

SIGNIFICANCE OF CREDIT
RATIONING IN UKRAINE

by

Ivan Poltavets

A thesis submitted in partial fulfilment
of the requirements for the degree of

Master of Arts in Economics

EERC

2002

Approved by: Professor Serhiy Korablin, Institute for Economic
Forecasting at the National Academy of Sciences of
Ukraine, Chairperson of Supervisory Committee

Program Authorized
to Offer Degree _____

Date _____

EERC

Abstract

SIGNIFICANCE OF CREDIT
RATIONING IN UKRAINE

by Ivan Poltavets

Chairperson of the Supervisory Committee: Professor Serhiy Korablin,
Institute for Economic Forecasting at the National Academy
of Sciences of Ukraine

Smooth functioning of the financial system enhances efficiency of the economy by transferring funds from savers to borrowers. Financial markets differ from those for more conventional goods due to the asymmetry of information, which might result in credit rationing by non-price means. Credit rationing may also occur due to rigidities in interest rates. This thesis presents an overview of economic literature on credit rationing and attempts to localize this phenomenon for the case of transition countries.

The overview of the Ukrainian credit market suggests that while the development of the structure of the market is largely over there remain institutional inefficiencies that lead to 'infrastructure' credit rationing, preventing satisfaction of demand for credit.

Several indirect tests for the significance of credit rationing are undertaken on macro and micro levels for the case of Ukraine. A test suggested by Galbraith (1996) is implemented using Ukrainian data. It is found that monetary policy has a greater capacity to expand output rather than contract it. That is effective supply failure hypothesis and availability doctrine receive indirect support. Therefore, stimulation of credit expansion, through e.g. establishment of credit rating agencies, improvement of legislation on collateral, might lead to increase of real output, provided that currently Ukrainian economy may be characterised as liquidity constrained.

TABLE OF CONTENTS

List of Tables	ii
List of Figures.....	iii
Introduction.....	1
Chapter 1. Credit Rationing in Economic Literature	4
Chapter 2. Credit Market: Ukrainian Context.....	20
Chapter 3. Empirical testing and results.....	29
Conclusions.....	43

LIST OF TABLES

<i>Number</i>	<i>Page</i>
Table 2.1 Dynamics of the banking industry structure in Ukraine 1991-2001.....	25
Table 2.2 Categorization of banks according their net assets, 1 Feb 2002.....	26
Table 4.1 Description of data on credit volumes and interest rates.....	31
Table 4.2 Index of relative mobility of the interest rates for 1996-2001, using average monthly data, %.....	32
Table 4.3 Results of the estimation of interest rate influence on credit provision by commercial banks.....	33
Table 4.4 Correlation amongst the interest rates in the economy 1996-2001, monthly average data.....	33
Table 4.5 Results of the estimation of influence of the refinance rate on credit.....	34
Table 4.6 Data description for the estimation of the Galbraith model.....	36
Table 4.7 Estimation results for the model without threshold variable.....	37
Table 4.8 Results of the regression with a threshold variable of maximum significance.....	41

LIST OF FIGURES

<i>Number</i>	<i>Page</i>
Figure 1.1 Maximization of bank's expected returns.....	16
Figure 1.2 Determination of credit market equilibrium.....	16
Figure 2.1 Credit as a percentage of GDP.....	21
Figure 4.1 Results of the CUSUM test on the model estimated in equation 4.4.....	38
Figure 4.2 Results of the CUSUM of squares test on the model estimated in equation 4.4.....	39
Figure 4.3 Absolute values of T-statistics (C2) for the coefficients in front of the lagged monetary variable, truncated above the threshold plotted against the threshold values (C1)....	43

GLOSSARY

Asymmetric information. Information concerning a transaction that is unequally shared between the two parties to the transaction.

Collateral. A second security (in addition to the personal surety of the borrower) for a loan.

Credit guarantee. A type of insurance against default provided by a credit guarantee association or other institution to a lending institution. It enables otherwise 'sound' borrowers who lack collateral security, or are unable to obtain loans for other reasons, to obtain the credit they require through banks in the normal way.

Credit rating. Evaluation of ability to pay back the sum promised

Credit risk. Uncertainty with respect to the prices at which the securities can be sold before maturity

Credit union. A non-profit organization accepting deposits and making loans, operated as a cooperative.

Market risk. Uncertainty concerning the repayment of the principal

Moral hazard. The presence of incentives for individuals to act in ways that incur costs that they do not have to bear.

Transaction costs. The costs associated with the process of buying and selling.

INTRODUCTION

It is hard to overestimate the importance of an efficient financial intermediation for the economy's smooth functioning. Lending would be made extremely problematic in the absence of financial intermediaries. It would be too costly for the savers to engage in lending due to the costliness of locating the borrower, gathering information on his creditworthiness, writing up and monitoring the contract. Banks specialize in creditworthiness evaluation as well as may save on contracting costs due to the economies of scale. Due to asset transformation capacity banks also offer lenders more opportunities for maintaining a desired level of liquidity, while still being able to provide their borrowers with the long-term loans.

Successful institution of lending may greatly benefit the economy. Transfer of funds from savers to borrowers will allow the latter proceed with business projects, which would otherwise be impossible to implement. Financial intermediation also plays an important role in the money creation mechanism thus gaining importance in the course of the monetary policy conduct.

Various studies have shown that effectiveness of the financial system is positively correlated with the long-term economic growth¹, therefore, the development of financial system and efficiency of the credit provision in the economy should be of interest both to the economists and to policy-makers. Ukraine's banking system is still at the primary stages of development in comparison not only with the developed countries, but also with more advanced countries in transition (Sutlan and Michev, 2000). Chapter 2

¹ See Levine, Ross (1997). "Financial Development and Economic Growth: Views and Agenda" *Journal of Economic Literature*, Vol XXXV (June), pp. 688-726 (cited by Sultan and Michev 2000)

presents an overview of financial intermediation in Ukraine with an emphasis on credit provision.

This thesis looks into the phenomenon of credit rationing and its possible significance for Ukraine. By credit rationing we mean non-price discrimination of borrowers by the bankers. Credit rationing started to receive increasing attention in the Western economic literature starting from the middle of the 20th century. Although in the beginning credit rationing was thought to be the result of market imperfections and rigidities, later theoretical contributions saw credit rationing as a rational behaviour on behalf of profit maximizing rationally behaving bankers. Chapter 1 presents a detailed discussion of the economic literature on credit rationing.

Under explicit price ceilings, such as were the usury laws, credit rationing might be viewed through the prism of the deficit, created through difference between demand and supply for loans at the ceiling price, provided the market equilibrium price is above the ceiling. However, today, with no explicit price ceilings on credit, credit rationing persists. Customers may be still either refused a loan at all, or might receive a smaller than requested loan at the same price. Provided that some clients are riskier than others we could assume that some loan might still be issued, but at a higher interest rate. It is hard to imagine that under competitive market a producer of some tangible good would refuse to make a sale to a consumer. Thus it is possible to probe into the intrinsic characteristics of the loan market structure, e.g. asymmetric information, moral hazard, which makes it unlike the other more conventional goods markets.

Although credit rationing is impossible to capture directly empirical studies testing theoretical constructs became abundant in recent economic literature. To be able to comprehensively analyse credit rationing a very detailed set of microeconomic data is needed. However, it is possible to devise a number of tools to indirectly establish the significance of credit rationing both on the

macroeconomic and microeconomic levels. Such an attempt for the case of Ukraine is presented in Chapter 3. A model presented by Galbraith (1996) is estimated for Ukrainian data as well as several other tests are undertaken.

Credit rationing if exists may have influence both on the conduct of monetary policy and on output. If credit rationing is caused by rational behaviour in the face of the risk in the market place, then it may be thought of as efficient. However, if credit rationing is caused by some 'removable' market imperfections and rigidities, then policy-makers or bankers may undertake some institutional changes to allow for a better provision of credit in the economy. Chapter 3 and Conclusions discuss the implications of the empirical investigation into the significance of credit rationing in Ukraine for the policymaking and further development of the banking system.

Chapter 1

CREDIT RATIONING IN ECONOMIC LITERATURE

Credit rationing is an issue of much controversy in the economic literature, which may be attributed to the difficulties in the theoretical treatment of the phenomenon. Indeed, in the neoclassical world of perfect competition, hence, of zero transaction costs, perfect information, and instantaneous adjustment, credit rationing cannot exist. In the neoclassical framework, the loan has two characteristics: interest rate and maturity. The customer's risk is known, and, provided there are no information costs, the lenders may perfectly price discriminate amongst borrowers through setting interest rates on the loan for each customer. Moreover, if transactions are costless, contracts may be however complex, taking account of all contingencies as well as they can be fully observed and enforced (since monitoring costs are zero). In case of the exogenous shock to the economy, the interest rate will adjust instantaneously thus no loans will be refused due to the downward or upward rigidity of the interest rates.

It is hard to deny the existence of credit rationing in reality. Majority of the textbooks on Money and Banking include a brief reference (e.g. Mishkin, 2000, p. 232) to credit rationing. Two types are distinguished: loan is refused overall, or a lesser than asked for sum is loaned. The reason for non-price discrimination of borrowers is rooted in adverse selection and moral hazard. Borrowers who are willing to pay high interest rates are those with the least chances of paying back. Therefore, the loan is refused to them to reduce the risk of non-payment. Loaning of the lower than asked for amount is explained through the banker's willingness to create the correct incentives within the borrower to prevent moral hazard, for the higher is the sum loaned

the larger is the motivation to default, or engage in activities not provided for in the contract.

Although these explanations of credit rationing are empirically appealing, they are quite insufficient and do not stand up to the theoretical scrutiny. For example, provided those willing to pay high interest rates are indeed less likely to pay the debt back, it is still not clear, why the bank would not quote appropriate interest rates to compensate for possible losses. In case of moral hazard, it is assumed that willingness to default or violate contract is increasing in the size of the loan. No justification for such an assumption is being made aside from reliance on general common sense.

Therefore, we may contrast two extreme positions on credit rationing. On the one hand, in the purely neoclassical approach: this phenomenon does not exist. On the other hand, in the more reality-oriented disciplines, credit rationing exists, but is not well accounted for theoretically. With credit rationing being an intriguing instance, which may have serious consequences on economy, theoreticians had to relax some of the 'perfect' assumptions of the 'orthodox' approach to provide for its existence.

Within the literature on credit rationing two threads are clearly distinguishable. One deals with the possible macroconsequences of credit rationing, while the other is characterized by necessity to provide microfoundations for the credit rationing mechanism. Further, we will consider major contributions to both threads of economic literature since the middle of the 20th century.

1.1 Tight credit and monetary transmission mechanism

Theoreticians were drawn to the issue of credit rationing via consideration of the monetary policy mechanism. The availability doctrine sprung in the 1950s from the development of the economic theory in the area of monetary policy conduct. Although there were prior statements of the availability doctrine (e.g. Roosa 1951)² and some attempts at its formal analysis (e.g. Kareken 1957), Scott (1957) formalized it presenting a clear theoretical model. He presents the main proposition of the availability doctrine, which still finds its reflections in modern treatment of bank lending monetary transmission mechanism theory, in the following manner: 'a restrictive monetary policy may cause a reduction in the quantity of credit supplied private borrowers by private lenders irrespective of the elasticity of demand for borrowed funds (sic.) (Scott p 41). This is achieved through a seemingly counterintuitive argument, which states that, all other things being equal, the share of government securities in an investor's portfolios will increase as their riskiness increases. That is

$$DX_g/Ds_g > 0,$$

where X_g is the proportion in par value terms of the portfolio composed of government securities, and s_g is the standard deviation of government security's rates of return.

Hence the private loan share in portfolios will contract. Even if the demand for loanable funds is inelastic in interest rates, the supply side will respond curtailing the supply. Higher demand for now riskier government securities stems from the willingness of investors to decrease the risk of their portfolios. Provided that riskier government bonds are still less risky than private loans

² Roosa, Robert V., (1951). "Interest Rates and the Central Bank," in *Money, Trade and Economic Growth; in Honor of John Henry Willians*, New York, The Macmillan Company. (cited by Jaffee 1971).

(private loans face both credit risk and market risk, while the governments are exposed only to the latter one), investors will decrease the share of the private loans increasing the share of government papers. Thus the restrictive monetary policy may succeed through contraction of supply, even if the loan interest rate is rigid, or the demand for loans is inelastic in interest rates. If we assume that the price of loan is fully reflected by the interest rate, then credit rationing phenomenon may be represented as a deficit in the market for private loans. Suppose that demand (L_d) and supply (L_s) for loans are linear and determined by the interest rate. Then, although market clearing interest rate is r^* credit rationing means that r will prevail on the market, thus creating a deficit (AB) of loanable funds.

However, private loan interest rate rigidity is rather an assumption than implication within the earlier formulation of the availability doctrine. Hodgman (1960) tries to save credit rationing from being labeled a temporary phenomenon that appears in the times of adjustment only. He attempts to show that credit rationing does not have to be caused only by stickiness of the interest rates or by the interest rate ceilings (since most businesses are now exempt from the protection of usury laws, and banks are free to discriminate using prices, rather than non-price mechanisms). Credit rationing is treated as the reaction of lenders to risk and is permanent, rather than temporary, in nature. Hodgman defines the risk of the loan as the ratio of expected value of the payment to the expected value of the possible payments below the agreed upon. It is shown that beyond some loan size this ratio will not be falling whatever the increases in the interest rates are. Therefore, it is rational to refuse credit at some level of the interest rate.

Hodgman builds the model of loan supply and demand differentiating amongst borrowers according to their credit rating. The corollary of the model is that at some point, with the rising sum of credit sought, some borrowers will be unable to obtain funds by offering to pay higher interest; but those with better credit ratings will still be able to increase the sum of

their loans by offering higher interest payments. Thus credit rationing is portrayed within the model as a rational reaction in the face of risk, and the supply of loans is differentiated amongst borrowers according to their credit ratings (with supply being interest-inelastic for some, while remaining interest-elastic for others) (Hodgman, 1960, p. 275).

One of the important implications for the central bank's conduct of monetary policy is that both the sale of government securities in the open market and an increase in reserve requirements will increase the riskiness of the banks' portfolio, which in turn will mean the decrease in the amount of total investable resources. Thus, the customer will now find more stringent terms in regards to interest and credit ratings required by banks. Some of the corollaries of the Hodgman paper are particularly interesting for the case of transition economy, such as Ukraine; therefore I will quote it in full:

The larger the proportion of marginal borrowers in the aggregate demand ... the more effectively will credit be restricted for a given rise in interest on government securities. ... Of course, the higher interest rates go, the more numerous are the borrowers who become marginal in terms of credit rationing (risk considerations) regardless of their willingness to commit themselves to higher interest charges. Ultimately every borrower is limited by his capacity rather than his willingness. Accordingly the higher interest rates go, the more pervasive will become the influence of credit rationing. More and more borrowers will find that "availability" rather than interest determines their access to credit. (Hodgman, p. 277)

We may find the echo of the availability doctrine in the more recent attempts to provide the micro foundations to the explanations of the monetary policy influence on real variables. Blinder and Stiglitz (1983) basically restate the availability doctrine stating that contraction of credit supply will lead to economic depression, since there are no close substitutes to credit from banks at least in the short run. Provided credit market is characterized by imperfect information, the information gathering and expertise is costly, the firms denied credit by their banks have little chances of raising funds elsewhere (e.g.

a firm looking for funding in the equity market after being rejected a loan by its servicing bank may be treated as a bad risk). Provided financial innovation significantly inhibits the central bank to influence real variables through restricting the quantity of the medium of exchange (innovation increases the number of substitutes to money), it may still influence the real economy relying on the bank's unique role in the economy. The other side of the medal though is that disregard for the influence of tight money on credit availability during the conduct of monetary policy may lead to harsher than necessary drag on economic activity.

In 1987 Blinder reconsidered the effects of the monetary policy on the real sector of the economy in the paper entitled "Credit rationing and effective supply failures". The intriguing point is that Blinder's theoretical explanation of monetary policy affecting real variables moves money to the shade, while making the credit rationing mechanism the main one in the explanation. Under effective supply failure the author understands the following: firms may need credit to produce goods to satisfy the market demand; however, unavailable credit may inhibit firms from producing as much as they would like to. The implication of this phenomenon is a rise in prices, rather than a fall in prices, that may be observed when recession is caused by decline in supply rather than in demand.

Further, the author introduces the mechanism of the 'credit multiplier': increase in demand leads to higher borrowing by firms to expand production; as economy speeds up higher deposits are needed to service the increased number of transactions, which in turn leads to more credit being extended by the banks. (Blinder, 1987, p 328).

To justify some of the model's properties Blinder discusses threads of economic literature on credit rationing in the developed and less developed countries. The contrast between these two approaches is that while in the LDCs credit rationing is treated mainly as a disequilibrium phenomenon

resulting from institutional imperfections (such as credit ceilings, sluggish adjustment), in developed countries credit rationing is viewed as an equilibrium phenomenon resulting from imperfect information in the credit market. Thus, credit rationing is shown to be present in most of the economies even with drastically different features.

Blinder develops two theoretical models in one of which the credit rationing mechanism restricts working capital of firms thus reducing aggregate supply. In the second model credit rationing tightens both demand and supply side of the economy through the restraint on investment spending. There are several important features shared by both models: firms need credit for working capital; bank credit does not have substitutes; credit rationing is assumed to be an equilibrium phenomenon; credit expands with the expansion of the economic activity; rational expectations are assumed; interest elasticity and money play no active role in the models.

The main results obtained from theoretical constructs is that depending on the level of credit-constraints in the economy the monetary policy may have different results on real economy. Whether economy is credit-constrained depends on relative magnitudes of central bank credit and aggregate demand. An interesting result obtained from the model is that if supply is reduced relatively to demand, then reduction in credit may prove to be inflationary, which in turn again leads to further credit tightening. Credit rationing is not viewed as a destabilizing phenomenon, however, but more as a self-correcting phenomenon (Blinder. p. 351).

McCallum (1991) sets the task of empirically testing Alan Blinder's hypothesis. The author used three different approaches to measuring credit rationing in the economy. The first approach considers whether the recent monetary policy was "substantially" tighter than usual. The second measure is

established on the work done by Eckstein (1983)³ and Sinai (1976)⁴, who developed estimates of tight credit periods. The third approach uses the work of King (1986)⁵, who estimated the periods of excess demand for credit.

The author reaches unambiguous conclusion on the importance of the credit rationing mechanism for the economy. The tests show that "output effects of money shocks are about twice as large when recent monetary policy has been "tight" as when recent monetary policy has been "loose" (McCallum, 1991, p 951). Therefore, the author lends some empirical support to Blinder's (1987) theoretical model, finding that credit rationing does indeed indirectly influence GNP under monetary shocks.

John Galbraith (1991) continues the thread of literature that investigates the macroconsequences of credit rationing. Generally, "credit-constrained" economy would simply mean that the monetary variable is below a certain threshold value and "credit-loose" that it is above. While McCallum used some readily available estimates of the threshold, Galbraith considers the case when the threshold value is not known and must be chosen from the sample. Galbraith develops some testing techniques to find threshold values for the U.S. and Canadian economy. The author concludes that the testing techniques employed represent strong evidence for the case of threshold effect existence. However, the surprising result of the tests was that threshold appears to be located in the upper range of monetary variable, which is associated with "loose" credit, which contradicts Blinder's prediction of monetary variable having more impact on the output in the case when the credit is "tight". Galbraith does not refute existence of credit rationing in terms of relative credit allocation among borrowers on microlevel, but prompts that threshold

³ Eckstein, Otto, (1983). *The DRI Model of the U.S. Economy*. New York: McGraw-Hill, (cited by McCallum, 1991)

⁴ Sinai, Allen. (1976). "Credit Crunches - An analysis of the postwar experience," in Otto Eckstein (ed.), *Parameters and Policies in the U.S. Economy*, Amsterdam: North-Holland, pp. 244-74 (cited by McCallum, 1991)

⁵ King, Stephen R. (1986) "Monetary Transmission: Through Bank Loans or Bank Liabilities?" *Journal of Money, Credit, and Banking*, 18, pp. 290-303 (cited by McCallum, 1991)

effect might reflect some phenomenon other than credit rationing, and more investigation is necessary in that regard. (Galbraith p. 429).

1.2 Microfoundations of credit rationing mechanism

The second thread of the economic literature dealing with credit rationing phenomenon represents a striving to create a credible theoretic microfoundation. Neoclassical tradition might recognize existence of the credit rationing only during the short-term adjustment. However, persistence of credit rationing made some authors look for 'rationality' (hence efficiency) of credit rationing.

Freimer and Gordon (1965) developed a model, which shows that under realistic circumstance the profit maximizing behavior will include credit rationing. The authors also distinguish between weak and strict credit rationing. Under weak rationing the banker may still vary the interest and the size of the loan. Under strict rationing the rate is set at the customary level and the banker only determines the size of the loan according to the entrepreneurs credit standing. It appears that it is more rational for bankers to use strict credit rationing. Jaffee and Russell (1976) also build a model that shows rationality of credit rationing as the response to adverse selection problem.

In 1983 Stiglitz and Weiss published a seminal paper on credit rationing entitled "Credit rationing in Markets with Imperfect Information". The goal of the paper continues the thread of discussion started by Hodgman that is the authors try to show that equilibrium in the market for loanable funds is characterized by credit rationing. Therefore, a permanent nature of credit rationing is asserted.

The model developed by authors implies that the equilibrium interest rate in the loan market will not clear the market; therefore, demand will exceed supply (or vice versa). Such a result, apparently violating the so-called Law of Supply and Demand, is caused by the specific characteristics of the 'price' for

loanable funds. The price, which is the interest rate, plays two roles, which it does not possess in other more typical markets: a) the interest rate affects the pool of loan seekers; b) the interest rate is also part of the incentive structure for borrowers, and therefore affects their behavior, after the loan is issued.

The higher interest rates will attract riskier borrowers, with lower probability of payoff, thus lowering banks expected return, while safer borrowers will not apply for credit. This situation is generally termed adverse selection. The incentive argument, which concerns moral hazard, states that the higher the interest rates (collateral, loan amount) the more incentive does the borrower has to engage in riskier projects, once the loan is issued. Thus the banks expected return is again lowered. That is why, provided that monitoring and information-gathering costs may be significant, the banks should take into account the influence of the interest rate on their borrowers.

The characteristics of the loan are not limited to interest rate and maturity. There are many dimensions to each loan: collateral requirements, restrictive covenants, contracting costs, etc. Baltensperger (p. 172-173) points out extensive economic literature that does not view the price of the loan limited to interest rate alone. Rather it is beneficial to think of the loan price, broadly conceived. That is rationing on the basis of insufficient collateral, although the entrepreneur is willing to pay the going interest rate, would not represent non-price rationing, since collateral is just another dimension of the quoted price. Therefore, we may think of the loan price in terms of a vector, which includes interest rate, maturity, collateral, contracting costs, etc. Therefore, credit rationing in its stricter sense should be thought of in terms of 'nonprice rationing only, thus reserving it to situations where a borrower's demand is unfulfilled, although he is willing to pay the ruling market price (in the broad sense, including all aspects of the loan-term vector).' Baltensperger (p. 173).

Modern approach to the issue of credit rationing treats the price in the aforementioned stricter sense of the word. Stiglitz and Weiss (1983) do not

limit their analysis to the investigation of the interest rate influence on the pool of borrowers and their incentives. They show that even an attempt to price discriminate the borrowers through the increase in collateral requirements, leaving the interest rate intact will lead to the decrease in the expected returns to the bank. The support behind this argument relies on the difference in risk aversion and risk neutrality of poorer and richer loan seekers. The latter ones are more likely to satisfy increased collateral requirements, thus pushing those, inclined to undertake safer projects, out of the pool of potential clients. Therefore, it may be inferred that other parameters of the vector price of credit are influencing incentives and the composition of the pool of borrowers in the manner similar to the interest rate. Basically, willingness to pay higher interest rate or provide abundant collateral may be used by a bank as one of the screening devices in assessing their customers.

In the model built by Stiglitz and Weiss (1983), both banks and entrepreneurs abide the profit maximization principle: banks set the profit maximizing interest rate and entrepreneurs choose the most profitable project available. Under more classic approach we think of equilibrium as of the point where the price is such that market clears, the authors show that there may exist interest rates lower than the 'market clearing' interest rate under which the banks increase their profits. Therefore, in line with the profit maximizing behavior the banks may be induced to keep the 'equilibrium' interest rate below the 'market clearing' interest rate, while limiting loan supply through non-price rationing the otherwise identical borrowers. Thus, we can say that there is an optimal interest rate r , which maximizes banks expected return on loans. The banks may find it not profitable to increase the interest rate beyond this equilibrium point even if it lies below the market clearing interest rate (see Figure 1.1):

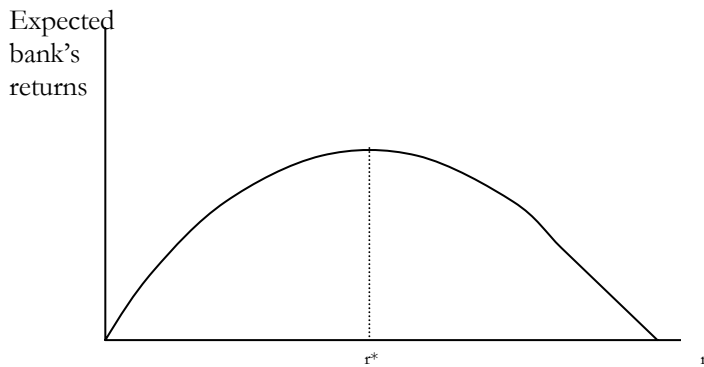


Figure 1.1 Maximization of bank's profits

Instead of the simplistic, conventional approach, Stiglitz and Weiss (1983, p. 397) propose an alternative representation of the determination of the market equilibrium in the loan market. The demand for loans is determined by r , the interest rate offered by banks, and the supply is determined by q , the mean return on loans. Figure 1.2 represents the expanded version of the demand-supply framework, which incorporates different determinants faced by borrowers and lenders.

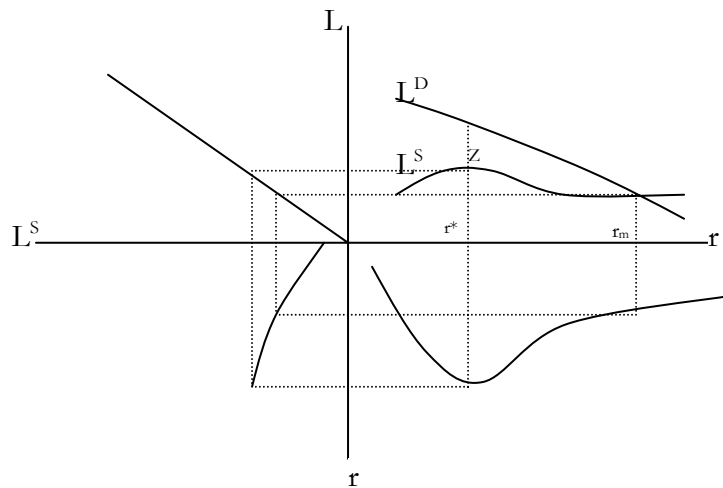


Figure 1.2 Determination of the credit market equilibrium

In the Figure 1.2 the loan demand and supply are depicted the upper right quadrant. Supply curve is increasing up to the critical value r until the bank

finds it profitable to expand the supply of loans; then the curve decreases for higher interest rates and lower expected returns for the bank. The relationship between expected return and interest rate is depicted in lower right quadrant (expected returns are maximized at point r^*). The curve in the lower left quadrant represents the relationship between the loan supply and expected returns. At the point of equilibrium r^* the demand for loans exceeds supply by Z , which is a measure of credit rationing. The market clearing interest rate r_m will not be an equilibrium one, since a bank could increase its profits by lowering the interest rate and moving towards the equilibrium interest rate r^* . At the lower interest rates the pool of potential borrowers is wider than at the higher interest rate and the bank may choose those with the lowest credit risk and earn at least as much profits per dollar earned.

Systematic risk aversion of individuals may be one of the factors underlying the existence of the 'below-the-clearing' optimal interest rate. The higher interest rates may significantly affect the composition of the applicant pool (Stiglitz and Weiss 1983 p. 399) for the less risky projects are now less profitable. Provided that less risky projects are undertaken by risk averse individuals, the pool of potential borrowers is thus contracted, and includes a higher proportion of the risk neutral individuals, ready to undertake the riskier projects, whose profitability was hurt less by the increase in the interest rate.

Now, I would like to provide a brief summary of the theoretical background on credit rationing.

It is useful to distinguish 'equilibrium' and 'disequilibrium' credit rationing. While first is static in nature and is long-term, the second one is of dynamic nature and tends to be short-term. Basically, the key difference is in credit rationing being permanent or temporary for these two types are caused by different sets of phenomena. Temporary credit rationing may occur primarily due to the sluggish adjustment within an economy (e.g. to external shocks),

while permanent credit rationing may be caused by various perpetual constraints.

The impossibility of instantaneous adjustment in reality is caused by non-zero adjustment costs (e.g. administrative costs, menu costs), which partially causes the interest rate stickiness in the short-run. For example, if due to the some external shock the real interest rate increases and it is less profitable for a bank to issue loans at the current nominal interest. However, adjustment costs might be higher than the profit that is lost due to the interest rate change. Then it is more rational of a response to credit ration the customer at the going nominal rate, thus reducing the quantity through the non-price mechanism. It is obvious that such a response would be rational and in tune with profit-maximization principle. However, if the adjustment costs are lower than the profit lost due to the interest rate change, than rationality of credit rationing is questionable and non-price discrimination of customers may be viewed as inefficient.

The permanent credit rationing is caused by constraints of various nature. In treatment of the constraints it is useful to differentiate between exogenous and endogenous sets.

Exogenous constraints may be subdivided in formal and informal. Formal exogenous constraints constitute explicit price ceilings as set by regulations (some variation of usury laws). Informal exogenous constraints are those that cause downward pressure on the interest rates through 'morals' and 'culture'. Bankers may be reluctant to perfectly price differentiate and intimidate some borrowers by asking for extremely high interest rates: they would rather preserve a uniform interest rate structure, limiting demand through non-price mechanisms. Exogenous constraints, if it is possible to dispose of them, are inefficient and cause some of the demand for loans to be unfulfilled, with all the repercussions of such an arrangement.

Endogenous constraints stem primarily from relaxation of some major neoclassical assumptions, the main one being those of perfect information, zero transaction cost, and good homogeneity. Asymmetric information, costly contracting, monitoring and contract enforcement cause the banks to engage in non-price discrimination of customers to minimize losses. Credit rationing in dealing with these types of constraints seems to be in tune with profit-maximization and does not represent irrational response on the part of the bankers. Therefore, credit rationing caused by exogenous constraints is viewed in the literature as an efficient phenomenon. However, some of the endogenous constraints may also be if not eliminated then alleviated. For example, more efficient management may lead to lowering of transaction costs; better expertise may lead to improvement of information on customers; fostered customer relationships may be alleviating credit rationing (though non-customers may start to be rationed more).

CREDIT MARKET: UKRAINIAN CONTEXT

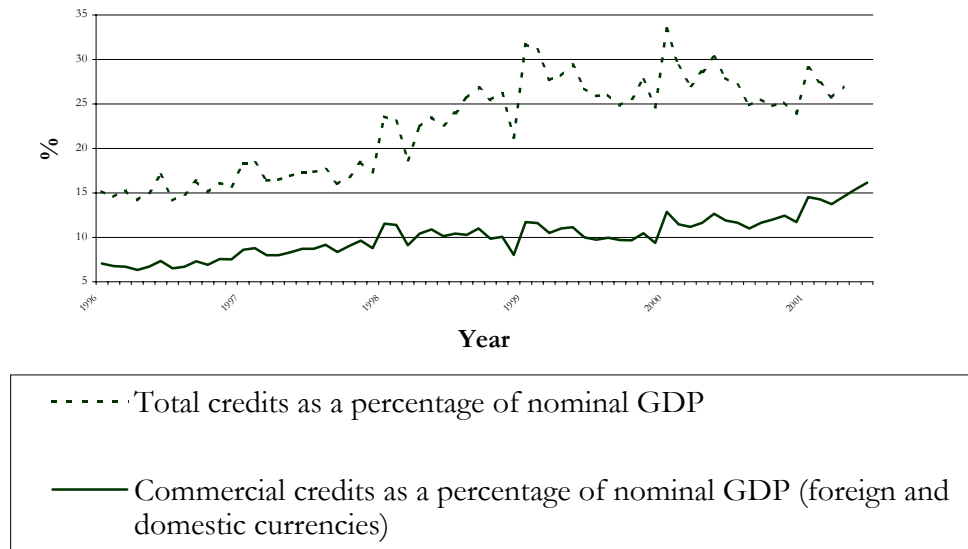
Generally, a firm in quest for financing can turn to several sources of obtaining it. The firm can usually obtain financing in terms of debt or equity. The company may also self-finance some investment projects decreasing its profits in a certain period, or, as is the case with small enterprises, the firm may turn to pawn-shop or informal financing, which includes both highly priced person-to-person loans and ‘interest free’ relative-to-relative loans. Therefore, banks are not the only source of credit available to firms or entrepreneurs. However, it is necessary to determine how important/available are these channels of external financing. It is perhaps also possible to pass a judgment on the degree of substitutability between various channels.

Let us first consider the opportunities for equity and debt financing through equity market in Ukraine. Claessens et al. (2000) point out that CIS countries generally have low market capitalization and it is practically not an option for the firms to seek equity financing abroad (ibid, p. 3). The turbulent years of macroeconomic adjustment was impeding development of the equity markets in Ukraine. Galloping inflation of 1992-1993 was making return on investment in equities largely negative after adjustment for risk (and somewhat negative prior to risk adjustment whereas, for example, holders of the US dollars saw their wealth appreciate in real terms (ibid, p. 8-9). Protection of shareholders rights was also underdeveloped in Ukraine. The equity market in Ukraine remained largely illiquid, which in part may be explained by the absence of large institutional investors, such as pension funds, investment and mutual funds. The last two categories of investors received a boost during the voucher privatization however they still remain in the very early stages of development if compared with their ‘developed

country's' counterparts. The authors also found positive correlation between the equity market capitalization as a percent of GDP and private credit as a percent of GDP. Basically, shallow private credit was taken as a measure of the underdevelopment of the basic financial system. Generally, the pattern of development suggests that banking systems develop prior to stock markets. Market capitalization in Ukraine reached only 4% of GDP in March 2000 comparing with say 93% in Hungary. For the same period market turnover as a percentage of market capitalization was 19% in Ukraine, compared to 93% in Hungary.

We think that banks are the most important intermediaries whereas the provision of loans in the economy is concerned. On the Figure 2.1 we may see the increasing trend of credit as percentage of GDP.

Figure 2.1. Credit as a percentage of GDP



Source: NBU, Derzhkomstat, author's calculations

Most of the transition Eastern European countries, including Ukraine, repeat a similar transition pattern as far as the banking sector is concerned. Before the collapse of the Soviet Union the state-run financial sector was dominated several specialized state banks. Through the last 10 years not only commercial banking sector itself had to be developed. The whole financial infrastructure was largely missing in Ukraine. National currency, foreign exchange, system of payments, regulation, supervisory organizations – all that was to be developed from a scratch.

2.1 Legislation

The Law of Ukraine On banking and banking activity was adopted by Verkhovna Rada in 1991. However, in 2001, instead of continuing to pass multiple amendments to the 1991 version of the law Verkhovna Rada passed a new version. This law determines the structure of the banking sector, setting up a two-tier banking system; provides legal rules for organization, operations and liquidation of banks. The law starts with the statement of its objective, which is

‘to provide legislation for the stable development and operations of the banks in Ukraine and the create an adequate competitive environment in the financial market; protect savers and bank clients; create conducive environment for the development of Ukrainian economy; support national producers.’ (Law of Ukraine N2740-III)

This law determines the structure of the banking sector, setting up a two-tier banking system; provides legal rules for organization, operations and liquidation of banks. Banks in Ukraine may be created as joint stock ventures, limited joint stock ventures or cooperative banks. Article 7 of the Law foresees creation and management of the state banks. Both foreign and national capital is allowed to participate in creation of banks in Ukraine. The law also regulates creation of inter-bank structures such as bank corporations, holding group, and financial holding group; as well as inclusion of banks into the production-financial groups.

Section II of the law deals with creation, registrations, licensing and reorganization of banks, while section III deals with capital management and requirements to the conduct of banking activities. Article 49 of the Section III sets up some rules of bank’s conduct whereas provision of credit is concerned. Banks are prohibited to provide loans for the purchase of their own stocks. Banks may accept its own stock as collateral for a loan only with an explicit consent of the National Bank of Ukraine. When issuing loans banks are required to check credit rating of the client, be sure of the client’s

financial viability and guarantee of the loan as well as abide by the National Bank's regulation concerning the concentration of risks.

As for the loan price (interest rate) controls Article 49 states that the banks cannot issue loans at an interest rate which is lower than of the loans taken by the banks itself, or which is lower than an interest rate which the bank pays on deposits. Exceptions however are allowed only for those cases, when such operations will not lead to any losses for the bank. Free loans are prohibited with some minor exceptions.

Section IV sets up the guidelines for the regulation of the banking activities and supervision of banking industry. According to Article 66 National Bank of Ukraine receives powers, which fall into two broad categories: 1) Normative, and 2) Indicative regulations. Administrative regulation measures include: 1) registration and licensing of the banks; 2) setting up of requirements and restrictions of banks operations; 3) administrative or financial sanctions; 4) supervision of banks activities; and 5) recommendations on bank activities. Indicative measures include: 1) setting up of financial requirements; 2) determination of required reserve ratio; 3) determination of reserve ratios to cover risks from certain banking operations; 4) determination of interest rate policy; 5) refinancing of banks; 6) correspondent banking; 7) foreign exchange intervention; 8) open market operations; 9) regulation of import and export of capital.

The Law also sets up procedures of financial reporting on behalf of banks as well as the procedure of bank's liquidation. Section VI deals with a possibility of challenging National Bank's decisions in court.

2.2 Actors

The period from 1991 to 1995 may be regarded as the most intensive in respect to banking industry development in Ukraine. The period of entry was followed by the period of stabilization in the industry, when non-viable actors were liquidated or became dormant. Table 2.1 represents dynamics of entry and exit in the banking industry, subdividing total numbers by ownership types.

Table 2.1 Dynamics of the banking industry structure in Ukraine 1991-2001

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
State banks	NA	NA	NA	2	2	2	2	2	2	2	2
JSC	NA	NA	NA	159	169	177	184	178	173	169	149
-open	NA	NA	NA	96	119	125	133	125	124	120	120
-closed	NA	NA	NA	63	50	52	51	53	49	49	49
Limited liability companies	NA	NA	NA	67	59	50	41	34	28	26	26
Banks liquidated	NA	3	6	11	1	11	10	16	11	9	9
Total number of banks in the register	76	133	211	228	230	229	227	214	203	195	195

Source: NBU

To better understand the structure of the banking industry in Ukraine it is useful to subdivide the banks into several categories according to the size of their net assets. The NBU distinguishes between four categories of largest,

large, medium and small banks. The following Table 2.2 demonstrates the categorization criteria.

Table 2.2 Categorization of banks according their net assets, 1 Feb 2002

	Largest	Large	Medium	Small
Net Assets, Mln UAH	>1200	1200-400	400-150	<150
Number of Banks	8	12	35	98

Source: NBU

. The largest banks include “Aval”, “Prominvestbank”, “Oshadbank”, “Ukreximbank”, “Ukrsotsbank”, Raffeyisenbank Ukraine, Privatbank, Ukrsibbank. Three out of the largest banks are the successors of the giant state banks. These banks left a bequest of inefficient management, inflated personnel and rigid bureaucratic apparatus. Another drawback of the former connection to the state machine is the leeway to political pressure being the key to the vaults of these banks, when the loans are issued with disregard for formal procedures, provision of proper guarantees and collateral. Liquidation of the Bank “Ukraina” is a sign of the in-built inefficiencies of the banks-successors of the state banks.

Banks that fall into large and medium category are those credited with high level of mobility and ability to compete. Small banks are usually created for serving a narrow clientele (usually the founders of the bank).

Overall, Ukrainian banking sector may be characterized as close to competitive conditions. For example, let us consider the Herfindahl-Hirschman Index, which we calculated summing up the squares of the asset shares of the individual banks. HHI can range from 0 (perfect competition –

infinite number of firms to 10,000 – monopoly, one firm controls all of the market). It appears that using the data of Association of Ukrainian Banks and including the Oshadbank to the sample the HHI equals to 567, which means that an industry is fairly close to the state of competition. However, it is reasonable to suggest that different levels of competition exist within various categories of services. As long as many banking services require additional licensing, not all banks are permitted to conduct all of the activities. Therefore, introduction of product differentiation may show that competition in rendering certain services may be quite low, however, in others, some banks may exercise significant power; thus, the market structure for certain highly differentiated services may remind that of the oligopoly or monopolistic competition.

One of the main factor inhibiting the smooth functioning of the Ukrainian banking sector in the very first years since the Ukrainian independence was the sweeping hyperinflation. It is perfectly understandable that inability to forecast the behavior of the interest rates at least with minimal confidence greatly impedes the functioning of the banking sector. However, the positive results of the macroeconomic stabilization program of the Ukrainian government brought the inflation under control

Walraven and Wright (2001) point out several dysfunctionalities within the banking sector. One of those is that the price of money is uncertain: given that the T-Bills market has crashed, no ‘risk-free’ instrument is available in the economy. Wage arrears and barter trade divert the financial flows from the banking industry. Although the banks start to turn their attention to the real sector of economy (as opposed to engaging primarily in interbank loaning), it must be noted that absence of appropriate techniques, ratings and credit histories for creditworthiness assessment make it increasingly risky for banks to engage both in “real sector” and in long-term crediting. The situation is exacerbated by the fact that Ukrainian firms do not use accounting in a way that would ease the bank’s attempts to evaluate the firm’s soundness by long-

ago developed formal evaluation techniques. Especially it is the case with the small business financing.

The product range of the Ukrainian banks is still inadequate: long-term borrowing is virtually inexistent, which is one of the most serious impairments of the banking system's servicing of the real economy. For example, in January 2001, approximately 81% of the credits provided by the banks to the economy were short term, and, respectively 19% were long-term. It is interesting to note that to reduce risk and uncertainty in the market place the banks choose to provide more long-term credit denominated in hard currency rather than in Hryvnia, whereas for the short-term credit the situation is reversed. Fifty five percent of short-term credit is provided in Hryvnia, while for the long-term credit this figure is 47%.

Short-term credit is used primarily to finance current operations of the enterprises. In January 2001, only 5.5% of all credit extended to the economy was used for investment projects. Only 1.3% of short-term loans is used for investment projects and for the long-term loans this figure rises to only 23.5%⁶.

Land cannot be used as collateral, which makes crediting agriculture more problematic. However, repayment rate of the agricultural loans made on transparent basis (not under political duress) is promising, which means that the forthcoming ability to use land as a collateral (hypotheq) will increase the flow of loans to the agricultural and related food processing industries.

⁶ Author's calculations using data from Visnyk NBU, January 2001

Chapter 4

EMPIRICAL TESTING AND RESULTS

Although existence of credit rationing is intuitively evident, a more rigorous empirical analysis is hard to undertake due to the implicit nature of the phenomenon under study. One of the main issues with studying credit rationing is an issue of measurement and distinction of its significance. To correctly measure the amount of credit, which would be observed under ‘market-clearing’ interest rate, we would need to be able to model both functions of demand for and supply of credit and then to find an equilibrium amount of credit. Then this ‘true’ amount could be contrasted with the amount of loans actually observed in the economy. The difference between these two volumes would be the measure for credit not disbursed due to banker’s credit rationing. However, this modelling approach is extremely difficult to implement. Therefore a number of indirect or simplified approaches were proposed in the literature (some of them were reviewed in Chapter 1). To model influence of credit rationing on the macro level and to determine its significance an indirect approach is to be used. It cannot be taken as direct evidence; however, it may lend indirect evidence on the importance of the phenomenon under study.

Another complication is that credit rationing may be viewed from a subjective point of view of the borrower. That is the borrower, who was rejected a loan may believe s/he was credit rationed (that is rejected a loan or an amount sought although s/he was prepared to pay the going price), although such a subjective ‘feeling’ cannot be taken as evidence or a criterion of credit rationing. This complicates the studying of credit rationing on the microlevel.

Thus, this chapter concentrates on those testable hypotheses rather than succumbs to more subjective techniques (e.g. polling).

4.1 Quantitative tests

The description of data to be used in the first part of this section is presented in the Table 4.1.

Table 4.1 Description of data on credit volumes and interest rates

Variable	Description	Sample Coverage	Source
TCRED	Volume of total credit extended by banks	1996:09-2001:09	NBU
DEP	Volume of deposits in banks	1996:09-2001:09	NBU
CINT	Average interest rate on commercial credit	1996:09-2001:09	NBU
RRATE	NBU refinance rate	1996:09-2001:09	NBU
DINT	Average interest rate on deposits	1996:09-2001:09	NBU
IND	Index of industrial production	1996:09-2001:09	Derzhko mstat

In every economy, unlike in the economics textbooks, there is no the only interest rate. There are interest rates that characterize long-term vs. short-term investments, loans, deposits; discount rates (refinance rate in Ukrainian case); interbank loan interest rate etc. To set up the stage for further testing it is interesting to study some of the basic characteristics of the interest rates in Ukraine. First, let us consider the rigidity of the interest rates as measured by the index of relative mobility⁷, which is calculated as accumulated absolute values of the relative (percentage) changes for the period observed.

$$IRM = \sum_i |\% \Delta_i|, i = 1, \dots, n,$$

⁷ This measure was used by Tsesliuk Sjarhei in an unpublished paper 'Pricing strategy of an enterprise in a dollarized economy', 1998, Belarussian State University.

where n is the length of time series. Table 4.2 provides the IRM measures calculated for the interest on loans and deposits as well as for the refinance rate for the period of 1996-2001, using the monthly data. Although figures may be slightly understated, since interest rates and refinance rate change within a month, these figures give us some understanding into the variables of interest. We see that the most rigid is the interest rate on deposits. Provided that interest rates are falling in Ukraine, interest on deposits falls relatively slower than the interest charged on loans. Interesting to note is that variability of the refinance rate and of the rate charged on loans are roughly the same. That is we can conclude that the interest rate charged on loans was quite mobile in Ukraine during the last 5 years. Provided that loans are mostly short-term, we may therefore suggest that credit rationing linked to adjustment processes should be minimized in Ukraine.

Table 4.2 Index of relative mobility of the interest rates for 1996-2001, using average monthly data, %.

	Loans	Deposits	Refinance Rate
IRM	229.8	153.4	221.2

To consider whether interest rate plays an important part in the determination of the volume of loans issued we may construct a simple test linking the volume of loans to the lagged value of loans, lagged interest rate change and lagged change in the index of industrial production. Table 4.3 provides estimation results of this model. Variables were transformed accordingly to the results of the unit root tests. Volumes of credit are first differenced in logarithms (DLCR), credit interest rates, and index of industrial production are first differenced (CIN and DIND respectively). As it is expected, the signs are in line with the general theory of the credit market. The sign of the coefficients in front of the interest rates are negative, showing that rising interest rates negatively affect credit, while industrial production affects credit positively.

Table 4.3 Results of the estimation of interest rate influence on credit provision by commercial banks⁸

Dependent Variable: DLCR
Sample(adjusted): 1997:02 2001:07
Included observations: 54 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004745	0.004290	1.106134	0.2743
DLCR(-12)	0.319932	0.103172	3.100948	0.0033
CIN(-3)	-0.001981	0.000902	-2.195605	0.0331
CIN(-11)	-0.002978	0.000872	-3.414887	0.0013
DIND(-1)	0.009102	0.003538	2.572347	0.0133
DIND(-3)	0.006489	0.003431	1.891337	0.0648
DIND(-6)	0.009009	0.003638	2.476183	0.0169
R-squared	0.451672	Mean dependent var		0.017133
Adjusted R-squared	0.381672	S.D. dependent var		0.034793
S.E. of regression	0.027359	Akaike info criterion		-4.239112
Sum squared resid	0.035180	Schwarz criterion		-3.981281
Log likelihood	121.4560	F-statistic		6.452515
Durbin-Watson stat	2.076913	Prob(F-statistic)		0.000052

Let us also consider correlation amongst the interest rates. Table 4.4 presents the correlations amongst the interest rates on loans, deposits and NBU refinance rate. As we can see interest rates on loans and on deposits are highly correlated, while exhibiting a lower correlation with the refinance rate.

Table 4.4 Correlation amongst the interest rates in the economy 1996-2001, monthly average data.

	Deposits	Credit	Refinance rate
Deposits	1.000000	0.967086	0.827621
Credit	0.967086	1.000000	0.836277
Refinance rate	0.827621	0.836277	1.000000

Therefore, refinance rate may be used as a proxy for the credit interest rate, which means that the NBU through the conduct of monetary policy may affect the amount of credit in the economy. To test this proposition the same regression as presented in Table 4.2 is run with the substitution of the first differenced credit interest rate for the first differenced refinance rate

⁸ This and all further calculations are carried out in Eviews version 3.0.

(DRATE). Although the tightness of fit is slightly lowered by the substitution we still see a very good explanation power of the refinance rate used as a proxy for the price of loans. The results of the regression are presented in Table 4.5

Table 4.5 Results of the estimation of influence of the refinance rate on credit.

Dependent Variable: DLCR
Sample(adjusted): 1997:02 2001:07
Included observations: 54 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.009719	0.004249	2.287412	0.0266
DLCR(-12)	0.309346	0.103752	2.981587	0.0045
DRATE(-3)	-0.001707	0.000766	-2.229636	0.0305
DRATE(-11)	-0.001669	0.000626	-2.663802	0.0105
DIND(-1)	0.006827	0.003786	1.803411	0.0776
DIND(-6)	0.005569	0.003670	1.517222	0.1358
R-squared	0.365759	Mean dependent var		0.017133
Adjusted R-squared	0.299692	S.D. dependent var		0.034793
S.E. of regression	0.029116	Akaike info criterion		-4.130594
Sum squared resid	0.040693	Schwarz criterion		-3.909596
Log likelihood	117.5260	F-statistic		5.536208
Durbin-Watson stat	1.895476	Prob(F-statistic)		0.000420

Having seen the tight knit between the credit in Ukraine and its price, and then establishing the correlation between the refinance rate and the price of loans it is possible to undertake a construction of tests for the existence of credit rationing on the macro level. One of the possible approaches to testing significance of credit rationing on macro level was presented by Galbraith (1996), which is to be used for the case of Ukraine in this section.

In Chapter 1 (p. 15-18), we briefly tackled the concepts developed by Blinder (1987) and tests carried out by McCallum (1991) to test Blinder's hypothesis. Blinder reaches the conclusion that due to the effective supply failure monetary policy may have different effectiveness depending on whether the initial state of credit was loose or tight. McCallum tests Blinder hypothesis introducing an indicator of tightness of monetary policy, where observations below a certain threshold value are included into the model as an additional

explanation variable. Although Blinder's theory receives support from McCallum's paper Galbraith points out the weakness in the arbitrary selection of the threshold values. Therefore, a test designed by Galbraith is called for to test for a range of threshold values that would appear to be significant once used for explaining additional influence of monetary policy on output.

Basically, the Galbraith's model tests whether the influence of money on output is linear across the whole range or whether it is non-linear and thus the same absolute changes in monetary aggregate will have different effects on output. Thus, if the range of significant coefficients in front of the threshold variable is located in the lower range of the monetary variable indirect support is provided for the availability doctrine and effective supply failure theory, which state that contractionary monetary policy is to have more effect on output if the previous money was tight

Galbraith starts out with estimating a general IS-LM model of the following form:

$$y_t = \alpha_0 + \sum_{i=1}^p \alpha_i y_{t-i} + \sum_{i=0}^s \beta_i g_{t-i} + \sum_{i=0}^l \eta_i m_{t-i} + \varepsilon_t \quad (4.1)$$

where y_t – logarithm of real GDP, g_t – logarithm of real government expenditure (current and capital) on goods and services, and m_t – is the logarithm of real M1.

The threshold variable is defined as

$$m^* = \tilde{m}_t I[\tilde{m} \leq \tau], \quad \text{where } I = 0 \text{ if } \tilde{m} > \tau; \quad \text{or } I = 1 \text{ if } \tilde{m} \leq \tau \quad (4.2)$$

thus m^* becomes an additional explanation variable, which mirrors the m variable, but all its values above τ are zeros, to give additional weight to the particular range of the monetary variable. To test the influence of the

threshold variable Galbraith transforms the initial model into first differences in the following way:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^2 \alpha_i \Delta y_{t-i} + \beta_1 \Delta g_t + \eta_1 \Delta m_t + \eta^* \Delta m^*_t + \varepsilon_t \quad (4.3)$$

Galbraith proceed with recalculating m^* for 200 values of the pre-selected grid of thresholds. He finds threshold to exist when the test was undertaken both for American and Canadian data, with less strong evidence for the Canadian case. However, an interesting finding lies in the fact that the range of significant threshold variables lies in the upper third of the range of the monetary variable (Galbraith, p. 428). Under theories put forward by Blinder and McCallum it is expected though that the values of the threshold will lie in the lower part of the monetary variable, that is below the average value of the monetary variable. Thus, Galbraith's results shed some doubt on the significance of credit-rationing explanation of the existence of the threshold variable. The author prompts for more investigation into the causes of the threshold effect phenomenon.

We will start out the testing of the threshold effect in the case of Ukraine from the construction of the IS-LM model, using the data, summarised in the Table 4.6.

Table 4.6 Data description for the estimation of the Galbraith model

Variable	Description	Sample Coverage	Source
GDP	Gross Domestic Product	1996:01-2001:06	Derzhkomstat, UEPLAC
M2	M2 monetary aggregate	1996:01-2001:06	NBU
GOV	Consolidated budget expenditures	1996:09-2001:09	Derzhkomstat
CPI	Consumer price index, 1990=1	1996:09-2001:09	Derzhkomstat

To prepare the data for the usage in the model estimation we need to undertake the following transformations. GDP, GOV and M2 are transformed to real terms in the prices of 1990. Based on the non-stationarity of the series and augmented dickey-fuller tests the series are transformed to first differences of the logarithms of the initial series in real terms. Thus, we define new variable $y = \text{DLOG}(\text{GDP}/\text{CPI})$, $g = \text{DLOG}(\text{GOV}/\text{CPI})$, $m = \text{DLOG}(\text{M2}/\text{CPI})$. Estimation of the IS-LM model starts from the estimation of the equation 4.1 with transformed variables y , g , and m . Initially 6 lags of the explanation variables were included into the model. After discarding insignificant lags, using the Akaike and Schwarz criteria the following specification of the model is obtained (equation 4.4):

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_3 y_{t-4} + \alpha_2 y_{t-5} + \beta_1 g_t + \beta_2 g_{t-1} + \beta_3 g_{t-5} + \eta_1 m_{-4} + \varepsilon_t$$

The results of the estimation are presented in Table 4.7.

Table 4.7 Estimation results for the model without threshold variable

Dependent Variable: Y
Method: Least Squares
Date: 04/10/02 Time: 20:33
Sample(adjusted): 1996:07 2001:06
Included observations: 60 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.003475	0.017441	-0.199223	0.8429
Y(-1)	-0.635034	0.102864	-6.173543	0.0000
Y(-4)	-0.217073	0.110173	-1.970288	0.0541
Y(-5)	-0.250510	0.111931	-2.238080	0.0295
G	0.323597	0.051157	6.325565	0.0000
G(-1)	0.217015	0.058396	3.716262	0.0005
G(-5)	0.148854	0.051084	2.913911	0.0053
M(-4)	1.094391	0.530130	2.064381	0.0440
R-squared	0.634640	Mean dependent var		0.006508
Adjusted R-squared	0.585457	S.D. dependent var		0.198932
S.E. of regression	0.128082	Akaike info criterion		-1.148724
Sum squared resid	0.853062	Schwarz criterion		-0.869478
Log likelihood	42.46173	F-statistic		12.90364
Durbin-Watson stat	2.024938	Prob(F-statistic)		0.000000

To assess the stability of the coefficients in the model two stability tests were undertaken: CUSUM and CUSUM of squares tests. The model under these tests is stable under the 5% significance level. The Figure 4.1 shows the results of the CUSUM test and the Figure 4.2 represents the output of the CUSUM of squares test. Both of the tests render consistent results. White's test for heteroskedasticity supports the null hypothesis of no heteroskedasticity present (with the p-value of the F-statistic 0.3). Breush-Godfrey test of serial autocorrelation shows not autocorrelation present in residuals. The hypothesis of normality of residuals cannot be rejected (Jarque-Bera statistic 1.08, p-value 0.58).

Figure 4.1 Results of the CUSUM test on the model estimated in equation 4.4

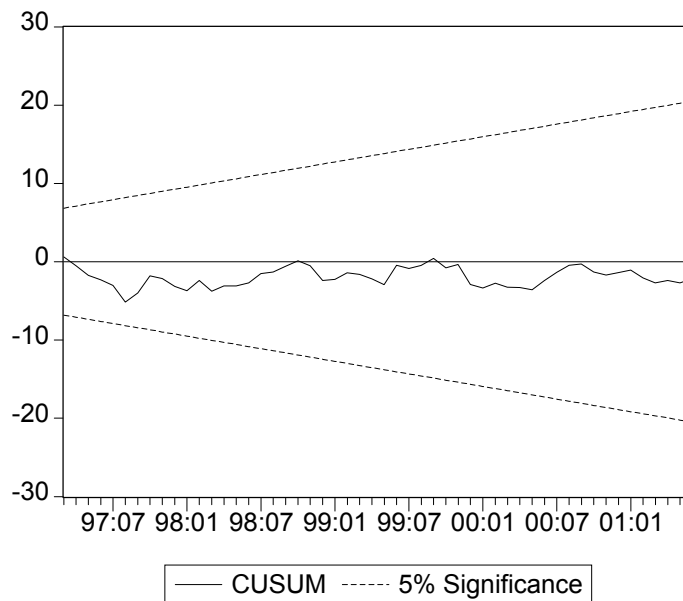
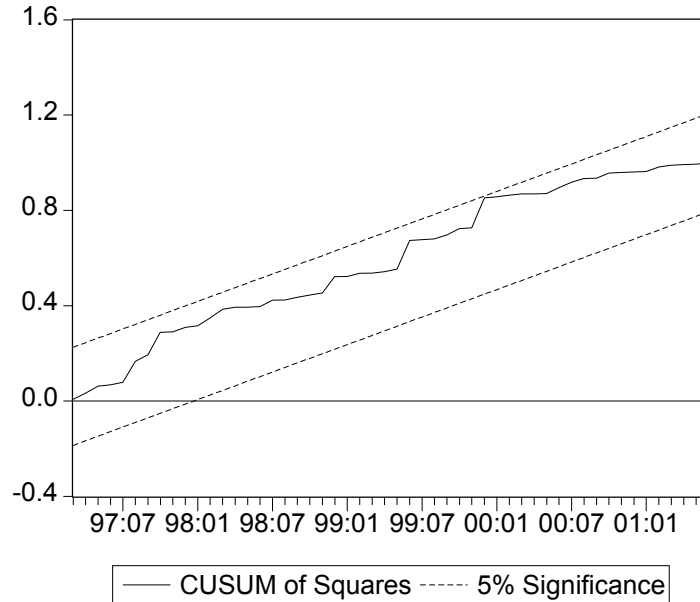


Figure 4.2 Results of the CUSUM of squares test on the model estimated in equation 4.4



We proceed with the estimation of the model described by the equation 4.3 to find whether the range of the significant coefficients in front of the threshold variable can be found. For this purpose, we run 60 consequent regressions for the grid of 60 threshold variables redefined for each trial. The grid of the threshold variables was taken to be the 60 values of the monetary variable. The threshold variable entered the regression with a lag of one, signifying the previous state of the monetary variable in the economy. Thus, the equation estimated was (equation 4.5):

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \alpha_3 y_{t-3} + \alpha_4 y_{t-4} + \beta_1 g_t + \beta_2 g_{t-1} + \beta_3 g_{t-2} + \beta_4 g_{t-3} + \beta_5 g_{t-4} + \eta_1 m_{t-4} + \eta_2^* m_{t-4}^* + \varepsilon_t$$

From each of the successive regressions a t-value of the coefficient in front of the threshold variable was linked to the threshold itself. The results of the estimation are clearly seen in the plot of t-values against the threshold values presented in the Figure 4.3.

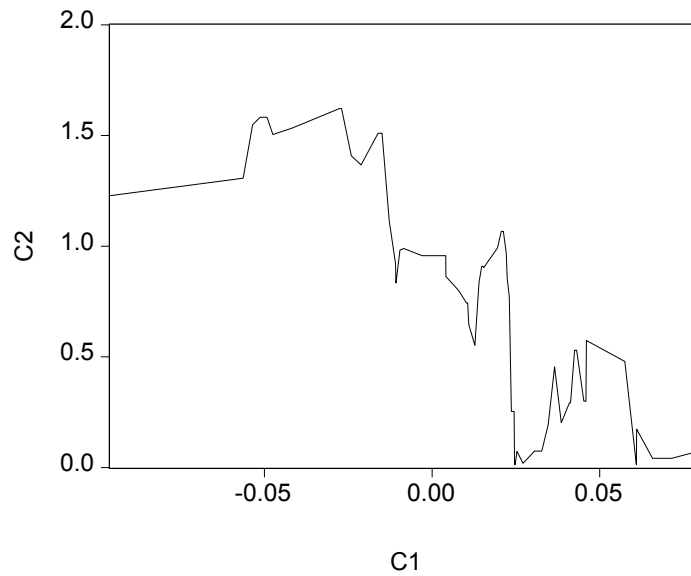


Figure 4.3 Absolute values of T-statistics (C2) for the coefficients in front of the lagged monetary variable truncated above the threshold plotted against the threshold values (C1).

We are primarily interested in the additional explanation variables truncated above the threshold, which appear to render the most significant coefficients and thus to add to the explanation power of the initial model with no thresholds. When the value of $\tau = -0.02769$ all values of the m variable above that value are truncated and equalled to zeros and the transformed variable enters the equation as $m8$ with a lag of four months, emphasizing the importance of the previous monetary regime in the economy. In the Table 4.8 we can see that the introduction of the threshold variable improves R-squared as well as it improves Akaike information criterion.

Table 4.8 Results of the regression with a threshold variable of maximum significance.

Dependent Variable: Y
Sample(adjusted): 1996:07 2001:06
Included observations: 60 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.027900	0.022846	-1.221248	0.2276
Y(-1)	-0.622939	0.101564	-6.133434	0.0000
Y(-4)	-0.235071	0.109054	-2.155551	0.0359
Y(-5)	-0.240947	0.110376	-2.182963	0.0337
G	0.320422	0.050412	6.356016	0.0000
G(-1)	0.222030	0.057586	3.855644	0.0003
G(-5)	0.127128	0.052057	2.442118	0.0181
M(-4)	1.880327	0.712395	2.639446	0.0110
M8(-4)	-1.887547	1.164250	-1.621256	0.1111
R-squared	0.652547	Mean dependent var		0.006508
Adjusted R-squared	0.598045	S.D. dependent var		0.198932
S.E. of regression	0.126122	Akaike info criterion		-1.165645
Sum squared resid	0.811251	Schwarz criterion		-0.851494
Log likelihood	43.96936	F-statistic		11.97283
Durbin-Watson stat	2.066567	Prob(F-statistic)		0.000000

Stability tests performed on the original model (equation 4.4) show the same results of stability of the model's coefficients with the introduction of the threshold variable under 5% significance level. It appears that based on the estimated model we cannot definitely reject the hypothesis of no threshold value for the Ukrainian economy. Moreover, evidence suggests that the threshold value lies in the lower part of the monetary range, which is consistent with the theories of effective supply failure and availability doctrine outlined in Chapter 1. Basically, the location of the supposed threshold variable in the lower range of the monetary variable testifies that monetary policy in Ukraine (in absolute terms) more effectively expands the economy. The negative sign of the threshold variable coefficient, which is equal to the coefficient in front of the non-truncated variable signals that monetary policy in Ukraine is more likely to be effective in expanding output rather than in contracting it. The negative sign in front of the threshold variable means that contractionary monetary policy does not exert any influence on the real output. Reformulation of the threshold variable to include the highest values of the monetary variable, while truncating the lowest gives consistent results,

showing insignificance of the monetary influence on the real output in the lowest range of the monetary values. Perhaps, this result might be explained by a rather conservative approach of NBU to the monetary policy, which can overall be characterized as tight, or even overly tight which means that monetary expansion was very likely to result in real effects.

CONCLUSIONS

Financial sector development is vital for the development of economy as a whole. Smoothly running financial intermediaries do contribute to economic growth through servicing economy and lowering transaction costs and financial risks. Currently, Ukraine is still in the initial stages of its financial sector development; however, the banking industry may definitely be called one of the most stable and advanced Ukrainian industries. Provision of credit is one of the main functions of the banks. In Ukraine, short-term credit dominates and its volume is not adequate, if compared to other transition economies. Therefore, it is specifically of interest how credit provision is to be improved in the Ukrainian economy. In Chapter 1, we have demonstrated that research on credit rationing enables us to speak of the rational nature of credit rationing. In Ukraine, however, we surmise that in Ukraine it is worth to speak of credit rationing caused by imperfections of the infrastructure. In Chapter 2, we have seen that although the development of the banking sector is largely complete in Ukraine, we cannot say so of the services that banks provided to the economy. Unsatisfied demand for credit in Ukraine is matched by pent up supply.

Study of credit rationing phenomenon might suggest several ways towards increasing the volume of credit issued as well prolong its maturity. In this thesis, we attempted to demonstrate significance of the credit rationing phenomenon for Ukraine economy. On the macroeconomic level, we estimated the test for credit rationing suggested by Galbraith (1996), which detects asymmetry in the influence of the monetary policy on real output. The results of model estimated with Ukrainian data differ from those received by Galbraith. While on the basis of his model he suggested that monetary policy is more effective in contracting output rather than expanding it for the US and Canadian economies, we receive the result that suggests that for

Ukrainian economy expansionary monetary policy is more likely to be effective than contractionary one. This can be explained by the overly conservative approach of the NBU towards the conduct of the monetary policy in the recent years caused by the previous history of high inflation in Ukraine. These results are in line with recent actions of the NBU, which started to expand money in the economy through various mechanisms (e.g. lowering the required reserve ratios for Ukrainian banks, lowering the refinance rate etc).

However, the theory of credit rationing suggests ways in which credit may be extended through non-price institutional adjustments to enable the transactions in the credit market. For example, in Ukraine can benefit from setting up a credit rating agency that would collect information on credit histories of Ukrainian enterprises and provided it to all banks prepared to pay the fee. Legislation should be improved in its treatment of collateral, especially when land serves as collateral. Mandatory accounting standards might be adjusted for the firms to make it easier for the banks to check the soundness of the enterprises, therefore benefiting from economies of scale.

In short, measures aimed at removing institutional imperfections can lead to the increase in the volume of credit issued even without the expansion of money in the economy. However, evidence suggests that even some expansionary monetary policy might be quite effective is stimulating output.

BIBLIOGRAPHY

- Baltensperger, Ernst (1978). 'Credit Rationing: Issues and Questions.' *Journal of Money, Credit and Banking*, Vol. 10, No. 2, pp. 170-183.
- Berger, Allen N. and Udell, Gregory F. (1992). 'Some Evidence on the Empirical Significance of Credit Rationing.' *The Journal of Political Economy*, Vol. 100, No. 5, pp. 1047-1077
- Blinder, Alan S. (1987) 'Credit Rationing and Effective Supply Failures.' *The Economic Journal*, Vol. 97, No. 386, pp. 327-352.
- Claessens, Stijn, Djankov, Simeon and Klingebiel, Daniela. (2000) 'Stock Markets in Transition Economies.' *Financial Sector Discussion Paper No. 5*. The World Bank.
- Freimer, Marshall and Gordon Myron J. (1965) 'Why Bankers Ration Credit.' *The quarterly Journal of Economics*, Volume 79, Issue 3, pp. 397-416
- Galbraith, John W. (1996). 'Credit Rationing and Threshold Effects in the Relation Between Money and Output.' *Journal of Applied Econometrics*, Vol. 11, No. 4, pp. 419-429.
- Hodgman, Donald R. (1960). 'Credit Risk and Credit Rationing.' *The Quarterly Journal of Economics*, Vol. 74, No. 2, pp. 258-278.
- Jaffee, Dwight M. (1971). *Credit Rationing and the Commercial Loan Market. An Econometric Study of the Structure of the Commercial Loan Market*. New York: John Wiley & Sons, Inc.
- and Russell, Thomas (1976). 'Imperfect Information, Uncertainty, and Credit Rationing.' *The Quarterly Journal of Economics*, Vol. 90, No. 4, pp. 651-666.
- and Modigliani, Franco (1969). 'A Theory and Test of Credit Rationing.' *The American Economic Review*, Vol. 59, No. 5, pp. 850-872.
- Kareken, John H. (1957). 'Lenders' Preferences, Credit Rationing, and the Effectiveness of Monetary Policy.' *The Review of Economics and Statistics*, Vol. 39, No. 3, pp. 292-302.
- McCallum, John (1991). 'Credit Rationing and the Monetary Transmission Mechanism.' *The American Economic Review*, Vol. 81, No. 4, pp. 946-951.
- Law of Ukraine №2740-III. (2001) 'On banks and banking activity'
- Mishkin, Frederic S. (2001). *The Economics of Money, Banking, and Financial Markets*. Boston: Addison, Wesley, Longman.

Scott, Ira O., Jr. (1957). 'The Availability Doctrine: Theoretical Underpinnings.' *The Review of Economic Studies*, Volume 25, Issue 1, pp. 41-48.

Stiglitz, Joseph E. and Weiss, Andrew (1981) 'Credit Rationing in Markets with Imperfect Information.' *The American Economic Review*, Vol. 71, No. 3, pp. 393-410.

Sultan, Khwaja M. and Michev, Dimitar G. (2000) 'Role of the Financial System in Economic Growth in Transition Countries – the Case of Ukraine Banking System.' *Development Discussion Paper No. 767*. Harvard Institute for International Development.

Walraven, Kornelis and Wright James. (2001). 'An Evaluation of USAID/Ukraine Banking Sector Activities 1995-2000'. *Development Associates, Inc. Report submitted to USAID Ukraine*.

Stiglitz, Joseph E. and Weiss, Andrew (1983). 'Money, Credit Constraints, and Economic Activity.' *The American Economic Review*, Vol. 73, No. 2, pp. 297-302.

