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Reserve Requirements as Implicit Taxation of Commercial Banks

Igor Eromenko

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Abstract

Reserve requirements is viewed as very important instrument of the monetary policy, with the help of which Central Bank can influence at money supply and credit creation. At the same time this instrument imposes implicit tax on financial institutions, which are subject to this regulation. Reserve requirements in Ukraine stay at quite high level and the topic of this paper is analysis of such implicit taxation, its impact on economy and possible path of reforms in Ukraine. We argue that faced with high reserve requirements and, as a consequence, diminishing revenues, commercial banks will try to pass as much costs as they can to their clients, widening interest rate spread. Eventual effect of high reserve requirements would be lower deposit rate, higher loan rate, less intermediation and aggregate investment that finally can lead to drop in output. In this paper we develop formal model of implicit taxation and provide empirical analysis, roughly estimating cost of reserve requirements for Ukrainian banking sector, which comes to almost 1 UAH bn per year. Further, we discuss policy issues and possibility of reducing reserve requirements and come to the conclusion that in Ukraine gradual decrease of required reserves is possible and indeed needed.

JEL Classification Numbers: C60; E52; E58; G28

Keywords: monetary policy; instruments of central bank; reserve requirements; model of banking sector; Ukraine

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1. Introduction

Monetary policy, in line with fiscal one is viewed as the major determinant of the sustainable economic development in any country. Success of this policy depends on the choice of long-run time consistent strategy, as well as on particular ways of how it is transmitted to the economic agents, i.e. on the so-called instruments of the monetary policy.

Traditionally, there are three instruments of the Central Bank recognized: discount window, open market operations and reserve requirements. Facing specific conditions of the economy, Central Bank chooses one or another instruments or a combination of them, with which it can influence at the money market and than further at the stance of whole economy. In the process of this decision, Central Bank will in some cases tend to maximize its utility by choosing such way of conducting monetary policy, which can bring fast and easy-to-see results. Although they can be not favorable for economic growth in the long run, Central Bank will be less concerned about it, trying to comply with present wants of the government, despite that they can be time inconsistent.

In other words, we can say that actually in this issue there are two sides of the medal: From one side, Central Bank chooses monetary instrument in accordance to how well it can implement its policy through it. From the other side, this choice can have its further impact on the economy, which in fact is not always anticipated or desirable.

In this paper we will talk about one such aspect: reserve requirements as the instrument of the monetary policy and its implicit impact on the private sector, particularly its function as implicit tax on the banking sector. Historically, reserve requirements were viewed as the core of the monetary policy, but later its role significantly diminished. The main driving forces behind these changes were availability of the new, more efficient instruments of the monetary policy and the fact that reserve requirements put additional costs at the banking sector, lowering its profit and level of intermediation. Eventually, as was confirmed by empirical analyses, it can result in the diminishing investment and thus, drop in the production. In this research we will provide theoretical model of the implicit taxation of commercial banks by reserve requirements and further will concentrate on the use of this instrument in Ukraine, estimating implicit taxation and proposing some measures, which can possibly improve the situation.

The paper will go as following: In Chapter 2 we will talk about such theoretical issues of reserve requirements as their functions and methods of implementing monetary policy with this instrument. The role of reserve requirements, their pro's and contra's and major reasons of world-wide diminishing use of reserve requirements as the instrument of Central Banks will be discussed in Chapter 3. Chapter 4 will develop formal model of the impact of reserve requirements on the private sector, emphasizing on the role of reserves as implicit tax on the banking sector. Chapter 5 will talk about reserve requirements in Ukraine, whether they are use is optimal and possible ways of reforms. Finally, in Chapter 6 we will summarize the main findings of the paper.

2. Theory of reserve requirements

2.1. Functions of reserve requirements

In many countries commercial banks are obliged to comply with reserve requirements: i.e. to hold certain fraction of their deposit liabilities at the account in the Central Bank or as the vault cash.

There are four major functions of this instrument, importance of which was changing over time, as financial intermediation and methods of conducting monetary policy were developing too.

Initially, reserve requirements were meant to ensure financial stability and reduce negative effects of bank runs. Holding certain amount of its deposits as reserves, commercial banks would be less exposed to the liquidity problems, caused by panic among depositors; besides that, reserve requirements can also serve as a kind of insurance fund in case of bank insolvency. Later on, importance of both of these tasks considerably diminished: open market operations were used much effectively for maintaining liquidity of the banking sector, while specially created deposit insurance funds undertook the role of the other task.

Second, reserve requirements are used to control bank credit creation. That is, if Central Bank aims to reduce the volume of credits that banks give to the economic agents, it can achieve so by increasing reserve requirements, thus limiting funds, available for the intermediation; vice versa, lowering reserve rate can cause credit expansion. Although using this instrument for credit control is a very powerful tool, it may be too powerful and slow. More of it, in countries with developed financial system, imposing reserve requirements on banks may put later in disadvantage with other financial institutions that also give credits, but are not subject to such regulations.

Third function of the reserve requirements is control over money supply. Reserve requirements are important component of money multiplier and changing reserve ratio can pass through multiplier mechanism to affect broader money aggregates. Using reserve requirements for changing money supply is used relatively heavily in transition countries, where other instruments of the monetary policy are not always available.

Finally, holding reserve requirements can reduce interest rate volatility. The point is that commercial banks are obliged to hold reserves not on the day-to-day basis, but averaging over certain period. Manager of the commercial bank, facing hikes and downs in the money market interest rates, can either withdraw funds from reserve account and put them into the money market, thus making a profit or put them back into reserve account, thus complying with requirements. In such way, the flow of funds becomes smoother, reducing volatility in the money market interest rate.

2.2. Mechanism of the monetary policy with reserve requirements

Central Bank, conducting monetary policy via reserve requirements can introduce changes via three basic ways: the level of reserve ratio, the base of requirements (i.e. the types of liabilities, at which reserve requirements are imposed) and the method and period of reserve requirements calculation and placement. Below, we represent these ways in more details:

2.2.1. The level of reserve requirements

The mechanism of this tool is quite straightforward: changing the ratio of the reserves to deposits, Central Bank determines the level of liquid funds, available for financial intermediaries, and thus the level of money supply. This mechanism is the most powerful and can be used for control over money supply as well as credit creation.

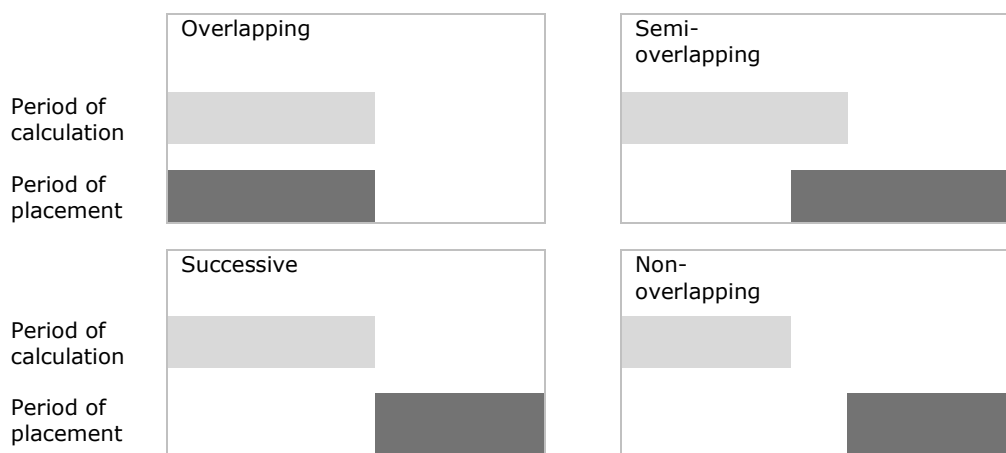
2.2.2. The base of reserves

Here, the Central Bank differentiates the rate of reserves, according to: specific type of liability in the balance sheets, whether deposits are short term or long term, denominated in national or foreign currency. Changes in base of reserves are meant not as much for external alterations in the money supply, but more for structural adjustment within reserves.

2.2.3. The method and period of reserve requirements calculation and placement

Complying with reserve requirements, commercial banks have to hold a fraction of deposits according to calculated amount and the period of required reserves calculation and actual placement of funds into Central Bank account can differ. There are four principal methods of reserve calculation and placement: overlapping, semi-overlapping, successive and non-overlapping (see Table 1).

Table 1. Methods of required reserves calculation and placement



Source: National Bank of Hungary

The larger lag between period of calculation and placement, the more freedom commercial banks have in planning their liquidity management, but at the same time changes in the reserve requirements will take longer time to be transmitted, so the Central Bank will have less flexibility while conducting monetary policy.

Besides that, Central Bank can affect banks' liquidity by changing the very size of period, within which commercial banks have to meet reserve requirements. In doing so, it can set this period from one day to month or more. Such, when economy experiences inflationary pressure, Central Bank may want to have tight control over money supply, then it can oblige banks to comply with reserve requirements on the daily basis; if monetary easing is desired, commercial banks can be allowed to meet reserves requirements on the average of the longer period.

3. The role of reserve requirements nowadays

The next question, which we would like to consider, is what the role of reserve requirements in the modern monetary policy. Traditionally, in many ways it has been a key instrument of the Central Banks and they tended to rely on it heavily, determining the money supply or credit creation. Lately, especially during last decade, the role of the reserve requirements considerably diminished. Table 2 presents legal reserve requirements in several selected countries.

Table2. Legal reserve requirements, %

United States	3.0-10.0
Canada	0.0
EU	0.0-2.0
UK	0.35
Switzerland	0.0
Japan	0.05-1.2
New Zealand	0.0
Czech Republic	2.0
Poland	4.5
Hungary	6.0
Moldova	8.0
Bulgaria	11.0
Russia	7.0-10.0
Ukraine	9.0-15.0

Source: Central Banks of according countries

Such countries, as Canada, UK, Switzerland, New Zealand draw their reserve requirements to zero, United States consider this measure as well; European Central Bank sets it at pretty low level – from 0% to 2% of deposits and this ratio has to be adopted by members of EU as well as by candidate countries in CEE region; many other countries tend to decrease reserve ratio as well.

Moreover, members of European System of Central Banks and some other accessing countries (Hungary for example) pay interest rate on the holdings of reserve requirements over maintenance period (see Box 1).

Box 1. Calculation of the remuneration of holding of required reserves in European System of Central Banks

The holdings of required reserves is remunerated according to the following formula:

$$R_t = \frac{RR_t \cdot n_t \cdot \sum_{i=1}^n \frac{MR_i}{n_t \cdot 100}}{360}$$

Where:

R_t = remuneration to be paid on holdings of required reserves for the maintenance period t

RR_t = holdings of required reserves for the maintenance period t

n_t = number of calendar days in the maintenance period t

i = i th calendar day of the maintenance period t

MR_i = marginal interest rate of the most recent main refinancing operations spanning calendar day i

Source: European Central Bank

In order to explain the rationale behind these changes, let's first consider what benefits and costs for the economy reserve requirements have.

The main advantages of reserve requirements are following:

- It is easy to implement and does not require sophisticated structure of financial market; actually it was important driving force behind widespread use of this instrument in transition economies.
- Alterations in reserve requirements have very powerful effect and usually just a tiny change is required.
- Reserve requirements can be a source of funds for the public sector of economy.

Disadvantages:

- a) The benefit of using reserve requirements can in fact turn into the cost: as we stated above, small changes have very large effect on money supply, but this effect can be (and often actually is) too big comparing to the target. Thus, the reserve requirements should be used just in cases when considerable changes in the money stock

are needed and definitely do not suit for fine-tuning of the monetary policy.

- b) Frequent changes in reserve requirement may cause higher uncertainty for banks and their liquidity management will be embarrassed;
- c) Imposing reserve requirements at the level, higher than commercial banks tend to hold naturally, is in fact an implicit taxation of these financial institutions. That is, obliged to hold high reserve requirements, banks will have less liquidity and fewer opportunities to lend that will likely diminish banks profit.
- d) Suffering from high reserve requirements, commercial banks will try to pass as much costs as they can on their clients. Since agents of public sector usually have other sources of funding, the costs will be passed to the private sector, in first turn to small borrowers and households. Commercial banks will try to make up their diminishing profits by widening the spread of interest rates, lowering deposit rate and increasing loan rate, at that, the level of intermediation will decrease and eventually this may have negative effect for the performance of whole economy. In fact, reserve requirements will transfer income from private sector to public sector.
- e) Obliging commercial banks to comply with reserve requirements can actually discriminate them against 1) other financial institutions in the country, which do not have to meet this regulation and 2) financial intermediaries in other countries, where such regulations are lower.
- f) As financial institutions develop further and use new modern financial instruments, they tend to have more possibilities for reserve avoidance, either transforming deposits, which are subject to reserve requirements into other forms of liabilities or holding funds in foreign branches, where reserve ratio is less. Thus, the effectiveness of reserve requirements diminishes.

Summarizing and taking to the account experience of Central Banks, we can determine two major reasons of why reserve requirements became less in use:

First of all, it was caused by development of the monetary policy mechanism. Reserve requirements might be good for conducting policy in transition countries, where approximate changes can be accepted, but it is not recommended for accurate influence at the economy. Hence, Central Banks tend to rely now on other instruments, at the first place on open market operations.

Second, very important motive, is the fact that reserve requirements put substantial costs on the banking sector and further, these costs are transmitted to the rest of the economy, resulting in welfare losses of the private sector.

While first reason was necessary condition for changing use of the reserve requirements (i.e. without other developed monetary instruments, at the first place open market operations, it would not be possible to diminish role

of reserve requirements), the second issue, cost for the private sector, in many ways was the driving force for such reforms.

Our paper is aimed at the analysis of this topic and in the next section we will develop formal model of the reserve requirements as the implicit tax on commercial banks and its impact on private sector.

4. Impact of reserve requirements on private sector

4.1. Literature review

In this section we would like to overview some papers, which talk about cost side of reserve requirements.

Kuprianov (1997) discusses explicit and implicit taxes on financial system and makes stress on the reserve requirements as implicit tax. First, he builds theoretical model where the cost for the banks of complying with reserve requirements is shown; at that, the distinction between small and big banks is made. Then, the author continues analysis by looking at how these costs are transmitted to the clients of the banks. The second part of the paper is devoted to empirical test of the model for the U.S. data. Concluding, Kuprianov argues that although required reserves were diminishing in U.S. (both due to administrative decrease in the reserve rate and avoidance from banks) and it had its positive effect for intermediation, the further reforms and easing of requirements are needed.

Repullo (1992) talks about such ways of financing budget deficits, as seigniorage and implicit taxation, developing a model of financial sector and estimating implicit tax for Portugal and Spain. The analyses are done for the period of political instability and increased budget expenditures in late 1970's – early 1980's. Author shows that although financing budget deficit by seigniorage and simultaneously increasing reserve requirements helped government at the moment, it had quite straight negative consequence for the banking sector and further, for the private sector. Moreover, high reserve requirements put banks of those countries in disadvantage with other countries, first of all EU.

Loungani and Rush (1995) study the effect of changes in reserve requirements on investment and GNP. They argue that facing higher reserve requirements, not only the profitability of commercial banks will go down, but the level of intermediation will decrease as well. Further, it will have negative impact on real activity, particularly on aggregate investment. Eventually, high reserve requirements will result in drop of production in economy. After building formal model, they conduct empirical analysis for United States.

Although these authors talk about reserve requirements as implicit tax for financial system, their discussion is mixed with other economic issues, and the models are not designed specifically to show the effect of reserves. In our paper we are intended to build the model, which would explicitly show

the mechanism of reserve requirements impact on the intermediation and its further consequence on the private sector.

4.2. A model of the banking sector

Let's consider a simple partial equilibrium model with four agents of economy: commercial banks, Central Bank, households and firms. The characteristics of agents are following:

(i) Central Bank is a main regulating body of the monetary policy. It can affect cost of funds, using several instruments, usually a mixture of them. In this model we concentrate on the reserve requirements and introduce government bonds, keeping other instruments fixed.

(ii) Commercial banks are monopolies that set interest rates on deposits and credits. Their function is to collect deposits from the population and allocate them as credits to the real economy. There is only one kind of deposit and one kind of loan and banks meet entire market for them. Besides that, commercial banks hold government bonds, which we denote as BB here. Finally, banks have to comply with reserve requirements, keeping the share of deposits ρ at the Central Bank. Thus, the balance sheet of the representative bank is following:

$$L + BB + RR = D + E \quad (1)$$

where L represents loans, BB - government bonds, RR is a part of deposits, which is hold to comply with reserves requirements, D is deposits and E is bank's equity, which is exogenous here.

Banks collect deposits and their demand function is given by

$$D^D = k(i) \quad (2)$$

where banks demand on deposits negatively depends on the interest rate for them.

Further, allocating funds, banks have loan supply function represented by following:

$$L^S = f(i) \cdot D(1 - \rho) \quad (3)$$

where loan supply is a positive function of the interest rates and $D(1 - \rho)$ represents funds, available for crediting after fulfilling reserve requirements.

(iii) Households have deposit supply, which positively depends on the deposit interest rate and negatively on bond rate:

$$D^S = h\left(i_D, i_B\right) \quad (4)$$

Bond demand function is represented as

$$B^D = B\left(i_D, i_B\right)$$

increasing at bond rate and decreasing at deposit rate.

(iv) Firms demand credits from the banks according to the following function:

$$L^D = g\left(i, y\right) \quad (5)$$

which negatively depends on the interest rates and positively depends on their income.

Now let's turn to the banking sector. In their day-to-day operations, banks receive income from giving credits to the economy and the revenue is equal to the level of loans times the interest rate on them, $i_L \cdot L$. At the same time, cost of operations consists of two parts: 1) amount of money, banks have to pay for attracted deposits $i_D D$ and 2) operational costs, which is denoted as Z and assumed to be fixed. So, the profit equation for the banking sector will be given by

$$\Pi = i_L L - i_D D - Z \quad (6)$$

Following Klein (1971), the independence between loan and deposit rates is allowed by introducing bond rate. In this case equation (7) represents marginal revenue on loans (LHS), which is equal to opportunity cost (RHS).

$$i_L (1 - \delta_L^{-1}) = i_B$$

$$i_L \left(\frac{\delta_L - 1}{\delta_L} \right) = i_B$$

(7)

Transforming, we get following equation for equilibrium loan rate:

$$i_L = \left(\frac{\delta_L}{\delta_L - 1} \right) i_B \quad (7a)$$

Where $\delta_L = \delta_L\left(i_L\right)$ is elasticity of demand for loans, which negatively depends on interest rate for credits.

Similarly, equation (8) shows equality of marginal cost of deposits and their marginal return.

$$i_D (1 + \delta_D^{-1}) = (1 - \rho) i_B$$

$$i_D \left(\frac{\delta_D + 1}{\delta_D} \right) = (1 - \rho) i_B \quad (8)$$

The equilibrium loan rate is given in equation (8a):

$$i_D = \left(\frac{\delta_D}{\delta_D + 1} \right) (1 - \rho) i_B \quad (8a)$$

Here $\delta_D = \delta_D \left(i_D, i_B \right)$ is elasticity of demand for deposits; the function is positive with respect to interest rate on deposits and negative with respect to bond rate.

Having first order conditions, now we proceed to the equilibrium equation for the government bonds. In (9) the left side of the equation is the sum of household demand for bonds and demand from commercial banks, the right side is the supply of bonds.

$$B(i_D, i_B) + BB = B \quad (9)$$

Reorganizing commercial banks balance sheet in terms of demand for bonds and substituting to the equation (10), we get following:

$$B(i_D, i_B) + (1 - \rho)D(i_D, i_B) - L(i_L) - E = B \quad (10)$$

Now, (7a), (8a) and (10) form a system of equations. Totally differentiating it subject to the ratio of reserve requirements ρ , we can find effect of reserve requirements on the loan, deposit and bond rates.

The first results are shown at the following equation:

$$-D(i_D, i_B) - \frac{\partial i_L}{\partial \rho} \frac{\partial L}{\partial i_L} + \frac{\partial i_B}{\partial \rho} \frac{\partial B}{\partial i_B} + \frac{\partial i_D}{\partial \rho} \frac{\partial B}{\partial i_D} + \frac{\partial i_D}{\partial \rho} \frac{\partial D}{\partial i_D} + \frac{\partial i_D}{\partial \rho} \frac{\partial D}{\partial i_D} - \rho \frac{\partial i_B}{\partial \rho} \frac{\partial D}{\partial i_B} - \rho \frac{\partial i_D}{\partial \rho} \frac{\partial D}{\partial i_D} = 0 \quad (11)$$

Rearranging terms, we get:

$$-D(i_D, i_B) - \frac{\partial i_L}{\partial \rho} \frac{\partial L}{\partial i_L} + \frac{\partial i_B}{\partial \rho} \left(\frac{\partial B}{\partial i_B} + \frac{\partial D}{\partial i_B} - \rho \frac{\partial D}{\partial i_B} \right) + \frac{\partial i_D}{\partial \rho} \left(\frac{\partial B}{\partial i_D} + \frac{\partial D}{\partial i_D} - \rho \frac{\partial D}{\partial i_D} \right) = 0 \quad (12)$$

Further, $\frac{\partial L}{\partial i_L} < 0$, since amount of loans demanded negatively depends on interest rate for them; level of deposits, supplied by households is higher, the higher deposit rate is, $\frac{\partial D}{\partial i_D} > 0$; demand on bonds has positive relation

with the bond rate: $\frac{\partial B}{\partial i_B} > 0$; finally, $\frac{\partial B}{\partial i_D} < 0$ and $\frac{\partial D}{\partial i_D} < 0$ since deposits and bonds are considered as substitutes.

Using this information we can derive signs for the interest rate expressions:

$$\frac{\partial i_L}{\partial \rho} > 0 \quad (13)$$

$$\frac{\partial i_D}{\partial \rho} > 0 \quad (14)$$

$$\frac{\partial i_B}{\partial \rho} > 0 \quad (15)$$

As we can see, higher reserve requirements make loan, deposit and bond rates to increase.

The intuition of the process can be shown by following explanation:

As we know, all deposits can be divided into those that has to be held in the cash to comply with reserve requirements, $D\rho$ and those, available for the crediting, $D(1-\rho)$. So, decomposing deposits in the profit equation, we get:

$$\Pi = i_L \cdot L - i_D \cdot D(1-\rho) - i_D \cdot D\rho - Z$$

Since banks can loan only at the level they have collected funds in the form of deposits and there is no other source of funds (banks own funds, E , are not important here), the level of loans, L is equal to the amount of deposits $D(1-\rho)$, left after meeting reserve requirements, i.e. $L = D(1-\rho)$. Rearranging terms in the profit equations, we come to the following:

$$\begin{aligned} \Pi &= (i_L - i_D) \cdot L - i_D \cdot D\rho - Z \\ &= (i_L - i_D) \cdot D(1-\rho) - i_D \cdot D\rho - Z \end{aligned}$$

Here, bank's revenue is equal to the level of loans times the spread between the interest rates on loans and deposits. The costs are coming from holding a fraction of deposits, at which banks have to pay interest i_D , as zero interest rate reserve requirements and from operational expenses.

This equation shows us the main sources of revenues and expenditures of the banking sector and, what is important for our topic of interest, the effect of reserve requirements on the banks performance.

Let's consider the increase in the norm of reserve requirements ρ . Now banks have to hold larger share of deposits, at which they have to pay interest, in the form of non-earning reserves; more of it, banks will have fewer funds, available for lending operations, as $D(1-\rho)$ diminishes. Taking into account higher costs and fewer possibilities of lending, bank's profits Π will start to go down and as can be seen from equation (8), the solution for banks would be to increase the spread of interest rates. Thus,

banks will decrease interest paid on deposits i_D and increase lending rate i_L .

Following this decision, the supply of deposits will be less, since consumers supply of deposits D^S (equation 4) directly depends on the interest rate. Firms, on their turn will demand fewer loans, in accordance with firm's loan demand function L^D (equation 5), which has inverse relation with the interest rate. The magnitude of the changes in deposits and loans depends on the corresponding elasticities.

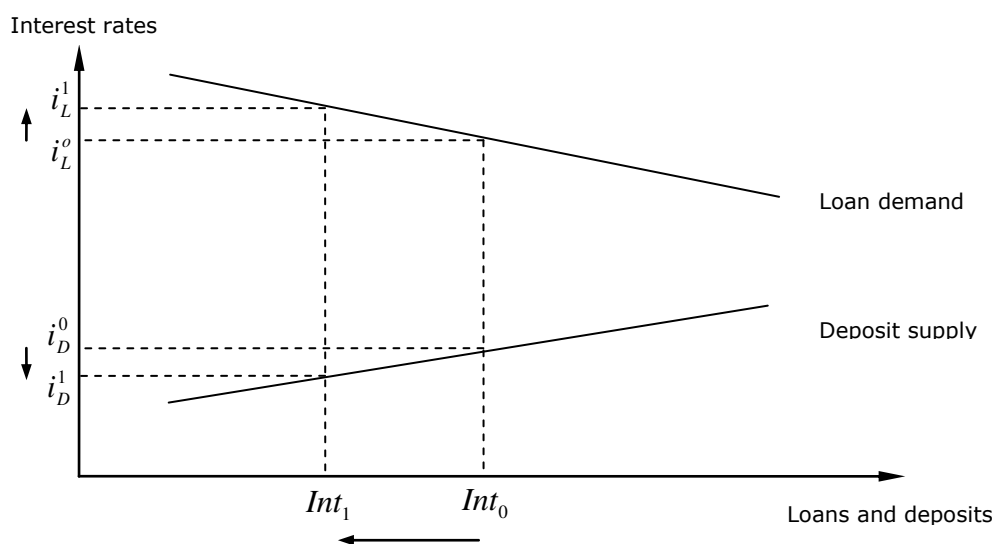
As the result of increase in the reserve requirements, we will have higher lending rate, lower deposit rate, higher costs for the banking sector and less intermediation in the economy.

The summary of the mechanism, described above, can be represented as the following:

$$RR \uparrow \Rightarrow Liquidity \downarrow \Rightarrow Banks_profit \downarrow \Rightarrow (i_L - i_D) \uparrow \Rightarrow i_L \uparrow \ i_D \downarrow \Rightarrow L \downarrow \ D \downarrow \Rightarrow Intermediation \downarrow$$

Also it is useful to represent the process in the graphical way. Figure 1 shows the level of intermediation in the economy and corresponding interest rates for the credits and deposits.

Figure 1. Impact of reserve requirements on interest rates and intermedaition



Here, loan demand is a function, described above: $L^D = g(i, y)$. It is downward sloping, since firms demand fewer credits if interest rate for them (i_L) becomes higher. Deposit supply corresponds to the function

$D^S = h(i, y)$ and is upward sloping, i.e. households are willing to deposit more if they get higher interests rate i_D . For the purpose of not overloading model and keeping it simple but demonstrative, we represent deposits as net of reserve requirements, so that loan demand can meet deposit supply at one point. The spread between interest rates on loans and deposits ($i_L - i_D$) represents mark-up of the banks, which covers certain profit target and costs, coming from various sources, including reserve requirements.

Initial level of intermediation is given at point Int^o ; corresponding interest rates are i_D^0 for deposits and i_L^0 for loans. Then, according to the mechanism, described above, if Central Bank decides to increase the level of reserve requirements, banks will have less liquidity and will react by widening interest rate spread: interest paid on deposits will come down to i_D^1 , while interest for loans will go up to i_L^1 . Economy will react by providing fewer deposits and demanding fewer loans, thus, the level of the intermediation will go down to Int^1 .

Thus, the new equilibrium will have higher loan interest rate i_L^1 , lower deposit rate i_D^1 and less deposits supplied and loans demanded, Int^1 .

4.3. Implicit taxation of banks

Direct cost for the banks, coming from reserve requirements can be seen quite easily: banks attract deposits from households, paying interest rate on them, defined here as i_D . Then, complying with the reserve requirements, banks have to hold in the Central Bank a fraction of deposits $D\rho$ in the form of zero interest rate reserves. Thus, in other words, commercial banks buy funds from households and give them for free to the Central Bank; the cost would be following:

$$\text{Direct cost} = i_D \cdot D\rho \quad (9)$$

Then, having a certain amount of funds frozen at the Central Bank account, commercial banks cannot use them in their operations, in our case – to give credits to the real economy. So, the opportunity cost is defined as forgiven revenue from not providing loans for economy and charging interest rate on them:

$$\text{Opportunity cost} = i_L \cdot D\rho \quad (10)$$

Total cost of holding reserve requirements is just a sum of direct and opportunity costs, described above:

$$\text{Total cost} = i_D \cdot D\rho + i_L \cdot D\rho = (i_D + i_L) \cdot D\rho \quad (11)$$

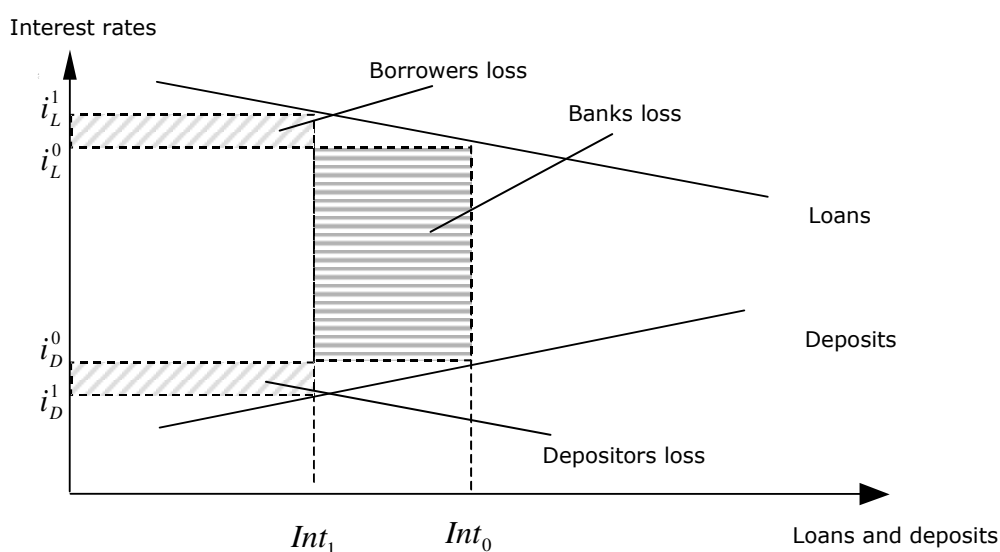
In order to proceed from cost to the implicit taxation, we must note that commercial banks naturally tend to hold a certain amount of deposits in the Central Bank, using it for transactions with government and other purposes. If we denote this natural reserve rate as ρ^* , than a rate, higher than this would indicate implicit taxation of banks. Converting equation 11, we get the following formula, which shows us implicit taxation from holding excess reserve requirements:

$$\text{Implicit tax} = (i_D + i_L) \cdot D(\rho - \rho^*) \quad (12)$$

4.4. Cost for the economy

Now, as we have got first results for the consequences of the increase in reserve requirements, let's try to estimate its impact on the economy more deeply.

First, lets see what economic theory has to say about it. For the public sector, reserve requirements are beneficial and serve as a form of seigniorage. But money cannot come from nowhere, and actually reserve requirements reallocate income from private sector to public sector and Figure 2 shows us welfare impact of holding higher reserves on private sector.



Here, firms have welfare losses since now they have to pay higher interest rate i_L^1 for the credits. It can be represented by the area of the upper shaded rectangle, which is equal to the increase in the interest rates $(i_L^1 - i_L^0)$ times the volume of credits, Int_1 . Households lose, because they can get less revenue from providing deposits, as interest rate on them came down. Welfare loss is shown by lower shaded rectangle and is equal

to the decrease in the interest rate $(i_D^0 - i_D^1)$ times the level of deposits. Shaded rectangular at the left shows welfare losses of the commercial banks.

As we can see, increased reserve requirements can bring welfare losses to all three private agents in our model: firms, households and commercial banks. But before making conclusions from this part of the paper, we should recall that this is static partial equilibrium analysis and it gives us just the most evident consequences. In reality, the magnitude of alterations would be much higher: making economic agents worse off and depressing intermediation in the economy will have its further negative impact on investment pattern, technological innovations and in the dynamic situation may cause drop in GDP. Actually, Loungani and Rush (1995) empirically tested this hypothesis for United States and found out that higher reserve requirements have adverse effect on investment and output. Of course, in order to estimate this effect, we have to build rather complicated general equilibrium model, which would incorporate various links between all agents of the economy. In this paper we do not conduct such research and focus instead on partial equilibrium analysis, looking first of all at the banking sector.

5. Reserve requirements in Ukraine

5.1. History and role of reserve requirements in Ukraine

Reserve requirements in Ukraine were first implemented in 1989, during Soviet Union time yet. For this purpose State Bank of USSR issued decree about creation of the Fund for regulation of the credit resources, according to which commercial banks had to hold a certain amount of attracted funds at the special account. Since its foundation 1991, National Bank of Ukraine started to use the norm of reserve requirements for conducting its monetary policy, changing it in accordance with the stance of economy (Table 3 shows the level of reserve requirements in 1992 through 2000).

Table 3. The level of reserve requirements in Ukraine in 1992 - 2000, %

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000
Level	13	25	15	15	15	15	16,5	17	15

Source: NBU Bulletin

In doing so, reserve requirements were viewed as very important instrument of the National Bank policy. The basic cause for it was the fact that Ukraine had to start building its financial system from the very beginning, without previous experience of conducting monetary policy or commercial banks operations. In these circumstances, as in many other transition countries, reserve requirements were attractive for the Central Bank due to its effectiveness and relative simplicity of use. Thus, reserve

requirements were used quite intensively during financial crises in 1997, 1998 and 1999 for keeping money supply under control and not allowing for hyperinflation. In this process, the NBU was changing the rate of reserve requirements – fluctuating between 15% and 17%, the type of liabilities, which were matter for reserves, as well as the period for complying with requirements - from one day to the month.

Recently, reserve requirements in Ukraine were somewhat liberalized and in year 2001 are held at the level from 9% to 15% and differentiated according to the term and type of liability and currency of denomination (see Table 4). Besides that, the control over compliance with reserve requirements from May 2001 is carried out once a month, comparing to earlier two-week period.

Table 4. The level of reserve requirements in Ukraine in 2001, %

Source	Type of deposit	Short-term	Long-term
Juridical persons	National currency	14	11
	Foreign currency	14	11
Natural persons	National currency	12	9
	Foreign currency	13	13
Rest		15	

Source: NBU

Although reserve requirements were quite useful instrument for conducting monetary policy during last decade and importance of it should not be underestimated and also some liberalization has taken place, the rate of reserve requirement in Ukraine still stay at the high level, which has negative effect on the economy.

5.2. Estimation of the cost of reserve requirements for private sector in Ukraine

In this section we will try to estimate, although quite roughly, the cost of reserve requirements for the private sector and commercial banks in Ukraine. Before doing it, we must note that these calculations are approximate and are not intended to give precise bookkeeping number, but instead the very idea of the cost, which could be used for further analyses.

At the present, the amount of funds, which commercial banks hold as reserves at the National Bank of Ukraine account or vault cash is equal to UAH 2500 m. Average deposit interest rate is taken as 8%, average loan rate is 30% per annum.

Then, turning to the formulas, described in section 4.2., we can estimate that direct cost of holding non-earning reserves, for which commercial banks have to pay 8 % deposit rate is equal to:

$$\text{Direct cost} = i_D \cdot D\rho = 0.08 \cdot 2500 = 200^*$$

* Actually, the average deposit rate does not count in deposits, at which interest rate is not provided, thus this number should be somewhat less.

That is, Ukrainian commercial banks have to pay UAH 200 m as the interest rate on deposits, which they freeze in the Central Bank. In other words, commercial banks pay UAH 200 m for the right to collect deposits.

The opportunity cost is calculated as forgone revenue from not giving loans to the economy:

$$\text{Opportunity cost} = i_L \cdot D\rho = 0.30 \cdot 2500 = 750$$

The number UAH 750 m shows us the revenue, which commercial banks could earn by giving credits at the average interest rate of 30%, instead, funds that could be used for it are held as required reserves.

The total cost is just the sum of the previous two and is equal to the UAH 950 m:

$$\text{Total cost} = (i_D + i_L) \cdot D\rho = (0.08 + 0.30) \cdot 2500 = 950$$

Thus, almost UAH 1 bn represents costs that commercial banks bear from holding reserve requirements. Talking about this issue, we should clearly define that this is not an accounting cost and it does not appear anywhere in the official financial reports. Instead, this represents money flows in the economic sense of this term, showing real costs that banks bear.

As we can see, imposing high reserve requirements can bring quite significant costs for the banking sector. Of course, we should remember that the costs for commercial banks from complying with reserve requirements does not coincide with the implicit tax, which actually hurts banking sector, since banks voluntarily hold some fraction of deposits as reserve for transactions with government or other purposes. Thus, in order to calculate implicit tax, we need to know the natural level of holding reserves ρ^* , which depends on the specific payment system in the country and other factors and cannot be easily and precisely estimated.

Just giving a clue, making reserves twice less and bringing them to the average of around 6% (still quite a substantial number) would reduce banks costs by approximate UAH 500 m per year. Yet, this is not the end of the story, since decrease in reserve requirements would also mean that around UAH 1.25 bn will be freed for commercial banks operations and, as was stated in section 4.3., could potentially be used for crediting of the real sector, making investment grow and, thus, increasing production.

5.3. Agenda for reforms

Summing up the results of the partial analysis in our paper, we can see that reserve requirements, although appear to be powerful instrument of the monetary policy, do bring additional costs to the banking system and private sector. Central Banks in many countries, especially during last decades, became more concerned about this drawback and tend to change accents, relying less on reserve requirements than on other instruments of the monetary policy. Reducing costs of the private sector, Central Banks try to diminish the burden of reserve requirements by substantially lowering the rate of reserves (in some cases driving it to zero), constricting

types of liabilities, subject to regulations, or even by paying interest rate on the reserves. As the result, the stance of the commercial banks is eased and more intermediation is going in the economy.

Although in the short run diminishing role of reserve requirements can make work of Central Bank more complicated, as it has to reconsider implementation of its instruments and assure that it still has reliable control over transmission of the monetary policy, over the longer period reforms will be beneficial for the economic growth.

Very important point, which we should make clear, is that while Central Banks tend to make reserve rate less, it does not mean that they cannot use this instrument anymore. The main underlying idea here is that what is more important for controlling money supply by reserve requirements is not the absolute level of reserves, but relative changes. That is, if the Central Bank intends to shock money supply, using this instrument, it does so by changing the reserve rate; initial amount plays a secondary, although still significant role here.

Of course we should not underestimate the absolute level too, since in many ways it determines the magnitude of the Central Bank influence on the economy. The higher that level, the easier Central Bank can control money supply and more confident it would be conducting monetary policy. As Freidman wrote about it, hypothetically Central Bank can put money supply under its complete control by setting reserve requirements at 100% of deposits, but in that case financial intermediaries will not be able to give credits (Mishkin 1999). In real economy Central Bank, concerned about sustainable growth, tries to choose the level of reserves that will enable Central Bank to use it as effective instrument of the monetary policy but at the same time will not be over pressing for financial intermediaries.

The minimum level, at which Central Bank can set reserve requirements greatly depends on the development of the financial system and availability of other instruments of the monetary policy. Following these factors, in countries with more sophisticated financial markets and instruments of monetary policy, Central Bank can permit oneself driving reserve rate to really low level, but in less developed economies Central Bank set reserve rate at higher level, in such way securing more power for shocking economy.

Now, as we considered general path of reforms in reserve requirements, lets turn to the situation in Ukraine.

As was mentioned earlier, the level of reserve requirements in Ukraine stays at relatively high level, considerably higher then in developed economies and transition countries of Central Europe, and even higher than in neighboring Russia and Moldova. At the same time the spread between interest rates in Ukraine stays at one of the highest levels in European transition countries, while the depth of financial system is rather low (see Table 5).

Table 5. Interest rate spread and depth of financial system in Eastern European countries, 1998*

Country	Interest rate spread, %	Credits to GDP, %
Czech Republic	5.5	79.8
Slovak Republic	5.2	71.8
Hungary	3.2	49.1
Poland	5.6	36.9
Slovenia	6.8	35.5
Bulgaria	37.1	30.0
Russia	15.3	25.9
Belarus	16.2	17.7
Ukraine	30.9	17.2

Source: IMF, International Financial Statistics, 1999

According to our analysis, decrease in required reserves in Ukraine could mean reduction of the regulative costs for the banking sector and, as predict theory and experience of other countries, consequent decrease in the interest rate spread. Further, this would result in the expansion of aggregate investment and creation of necessary prerequisites for output growth. Actually, in year 2001, when quite substantial reforms of reserve requirements were undertaken, credits to the Ukrainian economy for the first four months grew by 22%, deposits – by 23.5% and at least part of this intermediation improvement can be attributed to the liberalization in reserves requirements.

Moreover, decrease in reserve requirements will be positive in the sense of equalizing costs of commercial banks with other financial intermediaries, which are not subject to reserve requirements regulations. This would take off some relative benefits of “gray lenders” and promote inflow of capital in to the official economy. Besides that, Ukrainian commercial banks will be put into more competitive conditions with foreign financial markets.

Thus, looking at the results of this partial analysis, the straightforward policy implication for Ukraine would be to bring reserve requirements down. But, this issue is not as simple as it seems and actually we cannot say right away that such decrease in reserve requirements will bring us positive changes, described above, without examining some further aspects of the question.

First of all, Central Bank has to be sure that it will be able to conduct monetary policy in new conditions and has in its use other effective and reliable instruments. For Ukraine the biggest challenge in this issue lies in the development of open market operations and revival of T-bills market.

The second warning is that decrease in reserve requirements actually creates new free money in the economy. Taking into account that for year

* Although the data for Ukraine do not exactly coincide with the statistics of the NBU, we give it as reported by IMF for the purpose of comparative analysis with other countries.

2001 planned increase in the money base is UAH 2 bn, any significant change in the required reserves (which stay at the level of UAH 2.5 bn) can raise concerns about the stability of the national currency. Thus, the policy of liberalizing reserve requirements should be incorporated into the overall Central Bank strategy of money emission. Moreover, following the experience of EU states and some CEE countries, issuing long-term government bonds can neutralize this negative liquidity effect.

The danger of greater interest rate volatility is another important issue. This problem is of more significance for the countries, which drive reserve ratio to zero or so, but if reserve requirements are held at the medium level, banks still will be able to use it as a buffer for smoothing interest rate at the money market. For Ukraine it is also important to promote development of the interbank market: properly functioning, it could as well help to avoid volatility of the interest rate.

The next problem lies in the conflict between private and public interests: reduction in reserve requirements (under the stipulation that Central Bank takes this process into consideration while emitting money) would mean that government has less possibilities for direct money creation, thus, seigniorage revenues will fall as well. Here it should be noted that this issue is a matter of political will of the government to give up some easy money for the sake of long-term economic growth.

The fifth question, which we should consider, is whether liberalization in reserve requirements can actually result in the expansion of credits to the economy. In the situation of strongly regulated financial markets and lack of developed legislative and institutional settings, commercial banks can accumulate considerable liquidity, but will not be able (or willing) to give sound credits to the real sector (that is actually the case in Ukraine). Thus, the Central Bank should not only ease the stance of commercial banks through reserve requirements, but also promote creation of favorable conditions through effective mechanisms of collateral and bankruptcy, law on credits, etc.

Finally, as ratio of reserves to deposits diminishes, the need of reliable deposit insurance fund becomes more demanding.

Now, turning to the idea of reforming reserve requirements in Ukraine and taking into account the warnings, discussed above, we can step to the question of how such changes of existing system can be exactly done.

First of all, we should note that rapid decrease of reserve requirements is not desirable for any economy, since a) it creates new money, which can result in high inflation and b) Central Bank may not have enough time for adjustment of the monetary policy. Following this logic, Central Banks pursue gradual policy of driving down reserve requirements, extending it for several years. Thus, Central Bank of Canada authorized elimination of reserve requirements by Bank Act in 1991, while the process proceeded till mid 1994. Other countries, which also experienced substantial reforms of reserve requirements, such as UK and New Zealand, conducted it for several years as well. CEE accessing countries, which have to meet regulations of European System of Central Banks, all accept longstanding plans of decrease in reserve requirements. For such transition economy as Ukraine the issue of gradualism is especially important, since weak

financial sector and lack of effective alternative instruments of the NBU can turn sharp decrease of reserves into the volatility in financial markets and currency instability, thus this process should be securely extended for a middle-run period.

Second issue concerns the target level of reserve requirements reforms. Although bringing reserves to the low level could give relief to the commercial banks, doing so is dangerous, since NBU will be confronted with difficulties of controlling money supply; hence, again, for the middle run term decreasing reserve to deposit ratio lower than 5-6% is most probably undesirable.

Also there is one more possibility of easing costs of reserve requirements: government could pay interest rate on reserve holdings. Using ESCB methodology (see Box 1) and accepting NBU Lombard rate (25%) as a remunerate basis, it would turn into more than UAH 300 m per year. Taking into account difficulties with the budget execution, this option, unfortunately for the private sector, can be hardly called realistic.

Summarizing this section of our analysis, we can state that reforms of reserve requirements system in Ukraine can lead to the relief of the now-troubled banking sector, expansion of intermediation and eventually creation of favorable preconditions for economic growth. Such option as paying remuneration for the reserve holding probably is not feasible in current conditions, but reducing the ratio of reserves to deposits is completely possible. The indispensable terms for such reform should be clear strategy of reducing reserve ratio, which has to take into account the warnings we mentioned above, as well as other measures, directed at the development of the banking sector in Ukraine. The proposed reform for the middle-run period is reducing reserve ratio to the 5-6 percent average within next 2 or 3 years. This speed of changes and target level of reserves should promote financial intermediation and at the same time will allow NBU to be confident about conducting monetary policy and controlling money supply.

6. Conclusions

In this paper we were talking about such instrument of the monetary policy as reserve requirements and its impact on private sector. The main idea of the analysis is that although reserves is a suitable tool for the Central Bank, it imposes additional burden to the commercial banks and, further, to other agents of economy. We argue that commercial banks will try to pass costs of holding reserves to their clients, widening interest rate. Eventually this process will come to the distortion in aggregate investment and will have adverse effect on output.

Estimated cost of holding reserve requirements for Ukrainian commercial banks roughly total to UAH 1 bn. Taking into account that presently financial system in Ukraine is pretty thin and interest rate spread, reflecting various bank costs, is large, liberalizing reserve requirements could be one of the facilitating factors, creating favorable conditions for

development of the banking sector and promoting crediting of the real economy.

According to our analysis, the reforms of the reserve requirements can be done without making pressure for the price stability or compromising ability of NBU to conduct monetary policy. We propose accepting program of gradually reducing reserve requirements to 5-6% average within next 2 or 3 years. The process of reserve reforms should be compulsory incorporated into fiscal and monetary policy and coordinated within the government bodies. The very important point here is that NBU should accept money emission, coming from reserve reduction into its general plan of creating money, avoiding thus inflationary pressure. In such way financial system will experience relief of the regulatory burden and the benefits will be spread over wider range of economic agents, servicing for long-term economic growth. NBU, in its turn will still be able to conduct monetary policy and have control over money supply via this instrument.

In year 2001 reserve requirements underwent some reforms in Ukraine, which had its positive impact on financial intermediation. The success of further changes greatly depends on the understanding of importance of financial sector for long-term economic growth and commitment to pursue time consistent policy, giving up some easy-to-achieve measures for the sake of real reforms.

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