows that the real exchange rate is the Granger cause for changes in both nominal exchange rate and inflation. Analysis of this VAR does not say so much about the within economy impact of the exchange rate channel, but shows the causality of relationship where the real exchange rate is the leading one.

**Figure 2. Responses of nominal exchange rate, real exchange rate and prices to correspondent shocks.**



Thus, we can state that the external competitiveness might be of vital importance when governing the current level of nominal exchange rate.

In the context of discussion of NBB's ability to transmit its policy rates to the market level we consider in a third step an unrestricted VAR of following logged real quarterly interest rates: refinancing, interbank, on new loans and on new time deposits. Granger causality test does not give support to rejection of any hypothesis that any of these interest rates does not cause another one<sup>1</sup>.

Thus, we may state there is no clear proof of NBB abilities to transmit interest rates to the market.

Furthermore if using this VAR for an analysis of impulse responses, it demonstrates responses of other interest rates to the innovation in the interbank rate, while all the responses on the change in the real refinancing rate are insignificant.

### 3.2.2. Structural Model Methodology

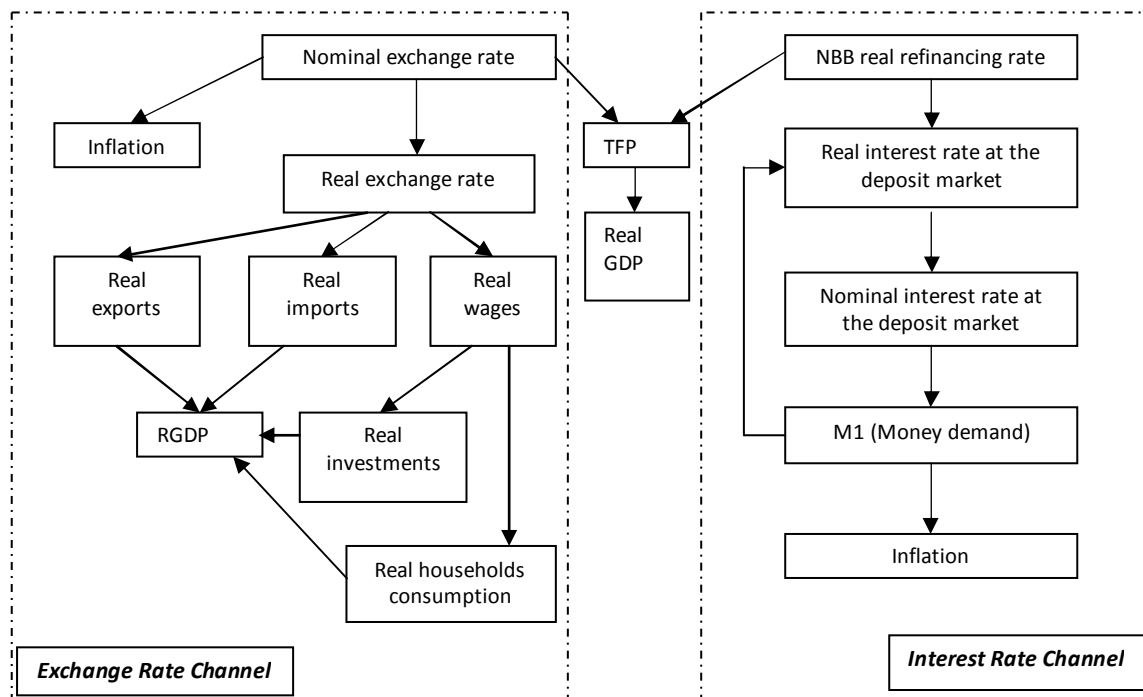
At the IPM Research Centre's quarterly model of the Belarusian economy, there are fewer structural relationships that are of interest in the context of MTM discussion. These relationships demonstrate the validity of the range of the MTM channels not only at a purely statistical level (as in the VAR approach), but at the theoretical level as well, i.e. they give us theoretical grounds for discuss-

<sup>1</sup> The result might have been worsened due to analyzing quarterly data which may be not an optimal frequency for the interest rates that are rather volatile within the quarter.

ing an individual MTM channel. Here we can change the causality a bit and say that while structural model supports the existence of one or the other channel, there are grounds for more thorough econometric research of this individual channel apart from the structural model.

The structural model includes two channels of monetary transmission: the exchange rate channel and the interest rate channel (see Figure 3).

**Figure 3. MTM channels in the structural macromodel in the Belarusian economy.**



The specifics of the Belarusian economy and some specific features of the modeling determine not fully a “benchmark” structure of the exchange rate channel. For instance, the relatively small scope of the model excludes a range of intermediary variables from it, and due to this we have got a very strong direct relationship between exchange rate and inflation. Nevertheless, other relationships of this channel mirror the causality in its influence on the real indicators (components of the aggregate demand and GDP). Furthermore this specification of the model allows including the interest rate channel in it. But nevertheless the pass-through effect from interest rates to prices is rather weak<sup>1</sup>, allowing the interest rate to be a weak predictor of the money demand only in the short-run relationship.

Two slightly different available specifications of the model demonstrate a changing nature of the MTM channels included. For instance, there is no evidence of the interest channel in the second specification of the model, while the role of the exchange rate channel is emphasized. Through this structural modeling gives enough grounds for exploring and estimating exchange rate channel, while the existence of the interest channel is still not evident.

Hence, both the VAR approach and the structural modeling approach emphasize the prominent role of the exchange rate channel for Belarus. Under this condition the shift to the new monetary policy regime should be very cautious and the high degree of the pass-through from the exchange rate to prices should be kept in mind.

<sup>1</sup> Moreover some assumptions in the model might lead to minor misspecification in the interest rate channel. For instance, the causality between NBB rate and market deposit rate was taken without preliminary testing.

But however there are theoretical and empirical grounds to suppose that the channels of monetary transmission will be changing due to the decision to change the monetary policy regime. In this sense, a NBB shift to IT itself may lead to more favorable monetary environment for this regime.

## **4. Monetary Policy Operations under Inflation Targeting Regime**

### **4.1. Goals of Central Bank when Shaping the Operational Framework under IT**

Previous analysis shows that shift to the IT regime is rather ambiguous step, as it might emphasize the problem of monetary policy goals mismatching. This problem might be more evident in application to the operational framework of the monetary policy. Implementing the IT regime means that central bank adopts its operational framework (chooses the prior monetary policy instrument) in a way that it has got a control under the key transmission channel.

As a rule the IT regime is carried out under the condition that there is a pass-through effect from the interest rate to the output and prices, i.e. that the interest rate channel (shaped in any form) may be treated as most powerful one<sup>1</sup>. For the first step of transmission it means that there is a powerful pass-through from the central bank's interest rate to the market interest rate. For the second step of transmission it means that economic agents rapidly and strongly react to the change just in the market interest rate. Hence the central bank should shape the operational framework in such a way that the base official rate (most often open market operations rate, OMO) should be transmitted to the economy as the average short-term market interest rate.

Market rate is derived from the market interactions of commercial banks. Governing their liquidity level they plan a definite volume of their operations during the short-term. While the central bank is the legal lender of last resort, these plans of the commercial banks are based as well on their expectations on the dynamics of the OMO and volumes of needed transactions with the central bank. The latter defines the expected probability of using the main refinancing operations and standing facilities. Both expected probability of using standing facilities and main operations and expected interest rates (OMO and standing facilities rate (SF)) by commercial banks influence market rate. Thus the task of the central bank may be presented as minimizing of gap between expected interest rate by banks and actual rate. The simplest measure to achieve this is predictable change of official interest rate for market agents that may take place only according to the schedule. From this point of view central bank should follow an implicit policy rule when defining its policy rate.

At the same time central bank faces much more crucial problem of predicting short-term liquidity fluctuations. In other words it's the same to predict liquidity flows governed by commercial banks and thus decreasing their expected probability of using standing facilities. If it is the case commercial banks will use just main operations at OMO rate for satisfying their liquidity needs and just this rate will be transmitted to the money market. Thus the key problem in making OMO liquidity smoothing rate and providing transmission of this policy rate to the money market is the ability of central bank to predict short-term liquidity vulnerability and minimize using of standing facilities.

### **4.2. Transmitting the Policy Rate to the Money Market**

#### **4.2.1. Predicting the Short-Term Liquidity Level**

The short-term money demand may be treated as almost absolutely inelastic. Through this unexpected increase in the short-term money demand by banks will push money market rate up to the

<sup>1</sup> It does not mean that other channels that are connected with change in official interest rate are invalid for a country, but means they are weaker than the interest rate channel. Furthermore, the IT regime can function alongside with the domination of assets price channels.

SF rate and vice versa. For the purpose of predicting liquidity central bank should thoroughly analyze other possible source of liquidity inflow or outflow. Based on the structure of the central bank balance sheet we can derive the following identity:

$$\begin{aligned} \text{excess (lack) of liquidity} = & \text{net foreign assets} + \text{net claims on government} + \\ & \text{claims on banks} + \text{other items (net)} - \text{cash (outside banks)} - \text{required or con-} \\ & \text{tractual reserves} - \text{desired (by commercial banks) level of free reserves} \end{aligned} \quad (1)^1$$

If central bank has enough information to anticipate flows in these balance items during the short-term then it can provide a consistent liquidity forecast and thus set the level of OMO that will smooth liquidity vulnerability and provide needed impact on money market rate and further on inflation. A part of these items are under the full control of the central bank per se, namely claims on banks (excluding standing facilities), other items (net) and required reserves. The problems in adequate forecast may be caused from unexpected change in: (i) demand for cash, (ii) demand for desired level of free reserves, (iii) net foreign assets, (iv) net claims on the government. Taking in mind very short-term of predicting liquidity and inelastic demand for money in it, the demand both for cash and non-cash money is usually determined by autonomous rather predictable factors. It may be, say, the days of tax payments or another seasonal factor. Much more of central bank concern are indicators connected with assets side of the balance that are not controlled directly by the central bank. First, under different from the floating exchange rate regime central bank's foreign assets are treated as the shock absorber in order to maintain the exchange rate target. Hence net foreign assets are vulnerable in this case, which determine correspondent liquidity in national currency flows. This or that extent of foreign reserves vulnerability are peculiar to all countries, while there almost no examples of pure floating exchange. But generally vulnerability of reserves is decreasing under the different exchange rate regimes, being the highest under the pegged rate and the lowest under the floating rate. Moreover the share of foreign reserves in central bank's assets also matters. If the country bases its currency issue much on foreign reserves then even imaging floating rate and relatively small inflow/outflow of reserves may inject/withdraw substantial in comparison to the monetary base excess liquidity.

Similar problems for liquidity projections may be caused by the unexpected changes in net claims on government. These net claims mirror both government bonds in the central bank's portfolio and deposits of the central government. As a rule governments place their deposits that are formed from the consolidated revenues in the central bank. A mismatch between consolidated income and expenditure caused by any reason then will influence actual money supply. In countries where governments have some seasonal factors in either incomes or expenditures or the government aimed at gaining some profits due to marinating temporary proficit the money market will face some seasonal inflow/outflow of liquidity.

Thus, we may argue that monetary environment should allow predicting short-term liquidity vulnerability in policy-making decisions, which will facilitate OMO (policy rate) to be the effective instrument under IT. At the same time vulnerabilities of foreign reserves and net claims on government may undermine this central bank's ability.

One more monetary policy instrument should be considered in the context of liquidity forecast, i.e. reserve requirements. Contemporary central banking practice assumes the mechanism of averaging the volume of required reserved during definite maintenance period. In the view of our discussion this possibility of averaging reserve does not suppose additional unpredictable liquidity flows, but just on the contrary means adoption of additional liquidity smoothing instrument. As a rule com-

<sup>1</sup> See Gray, Talbot (2006).

mercial banks use this instrument prior to the standing facilities for regulation relatively small liquidity deviations. In case of liquidity deficit a commercial bank can withdraw an available under the regulation part of required reserves for recovering the desirable level and vice versa. Hence this mechanism of forming required reserves reduce a bit the demand on standing facilities that enhancing the possibility of transmitting the OMO rate to the market. Nevertheless if the central bank's rate(s) are going to change during the reserves maintenance period then commercial banks will adjust their liquidity behavior in the direction opposite to the direction of expected change in the interest rate(s). If it is the case instead of enhancing of transmission the policy rate to the market rate, commercial banks will prevent such a transmission.

The simplest solution is preventing this mismatch between the maintenance of reserve requirements period and the period of the change in the policy rate. Thus the sittings of the body that is empowered to change the central bank's policy rate should be scheduled at the days of the end of one maintenance period and beginning of the next one.

#### **4.2.2. Setting the Policy Rates Corridor System**

Another possible option for transmitting policy rate towards the money market is narrowing the corridor between rates on standing facilities. As a rule SF rates (on overnight loans and deposit facilities) form the corridor in boundaries of which market rates are fluctuating. Most often it has the same spread between the OMO rate and upper and lower SF rates, which mirrors central bank's intention to proper regulation of liquidity with equal probability of using standing facilities in both directions. This corridor should create incentives for commercial bank to use OMO rate as their core rate, while the SF rates have got a "penalty" character. But at the same time a wide corridor will cause deviations of market rates from the OMO rate if unexpected liquidity movement shave occurred. Moreover in case of absence of averaging mechanism of reserves narrower corridor may facilitate to offset liquidity fluctuations. Through this some central banks pursue a tactic of extremely narrow corridor. For instance central banks of Australia, Canada and New Zeland (Gray, Talbot (2006)) all take this approach. Furthermore the Bank of England adopted since 2006 reserve averaging system together with a narrow interest rate corridor on the last day of maintenance period<sup>1</sup>. In general case there cannot be a common solution in regards to the variance of the corridor. It depends on the shape of other monetary policy instruments and monetary environment.

However, under the IT or transition to IT it is desirable that for any variance of the corridor it should reflect the "neutral liquidity orientations" by the central bank through treating OMO as the middle of the corridor with equal spreads to standing facilities in both directions.

#### **4.3. Improving the Monetary Policy Operational Framework in Belarus under the Transition to IT**

The architecture of liquidity regulation and monetary operational framework in Belarus may be treated as rather developed according to the international standards. It reflects the standard contemporary division of liquidity regulation instruments on standing facilities (overnight loans (for one day and within the day) and short-term deposit facilities and open market operations. The latter may be implemented through auction REPO operations (in practice mainly lombard auctions (either rate or volume auctions)) that may be treated as main refinancing operations, longer-term operations and fine-tuning operations on bilateral basis. Furthermore, the NBB has already implemented the mechanism of reserves averaging and there is conformity between the maintenance of

<sup>1</sup> See Gray, Talbot (2006).

reserve requirements period and the period of the change in the policy rate. However, despite almost perfect legal architecture it does not work in a perfect way.

The first drawback to be emphasized in using the liquidity regulation mechanism is the intensive using of standing facilities in absolute and in comparison with main refinancing operations as well. A number of reasons for this may be stressed. At the beginning it must be admitted that high liquidity vulnerability is connected with hesitations in the level of NBB net foreign assets. The inverse connection between the dynamics of net foreign assets and using standing facilities is more evident since 2006, when foreign assets became the key factor in base money growth. In overall it must mean that while significant part of base money is based on hard currency the adequate liquidity forecast and hence regulation is unlikely to be maintained. The possibilities of liquidity forecast in Belarus are worsened by another source of base money, net claims on government, due to the volatility of government deposits with the NBB. These two instruments formed the major part of base money dynamics during last years (see Table 1).

*Table 1. Contribution of Balance Factors in Growth of Base Money (in percentage points).*

	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Net foreign assets	18.6	34.1	46.2	11.4	112.2
Net claims on government	30.8	-18.8	5.3	-12.7	-80.0
Claims on commercial banks	6.8	13.8	10.6	20.0	3.1
Other net assets	-6.8	10.9	3.1	-1.8	-11.3
Base money	49.9	41.9	73.7	19.8	38.4

*Source: Own calculations basing on the NBB data.*

This relationship is rather objective and demonstrates on the operational level the challenges for implementing Belarusian IT in Section 2, i.e. dollarization, openness of economy and transition agenda. The composition of base money reflects the external environment of the monetary policy. So this problem that causes inability to provide a short-term forecast of liquidity and thus to transmit policy rate to the market cannot be treated on the level of operational framework. If the monetary policy environment will change, e.g. just due to the decision to shift to IT as described in Section 2, it will influence correspondent changes in base money and the problem will be mitigated.

However two more issues should be mentioned in the context of the Belarusian operational framework. First, it is prevailing volume of providing liquidity operations in comparison to absorbing ones. As shown above effective offsetting policy assumes the equal probability of using both directions of instruments of standing facilities. Hence a proportion with loans dominating over the deposits demonstrates "liquidity limitation" policy of the NBB. It means that for the NBB the situation of liquidity deficit is more favorable rather than its excess, because in the last case it will have to incur losses and provide real financing for the excessive liquidity. Besides the structure of the interest rate corridor maintained is not optimal in our opinion. There is no actual gap between the OMO rate and rate on overnight loans that belongs to the standing facilities. At the same time there is significant corridor between OMO and deposit rate, but which is unstable both in nominal and real terms. Partially such a structure may be useful for forming desired flat yield curve and/or transmitting the desired rate to the money market by narrowing the interest rate corridor from the upper side. But as described in 4.2.2, such approach is only possible under already predictable liquidity flows; otherwise OMO interest rate is under the risk of losing its anchor meaning for market agents at all.

Thus, when the decision for shifting to IT has been made, we propose a shift to the corridor where the OMO rate will be the average one with equal spreads between both SF rates. The variance of this corridor should depend on the ability of the NBB to predict liquidity level during the current time period.

Second, the low economic meaning of the official refinancing rate for the Belarusian market should be emphasized. Today there is no clear economic meaning of the official refinancing rate and no NBB operation is directly connected with rate. Furthermore spreads between rates on NBB operations and refinancing rate are also vulnerable both in nominal and real terms. Today, the refinancing rate is mainly an indicative parameter of the interest rate that has been connected through directive measures with deposit and credit market rates.

We suppose that while shifting to IT there should be a clear informative indicator of interest rate (either it will be treated as an operational tool or the shock absorber during intermediary period) that should be the average of the corridor. Thus, we suppose that the refinancing rate should reflect the actual main OMO rate of the NBB and its change should be made on the scheduled basis on the end day of the reserve maintenance period.

## 5. Approaches to Implementing Inflation Targeting in Belarus

Taken in mind mentioned above we must state that “classic” IT regime is not worthwhile for Belarus at least at the initial stages<sup>1</sup>, while at the same time the high vulnerability of exchange rate should be prevented and the reliable forecast should be provided. Through this for shaping the strategic issues we initially will choose the possible and most proper for Belarus design (the relationships of targets and operational tools) of monetary policy during first steps towards the IT regime.

Referring to the international experience regarding countries with dollarized and/or open economy in addition to “classic” design of IT regime some researchers point out few more strategies of monetary policy that in higher or less extent deal with IT (see Table 2).

Table 2. Alternative Monetary Policy Designs

	Full-Fledged Inflation Targeting (FFIT)	Intermediate Inflation Targeting (IIT)	Fear of Floating Competitiveness Targeting (FFCT)
Primary final target	Inflation	Inflation	Competitiveness
Secondary final target	Competitiveness	Competitiveness	Inflation
Operational target	Interest rate	Monetary aggregate	Rate of crawl
Primary shock absorber	Exchange rate	Interest rate	Foreign assets
Secondary shock absorber	Foreign assets	Exchange rate/Foreign assets	Interest rate

Source: Leiderman et al (2006)

In the FFCT case and partially in the IIT case there is a possibility of preventing high vulnerability of external competitiveness that is severe under the condition of open economy. Moreover focus on these regimes coincides with potentially high pass-through effect of exchange rate (FFCT in a great-

<sup>1</sup> This conclusion is much in depending on the time of shifting to the IT regime. The program “Banking Sector Development in 2006-2010” foresees this shift during the last years of this period without fixing more narrow time interval. But nevertheless its doubtful that all the factors mentioned – dollarisation, openness of economy and transitional context – may alter its impact in predicable future before implementing the IT regime.

er extent, IIT in lower extent). Argues against these designs may be as follows. First, it does not fully coincide with IT definition when inflation is treated as the only and dominant ultimate goal. Second, it may weaken the “automatic” character of the monetary policy and thus its transparency and public support. But the impact of dollarization and high importance of external competitiveness are much more crucial for Belarus. Furthermore, absolutely “automatic” monetary policy loses a part of its potential of absorbing and preventing shocks.

Thus, in our opinion, at the first stages of IT regime the choice should be made between FFCT and IIT (i.e. IT lite). The experience of majority countries shows that the direct shift to IT is rather risky and they used initial step to IT lite and accepting FFIT only after that (Stone (2002), Stone, Bhundia (2004)). Initial choice should be done in favor of FFCT, while it includes the importance of exchange rate in more suitable for Belarus manner. If this policy becomes a factor of more stable economic agents’ behavior and the rate of dollarization as well the exchange rate pass-through effect decline, a further shift to IIT is possible. However, this shift has to be made in a gradual manner because of the factors mentioned, which also govern its speed. In case adverse shocks do not allow a quick transition towards full IT, the time period for reaching it needs to be extended and used for the establishment of the necessary requirements.

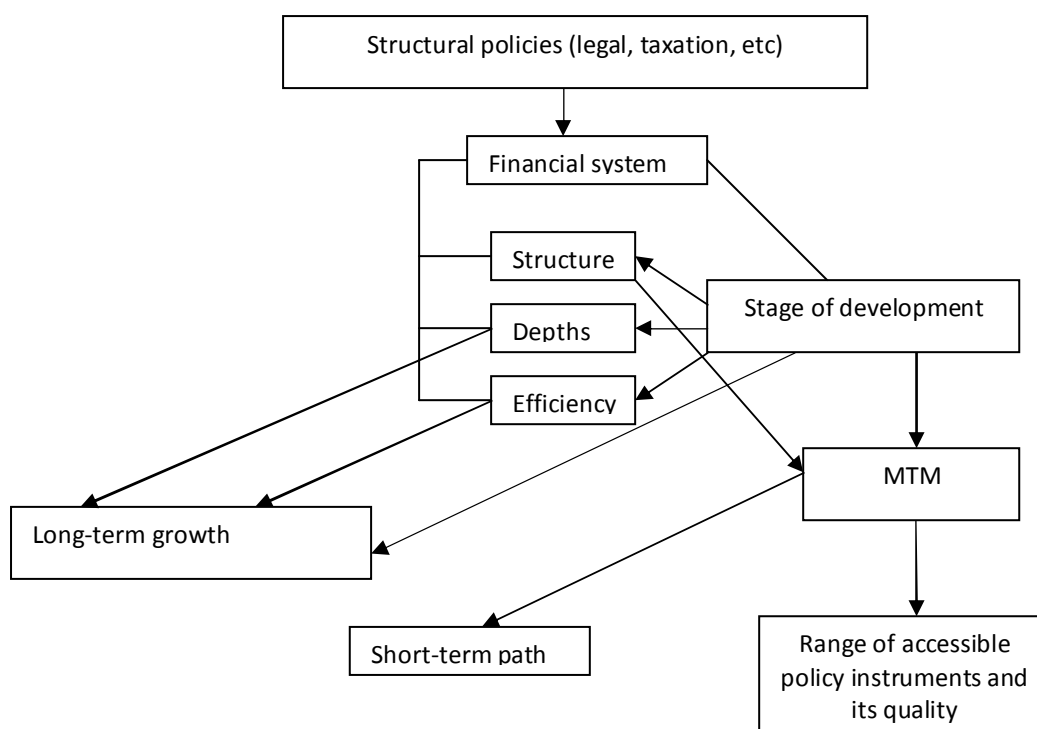
## **6. Impact of Switching to IT in a Long-Term**

There is a wide theoretical consensus that providing low and stable inflation is the best contribution by the central bank to the long-term growth. While economic agents have got expectations of low and stable inflation, their behavior is not distorted and the economy is reaching its growth potential *ceteris paribus*. Emperically it has been shown by Fischer (1996) that the inflation of 1% to 3% is ideal for a long-run growth. Moreover, Sarel (1996) has shown that the relationship between inflation and growth turns from negative to positive below around 8% of inflation.

Initial idea of IT is taking commitment by central bank of maintaining inflation under the explicit level. Recognizing that monetary policy has got a forward-looking character, it commits to react on deviation of the either current actual inflation rate or forecasted inflation rate witing the time-horizon from the target level by means of its main instrument. Policy interest rate as rule is viewed as such an instrument. Because of this commitment (ia the IT is accepted as credible by the economic agents) central bank enhance more certainty to the economic agents. Hence their expectations and consequently their behaviour is concordant with the policy of the central bank.

But in our opinion providing a low and stable inflation might not be the only channel of facilitating to growth by means of IT adoption. There is a plenty of studies dealing with relationship of finance and growth (literature review of these studies can be seen for instance in Kruk (2006), Eschenbach (2004), Thiel (2001)). Despite different approaches to the theoretical relationship between finance and growth (bank-based view, market-based view, financial services view, law-based view) a partial consensus may be formulated as follows: deeper, healthier and more efficient financial system is more beneficial for long-term growth. Relationship between structural policies, financial system and its impact on the real dynamics of the economy may be presented as follows (see Figure 4).

Figure 4: Relationships between financial system and economic development.



Adopting new regime of monetary policy may be considered as a measure of a structural policy, while it assumes to implement a range of new incentives for economic agents, including financial intermediaries. Hence, besides providing low and stable inflation in case of successful IT, the regime itself may influence financial system creating preconditions for widening of its depth and increasing efficiency.

Levine (2002) has stressed the following most basic channels of how the financial system can promote economic growth.

1. Assessing potential investment opportunities and thus exerting corporate control.
2. Enhancing liquidity and easing savings mobilization
3. Facilitating risk management and thus reducing risks in the economy.

In projection to the bank-based view this general classification may be broadened a bit as follows: (i) acquiring information about firms and managers and thereby improving capital allocation and corporate governance; (ii) mobilizing capital and thereby exploiting economies of scale; (iii) managing cross-sectional, intertemporal and liquidity risks and thereby enhancing investment efficiency economic growth. In application to growth theory these channels of growth are usually associated with capital productivity (in AK-models) or with total factor productivity in models with few production factors. In Kruk (2006) it shown that for transitional economies these channels may be encompassed by two more channels: (i) implementing new management and practices to the financial intermediation and thus raising competitiveness and reducing losses of financial system; (ii) implementing cost-reducing technologies to the financial system and thus reducing losses of financial system. These two latter channels are usually connected with the loss ratio in a growth theory.

In Kruk (2006) it is shown that the role of the Belarusian financial system as a growth propagator is extremely low. A range of distortions in the work the mentioned channels is the key reason for this underperforming of the Belarusian financial system. Within the theory of finance and growth (us-

ing the categories by King and Levine (1993 b)) these distortions for the financial system of the transition economy may be revealed as follows (Kruk (2006)).

1. Low quality of the entrepreneurs pool and low probability of innovations. Entrepreneurs compete to each other by means of price, quality and volume of labour and capital, which form competitive advantages herewith. Hence their interest in the innovations and exerting corporate control might be rather low. Furthermore on this stage a situation of soft budget constraints often take place, which also undermines the quality of the entrepreneurs pool and the intention to innovations.
2. Distortions in banks' screening and selecting proper projects behavior. In case of low quality of entrepreneurs pool banks may be reluctant to screening procedures, while it requires excessive resources. Furthermore on this stage influence of government may be rather substantial and through this a significant part of the resources may be allocated under the government's priorities, which undermines selection incentives for banks and thus leads to inefficient allocation of resources. Furthermore this situation may be strengthened if the government has a significant share in the banking system, which is a case in a range of transitions on this stage, and influence the allocation of resources (creating soft budget constraints regime) directly.
3. Different access to capital by different entrepreneurs. This fact is consequent to the previous one and soft budget constraints. Furthermore even if the latter problem is mitigated, then banking system being the only substantial financial intermediary has incentives to exploit the economy on scale through focusing on the relatively big enterprises, being reluctant to crediting SME due to larger overhead costs per unit of credit.
4. Low level of competition in the financial sector. While the banking system in transition countries initially derives from the state banks in directive economy, the banking system might be monopolized by these banks especially on early stages. Furthermore if keeping this environment and maintaining state monopoly in the banking system, other sources (for instance foreign capital) of capital are limited, as potential investors cannot invest in state banks, while foundation of new intermediaries may be too costly in this environment without possibilities for competition with large state banks, due to the state policy.
5. Limited possibilities of attracting liabilities and in provision liquidity. On the one hand there is almost no alternatives for savings rather than bank deposits, but nevertheless some difficulties might take place, for instance due to the generally low demand for national currency and thus preference of holding savings in foreign currency outside banking system. Moreover as discussed above there may be obstacles for increasing the capitalization of the banking system on the first stage. This stylized fact is not constant during the period. Initially the deficit in liquidity required may be not so meaningful, but when being closer to the second stage of the development path this problem might strengthen.
6. Low level of intertemporal risk management. While the entrepreneurs are in major competing to each other due to the production factors, the incentives for innovations and longer term projects is relatively low. Hence the banking system executes the function of provision liquidity, but mainly making the loans short-termed. Thus financial system avoid intertemporal risk management, which undermines the channel of growth connected with risk sharing in the economy.

As shown in Kirchner, Kruk (2007) successful and credible IT assumes establishment of a number of macroeconomic and financial preconditions, external and financial sector stability. These include

five pillars: absence of other nominal anchors, an institutional commitment to price stability, absence of fiscal dominance, policy instrument independence, policy transparency and accountability (Mishkin, Schmidt-Hebbel (2001)). These institutional preconditions cover the distortions connected with different access to capital by different financial intermediaries; enhance proper screening procedures, risk-management and competition in the financial sector. So if these requirements are met<sup>1</sup> we may argue that adoption of IT will have a favourable effect on the depth and efficiency of the Belarusian system and hence will contribute to the perspectives of the long-term growth. This hypothesis might be one of the major arguments in favour of inflation targeting

Testing this hypothesis is the direction for further research. It could be done in two ways. First, through treating the monetary policy regime as a special institutional dummy variable through the methodology of political economy of growth (Chubrik (2002)). Moreover, while major channels of monetary policy regime impact on growth are connected with technological progress, i.e. total factor productivity, this component could be pointed out through estimation of the production function. The next step is the estimation of total factor productivity using monetary policy regime as an explanatory variable. This approach is likely to be used with panel data on a range of countries with different monetary policy regime.

Second approach assumes estimating the significance of the financial system to growth before adopting IT regime and after it. Separating total factor productivity and testing impact on it by the financial system before and after the adoption of IT regime is also viable here. Such an approach will give grounds in favour or against the hypothesis that IT regime makes financial system deeper and more efficient. Alongside a number of methodological requirements should also be considered<sup>2</sup>.

## 7. Conclusions and Directions for Further Research

In this paper we have stressed a number of challenges for the adoption of IT in Belarus. Main obstacles are dollarization, openness of the economy and transition context. Assessment of the existing channels of monetary policy transmission also shows a substantial role of the exchange rate channel for Belarus. Hence revolutionary adoption of IT regime may undermine financial stability due to balance sheet effect and banks run. Thus in our opinion the optimal way for Belarus is gradual shift to IT, using intermediary forms of IT Lite (FFCT and IIT). Furthermore we stress a number of requirements at the operational level of monetary policy for successful exploit of IT regime. Taking all these in mind we suggest our vision of IT regime parameters for Belarus. However, we suppose that today's knowledge about IT regime may not include its possible favourable impact of the long-term growth, which is the core of the economic development. In this paper we propose a number of theoretical arguments in favour of this vision. We argue that besides providing a low and stable level of inflation IT regime could also enhance positive incentives for the financial system and it, in turn, may play a role of the growth propagator. We propose a methodology of testing this hypothesis, which is the goal for the further research.

<sup>1</sup> It might be a case in Belarus, while a number of similar measures has been foreseen by "Program of Banking Sector Development in the Belarusian Economy for 2006-2010"

<sup>2</sup> Taking into account methodological discussion on making such research (Pelipas, Chubrik (2007), De Haan, Lundstrom and Sturm (2005)) the methodology of modelling this relationship should include analysis of the order of integration of the data and the model should exploit data with the same order of integration. Furthermore, for avoiding using both levels and differences in one equation, it might be more reasonable to use the real GDP per capita in a left side rather than GDP growth rate (Pelipas, Chubrik (2007)).

## References

- Bernanke, Mishkin (1997) Inflation Targeting: a New Framework for Monetary Policy? NBER WP No.5893.
- Bogetic, Mladenovic (2006) Inflation and the Monetary Transmission Mechanism in Belarus, 1996-2001, International Research Journal of Finance and Economics, Issue 1 (2006).
- Chubrik A (2002), Return to scale of the production function and total factor productivity: example of Poland and Belarus, *Ecowest*, 2, 252-275 (in Russian).
- Daianu, Lungu (2005), Inflation Targeting, Between Rhetoric and Reality. The Case of Transition Economies, William Davidson Institute WP No.743.
- Eschenbach F. (2004), Finance and Growth: A Survey of the Theoretical and Empirical Literature, Tinbergen Institute Discussion Paper No. 039/2.
- European Central Bank (2004) The Monetary Policy of the ECB
- Fischer (1996) Why Are Central Banks Pursuing Long-Run Price Stability? paper presented at the Federal Reserve Bank of Kansas City Symposium "Achieving Price Stability".
- Gali, Manacelli (2002), Monetary Policy and Exchange Rate Volatility in a Small Open Economy, NBER WP No. 8905.
- Ganev G., Molnar K., Rybinski K., Wozniak P. (2002), Transmission mechanisms of monetary policy in Central and Eastern Europe, CASE report No. 52.
- Gray, Talbot (2006) Monetary Operations, Bank of England, Handbook in Central Banking No.24.
- Horvath, Maino (2006) Monetary Transmission Mechanisms in Belarus, IMF WP/06/246.
- Jonas, Mishkin (2003), Inflation Targeting in Transition Countries: Experience and Prospects, NBER WP No. 9667.
- Kalaur P., Komkov V., Chernookiy V. (2005), The mechanism of transmission of monetary policy in the economy of Belarus, *Belarusian Economic Journal*, 3 (in Russian).
- King R., Levine R. (1993 a), Finance and growth: Schumpeter might be right, *The Quarterly Journal of Economics*, 108, 717-737.
- King R., Levine R., (1993 b), Finance, entrepreneurship, and growth: theory and evidence. *Journal of Monetary Economics*, 32, 513-542.
- Kirchner, Kruk (2007) Adopting Inflation Targeting: Overview of Preconditions and Institutional Requirement, IPM Research Centre PP/07/06.
- Kruk (2005) The Channels of Monetary Transmission in Belarus, mimeo.
- Kruk (2006) How Can Financial System Spur Growth in Transition Countries? ICEGEC Working paper №32
- Leiderman, Maino, Parrado (2006). Inflation Targeting in Dollarized Economies, IMF WP 06/157.
- Levine R. (2002), Bank-based or market-based financial systems: which is better, *Journal of Financial Intermediation* 11, 398-428
- Libich (2008), An Explicit Inflation Target as a Commitment Device, *Journal of Macroeconomics*, V-30, 43-68.
- Mishkin (2000) Inflation Targeting in Emerging Market Countries, NBER WP No.7618
- Mishkin, Schmidt-Hebbel (2001), One Decade of Inflation Targeting in the World: What Do We Know and What Do We Need to Know? NBER WP No.8397.
- Pelipas, Chubrik (2007) Market Reforms and Economic Growth in Postsocialist Countries: Results of the Empirical Analysis, IPM Research Centre WP/07/01 (In Russian).
- Sarel (1996) Nonlinear Effects of Inflation on Economic Growth, *IMF Staff Papers*, V-43, 199-215.
- Stone (2002), Inflation Targeting Lite, IMF WP/03/12.
- Stone, Bhundia (2004), A New Taxonomy of Monetary Regimes, IMF WP/04/191.
- Svensson (1997) Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets, *European Economic Review*, V-41, 1111-1146.
- Svensson (1998), Open Economy Inflation Targeting, NBER WP No.6545.
- Thiel M. (2001), Finance and economic growth – a review of theory and available evidence, Commission of the EC, European Economy – Economic Papers, No. 158.
- Trew (2004), Endogenous growth and welfare with asymmetric information in financial intermediation, University of Warwick, MSc Dissertation in Economics.