EVIDENCE ON THE BANK LENDING CHANNEL IN UKRAINE

by

Inna Golodniuk
University Degree in Physics, Chernivtsi National University, 1997
MA in Economics, University of Kyiv-Mohyla Academy, 1999

PROJECT
SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

In the
Department
of
Economics

SIMON FRASER UNIVERSITY

Summer 2005

APPROVAL

Name: **Inna Golodniuk**

Degree: **M. A. (Economics)**

Title of Project: **Evidence On The Bank Lending Channel In Ukraine**

Examining Committee:

Chair: Ken Kasa

Robbie Jones
Senior Supervisor

Peter Kennedy
Supervisor

James Dean
Internal Examiner

Date Approved: Thursday, July 22, 2004

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ABSTRACT

The paper examines evidence for a bank lending channel in Ukraine. We use a panel of bank balance sheet data to estimate the response of bank lending to changes in monetary policy between 1998 and 2003. In particular, we segregate banks according to their asset size, capitalization and liquidity standing to test whether lending responses differ depending on the strength of a bank. The main result is that undercapitalized banks are more affected by a monetary policy change than is an average bank, which is consistent with the bank lending channel hypothesis, suggesting that monetary policy can affect deposits of commercial banks forcing them to change lending, which influences the amount of investment in the economy.

ACKNOWLEDGEMENTS

I owe a special debt of gratitude to my supervisors, Professors Robert Jones and Peter Kennedy, whose advice and critique guided me during the work. I am also enormously grateful to Vladimir Domrachev for his help with search for data.

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LIST OF ACRONYMS

ARDL	Autoregressive Distributed Lags (model)
CD	Certificate of Deposit
CPI	Consumer Price Index
EMU	European Monetary Union
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
OLS	Ordinary Least Squares

INTRODUCTION

While economists agree that monetary policy can affect, at least in the short run, the real economy, there is considerable controversy over how exactly changes in the monetary policy are transmitted to and over the economy.

The conventional Keynesian view of the monetary policy transmission mechanism, often referred to as the traditional interest rate channel, suggests that monetary policy shock propagates through the economy in the following way:

$$M \uparrow \Rightarrow i_r \downarrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$$

Expansionary monetary policy leads to a fall in the real interest rate thus lowering the cost of capital. Reduced cost of capital causes an increase in investment spending, which increases aggregate demand, and, ultimately, output.

Some economists still believe that the interest rate channel is a strong one and there is substantial impact of interest rates on investment spending through the cost of capital (see Taylor (1995), for example).

Much more economists find that empirical evidence does not support the proposition that interest rates can effect investment through the cost of capital. Bernanke and Gertler (1995) provide an overview of studies showing that cost effects are very weak. Another problem with the traditional interest rate channel – it is unclear how changes in the short term interest rates (the rates that the central bank can control) can create changes in investment that should depend on the real long-term interest rates.

These two shortfalls of traditional theory stimulated a lot of research on the alternative transmission mechanisms that would be able to explain how changes in the short-term interest rates can induce changes in the level of investment. Mishkin (1997) lists about nine such mechanisms that can be broadly divided into two categories: those operating through asset prices and those operating through credit markets. Recent research has focused on the mechanisms operating through credit markets. This paper considers one of the mechanisms operating through credit markets – bank lending channel.

Transmission mechanism of the bank lending channel is, essentially, as follows:

$$M \downarrow \Rightarrow DE \downarrow \Rightarrow LN \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$$

that is a contraction in the money supply by the central bank decreases bank deposits and forces the commercial banks to cut on lending. The decrease on loans makes business and consumers, who depend on bank loans and cannot raise funds from other sources, reduce their purchases of durable goods and purchases of capital for investment so that real economic activity slows down.

Kashyap and Stein(1994) conclude that for most economies the fact that a central bank can affect the supply of loans implies the existence of bank lending channel. Hence, empirical studies have concentrated on testing whether a central bank can control the supply of commercial bank loans. They typically study individual bank data and build on the theoretical conclusion (Peek and Rosengren, 1995) that strong and weak banks should respond differently to policy shocks. Lending responses, if they emanate from loan supply changes, should be disproportionately large for less creditworthy banks

with weak balance sheets, which are more likely to have difficulties substituting lost deposits with external forms of finance.

This paper attempts to investigate whether the bank lending channel has any economic power in the Ukrainian economy. We use the panel of annual balance sheet data (1998 to 2003) on 149 Ukrainian commercial banks and test whether lending responses to a change in monetary policy differ depending on the balance sheet strength of a bank. Our results suggest that undercapitalized banks are more affected by a monetary policy than an average bank, which is consistent with bank lending channel hypothesis.

The paper proceeds as follows. Section 1 provides the overview of the most recent theoretical literature on the bank lending channel and a brief survey of the empirical work testing for the presence of bank lending channel for different economies. The Peek and Rosengren's theoretical model that we use to formulate specification of the empirical model is presented in Section 2. The empirical model is described in Section 3. Section 4 is a short presentation of the stylized facts relevant to understanding the conduct of monetary policy in Ukraine as well as the most important features of the Ukrainian banking system. Results of the model estimation are in Section 5 followed by the conclusions (Conclusions).

1. LITERATURE REVIEW

1.1 Theoretical literature

The recent academic debate on the bank lending channel is trying to accurately define the role of the banks in monetary transmission as well as to explain behavior of a bank as it reacts to a shock.

According to Mishkin (1996) the policy transmission through lending channel is the following Contractionary monetary policy => Bank deposits ⇓ => Bank loans ⇓ =>Investment, consumer spending ⇓ => Output ⇓

Declining bank loans lead to lower investment and consumer spending because banks play a special role in reducing asymmetric information between borrowers and lenders, who would not be able to obtain loans without bank intermediation. Reduction in bank deposits causes a reduction in bank loans because of imperfect substitutability between bank deposits and other sources of financing for banks. Mishkin (1996) stresses the role that asymmetric information between borrowers and lenders plays for the lending channel to have economic power. He doesn't state explicitly whether the bank lending channel is an independent one sub-channel for the traditional interest rate channel.

Bernanke and Gertler (1995) argue that the bank lending channel component is not a truly independent mechanism, but rather a special amplifier of the conventional interest rate channel. They introduce the external finance premium, which is defined the difference in cost between funds raised externally (by issuing debt or equity) and funds

generated internally (retained earnings). According to the authors, a change in the monetary policy that raises or lowers open market interest rates usually changes external finance premium in the same direction. The size of this premium reflects the degree of imperfections in credit markets that determines the discrepancy between the expected return received by lenders and the costs faced by potential borrowers. According to their formulation of credit view, "a change in monetary policy that raises or lowers open-market interest rates tends to change the external finance premium in the same direction". And because of this additional effect of monetary policy on external finance premium the impact of monetary policy on borrowing cost and, therefore, on real activity is amplified.

Thus, in the view of Bernanke and Gertler (1995), the bank lending channel is the linkage that explains impact of actions taken by central bank on external finance and it operates as follows:

(i) monetary contraction leads to a deficiency in reserves and reduces banks' core deposit base and forces banks to raise funds from other (new) sources thus increasing banks' relative costs of funds and making banks reduce the supply of loans;

(ii) after banks have reduced the supply of loans, bank -dependent borrowers have to bear additional costs to find a new lender and establish credit relationship, which is likely to increase the external finance premium and hence drive real economic activity down.

A much more fundamental study of the bank lending channel is made by Kashyap and Stein (1993). They generally follow an earlier formulation by Bernanke and Blinder (1988), but strengthen their theoretical postulates and assumptions by outlining microeconomic foundations needed to generate bank lending channel. Importantly,

Kashyap and Stein (1993) argue that information asymmetries in loan-making are irrelevant for the lending channel existence -- the lending channel simply requires that the supply of loans to decrease, when the central bank implements contractionary policy and increase when expansionary policy is conducted. Kashyap and Stein (1993), unlike Bernanke and Gertler (1995), treat the bank lending channel as an independent one contrasting it with the traditional interest rate view.

To analyze microeconomic foundations effecting the existence and power of bank lending channel Kashyap and Stein rely on three conditions formulated earlier by Bernanke and Blinder (1988) – for a distinct bank lending channel to exist the following conditions must hold:

1. Firms should not be able to completely compensate reduced supply of commercial bank loans from other sources. If, for instance, firms experiencing shortage of bank loans can instead start borrowing money from the public via bonds, then the decrease in supply of loans does not affect the firms in any way.

2. The central bank must be able to affect the supply of loans -- banks must not be able to offset the decrease in deposits caused by open market sales of the central bank or increased reserve requirements by raising funds from any other source. Otherwise, banks can do so, and total supply of loans to the economy may not change.

3. There must be imperfection in the adjustment of the aggregate price level. The imperfect adjustment in prices is necessary since monetary policy would have no effect if prices increased by 10% every time money supply

increased by 10%. Only when an increase of 10% in money supply is accompanied by an increase of less than 10% in prices will monetary policy be effective.

The third condition is usually met in an economy according to the authors. Thus, to test the existence of the lending channel one has to verify that conditions 1 and 2 are satisfied for an economy in question.

With respect to the first condition, Kashyap and Stein refer to other researchers (e.g. Diamond (1984)) and conclude that if contractionary monetary policy reduces the supply of loans, firms dependent on loans to finance their business activities will be affected adversely.

The second condition requires careful empirical examination for each particular economy. There can be institutional arrangements that weaken the power of bank lending channel. Two most important ones are capital adequacy regulation and participation of non-banking financial institutions in the loan supply. Capital adequacy regulation restricts the supply of loans that a bank can make by the amount of available capital and leaves less room for loan response to monetary policy. The central bank also cannot control loans issued by non-banking financial institutions, which implies lower overall capacity to affect loans to the economy.

Kashyap and Stein consider also behavior of banks in response to policy change. If, for example, monetary tightening raises reserve requirements and reduces bank deposits, a bank can respond by selling some of its securities holdings (T-bills), can attempt to raise non-deposit financing (long term debt, CDs, equity, etc.) or can cut back on the amount of loans it makes. The authors conclude that the first two outcomes are

not very likely. Banks usually hold some optimal amount of T-bills – the amount that is necessary to cushion against the risk of sudden deposit withdrawal. Holding more than that amount bears opportunity costs as T-bills usually pay lower return than loans. Raising non-deposit financing (i.e., non-reservable form of finance) is also problematic, especially for small and/or modestly capitalized banks. Because of asymmetric information between debt issuing bank and investors, marginal cost of external financing is an increasing function of the amount raised. Therefore, the conclusion Kashyap and Stein (1993) is that an average bank should respond by cutting back on loans, only strong and well-established banks can attempt to raise external finance and thus, their lending may respond less to policy changes.

The majority of empirical studies on the bank lending channel have been trying to test the second condition that a central bank can affect the supply of commercial bank loans. The studies are carried out both in a time-series framework and a cross-sectional framework.

Earlier studies, like Bernanke (1983) and King (1986), relied on time series models. Bernanke (1983) show that an increase in the federal funds rate (specifically due to contractionary monetary policy) leads to downsizing of bank activity and a decrease in the level of loan supply. They also find that decrease in the supply of loans leads to a decrease in GDP.

King (1986) studies the same data as in Bernake (1983) and shows that changes in monetary aggregates take place before changes in GDP. And a change in the volume of loans takes place almost the same time as the change in GDP. This is considered as evidence against the Bernanke's conclusions. If loans were an important link of

monetary transmission, the change in GDP would have to follow the change in the volume of loans.

These two studies illustrate a common problem of time series models – they cannot conclude on the causality. The more recent research tends to use panel data on the individual bank level.

Almost all available studies of the individual bank data build on the theoretical conclusion (Peek and Rosengren, 1995) that strong and weak banks respond differently to policy shocks. Lending responses, if they emanate from loan supply changes, should be disproportionately large for less creditworthy banks with weak balance sheets, which are more likely to have difficulties substituting lost deposits with external forms of finance.

1.2. Empirical literature

Studies of the US monetary policy provide evidence of credit channel and bank lending channel. The evidence for European Union as a whole is mixed (Atlunbus et al, 2002). The authors conclude that the bank-lending channel appears more prevalent for banks with low capitalization operating in smaller EMU countries. Westenlund (2003) finds that in Sweden small and undercapitalized banks are significantly affected by monetary policy, which supports the hypothesis of bank lending channel. Hernando (2001) tests the existence of bank lending channel in Spanish economy for the period 1991-1998 and find no evidence in favor of the channel. Farinha (2001) finds the existence of the bank lending channel in Portugese economy. There is also evidence on the significant strength of bank lending channel in Chile (Alfaro (2003)).

Below we briefly overview the methodology of these empirical studies and discuss their conclusion in more detail.

Kishan and Opiela (Kishan and Opiela, 2000) use quarterly balance sheet data from 1980:1 to 1995:4 for 13, 042 US commercial banks. To analyze cross sectional differences in lending banks are divided into six asset categories, and within each category are further subdivided into three capital leverage ratio groups. Then for each of the eighteen samples the authors estimate the effect of policy on total loans – the growth rate of loans is regressed on four lagged values of itself, four lagged values of the change in the federal funds rate (monetary policy indicator), current period growth in the large time deposits and current period growth in securities. Also included are three seasonal dummy variables and GDP growth. Time deposits and securities are included, according to the authors, to control for funding effects on loans – the possibility for a bank to attract more time deposits or sell securities from its portfolio to issue loans when the central bank conducts restrictive policy. GDP is used as a measure of overall economic health. The model is estimated by OLS and the paper does not discuss issues arising on the estimation stage – estimation of the distributed lags model, possibility of alternative use of panel data estimators, etc.

Kishan and Opiela find the loan growth of small undercapitalized banks, small adequately capitalized, and small well capitalized banks is significantly affected by policy. Another conclusion they make is that categorizing banks by size and capital adequacy will highlight loan supply shifts given a change in monetary policy.

Atlunbus (Atlunbus et al, 2002) adopt an approach similar to Kashyap and Opiela (2000) and investigate evidence of the lending channel across the 11 European Monetary

Union countries and then investigate the same channel for the four largest banking systems – Germany, France, Italy, and Spain. They use annual data for the period 1991 to 1999. Using individual bank level data the growth of bank loans is regressed on the lagged value of itself, current period and lagged values of changes in the short-term money market rate, current and lagged growth in bank securities holdings, current and lagged growth in interbank deposits, current and lagged GDP growth. The authors estimate the similar models for deposits, securities holdings and interbank borrowings to better explain which balance sheet items can be influenced by the policy. All models are estimated using the random effect panel data estimator. The possibility of alternative panel data estimators and problems created by presence of the lagged dependent variable are not discussed.

The paper concludes that across European Monetary Union undercapitalized banks (of any size) tend to respond more to change in policy. Results for individual country estimates for France, Germany, Italy, and Spain suggest that only in the latter two cases there is evidence of bank lending channel.

Unlike Altunbus et al, Hernando's (2001) test for bank lending channel in Spanish economy finds no evidence in favor of the channel. He studies response of loans and deposits to monetary policy and the model is specified as

$$\Delta z_{it} = \sum_{j=1}^{4} \rho_j \Delta z_{it-j} + \sum_{j=0}^{4} \beta_{1j} \Delta x_{t-j} + \beta_2 c_{it-1} + \sum_{n=1}^{N} \sum_{j=0}^{4} \beta_{3j}^{n} c_{it-1}^{n} \Delta x_{t-j} + \varepsilon_{it} \quad (1)$$

where z is the log of deposits or the logs of loans, x is a vector of macroeconomic variables (real GDP growth, inflation) and monetary policy indicator, c is a vector of bank specific characteristics. Macroeconomic variables are included to control for

demand effects and the cross product term should capture difference in policy response for different banks. The model is estimated with quarterly data, 1991-1998, and therefore four lags are included to take into account seasonal properties of the data. The author takes first differences of (1) and then employs GMM estimator[1] as estimation by least squares is problematic with fixed effects, when lagged dependent variable is included as a regressor. The paper finds no evidence for the existence of an operative bank lending channel in the Spanish economy in the 1990s.

Similar study for Portugal by Farinha (2001) finds the existence of the bank lending channel in the Portuguese economy.

Westenlund (2003) studies monthly data (1998:M1 to 2003 M6) on 12 Swedish banks. The loans are modelled using the following ARDL model:

$$\Delta LN_{it} = \alpha_i + \sum_{j=1}^{J} \gamma_i \Delta LN_{it-j} + \sum_{j=o}^{J} \beta_j \Delta i_{t-j} + \sum_{j=o}^{J} \delta_j \Delta i_{t-j} W_{it-1} + \sum_{j=o}^{J} \psi_j \Delta CD_{it-j} + \sum_{j=o}^{J} \phi_j \Delta SEC_{it-j} + \sum_{k=1}^{K} \theta_k DUM_{tk} + u_{it} \quad (2)$$

ΔLN is the growth rates of loans, Δi -- change in the monetary policy indicator, W – balance sheet measures (asset size, capitalization, liquidity), ΔCD and ΔSEC are growth rates of real certificates of deposits and securities respectively, both included to capture movements in demand for loans. DUM is a set of 11 monthly dummy variables. Six lags of all variables, except W, are included. W enters the model with only one lagged value.

To address the bias problem created by the lagged values of loans in the right hand side, the author suggests using valid instruments for each of the six lagged values.

[1] The Generalized Method of Moments (GMM) estimator proposed by Arrelano and Bond (1991) for estimation of dynamic panel data models.

He follows the suggestion made by Anderson and Hsiao (1982) and uses the twice-lagged levels as instruments.

Westenlund finds that in Sweden small and undercapitalized banks are significantly affected by monetary policy, which supports the hypothesis of bank lending channel.

Alfaro (2003) estimates the model very similar to (2) for Chilean economy. The only difference with Westenlund's specification is that Alfaro uses macroeconomic variables (like annual GDP growth and annual depreciation of the real exchange rate) to control for demand side shocks to bank loans. The model is estimated with quarterly data. The paper employs bias corrected estimator to deal with the biasedness of the fixed effects estimator in a dynamic context. The bias corrected estimator used was proposed by Hahn and Kuersteiner (2002), who demonstrated that traditionally used Arellano and Bond GMM procedure is subject to a substantial finite sample bias.

Alfaro (2003) concludes on the pronounced strength of bank lending channel in Chile during 1990s.

There are two potential problems with the empirical works cited above. First, all use money market interest rates as an indicator of monetary policy. This is quite consistent with Bernanke and Blinder (1992), who show that the short term interest rate controlled by the central bank is a good indicator of monetary policy and is less contaminated by endogenous responses to contemporaneous economic conditions than is the money growth rate. However, using nominal rates may be problematic if the inflation is substantially changing during the period in question.

Second, all theoretical works cited above interpret bank behavior as response to monetary contraction. That is monetary contraction decreases reserves, which reduces deposits in the banks and thus forces banks to cut back on lending – small and/or undercapitalized banks cut their loans by larger amount than well-established banks. Thus, monetary contraction is transmitted mainly through weaker banks. It is unclear from the literature if the reverse interpretation and conclusions are valid for monetary expansion. The above empirical literature uses a specification that implicitly assumes that bank responses should be symmetric for expansionary and restrictive shocks. Ideally, one should estimate these models separately for expansionary and contractionary periods and compare the respective bank responses

2. THEORETICAL MODEL

We consider a representative bank, whose behaviour can be described by the Peek and Rosengren (1996) model. The bank has three types of assets: required reserves (RR), securities (SEC), and loans (LN) and three types of liabilities: demand deposits (DD), large time deposits (TD) and capital (K). Balance sheet requires

$$RR + SEC + LN = DD + TD + K \tag{3}$$

Demand deposits are inversely related to a market interest rate (for example, the federal funds rate, r_{FF}). An increase in market interest rates increases opportunity cost of holding demand deposits, causing bank customers to reduce their holdings of demand deposits and shift into interest paying assets.

We assume also that bank has some market power in the TD market and can raise the TD by raising its rates (r_{TD}) above the market mean rate ($\bar{r}_{TD}$). Therefore,

$$DD = a_0 - a_1 r_{FF} \tag{4}$$

$$TD = b_0 + b_1 (r_{TD} - \bar{r}_{TD}) \tag{5}$$

Banks hold a fraction α of DD in required reserves (RR). Security holdings are assumed to compose a fixed proportion of DD (buffer stock motive for holding securities). The market for bank credit is assumed to be imperfectly competitive – a bank can decrease (increase) its loans by setting its credit rates below (above) the mean market rate ($\bar{r}_{LN}$):

$$RR = \alpha DD \tag{6}$$

$$SEC = c_0 + c_1 DD - RR \tag{7}$$

$$LN = d_0 - d_1(r_{LN} - \bar{r}_{LN}) \tag{6}$$

The mean market rates are assumed to be directly related to the federal funds rate with fixed spreads:

$$\bar{r}_{TD} = e_0 + \phi r_{FF} \tag{8}$$

$$\bar{r}_{SEC} = f_0 + \phi r_{FF} \tag{9}$$

$$\bar{r}_{LN} = g_0 + \phi r_{FF} \tag{10}$$

Bank profits are interest income on loans net of loan losses (Φ*LN) and the interest on securities , minus the interest paid on demand deposits and on time deposits:

$$\pi = (r_{LN} - \Phi)LN + r_{SEC} SEC - r_{DD} DD - r_{TD} TD \tag{11}$$

Profits are maximized with respect to TD after eliminating RR, DD, LN, SEC, and r_{DD} and r_{LN} and first order conditions are solved for TD. In a similar way, we solve for LN and SEC.

We want to test the hypotheses that policy shocks should have different impact on strong and on weak banks. Small and undercapitalized banks should be more sensitive to the policy than large banks.

To derive testable relationships take the derivatives of the LN, TD, and SEC equations with respect to r_{FF} :

$$\frac{\partial LN}{\partial r_{FF}} = -[a_1 d_1 (1 - c_1)]/[b_1 + d_1] < 0 \tag{12}$$

$$\frac{\partial TD}{\partial r_{FF}} = [a_1 d_1 (1 - c_1)]/[b_1 + d_1] > 0 \tag{13}$$

$$\frac{\partial SEC}{\partial r_{FF}} = -a_1 (c_1 - \alpha) \lesseqgtr 0 \tag{14}$$

Increase in the r_{FF} increases TD, but LN will fall in response to contractionary policy. The response of SEC is indeterminate. Contractionary policy could induce well-capitalized banks to sell securities to continue providing loans. Therefore, for banks with high capital and/or large securities portfolio (13) is likely to be negative. If TD are used to increase loans during monetary contraction, securities may increase to balance asset risk. This also depends on capitalization.

The model also assumes that the interest rate sensitivies of TD and LN are related to bank size and capital adequacy. Larger and better capitalized banks should be able to easier attract TD. Since large banks have a larger proportion of loans with large firms (Morgan 1998) and large firms have more alternative sources for borrowing, we hypothesize that the demand for bank loans of large firms is more elastic with respect to loan rates than that of smaller firms:

$$b_1 = \beta(A, K), \quad where\ \beta_1, \beta_2 > 0 \tag{15}$$

$$d_1 = \delta(a), \quad where\ \delta_1 > 0 \tag{16}$$

A -- size of assets

(14), (15) → (11), (12) and take the derivative with respect to assets and capital:

$$\partial(\frac{\partial LN}{\partial r_{FF}}) / \partial A \leq \geq 0 \tag{17}$$

$$\partial(\frac{\partial LN}{\partial r_{FF}}) / \partial K > 0 \tag{18}$$

The net effect of asset size on sensitivity of LN and TD is indeterminate. Since large banks may find it easy to raise funds to offset the effects of contractionary policy, they can use these funds to grant loans. But as rates increase they can lose loans to substitute source of financing.

The effect of capital on the response of loans to the change in federal rates is positive. As bank becomes better capitalized the amount of loan it provides becomes less sensitive to the policy.

Hypothesis (11) and (17) support the bank lending channel that policy affects loans and the strength of the effect depends on bank capital.

3. EMPIRICAL MODEL

We want to empirically test the hypothesis following from the Peek and Rosegren (1996) theoretical model that strong and weak bank react differently to a change in monetary policy. In particular, we want to test the effect of bank capital and bank asset on the response of loans to change in the policy. The theory predicts that better capitalized banks should be less sensitive to changes in policy and the impact of asset size is ambiguous.

Therefore, we are trying to explain the growth rate of bank loans, ΔLN, for bank i=1, 2, ..., N in time period t=1, 2, ..., T.

The explanatory variable of primary interest is i_t - an exogenous indicator variable describing monetary policy shocks. The literature suggests two variables that can serve as a good measure of monetary policy shocks: the change in the in a short term interest rate under the control of the central bank (Bernanke and Blinder, 1992) or the so called Bernanke-Mihov indicator (Bernanke and Mihov, 1998). . Bernanke and Mihov estimate central bank reaction function and demonstrate that residuals from the model can be used to measure monetary policy. Kishan and Opiela (2000), who studied American economy, find that model conclusions are the same regardless of whether they use the change in the federal funds rate or Bernanke-Mihov indicator as a measure of monetary policy. All available recent studies of European economies use a short-term interest rate under control of the central bank (Hernando and Martines-Pages, 2001, Kakes and Sturm,

2002, Altunbas, Fazylov, and Molyneux, 2002, Farinha and Marques, 2001, Westerlund, 2003). We will use Kyiv interbank offered rate as the policy indicator.

The effect of monetary policy on bank loans depends, as explained above, on the balance sheet strength of a bank. We include second set of explanatory variables that is interaction between the change in i_t and a measure of balance sheet strength of a bank. As already mentioned the theory suggests capital and asset size as measures of bank strength. Empirical papers typically use asset size (A_{it}), liquidity (LIQ_{it}), or capitalization (CA_{it}) (opcit) as separating variables. We include all three of them into the original specification and then test down – test for their joint significance and drop the irrelevant variable(s)

We also have to isolate changes in total loans caused by movements in loan demand, since we are testing whether Ukrainian central bank can affect the supply of loans. To account for loan demand movements variables like GDP or CPI have traditionally been added to the model. However, macroeconomic aggregates are common for all banks and fail to capture demand changes for an individual bank. To better control for cross-sectional differences in loan demand, measures like real certificates of deposits and bank securities holdings (Kashyap and Stein, 1995; Kishan and Opiela, 2000) were suggested.

We will use term deposits (*TEDE*) and interbank borrowings (*IBLN*) to proxy movements in demand for loans of a particular bank. For Ukrainian banks securities holdings is not likely to capture demand. First, as discussed in Chapter 4 securities is a negligible asset item for all Ukrainian banks (Tables 1 and 2). Second, Ukrainian central

bank has restrictive regulations on bank operations with commercial securities -- a bank needs special permission for each type of operations with securities. Besides, Ukrainian stock market is in rudimentary state of development, which makes transactions in securities very costly and also risky.

We also have to include lagged values of both dependent and explanatory variables to allow for dynamic effects. There are two major economic arguments suggesting that the lags should be included. First, in a stable relationship between a bank and a customer the bank acquires informational monopoly over a client. It becomes costly to a customer to change a bank once relationship is established, as services of another bank will be more expensive while this new bank collects information on the new customer. Thus, lagged loans affect current loans. Second, due to long term contractual commitments policy can only impact lending with a lag, thus we have to include lagged interest rate change.

Since we work with annual data, and in the long run monetary policy is neutral, we include only one lag of the variables of interest, as it is extremely unlikely that in Ukrainian economy a monetary shock can propagate for longer than two years. Therefore, the model specification is as follows:

$$\Delta LN_{it} = \alpha_i + \gamma_i \Delta LN_{it}(-1) + \sum_{j=o}^{1} \beta_j \Delta i_{t-j} + \sum_{j=o}^{1} \delta_j \Delta i_{t-j} BS_{it-1} + \theta_J BS_{it-1} + \sum_{j=o}^{1} \psi_j \Delta TEDE_{it-j} + \sum_{j=o}^{1} \phi_j \Delta IBLN_{it-j} + u_{it} \quad (19)$$

where ΔLN_{it} is growth rate of loans of bank i in year t. The data on loans and all other balance sheet items is taken "as is" from the balance sheet of banks. Δi_t -- change in annualized, average weighted, short-term (three month) Kyiv interbank offered rate.

BS_{it} – vector of the three separating variables capturing balance sheet strength of a bank – Asset size (A_{it}), Liquidity (LIQ_{it}) and capitalization (CA_{it}). Asset size is total assets (real terms), liquidity and capitalization are calculated ratios of bank liquid assets and capital to total assets, respectively. $\Delta TEDE_{it}$ is growth rate of total term deposits and $\Delta IBLN_{it}$ is growth rate of bank's interbank borrowings.

Coefficients on Δi_{t-j} determine a response to a monetary shock by an average bank. Coefficients on BS_{it} cross term describe how a response differs for weak and strong banks. For an operational lending channel to exist it is sufficient that all coefficients on Δi_{t-j} are negative and the coefficients on BS_{it} and Δi_{t-j} cross products are positive

4. STYLIZED FACTS ON UKRAINIAN MONETARY POLICY AND BANKING SYSTEM

4.1 Interest rates and monetary policy

Ukraine has a large number of banks and non-banking financial institutions. However, most of these are very small by any standard; and many are extremely inefficient. The overall costs of transacting through the Ukrainian banking system are quite high compared to that of developed, and even successful transition, economies. Figure 1 illustrates spreads between interest rate on credits and interest rate on deposits for several countries. The spread, which is widely used to measure the degree of efficiency of a bank in acting as an intermediary between savers and borrowers, is very large in Ukraine.

This large transaction costs associated with Ukrainian banking reflects overall riskiness of the economic environment, in particular high credit risks. High credit risks, in turn, are created by predatory institutions and unprofessional policies. To name just a few, Ukraine has extremely weak protection of creditor rights; the mechanism similar to credit history has been introduced only recently and is not fully operational yet; tax administration procedures are non-transparent and leave much discretion to tax inspectors, who can arrest enterprise's liquid assets without any court resolution and overnight turn a successful business into an insolvent one.

High credit risks are the core rationale behind the high real interest rates that have been prevailing in Ukraine since mid 90s – the real (ex post) interest rates on commercial

bank loans were fluctuating between -1% and 18%. The real (ex post) interest rate on short term interbank loans reveals two same features – it is high in level and has a lot of variability (0%-28%).

Second most important factor explaining the behavior of interest rates is the monetary policy conducted by the National bank of Ukraine.

Ukraine had a period of hyperinflation in 1992- 1995, when government financed budget deficit by printing money. Curbing the inflation was difficult as by that time economic agents developed strong inflationary expectations. Many transactions were priced and accounted in the US dollar. To preserve price stability the central bank began targeting the exchange rate (Ukrainian hryvnia to US dollar). To manage the exchange rate severe capital controls in foreign exchange market plus reserve requirements have been used extensively, which both influence the real interest rates.

The capital controls are implemented through active participation of the National bank of Ukraine on the interbank foreign currency exchange – it sells hard currency from its reserves or buys the excessive supply of currency to keep the exchange rate at the desired level. The interventions were successful up to mid-1998. In 1998 the government could not redeem its bonds, 60% of which were held by foreigners. The National bank was forced by the government to buy the majority of those bonds, which depleted foreign reserves plus created inflationary expectations forcing the central bank to devalue the domestic currency, which was finally triggered by Russian financial crisis of mid-1998. Ukrainian hryvnia then lost about 50% of its nominal value. In post-crisis years nominal exchange rate has slowly decreased by another 50%, however real exchange rate has appreciated.

The crisis had another detrimental consequence – government bonds, before considered to bear low risk, could no longer be used for open market operations. The only operational monetary policy tool left were reserve requirements. Reserve requirements are applied to deposits collected by the banks. The rate of required reserves was moving between 17% and 10% between 1998 and 2000. In 2001 differential rate was introduced – different rates are applied depending on the category of a deposit, demand deposits are subject to higher required reserve rate than term deposits. The banks usually show good compliance and maintain the required amount of reserves, holding noticeable excess reserves is quite rare, as keeping money on reserves is very costly given high level of interest rates.

Both reserve requirements and foreign exchange controls affect short term interest rate by altering the banking system's supply of loanable funds.

4.2 Characteristics of Ukrainian banks

There are seven very large banks, usually called system banks, which keep slightly more than 55% of total banking system assets (end of 2003). Among these banks, two are state banks (Oshchadbank and UkrEximbank) and two former state banks (Prominvestbank and Ukrsotsbank). Inherited close links with the government allow these banks to enjoy loose supervision and enforcement of prudential norms by the central bank. Often, the government grants them exclusive rights to service various government accounts and projects (servicing of budget accounts, state pension funds, etc), which explains their large asset size. They have low capitalization and the highest proportion of the delinquent loans (Table 2).

The other system banks and large banks with the assets above 75th percentile are successful and well-organized private banks with good lobbying power and strong governmental ties but at the same time with strong managers and efficient management systems.

Medium banks (25-75 percentiles) compose about 30% of total banking sector assets. Many of these banks show almost the same level of management proficiency as successful large banks, however they are much more exposed to various risks because of a narrower client base. Usually they do not have powerful political or governmental support and access to contracts to provide large-scale services to the government.

Small banks are highly dependent on a limited set of clients and face much more serious risks than large or medium banks. Some of them also do not meet the capital adequacy requirements. Figures in Table 2, though, show that average capitalization for these banks is very high, which is due to large dispersion in this group. Also, capital adequacy is based on risk weighted assets – many of these banks have to manage substantial risks and should maintain the capital at much higher than current level. Almost one third of the small banks are under pressure to merge with other banks or go out of business.

The data on the Ukrainian banks are briefly summarized in Tables 1 and 2. Comparison of the tables suggests that classifying banks by capitalization is more meaningful than by asset size. We can see that well capitalized banks are less dependent on deposits as a source of funding, than are poorly capitalized banks. So, well capitalized banks may also be less dependent on interest rate movements. Importantly, strong banks are also much less dependent on the demand deposits, and demand deposits are more

affected by interest rate changes than term deposits are. This observation can possibly suggest that better capitalized banks should be less sensitive to changes in interest rates. Interbank borrowings, also highly sensitive to changes in the short term rates, have higher importance for banks with low capitalization than for banks with strong capitalization. Classification by asset size does not allow to grasp any obvious pattern.

Liquidity of a bank seems to be negatively correlated with both bank capitalization, relation with bank size is not obvious. Securities holdings is related to bank size, which seems intuitive – the larger bank the more likely it has informal relations with the government and keep its security in the portfolio (holdings of private securities is extremely scarce). Securities, however, is a very negligible part of banks' assets to play any part in monetary transmission

4.3 Can bank lending channel be a powerful transmission mechanism in the Ukrainian economy?

Kashyap and Stein (1993), who conclude that for the bank-lending channel to be operational it is often sufficient that a central bank is able to affect the supply of loans by commercial banks, sketch two factors that influence central bank's capacity to control lending. The factors are participation of non-banking financial institutions in the economy and existence of capital requirements.

Non-banking financial institutions can collect deposits and issue loans, but in many countries they don't face reserve requirements on their deposits. So, the larger the participation of non-banking financial institutions in loan supply, the weaker is the ability of a central bank to manage loan supply.

The rudimentary state of Ukrainian non-banking institutions (Table 3) can hardly imply any serious role in loan supply. We can safely conclude that this factor cannot undermine the economic power of bank lending channel.

The practice of capital adequacy enforcement can and, most likely, does diminish strength of the bank lending channel. Ukrainian regulations on capital requirements determine both the size of statutory capital and overall capital adequacy. Banks have to maintain total equity capital at no less than 8 percent of total risk-weighted assets. Newly established banks should keep that ratio at 15 and 12 percent during their first and second financial years, respectively.

Capital adequacy ratio is calculated as total capital divided by total risk-weighted assets. According to Ukrainian banking regulation all categories of liquid assets are assigned risk weight of zero. All types of loans (except loans to the government) are assigned risk weight of 100%. Liquid assets and loans compose respectively about 52% and 40%[2] of total assets (for the banking system in total, end of 2003). Since liquid assets are riskless, the amount of available capital determines the maximum amount of loans a bank can provide. Roughly, the total amount of loans a Ukrainian bank can issue should not exceed its total capital divided by 0.08 (or 0.12/0.15 for the new banks). Therefore, there is an upper constraint on loan movements and the central bank cannot affect loans if banks are already crediting close to the maximum allowed level. This is an empirical question to be tested.

[2] Securities, accounts receivables are also assigned risk weights of 100%, but these are very small items on balance sheets of Ukrainian banks.

5. DATA AND ESTIMATION RESULTS

5.1 Data

The annual data I use covers the period 1998-2003. Bank balance sheet on 149 Ukrainian banks are taken "as is" from statistical annual publications of the National bank of Ukraine. Therefore, N=149 and T=6, there are 894 panel data observations available.

Total assets is defined as sum of all bank assets, liquid assets are calculated as cash plus balances with the National bank of Ukraine, plus balances with other commercial banks. Capital is bank equity. Term deposits include deposits of both households and businesses with maturity exceeding one year.

5.2 Estimation and results

The original model specification includes all the variables, which the empirical literature finds important to explain the loan movements. Also included are all alternative measures of balance sheet strength and two indicators of loan demand movements. Therefore, the original model specification is very general, and then we test down for the sets of coefficients equal to zero vector to simplify the general specification.

Since some banks grow quicker than others due to bank-specific and unobserved factors like corporate culture, qualification of bank managers, etc., we have to allow for fixed effects and estimate the model using fixed effects estimator. In our specific case employing the estimator is somewhat complicated due to presence of lagged dependent

variable among regressors. Although including a lag of the dependent variable is trivial in time series models, the fixed effects estimator is severely biased.

In the 90s the conventional solution to the problem was Arellano and Bond (1991) GMM procedure, which suggests to use instruments for lags of dependent variable in dynamic panel data models. These instruments are obtained by Arrellano and Bond from the orthogonality conditions that exist between lagged values of dependent variable and disturbances. Hahn and Kuersteiner (2002) found that Arrelano and Bond estimator is substantially biased for finite samples and proposed alternative bias-corrected estimator. Hahn and Kuersteiner estimator is appropriate for panels with large T and relatively small N. Hence, it is not a good solution in our case of large N-small T panel.

Another possibility is to use the instrument for lagged growth of loans suggested by Anderson and Hsiao (1982). They first difference the model similar to (19) to get rid of the fixed effects and then use Δy_{it-2} as an instrument for Δy_{it-1}. They also show that levels (y_{it-2}) is a more efficient instrument than growth rates (Δy_{it-2}). We will use this finding to estimate our model and use twice lagged level of loans as an instrument for $\Delta LN(-1)$.

The estimation results are presented in Table 4. We first estimate the straightforward model with $\Delta LN(-1)$ in the right hand side to compare the results to estimation with the instrument – $\Delta LN(-2)$. Simple comparison of estimation output in columns (1) and (2) of Table 4 shows that results are quite different for instrumental variable estimation (2) and straightforward estimation (1). Although lagged loans have no practical and statistical significance, including $\Delta LN(-1)$ makes other estimates

crucially different. Importantly, all of the cross products of BS_{it} and Δi_{t-j}, except $\Delta i * LIQ(-1)$, are not different from zero, either statistically or economically. Introducing the instrument for lagged dependent variable makes capitalization cross term significant, while liquidity cross term becomes insignificant.

Now we test specification (2) for joint significance of coefficient vectors to simplify the model. Coefficients before A, CA, LIQ, $LN(-2)$, $\Delta IBLN(-1)$, Δi *A(-1), $\Delta i(-1) * A(-1)$, $\Delta i * LIQ(-1)$, and $\Delta i(-1) * LIQ(-1)$ have high associated p-values and can be statistically insignificant. Wald test that the coefficients are jointly equal to zero (Ho) produces p-value of p-0.5920. We can confidently conclude that the data do not provide substantial evidence to reject the null and drop these variables from the model.

Estimation results for the simplified model are summarized in column (3) of the Table 4.

Coefficient associated with capitalization cross term is positive and relatively large, which is consistent with empirical literature and our theoretical model – well-capitalized banks should be less sensitive to policy shocks than banks with modest capital base.

All asset variables assets are insignificant for our data, which does not contradict the theory that concludes on the ambiguity on asset size (equation (17)).

Our results suggest also that liquidity standing is not very important in explaining lending response to monetary policy (all liquidity measures are insignificant for total loans, for consumer loans cross product $\Delta i(-1) * LIQ(-1)$ is statistically significant, but

its magnitude is about one hundredth of capitalization cross term) . The most appealing interpretation of this finding can be the following: liquid assets do not earn returns, therefore banks hold only as much liquidity as is needed to service liquidity requiring transactions, which should be roughly equal for small banks and large banks if they employ the same transaction technologies and manage their money flow rationally.

We are primarily interested to verify the existence of bank lending channel. In terms of our specification, this implies that all coefficients on Δi_{t-j} should be negative and the coefficients on BS_{it} and Δi_{t-j} cross products should be positive. In our case coefficient on current value of the interest rate change is negative (coefficient on lagged value of interest rate change has low economic significance) and coefficient on capital cross term is positive (the other cross products are not statistically or economically significant). So, we conclude that bank lending channel has some economic power in Ukrainian economy.

The results (3) allow us to assess the effects of permanent monetary policy shocks Δi_t on growth loans. Such shocks have contemporaneous effect on loans by a factor of $\beta_0 + \delta_0 CA_{it-1}$. β_0 describes how a shock effects an average bank, whereas $\delta_0 CA_{it-1}$ is the part of total effect dependent on the balance sheet strength of a bank – its capitalization. In the consequent period the loan response is $\beta_0 + \gamma_1(\beta_0 + \delta_0 CA_{it-1})$. The long-run multiplier is $\frac{\beta_0 + \beta_1}{1-\gamma} + \frac{\delta_0 + \delta_1}{1-\gamma}$, the first term represents effect common for all banks, second term – effect depending on capitalization of a bank. For simplicity

we ignore the coefficient on $\Delta i(-1) * LIQ(-1)$, which is very small relative to coefficient on Δi *CA(-1)

The long-run multiplier for our estimates is (-1.051+0.001)+0.348=-0.702

Long-run impact of monetary policy shock on an average Ukrainian bank is negative. If the central bank conducts restrictive policy that increases interest rates by 1%, an average bank reduces its total loans by some 4%. The second term is positive, so the larger is the capitalization of a bank the more capable the bank is to offset the negative shock. The result is, most likely, valid for monetary expansion also.

Data inspection suggests that lending responses to an interest rate change of 1% is roughly the same for the expansion periods and for the restriction period. Banks were classified into four capitalization categories as in Table 2 and then lending responds for different periods were assessed. The data do not allow more rigorous estimation as we have observations for only six years, i.e., 6 observations on the interest rate, taking interest rate change and lagged values leaves us with 5 points two of which correspond to monetary expansion and two for monetary restriction.

The conclusion we are making is valid if we estimate the model for consumer loans rather than total loans. Estimation output is given in columns (4) and (5) of the Table 4. The effect of a policy is more pronounced for consumer loans. Consumer loans are more sensitive to changes in the short term interest rate. Again, better capitalization implies less vulnerability to policy changes. All other coefficients are generally consistent with those in the respective models for total loans.

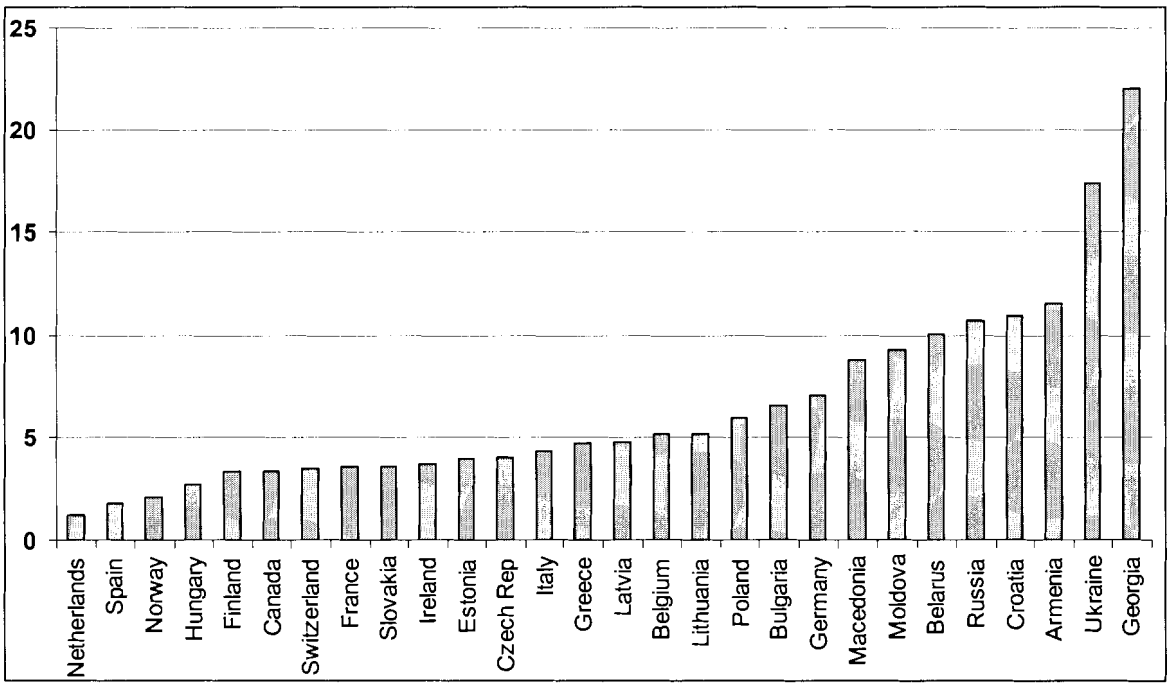
We infer that the National bank of Ukraine is able to affect the supply of loans, which implies that the lending channel has some economic power in the Ukrainian economy.

CONCLUSIONS

The existence of the bank lending channel has important implications for the conduct of monetary policy by the central bank. The literature predicts that if bank lending channel is present banks should cut back on lending in response to monetary contraction and weak undercapitalized banks should show greater change in loans than well established banks. This happens because for the former it is more problematic to offset reduction in deposits with funds from other external sources. Tests for the existence of bank lending channel are using the approach of disaggregating banks according to some measure of balance sheet strength, like capitalization or asset size and then estimating lending responses to monetary shock depending on bank strength. Our paper uses capitalization, bank assets and liquidity as disaggregating variables. We find that for Ukrainian banks the level of bank capitalization is the best measure of balance sheet strength. Our estimation results suggest that lending response of a Ukrainian bank depends on its capitalization – the higher the capitalization the less sensitive a bank is to changes in monetary policy. This result is consistent with theoretical predictions and implies that bank lending channel has some economic power in the Ukrainian economy

APPENDIX: FIGURES AND TABLES

Figure 1: Spread between Lending and Borrowing Interest Rate, %, end of 2002, Selected Countries.



Data source: World Development Indicators.

Table 1: Characteristics of the Ukrainian Banks by Capitalization, end of 2003.

	Capitalization (percentile)			
Market share, %	<25%	25-50%	50-75%	>75%
Total assets	96.01	2.98	0.64	0.37
Loans	95.28	3.94	0.44	0.34
Deposits	96.51	3.07	0.31	0.10
Asset Structure (average % total assets)				
Loans	41.49	44.23	26.39	33.98
Consumer loans, % total loans	12.30	9.65	12.97	15.16
Liquid assets	65.91	68.71	54.27	48.47
Securities	0.75	0.84	0.00	0.00
Fixed assets	4.06	5.86	11.95	10.15
Liability Structure (average % total liability)				
Deposits	38.38	40.36	28.06	21.66
Demand deposits, % total deposits	68.88	63.42	38.12	32.52
Interbank borrowings	11.29	7.32	6.38	2.38
Capitalization	10.22	26.10	40.94	63.95
Loan delinquency rate	2.74	2.25	1.46	1.95
Average capital size, USD mln	21.14	7.32	8.02	4.64
Average asset size, USD mln	339.06	31.24	19.44	8.25

Data source: National Bank of Ukraine.

Table 2: Characteristics of the Ukrainian Banks by Asset Size end of 2003.

	Asset Size (percentile)				**System banks**
	<25%	25-50%	50-75%	>75%	
Market share, %					
Total assets	16.51	13.91	4.94	12.90	52.74
Loans	19.72	16.39	5.42	12.52	47.04
Deposits	16.49	14.02	5.57	9.82	55.32
Asset structure (average % total assets)					
Loans	40.70	42.10	39.58	35.30	31.74
Consumer loans, % total loans	12.68	5.71	19.55	12.42	14.85
Liquid assets	64.71	69.37	63.02	53.59	44.44
Securities	0.30	0.74	0.15	3.05	4.24
Fixed assets	6.26	3.61	3.35	2.71	3.71
Liability structure (average % total liability)					
Deposits	36.65	36.75	39.77	29.13	36.66
Demand deposits, % total deposits	40.34	37.32	27.29	30.65	44.59
Interbank borrowings	8.42	14.75	4.55	14.36	3.54
Capitalization	24.51	8.87	5.50	5.75	4.79
Loan deliquency rate	2.31	2.09	2.40	2.22	6.45
Average capital size, mln USD	7.37	20.18	22.69	39.13	118.49
Average asset size, USD mln	47.35	233.37	414.35	721.34	2527.60

Data source: National Bank of Ukraine.

Table 3: Assets of Non-Bank Financial Institutions, % GDP, June 2000.

Country	Investment Funds	Pension Funds	Insurance Companies	Mutual Funds	Total
Czech Republic	6	2	9	2	19
Estonia	3	0	3	2	8
Hungary	4	4	3	8	19
Kazakhstan	2	3	1	0	6
Latvia	2	0	1	3	6
Lithuania	4	0	0	2	6
Poland	6	2	5	2	15
Romania	8	0	0	0	8
Russia	1	1	1	1	4
Slovakia	4	0	4	2	10
Slovenia	2	0	4	3	9
Ukraine	0	0	1	0	1
Germany	22.7	13.0	31.9	4.6	72.2
Mexico		2.7	1.7	3.6	8.0
Portugal	21.2	11.2	9.6		45.6
South Korea	19.5	1.8	15.9		37.2
Turkey	0.5	0.8	0.6	1.9	3.8
United Kingdom	29.3	101.0	88.9	30.4	249.6
United States	55.2	89.9	43.1	73.6	261.8

Source: Roe (2001).

Table 4: Effect of Monetary Policy Shocks on Loan Growth (p-values in parentheses)

	Dependent variable – growth rate of total loans			Dependent variable – growth rate of consumer loans	
Variable	1	2	3	4	5
$\Delta LN(-1)$	0.040				
	(0.001)				
$\Delta LN(-2)$		0.121			
		(0.684)			
$CLN(-2)$				-0.002	
				(0.868)	
Δi	-0.366	-1.051	-1.051	-3.087	-2.788
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
$\Delta i_{(-1)}$	0.080	0.003	0.001	-0.019	
	(0.585)	(0.000)	(0.000)	(0.590)	
$\Delta TEDE$	0.168	0.082	0.083	0.641	0.680
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta TEDE(-1)$	0.063	0.009	0.078	0.005	0.013
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta IBLN$	-0.012	0.056	0.060	-0.013	
	0.000	(0.016)	(0.000)	(0.148)	
$\Delta IBLN(-1)$	-0.117	0.9427		0.007	
	(0.098)	(0.912)		(0.817)	
A	0.000	0.000		0.000	
	(0.072)	0.712		(0.771)	
LIQ	-2.050	-4.095		-12.148	
	(0.005)	(0.156)		(0.289)	
CA	-3.04	0.978		11.526	
	(0.031)	(0.323)		(0.319)	
$\Delta i * A(-1)$	0.000	0.000		0.000	
	(0.500)	(0.294)		(0.700)	
$\Delta i(-1) * A(-1)$	0.000	0.000		0.000	
	(0.150)	(0.153)		(0.886)	
$\Delta i * CA(-1)$	-0.052	0.327	0.348	1.004	0.946
	(0.010)	(0.003)	(0.000)	(0.023)	(0.000)
$\Delta i(-1) *$	-0.045	-0.123	-0.004	0.478	
$CA(-1)$	(0.225)	(0.051)	(0.043)	(0.624)	
$\Delta i * LIQ(-1)$	0.041	-0.022		-0.138	
	(0.001)	(0.604)		(0.388)	
Δi (-1)* $LIQ(-1)$	-0.826	-0.015		-0.080	-0.090
	(0.648)	(0.873)		(0.022)	(0.022)

Source: own calculations.

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