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MASTER'S THESIS

Credit risk in Croatian banking

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IZJAVA

Študent Kristina Pojatina izjavljam, da sem avtor tega magistrskega dale, ki sem ga napisal pod mentorstvom dr. Marka Košaka in skladno s l. odstavkom 21. člena Zakona o avtorskih in sorodnih pravicah dovolim objavo magistrskega dela na fakultetnih spletnih straneh.

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1. Introduction

Among all the risks economic agents have to cope with credit risk is the most emphasized. In fact, entire modern economies and their development recline on an infinite number of relations established directly on the basis of trust. Banks are credit institutions by definition. No doubt that banking activity is very risky. Therefore it involves the threats of possible loss which can lead to the worst economic catastrophes. It is known that transitional countries were confronted with non-performing banking business whose huge irrecoverable claims were covered by tax-payers. Although banking troubles were the result of various external factors (economic, financial, and political), they were primarily connected with poor credit risk management. That was the case with Croatia as well. A bigger or smaller success in the management of that risk leads to various financial and economic consequences.

However, in theory there is no agreement upon possible influences of financial factors on real economy or upon which system is more efficient - bank or market oriented. The traditional theory of perfect markets and rational selection states that economic crises are the result of unexpected external shocks and that money and financing forms are neutral in that. However, most assumptions about the perfect market have become questionable. The things that need to be particularly emphasized here are: the assumption about financial instability and boom and bust, adverse selection problems, theory about asymmetric information ex ante and credit rationing as well as the concept of disaster myopia. Concrete researches confirm those theses to a great extent. The importance of financial variables in economic cycles is intensified by liberalization of national financial systems and by increase of international capital flows. In the last few decades the influence of these variables has existed both in developed and emergent countries. Statistic researches clearly confirmed that credit and assets markets functioned in pro-cyclic way and that they contributed to frequent bank crises. (BIS, 1998, p.117-141; BIS, 2001, p.123-141).

After rehabilitations, Croatian banks generally succeeded in improving credit risk management, so that the biggest ones among them were on the top of the list of the most profitable companies. At the same time, balance of payments deficit and total debt of the country became a heavy burden. Banks, which were predominantly in foreign ownership, contributed to that situation as well as to their own vulnerability by favouring too expensive credits to consumers from cheap foreign sources. Other observations, including regulated capital adequacy which is above the Basel standard level (10% instead of 8%), support our basic hypothesis - which is: Croatian banks have open space to improve credit risk management and to establish more adequate relation "risk - return" in the context of development of their own activities and fulfilment of their economic function (allocation efficacy). This hypothesis will be proved by more comprehensive analysis of publicly available relevant information, partly gathered by direct contact with some banks of different size.

A lot of different objectives need to be attained in order to illustrate this pressing topic, which is not being researched enough. These objectives can be presented as an effort in giving answers to numerous open questions referring to the presence and management of credit risk in

the Croatian banking system. The questions have been divided into several basic groups. They are: (1) The questions of dimension and the extent of credit risk in the Croatian financial system. (2) How effective is the credit activity of banks in the context of risk? (3) To what extent could credit exposures have effect on the stability of the financial system and real occurrences? (4) What tools are at disposal in order to improve credit risk management in Croatian banking? (5) What is the role of regulation and supervision of credit and other bank risks and what should their role be? In order to answer the questions and to establish our hypothesis first of all we need to take into account theoretical messages about credit risk that are searched in various sources in the relevant studied literature. The defined research directs us mostly towards the use of statistic methods (tables and graphics, econometric methods of predictions, simulation method of real measurement of the credit risk etc.) We also use some other methods such as method of deduction, induction, abstraction, concretization, generalization, specialization and especially methods of analysis and synthesis.

The content of the research is conceived according to demands of the posed questions. Firstly, we will examine the following issues: In what way could changes in the financial system have effect upon the risk exposure? What are the advantages of banks in credit risk management? Secondly, starting from the criterion of good management, we will assess the following issues: What financial and economic consequences result from banks' exposure to different sectors? How do banks successfully perform their fundamental function of transformation? How much have the restructurings of bank industry contributed to the credit risk management improvement? How fast do banks approach the optimum of their own funds in relation to exposure to risks? Thirdly, we will try to find a possible connection between credit risk and credit cycle on the one hand and economic cycle on the other hand. Potential threats to correct credit risk management and to stability of financial system, which results from the influence of different factors, will be identified as well. Fourthly, we will examine assumptions and evaluate the prospects for improvement of credit risk management (data bases, organizations, methods and models of debtor selection, etc.). Fifthly, regulatory aspects of credit risk will be examined and the efficiency of supervisors will be evaluated. At the same time the solutions offered in the Second Basel Accord and CRD as well as the problems of their implementation into Croatian banking system will be analysed. Finally, we will present the summary of results of our research.

2. Evaluation of the Croatian financial system

It is no use or it is even impossible to evaluate all ranges in credit risk management without taking into consideration the features of the financial system in which banks operate. Apart from banks there are other types of institutions operating in the financial system, supply and demand of financial products can be more or less heterogeneous, rules of conduct among active participants in the market can be better or worse regulated etc. It is also known that Croatian financial system is in the advanced stage of transition. Appearance of new financial institutions and products, strengthening of private sector, introducing of capital market and other novelties have essentially altered the disposition of power as well as the risk

consideration. The risk was not even mentioned before, but nowadays everyone talks about it and it has become a preoccupation for the main participants in markets. In addition, the developments in market economy make the credit risk management more complex. The old dilemma is being actualised at the theoretical level: which financial system is more efficient - bank or market orientated (Levine, 2002, p.1-4; La Porta 1998, p. 2869–2887; Ergungor, 2004, p.2).. It is interesting that both approaches rely upon their own advantages in credit risk and other managements.

2.1. Credit Risk in Structure of External Financing of Corporate Sector

When banks direct their assets towards financing of non-financial institutions they become exposed to higher or lower degree of risk depending on stipulated conditions. In spite of possible, even large, differences in that respect, in principle the fact is that external financiers of developing needs of economy are exposed to the highest risk. Likewise, in principle, depositors show tendency to liquidity and the financing of investments is of long-term character by nature. It is known that these dissonant tendencies can be reconciled through mediation of banks and/or financial markets.

In some theories it is stated that from social point of view it is more desirable to direct bank deposits towards financing of low risk projects (Jacklin and Bhattacharya, 1988 p. 568-592). In that case riskier investment projects should be financed through financial market. If we widen that view to the extreme, it can lead to the suggestion of narrow banking, which would not be a new idea. In other words, in this conception it is suggested that banks should direct all their deposits towards the purchase of risk free financial assets. However, it is questionable if such assets exist in the market - except those offered by the government and Central bank. Central bank's assets are without reward or they bring revenues that are too low. In fact, in that case it would be a question of the conservation of bank resources, which is the highest and unacceptable economic cost. The strategies based on suspension of transformation risk by strict adjustment of placement structure with bank resources structure have been studied at large. Among others, Hellwing (1991, p.33-63) clearly proves that those solutions are under optimum. Optimal distribution of risk in the area of real investment financing presumes that the role of transformation ought to be retained on the bank level. How the transformation (maturity, risk and profitability) is implemented in the Croatian banks represents the question we will attempt to answer in the Chapter 3 of this paper. For the time being it is important to get some insight into the credit risk exposure of banks exclusively towards corporate sector in conditions of emergence of new financial instruments.

Table 2.1 **External Financing Resources of Corporate Sector**
(in millions of HRK and percentage)

Year	Bank Credits[1)]	Shares Issue	Bonds Issue[2)]	Commercial Papers Issue [2)]	Total
1994	3,835	-	-	-	3,835
	100%	0.00%	0.00%	0.00%	100%
1995	3,940	-	-	-	3,940
	100%	0.00%	0.00%	0.00%	100%
1996	596	na*	-	-	596
	100%	0.00%	0.00%	0.00%	100%
1997	8,224	343[3)]	-	-	8,567
	96.00%	4.00%	0.00%	0.00%	100%
1998	5,362	872	-	-	6,234
	86.01%	13.99%	0.00%	0.00%	100%
1999	-5,330[4)]	1,326	19	400	-3,585
	x	x	x	x	100%
2000	273	293	-	83	649
	42.06%	45.15%	0.00%	12.79%	100%
2001	6,729	1,361	2	93	8,185
	82.21%	16.63%	0.02%	1.14%	100%
2002	8,675	1,905	166	294	11,040
	78.58%	17.26%	1.50%	2.66%	100%
2003	2,410	352	1,615	775	5,152
	46.78%	6.83%	31.35%	15.04%	100%
2004	3,945	574	1,678	1,812	8,009
	49.26%	7.17%	20.95%	22.62%	100%

* na - not available
1) The difference between credit statuses by the end of the year.
2) For placements abroad (mainly in Euros) the value in HRK is calculated at middle rate of CNB on dates of issue
3) Refers to period from 11th of October 1996 to 31st of December 1997.
4) State took over banks bad debts (Banking sector restructuring)
Sources: Croatian National Bank (CNB), Annual report, different years;
Croatian securities commission (Crosec), Annual report, different years. Author's calculation.

The analysed data from the Table 2.1 undoubtedly suggest that the changes in the value and structure of resources of corporate sector financing could have multiple influences on credit or other risk exposure of banks and other financial institutions. Various factors have influenced the sharp fluctuations of annual credit changes. Certainly, an essential role has been played by banks with their attitudes to credit risk and qualifying in the area of risk management. Slower increase of credits in some years and especially drastic decrease of their status in 1999, due to writing offs and/or transfer of problem credit demands of banks on to the government, might be explained only as a result of their imprudence in credit policy (Jankov, 2000, p.5-7). The period from 2001 could be seen as the time of raising awareness and learning, intensified prudence control by supervisors and finally increased reluctance of banks towards riskier placements.

Issues of shares and increased market value of corporate sector have surely operated in the course of strengthening of enterprise risk (the threat of probable loss in profitability) and market risk (probable underestimation of assets). It is not excluded that a part of shares held by

banks might be included in their assets portfolio with credit risk. Finally, all those results from methodology of classification were applied in Paragraphs 81, 253 etc. of the Second Basel Accord (BIS, 2005). The appearance of corporate bonds and commercial papers, and rather intensive rise of their value in the last two years reveal a significant progress in the direction of formation of a more efficient financial system. Naturally, it is a question of financial assets with credit risk attached to interest rate risk and foreign currency risk. In 2004 their issue value amounted to about 88% of the approved bank credits to the corporate sector in the same year. This increase of debt securities, as well as the fact that about 64 % of the issue value was placed in Euros in foreign financial markets, represents the response of the corporate sector to the excessive restraint of banks in credit approval to corporate sector. Since issuers had to fulfil rigorous conditions, primarily by offering various information about their business transactions and had to submit to numerous checks by credible organisations for rating evaluation - it should be a good incentive signal for resident (domestic) banks to improve their own skills in credit and other risks management. It is a fact that resident banks have considerably participated in subscription of these securities, so it can be seen that their tendency to take over the risky assets is not as questionable as the problem of risk management. No doubt, resident banks have wide space for development of not only risk management skills but production and supply of financial services designed for the corporate sector. Otherwise they could lose their clients in spite of their complete opening to the EU market.

2.2. Activities of Financial Institutions in Context of Risk

If we considered only the data from Table 2.1, we might get an impression that Croatian financial system has markedly evolved into a market orientated system in a very short period of time. As it can be observed, in the years 2003 and 2004, the issues of negotiable securities were about 7% higher than the approved bank credits (loans) to corporate sector. At the same time, a conclusion might be drawn that market risk was vigorously attached to credit risk. However, the value of such conclusions diminishes when other facts are observed. First of all, it is known that the financial system is at disposal to participants of other non-financial sectors (government and households). Secondly, there is no need for simultaneousness between market development and broadening of direct finances.

Namely, besides the banks, there are institutional investors who actively develop the management of joint portfolio. Since they are fundamentally orientated towards placements into negotiable securities, they really are in the centre of market intermediation. In addition, bank activities are classified as traditional intermediation (deposits and credits) and market intermediation, which includes the linking of savings with active management and diversification of negotiable securities portfolio (Košak et al., 2003; Pojatina et al., 2004). After all, there are rather ramified financial connections between financial institutions themselves. Although statistical sources are incomplete to a certain degree, they allow at least nearly credible conclusions.

Table 2.2 **Structure of Financial Institutions Assets**
(in millions of HRK)

	2000	Share in %	2001	Share in %	2002	Share in %	2003	Share in %	2004	Share in %	2005	Share in %	2006	Share in %
Banks and Savings banks	113,415.3	91.94	150,813.6	92.52	176,325.5	91.30	207,635.4	90.69	234,656.5	89,32	266,416.0	81.80	311,236,6	79.25
Insurance Companies	8,615.5	6.98	9,670.1	5.93	11,096.8	5.75	12,688.6	5.54	14 406.5	5,48	16,563.1	5.09	19,662,8	5.01
Investment Funds	1,332.5	1.08	2,516.8	1.55	3,671.7	1.90	3,918.8	1.71	5,648.0	2,15	10,371.8	3.18	18,482,4	4.71
Pension Funds	-	-	-	-	2,040.1	1.05	4,706.9	2.06	8,010.2	3,05	11,928.2	3.66	16,377,1	4.17
Leasing	na	na	na	na	na	na	na	na	na	na	20,403.6	6.26	26,968,6	6.87
Total	**123,363.3**	**100.0**	**163,000.5**	**100.0**	**193,134.1**	**100.0**	**228,949,7**	**100,0**	**262,721.2**	**100,0**	**325,987.1**	**100.0**	**392,727.5**	**100,0**

Sources: CNB, Annual report, different years. Author's calculation;
Insurance companies supervisory authority (DINADOS), Insurance market in Croatia, different years;
Crosec, Web site;
Agency for supervision of pension funds and insurance (Hagena), Annual report, different years;
HANFA, Web site.

2.2.1. Banks' dominance and Credit Risks

Although banks are gradually losing their relative importance in the structure of assets of financial institutions, they still remain dominant within the system. Because of their natural characteristics, it is logical to presume that credit risk dominates other risks in the system. In favour of this conclusion stands the fact of the presence of leasing companies. Naturally, the risk of leasing companies is not clean credit risk, but it has those features too. Absolute and relative increase of investment funds and especially pension funds is obvious, which is surely in favour of strengthening of financial market and market risk as well. The expected privatization and restructuring of the largest Croatian insurance company (its share in the assets of insurance companies is about 41.3%) could function in the same direction. In spite of the obvious sliding of Croatian financial system towards market model, the question of intensity and range of its growth tendency remains open. If we consider the facts from the structure of bank investments and institutional investors, the conclusion which can be drawn is that the ratio between credit risk and market risk changes much more slowly.

Table 2.3 **The Structure of Assets of Financial Institutions in 2004**[1)]
(in millions of HRK)

Institutions	Credits	Securities				Other	Total ASSETS
		Debt	Stocks	Other	Total		
Banks and Savings banks	126,107.3	25,200.6 [2)]	325.2 [2)]	245.7 [3)]	29,573.5	79,835.1	235,515.9
Insurance Companies	1,631.5	5,203	491	30 [4)]	5,724.0	7,051.0	14,406.5
Open Investment Funds *	-	na	na	-	4.527,7	-	4.527,7
- Money Funds	-	2,362.3	518.6	-	2,880.9	-	2,880.9
- Bonds Funds	-	667.2	-	-	667.2	-	667.2
- Stocks Funds	-	-	207.9	-	207.9	-	207.9

- Mixed Funds	-	na	na	-	771.7	-	771.7
Closed Investment Funds *	-	na	na	na	1,120.3	-	1,120.3
Pension Funds *	-	7,041.6	344.6	431.2 4)	7,817.4	191.5	8,008.9
Total	**127,738.8**				**48,762.9**	**87,077.6**	**263,579.3**

* Net value
1) Without leasing companies
2) Only banks
3) Only banks, other financial assets (factoring and forfeiting). Without shares in investment funs.
4) Shares in investment funds
Sources: CNB, Annual report, 2004. Author's calculation;
CNB, Aggregated statistical report, 31/12/2004. Author's calculation;
DINADOS, Insurance market in Croatia, 2004. Author's calculation;
Crosec, Web site;
Hagena, Annual report, 2004. Author's calculation.

Consequently, the major part of bank assets consists of credits and other assets. When we consider the particular position of banks as financial institutions liable to special regulations and controls of monetary authorities, the share of securities in their assets is not insignificant. In addition, it is not surprising that debt securities dominate in the structure of their securities portfolio. Despite certain limitations, the rise of securities portfolio in the total assets of banks is possible. After all, investment and pension funds management companies are mainly in their ownership.

2.2.2. Explosion of Leasing and Credit Risks

Exceptionally high growth of leasing companies in the assets of financial institutions should have been the sign of distinctive improvement of efficiency in the Croatian financial system. However, as in the case of introduction of other financial novelties (innovations) - this has not happened, or at least not to the necessary and possible degree. The proof for that statement is hidden in the reasons for the leasing explosion which coincides with the one Decision made by the CNB. In other words, in order to prevent excessive indebtedness of banks, mainly with their foreign parent banks, and placements of these resources primarily into the consumer sector, the CNB introduced required reserves for foreign credits.[1] Banks urgently reacted to the Decision by finding out a new channel for transfer of cheaper foreign resources towards resident households. Of course those were leasing companies mainly in their ownership. The vital proof for undesirable conduct of leasing companies can be found in the structure of their assets. Before presenting the facts it is useful to remember the basic features of leasing - to what degree it includes credit risk and what advantages it can have in relation to standard forms of credit financing by banks.

Since it includes several services, leasing belongs to a group of complex financial products. In a large number of countries leasing is regarded as bank business and it is supervised by

[1] Decision on Marginal Reserve Requirement , Official Gazette, No. 145/2005.

monetary authorities. One of the assistants of the Finance Minister must have thought of this particular fact when he laid the blame upon the CNB for the absence of distinct and more complete legislation of leasing[2], and elaborated measures for the fulfilment of prudence function in this area of financial and bank activities. Even though credit and leasing differ in many ways, they do have some identical features. Lending appears with both instruments: in credit financing it is money capital and in leasing it is real capital. In the former case a bank is the owner of financial assets (debts) and in the latter a leasing company is the owner of real assets. In both cases instalments are stipulated: in the former case it refers to financial assets and in the latter it refers to real capital. In both cases there is a probability of non-fulfilment of payments and accordingly a credit risk. Nevertheless, there is a difference in respect of risk exposure degree. In case of the non-fulfilment of payments, the leasing company can take over the assets, lend them to another party or sell. For all that the leasing company can suffer some loss connected, before all, with price fluctuations on the lending market and commodity market. A bank can sell its credit debts too, but only if they are assessed with high-grade by the Agency for debtor rating assessment. Accordingly, the credit risk exposure of a bank is higher than exposure of a leasing company. Certain advantages of leasing in relation to credit result from some other differences between these two financial products.

In case of the use of leasing for the purpose of the acquisition of corporate assets for a firm, the advantages frequently pointed out are promptness, absence of the indebtedness item in the balance sheet, indebtedness of their own resources and creditworthiness, favourable tax treatment and fast change of production equipment. Consequently, the conditions for getting of bank loan are more numerous, criteria are more rigorous, and procedures are more complex and long lasting. It is often said that "a bank will not approve a loan until it is proved needless" (Eakins and Mishkin, 2006, p.382). Unlike a loan, leasing is not an indebtedness item in firm's accounting. A firm can make good use of its own resources for other purposes - for instance: keeping an adequate degree of liquidity. When a firm acquires some equipment through leasing, it does not lose its creditworthiness and it always has the opportunity of indebtedness. Favourable tax treatment results from the fact that payment of leasing reduces income and accordingly the tax base. Leasing and especially operative leasing allows fast change of production equipment, which is particularly important from the point of view of innovation and competition. In general, leasing is a much more flexible financial instrument than standard loan. On the other hand, it has its disadvantages among which we can point out slightly higher prices of this type of external financing in relation to credit (loan) price. Even though the financing cost for leasing users in Croatia is higher than in the developed world, it is not such a problem as is the business orientation of leasing companies.

Towards the end of 2006 the participation of external resources in the structure of sources of leasing companies was 33.4 % (HANFA web page). Naturally, that led to the growth of the state debt. Unlike banks, leasing companies were not burdened with the costs of required reserves on external credit sources. Towards the end of 2006 credits (mostly long-term credits) participated with about 21% in the assets of leasing companies. In any case banks – owners of

[2] From December of 2006 first Leasing Act is applied. In Croatia leasing is under HANFA supervision and not under CNB.

leasing companies found an intelligent way to avoid monetary authority compulsion. Also, in terms of stabilization and developing objectives the structure of leasing company placements is not favourable.

Table 2.4 **Structure of Leasing Companies Placement**
(in percentage)

	2001.	2002.	2003.	2004.
Passenger cars	45.05	45.56	50.40	38.01
Lorries	21.12	20.86	16.58	13.67
Equipment	17.42	21.54	15.03	13.94
Real estate	13.46	8.09	14.26	29.84
Vessels	2.95	3.75	3.07	4.28
Others	0.01	0.20	0.66	0.26
Total	**100**	**100**	**100**	**100**

Source: Taken from Privredni vjesnik, Zagreb, br.3390 of 7./14. March 2005.

Leading position of passenger cars in the structure of leasing company's assets does not seem a favourable sign from the point of view of national economic priorities. Namely, leasing passenger car users are mainly physical persons, which means final consumers. In addition, it should be mentioned that bank loans for purchase of new cars are even higher. There is no doubt that this financial support stimulated import and in this way put considerable pressure on the trade balance of the country.

Considering the fact that lorries have a corporate purpose, one can get an impression that the reduced share of their taking in leasing company assets is not a good sign.

The increase of real estate portion in leasing company's assets can be regarded as encouraging for a significant move in development of this particular segment of market. So far, leasing companies have been chiefly interested in taking part in the construction and purchase of shopping centres and warehouses. Some of these companies slowly turn towards the purchase and lending of summer cottages. A large number of non-residents show a strong interest in the purchase of a housing place mainly in the Adriatic tourist area. However, non-residents' wants are inadequately met due to legal restrictions, complex and lasting approval procedures. The above-mentioned interest has contributed at least to a remarkable price rise in the mentioned real estate. Apart from the lack of adequate regulations, some other hindrances stay in the way of growth of real estate portion in the leasing company's assets and development of the real estate market in general. Among those hindrances disorganised land registers are certainly not the least ones. However, elimination of these hindrances could allow the boost of the real estate market. For the time being, the construction industry and real estate transactions in Croatia make about 13% of GDP (CBS, 2005). It would be especially desirable to develop a sale and lease back product. Croatian companies chronically suffer from lack of resources for the development of their own capacities. This problem could be considerably soothed by the sale of real estate and its simultaneous taking on lease from leasing companies. One of the essential conditions for admission to the EU is the complete liberty of real estate acquisition in the entire EU area. It means that regulations will need to be completely adjusted. At the same time the

opening of the real estate market will open the space for development of the speculative component in the real estate market. There are some solutions for that phenomenon, primarily in the area of improvement of fiscal regulations.

Low level of equipment portion in the structure of assets and specific tendencies of its fall confirm the theory that leasing company owners' aim is to gain the maximal profit at low risk. That kind of conduct is not consistent with the principle of higher profit at accepted higher risk, nor does it correspond to the actual behaviour of participants in the most developed markets. Of course, it is easier to gain profit from the less risky leasing of passenger cars. Why not - if it is possible? However, the required acceleration of economic growth primarily depends on investment in equipment. According to various sources of information Croatian entrepreneurs are quite interested in equipment acquisition through financial leasing, and there are good prospects for starting operative leasing development. On the other hand, the demand is not met by the supply. Acquirers of profit from leasing companies point out that the obstacle for larger equipment supply derives from the lack of a unified equipment register and difficulties of equipment sale in case of discontinuation in payment of lease by its user. The problems of ownership transfers exist in real estate as well, but despite that their financing through leasing markedly grows. As to the difficulties of equipment resale they also exist in the developed markets of leasing equipment. The problem is solved by simple calculation of risk premium into the amount of capital reward.

Finally, the portion of vessels in the structure of leasing company's assets is too small. The reasons for that are partly the same as with the leasing of equipment although there are some special and limiting factors in demand, which are connected with the seasonal potentials of vessels exploitation (seasonal character). In general it can be concluded that despite fast growth, the leasing in Croatia is more the factor of instability and non-creative destruction than it is the factor of economic growth.

2.3. Credit Risk in Process of Strengthening the Capital Market

Financial analysts regularly emphasize that particularly in the last three decades institutional investors played an important role in development of Western capital markets (Vittas, 1998, p.7-8.; Davis, 2003, p.95; Aras and Müslümov, 2005, p.6-8). In the circumstances of poor interest of individual savers (depositors) to invest into securities, institutional investors also contributed to the development of the Croatian capital market. On the other hand, their influence in that area is limited and their capacities are inadequately used. As it was previously said, their presence does not create the problem of the demand for securities or it is not so explicit. This might mean that the supply of securities would present a bigger problem. Clearly, supply and demand depend on various factors. Also, it is well known that primary and secondary capital markets condition each other. Obviously, without new securities issue there is no progress in the secondary capital market. On the other hand – the more the secondary market successfully fulfils its functions of capital liquidity and mobility, the bigger are the

chances for development of the primary market. This observation is clearly confirmed by the facts from the Croatian capital market.

2.3.1. Primary Market versus Banking Loans

It seems that the biggest difficulties in modification of the portfolio structure of Croatian institutional investors lie in the insufficient shares issue of domestic companies from corporate sector and inefficiency of the secondary capital market (Pojatina et al, 2004).

Table 2.5 **Issues and Market Value of Securities and Banking Loans**
(in millions of HRK)

Year	Equity market				Debt securities market				Banking loans to non-finan. comp.[5)]	Banking loans TOTAL[6)]
	Issues of non-finan. comp.[1)]	Issues of finan. comp.[2)]	Total	Market value of comp.	Issues of non-finan. comp.	Other entities issue[3)]	Total	Market value of bonds[4)]		
1997	343	2,082	2,425	na	na	na	na	na	8.224	45.334
1998	767	2,011	2,778	na	na	na	na	na	5.362	56.428
1999	1,326	221	1,547	26,972	419	20	439	na	-5.330	53.745
2000	293	900	1,193	28,974	83	4,207	4,290	na	273	59.194
2001	1,361	904	2,265	40,139	95	2,970	3,065	7,200	6.729	72.942
2002	1,905	1,132	3,037	43,929	490	4,429	4,919	10,131	8.675	97.452
2003	352	726	1,078	60,495	2,390	2,133	4,523	13,419	2.210	113.851
2004	574	740	1,314	103,474	3,490	15,237	18,727	24,564	3.945	128.774
Total	**6,921**	**8,716**	**15.,637**	**-**	**6,967**	**2,.996**	**35,963**	**-**	**-**	**-**

1) Mainly private bid;
2) Predominantly private bid;
3) The emitents are: banks, central government, local authorities, State Agency for Deposit Insurance and Bank Rehabilitation (DAB) and Croatian institute for health insurance (HZZO);
4) Without data from Varaždin stock exchange (VSE);
5) The difference between credit statuses by the end of the year;
6) Situation at the end of the year.
Sources: Crosec, Annual report, different years;
ZSE, Trading review, different years;
VSE, Annual report, different years;
Croatian Ministry of finance, Web page;
CNB, Annual report, different years.

The data from the table above allow several important conclusions. First, in the period between 1997 and 2004 the value of finance companies shares issue was higher by about 26% than the value of non-financial companies' shares issue. Naturally, from the point of view of economic development it would be more acceptable if an inverse case was recorded. However we must take into account the circumstances in which those issues were made. It is known that Croatian banks, like all the banks in all transitional countries, had insufficient capital, and that their

previous restructuring was the condition for restructuring and privatisation of problematic (dubious) state-owned companies. Therefore it seems completely logical that in the first two years of the observed period the value of financial companies' shares issues was significantly higher than the value of non-financial companies' shares issues. Intense annual fluctuations of the values of financial institutions shares issue certainly are closely connected with the privatisation pace of the state-owned banks and with the rhythm of founding of new financial institutions from the sphere of institutional investors. The heterogeneous structure of financial institutions is the characteristic of advanced financial systems and for that reason the shares issue is not a problem. From a certain point of view, it might be a good thing if the values of banks shares issue rose instead of falling. Namely, it is known that these bank resources are of the highest grade and fit for the financing of long-term investment projects. Nevertheless, in the circumstances of scanty financial resources it would lead to a more intensive development of the permanent capital market of financial institutions and consequently create the market structure which would not be rated as favourable. Effective (efficient) capital market, in other words the market which enables the linking of final savers (depositors) to financially deficient entities in an easy, fast and cheap way, can exist only if it is dominated by the securities from the corporate sector companies. Accordingly, new shares issues of non-financial companies' are much more desirable.

However, instead of rising, the annual values of shares issue of corporate sector had a tendency to decrease. There is an indication that issues were mainly motivated by restructuring of non-performing companies and not by their managers' striving to improve the structure of financing resources for their development plans. Such a conclusion can be proved by some other facts.

Firstly, the shares issues were chiefly made through a private bid, which means that companies were privatized by selling to a small number of acquirers. In comparison to the method of distribution of shares to the public, this method is not acceptable due to some other reasons including the need for transparency and fair pricing in the capital market. In addition to these problematic legal solutions, banks were probably not able to play their role of market intermediary.

2.3.2. Speculative Characteristics of Secondary Market

A very important proof which shows that owners of private companies were not motivated to issue new shares lies in the structure of the secondary capital market. Namely, at the end of 2005 only 5 companies were quoted in the official stock exchange market with a negligible value of stock exchange capitalisation. This listing in the primary market section implies, among other things, that company owners should offer at least 25% of their share portfolio. That could have given them better chances for new shares issues and other ways of acquisition of company's external financing resources. Judging on the basis of financial results (IBI, 2005, p.1-193) and other conditions, a great number of companies from the Croatian corporate sector can be registered in the main stock market. Even without that, they would have a chance in the market in case of new shares issue. Even in this case, new shareholders would have to enter

and consequently it would lead to the dilution of ownership of the existing shareholders. It seems that the current company owners do not want the ownership dilution, so it could be the main reason for the absence of new shares issues. Therefore, companies rely not only on their own resources but they also rely on other aspects of external financing of their investment projects. For this reason companies tend to become more interested in debt securities issue.

Furthermore, in the circumstances of vivid growth of resources in the framework of institutional investors, the company's capital remains closed (without quotation in the main market). The intense growth of resources will continue, particularly in the framework of pension funds founded under the principles of capitalisation. Life insurance investments have good prospects; even bank savings could make a move towards institutional investors. However, investors insist on higher profitability but without accepting excessive risks. This can be provided only by portfolio managers but in the circumstances of growing supply of shares and other securities issued by successful firms. So far they have limited room for manoeuvre in spite of the fact that stock exchange capitalisation has reached the level of value of approved bank loans. The stock exchange capitalisation of domestic companies is overblown primarily due to its calculation methodology and partly due to playfulness of speculators. The presence of a great number of companies in the market in the first place is the consequence of legal compulsion. The shares of lots of companies are not traded at all or are traded only rarely. In general, this market is speculative, which makes it inefficient in its function of attracting savings and economy development financing. Consequently, market risk has largely increased but it is accepted by those inclined to hazard in order to gain capital. Only few of them will be lucky as in any other lottery.

It can be concluded that, in spite of the apparent growth of the stock exchange market and its characteristic risk, the credit risk in the Croatian financial institutions continues to be dominant. Debt securities issues increased together with banking loans. Within debt securities issues only about 19% refer to riskier securities of the corporate sector. Let us be reminded that in addition to the already mentioned debt securities, Croatian government issued bonds abroad and their value amounted to 32.76 billion HRK between 1999 and 2004. Consequently, people live by means of substantial debts and the risks deriving from that.

2.4 Banks' Advantages in Managing Risks

Risks stand in one of the most prominent positions if not in the central position of modern financial theory. Theoreticians who represent two particular approaches have been arguing for a long time about which system is more efficient in stimulating economic growth: bank (deposits and credits) or market (negotiable securities) orientated. Among other things, both parties tend to apply their arguments in the area of risk management. Our analysis of the Croatian financial system financing undoubtedly substantiates the advantage of banks. Because - banking loans and debt securities dominate in the circumstances of inefficient functioning of financial market. After all, domestic banks have a tradition of some credit risk management, whereas market institutions, instruments, and mechanisms represent innovation. Even without

that clear substantiation, the renewed theory of financial intermediation brings to light strong arguments in favour of banks, especially in the area of risk management, even when it does not question the need of existence of financial markets.

Numerous researches have proved that the market logic does not function in its pure form due to existence of asymmetric information. A common example of this explanation is the second-hand cars market where the quality of cars offered is known only to their vendors (Akerlof, 1970, p.488-500). An adverse selection exists in other markets as well, especially in labour market, insurance market and credit market. Asymmetric information which exists between debtors and creditors is the main problem in the identification of credit risk. It is often emphasized that asymmetric information is the main reason of banks and financial intermediation existence. Thus, Leland and Pyle (1977, p.382-383) point out: "Traditional models of financial markets have difficulty explaining the existence of financial intermediaries, firms which hold one class of securities and sell securities of other types. If transactions costs are not present, ultimate lenders might just as well purchase the primary securities directly and avoid the costs which intermediation must involve. Transitions costs could explain intermediation, but their magnitude does not in many cases appear sufficient to be the sole cause. We suggest that informational asymmetries may be a primary reason that intermediaries exist." This asymmetric information particularly threatens relations between entrepreneurs and their financiers. A basic theorem launched by Jensen and Meckling (1976, p.305-360) inspired significant researches connected with various implications. According to this interpretation every form of external financing needs an agency cost. Simply, certain entrepreneurs' actions threaten external financiers. These entrepreneurs' actions cannot be controlled without costs for a lender. Different forms of external finances include different types of agency costs. An investment in control activities is expensive. However, it can reduce asymmetric information and agency costs to certain measure. Information asymmetries can be classified in two typical categories marked by phenomenon of asymmetric information ex-ante and covered action (moral hazard).

Asymmetric information ex-ante is the result of heterogeneous potential borrowers, or in general, financing projects. These projects have been different in terms of their profitability and risk amount. Therefore, their selection is needed. The selection can be done starting from objective information about the characteristics of borrowers or investments. Here, a credit appears as the complex operation of bilateral nature. Their approval implies significant investment connected to gathering, processing and transfer of different pieces of information. Such work can be realised by the market. It is logical to presume that large listed companies can easily find financing sources for their investment projects in the market. At their disposal there are specialised operators such as financial analysts, rating agencies, etc. Recently there has been such a tendency. On the other hand, big corporations can also be insufficiently transparent despite various regulations and strictness of supervisory authorities in the market. For this reason a constant relation between corporations and bankers can give significant advantages in terms of information. The German financial system, which is bank orientated, gives numerous and good examples in this sense (Allen and Gale, 2001, p.17-18). After all, banks are indispensable with their services of market intermediary. However, corporations and

especially small and medium-sized enterprises (SME) are not all inclined to market as they are to credit financing. Anyway, asymmetric information between banks and their debtors persists, as well as the need for its reduction by good credit risk management (Hakenes, 2004, p. 2399–2426).

The second case of asymmetric information refers to the moral hazard that is asymmetric information ex-post. Here, every situation, in which the results of credit connection depend on debtors' actions after the signing of contract, is understood. Those actions are not noticeable by creditors. Thus, a company takes a more or less active part in the success of the financed project, which means realizing it in a way more or less convenient for the creditor. In some circumstances, for example, a company can take possession of the gain in natural form from the profit of the realized project, it can give an excessive premium to managers, etc. The situation of over-indebtedness is often analysed as the borrower's choice to contract for other debts and to weaken its solvency at the expense of creditor. Various other similar conducts of debtors lead to situations which have a common feature. The success of financed project implies the creditor's monitoring of its performance. The economic theory has been studying this mechanism for a long time. In this way, the idea of a bank as authorised controller has been developed.

It was Schumpeter (1939, p.116) who wrote that: "… the banker must not only know what the transaction is which he is asked to finance and how it is likely to turn out but he must also know the customer, his business and even his private habits, and get, by frequently “talking things over with him”, a clear Figure of the situation." In the context of asymmetric information researches and introduction of agency costs banks can be explained as an efficient mechanism of reducing the moral hazard agitating the relation between companies and their creditors. The famous Diamond model (1984) analyses financial intermediation as a solution of delegated control. In fact, the model in which a financial intermediary has a direct advantage in net cost in relation to direct borrowing and lending results from the analysis of parameters of the authorized person's costs. In addition, it emphasises the significance of diversification within intermediation.

It is known that for the purpose of financing of their projects companies turn to external financing resources, securities issues, or they run into debt with a bank. The financing through issue of securities bought by savers (depositors) involves the assessment of company's solvency by each lender. “In the class of contracts written directly between entrepreneurs and lenders, the less costly of these two is optimal.” (Diamond, 1984, p.394) If there are a lot of external financiers of companies (m), the supervision costs (K) can be very high. In any case, when the control costs are $K>0$ it means that total costs of direct supervision are $m \cdot K$. Accordingly, there is cost doubling of this type, or on the other hand under-optimal control if lenders accept such a conduct. In fact every free-rider lender can escape his control role because of the poor gain he gets from it and because he can rely upon other lenders' control. Simply, securities owner will not control (supervise) as his share in financing of company is very small. If this conduct is generalized, the entrepreneur is not controlled any more. These signs prove that financing through securities issue generally belongs to well known companies

which have solid reputation and/or such a capitalisation that bankruptcy risks are quasi zero. So, it is a question of companies positioned on top lists of official stock exchange trade. On the other hand, young companies as well as small and medium-sized enterprises, whose solvency reputation has not been ensured yet and/or whose funds appear to be insufficient, should be controlled more strictly. In this case, gathering of information shows some characteristics of monopoly. It is good to remember that monopoly exists in the market if the cost of more useful factors is minimal when the production is realised by just one company for each level of production. In this context Diamond finds out that it is useful when individual lenders entitle a financial intermediary in order to control the borrower company.

Diamond model is the model of asymmetric information ex post between potential lenders indifferent to risk and entrepreneurs also neutral to risk, who have a need of gradual collecting of capital for the purpose of financing of risky projects. This type of asymmetric information indicates that a lender cannot directly notice the profitability of financed project and consequently the debtor's capability to pay the credit. A borrower can choose not to announce the total profit drawn from the project financed through indebtedness, which needs an expensive control. Existence of banks helps to avoid the doubling of the lender's supervision costs. In fact, a financial intermediary gathers the funds from lenders community and gives them assurances for compensation of some profitability. Then the gathered resources are lent to entrepreneurs and the financial intermediary becomes exposed to costs of fulfilment and control of the signed credit contracts with indebted companies (borrowers). Supposing that information, controlled by a particular agent, cannot be directly noticed without any cost for others, a problem of moral hazard arises between a bank and its borrowers. In fact a bank controls the entrepreneur's information and receives its payments, but is not directly noticed by depositors. On the other hand an authorisation has its cost - the cost of bank's control for depositors. Diamond also finds out that the authorisation cost can tend to zero in case when a bank increases the diversification of its credit portfolio, which means that a bank gets involved in financing of projects whose profitability is independent of each other. In other words, the problem of moral hazard between a bank and its depositors decreases proportionally to the bank size.

In relation to other financial intermediaries, banks have additional advantage at their disposal owing to diversity of services they provide to their clients, which represents the source of information control. Banks are primarily originators and managers of payment instruments. Creation of money shows a very important influence on the accumulation of capital. Namely, the financing of new investment projects does not need to be exclusively effectuated out of saving formed in the previous period. Banks lend amounts of money and deposit them on borrowers' accounts. Of course, such a procedure has its limits because of possible inflation pressure. But according to certain theories that procedure is allowable and it is actually used. In any case while anticipating the future profits, banks somehow lay a bet on industrial projects. These bets are based on the evaluation of the project particular quality. Project quality evaluations are multi dimensional. The credit non-payment risk stands on parameters which are often insurmountable for a borrower. Anticipation of trade prosperity, internal qualities of a project, solvency and borrowers' future are often not measurable. Gathering of information

about those parameters is very expensive for a financial intermediary. Banks have an indisputable advantage in that matter. Particularly, their function of account servicing and management of payment instruments is the basic element of borrower's special quality evaluation. Bilateral relations between a bank and its clients really supply it with huge data. Previous credit connection, fluctuations and balances of different accounts managed by a bank, possible payment disarrangements etc. represent bank's internal information which is not transferable in the market.

Superiority of banks in comparison to the market and regarding the knowledge of borrower's quality partly stands on objective facts which are only at bank's disposal. These facts should be followed by a subjective evaluation which cannot be separated from a confidentiality developed between a bank and its clients during some time. Therefore, information about debtors acquired by banks is private, whereas information send to financial markets is joint one in terms of accessibility to everyone. In relation to this the distinction between negotiable and not negotiable assets depends on the extent in which information asked for the investment checking is offered in public by a borrower (Goodhard, 1988). Negotiable assets are those assets for which a borrower offers a great deal of information required by investors, while lenders gather more information for not negotiable assets. Consequently, banks appear in the role of financial intermediary specialised for credit granting (approval of loans) on the basis of substantial information input. This bank superiority is recognized and valued by the financial market as well. Thus, obtaining of credit at some creditable bank represents a strong signal for the market regarding the evaluation of company's health (James, 1987, p.217-236). This effect can be manifested through the securities rate rise of companies that announce the signing of credit agreement and through their possible admission to the stock exchange market.

3. Global Approach to Credit Risk in Croatian Banking

Managers of Croatian banks and analysts from their systems regularly point out that the system is very successful and stable (Šević, 2004, p 8; Božić, Ognjenović and Šonje, 2005, p. 4; HNB, May2005, p 36.). They relate key problems connected with functioning of economy to factors existing out of banks, on which banks allegedly have no influence. Surely domestic banks realise much more profit than their Western counterparts. Probably for that reason a respectable business newspaper "Financial Times" has found some biggest Croatian banks to be the best performing in transitional tract. Low position of these banks on the risk rank list, assigned by the most recognized international organizations for rating assessment, is primarily explained as the result of country's high risk. Indicators of Croatian banks risk exposure issued by their supervisor (CNB) are almost marvellous. One can get an impression that banks are excellent in credit and other risks management and that they adequately operate according to their functions.

However, in the chapter 2.2.2 we have seen that the expansion of leasing companies' activities had negative consequences which are not insignificant in relation to occurrences in domestic economy. These companies belong to bank groups but they stay out of banks' supervisor control. Furthermore, the analysis of financial market functioning has brought to light the fact

that domestic banks did not turn out to be so ambitious in their role of market intermediary, particularly in the issue of shares from corporate sector. Of course, there are bigger or smaller differences among banks themselves regarding the range of financial products supply and the level of skilfulness in credit and other risks management as well. It is also clear that precise answers to these questions could be obtained only by thorough microeconomic studies. However, it is not possible to carry out these studies in consistent and completed way. Unlike information publicly available in well organized financial markets, bank information is private and as such it is not so available in public. Croatian banks often regard data as something confidential even when they should not be. Nevertheless the information system implemented by the CNB has recently been essentially improved. Thanks to that it is possible to carry out rather reliable assessments about the credit risk management and the consequences resulting from it by means of aggregated data and some other facts related to bank business.

3.1. Main Characteristics of Banking Sector Assets with Respect to Risk

There is no form of bank assets which is not exposed to risk in any respect. Even the best made and protected vault is not completely safe. The risk of bank claims is even less questionable. Still, short-term claims towards the government are theoretically taken as risk-free assets (Levy and Sarnat, 1984, p.105). According to the Second Basel Accord (Basel II)[3] all government claims and claims towards central banks can have zero risk weight but only if they are confirmed as such by recognized organizations for creditworthiness assessment. On the contrary, the lower assessed rating of a country is, the bigger risk weight will be used in the classification of bank assets risk. Criteria for the risk assessment of bank claims towards the government and the central bank in one country and in national currency could be even poorer. This is the case with criteria regulated by the Croatian National Bank. In its Decision concerning the capital adequacy of banks (Official Gazette No. 17/2003 and 120/2003) the Croatian National Bank gave zero risk weight to itself and to the Republic of Croatia. It does not mean that the CNB and government always settle their obligations in maturity terms. On the contrary, we are going to see that the government particularly tends to have settlement lags towards banks so government assets do not have risk-free characteristics. Finally, apart from capital reserves, banks have to form reserves for identified and unidentified losses (Loan loss Provisions). It is known that these reserves serve to cover the non-payments of each bank debtor. Certainly, bank claims towards the government and the central bank are less risky from those towards clients of other sectors.

[3] "In developing the revised Framework, the Committee has sought to arrive at significantly *more risk-sensitive capital requirements* that are conceptually sound and at the same time pay due regard to particular features of the present supervisory and accounting systems in individual member countries." BIS June 2006, page 2., part of point 5.

Table 3.1 **The Sectors Structure of Croatian Banks Claims** [1)]
- in percentage -

Banks claims on	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Central bank	5	7	8	6	10	10	11	12	14	15	16	16
Central government	28	25	18	16	17	17	14	13	11	9	11	10
Other domestic sectors [2)]	52	50	57	64	60	55	52	59	57	57	59	61
Foreign	15	19	19	14	13	18	23	16	18	19	14	13
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

1) Consolidated balance sheet of banks;
2) Enterprises, households, local government and financial institutions.
Source: CNB, Annual report, different years. Author's calculation

The strong growth tendency of participation of bank claims towards the CNB surely functioned in the direction of decrease of the risk degree in their total assets. The recent growth of this participation is primarily the result of introduction of assets earmarking into the required reserve on growing foreign bank resources (credits of their foreign parents). No matter how much this move of the CNB is justified, the question of existing managing modes in monetary policy is still open. Also the CNB has a wide operating range for improvement of its prudential function, except in case of leasing. In fact the choice of better solutions in prudence regulation and control could contribute to more flexible and more efficient monetary policy. As we are going to elaborate later, owing to that situation and the growing competitive atmosphere banks could be compelled to more desirable economic diversification of their supply, they could intensify the fall of their products prices and realise satisfactory profits. Principally the distinctive fall of the central government participation in total banks assets should have had an influence on the increase of their credit risk exposure degree. But, considering financial needs of the government and various external foreign experiences, this tendency could be reversed. After all, the government's previous high participation in banks assets is the consequence of its taking of poor banks claims (restructuring and consolidation of banks) and pre-war obligations on the basis of savings in foreign exchange. Naturally, together with repayments these government obligations disappear from banks balance sheets, which is the sign that their business is more stable and less risky. The falling tendency of the participation of other domestic sectors in the structure of bank claims since 1998 can partly be explained as the result of restrictions in monetary policy and partly as bank efforts in limiting of their assets risk. Principally, such a course of events cannot be estimated as a favourable one from the point of view of the need to intensify economic growth. Especially strong growing tendency of claims towards foreign countries (the increase of credit risk, risk of a country etc.) can be estimated as even more unfavourable in this sense. An insight into the structure of bank assets gives us the opportunity to have a more complete estimate of credit risk levels and consequences which derive from it.

Table 3.2 **The Structure of Assets of Croatian Banks**
- in percentage-

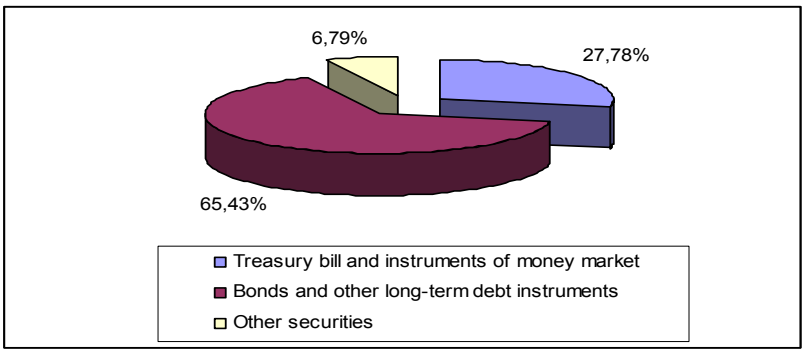
Assets	1998	1999	2000	2001	2002	2003	2004	2005	2006
Cash and other payment instruments	1	1	1	5	1	1	1	1	1
Deposits[1)]	18	20	25	26	23	28	28	24	23
Securities	23	23	23	20	20	14	13	13	11
Credits	52	50	46	44	53	54	55	58	61
Other[2)]	6	6	5	5	3	3	3	4	4
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

1) Deposits with CNB and with banking institutions
2) Derivative financial assets, foreclosed and repossessed assets, tangible assets (net of depreciation), interest, fees and other assets.
Sources: CNB, Annual report, different years. Author's calculation;

Let us put aside the inevitability of claims in the form of deposits, the fact is that the increase of their participation in total assets diminished banks capacity in financing of non-financial entities, and consequently corporations which are the base of economic progress. This type of bank claims has risk and "risk-free" characteristics. On 31 December 2006 bank deposits at the CNB came to about 64% (41% of required reserve and 23% others) and deposits at banks of the 2-rang came to about 36% (2% at domestic banks and 34% at foreign banks). Since time deposits participated with about 43% at the end of 1994 and with about 91% at the end 2006 in the structure of claims towards foreign banks, it is logical to presume that the credit risk exposure of domestic banks was on the increase according to this financial form. Other risks should be added to that, especially currency risk and interest rate risk. Finally, the fall of deposit participation in bank assets recorded in the 2006 is probably the sign of complete change of tendency in desirable direction.

The falling tendency of the participation of securities in the assets of banks balance sheet is only the result of repayments of the above mentioned government rehabilitation bonds. The diversity of securities in bank assets has recently increased in large measure. The presence of derivative instruments was statistically recorded for the first time in 2004 although it was of insignificant value (about 0.1% of assets). As we are going to demonstrate, their value in off-balance sheet operations is considerably higher. Despite the fact that all kinds of securities can be found in bank assets, the value of debt securities dominates in their structure.

Figure 3.1 **Securities and other financial instruments**



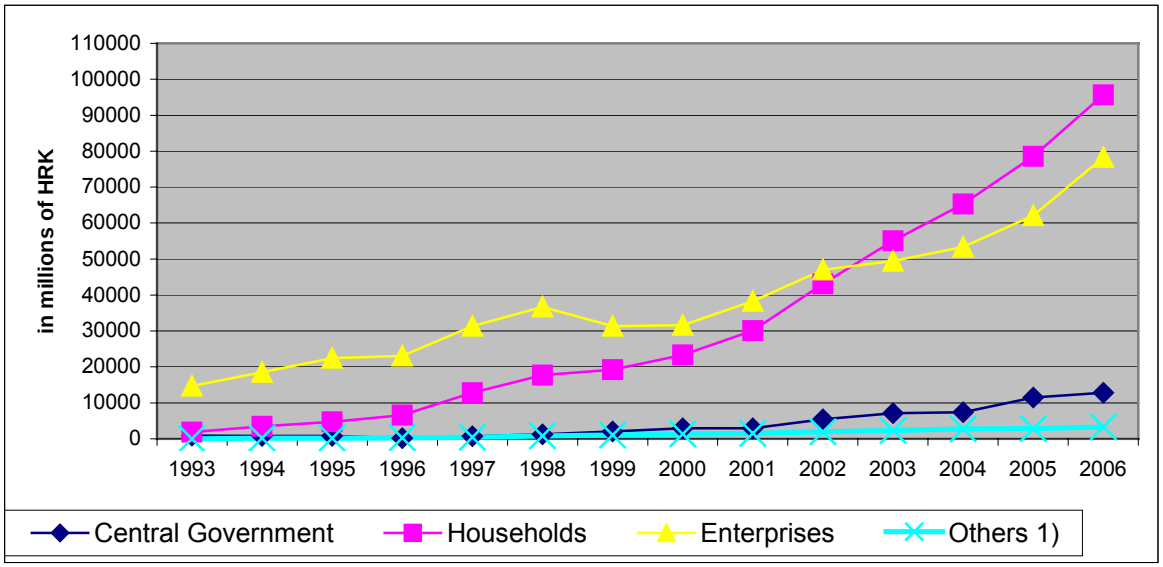
Source: CNB, Aggregated statistical report, 30/06/2005. Author's calculation.

There are different levels of risk within the components of securities bank portfolio, depending on maturity terms, issuers, currencies, etc. It is understandable that the credit risk as well as the interest rate risk are lower with short-term debt securities than with long-term debt securities. Since foreign issuers participate with about 34% in the total value of securities portfolio, it is logical to conclude that the country's risk is remarkably present here. The latter is more present in the portfolio of bonds and other long-term debt instruments within which foreign issuers participate with about 47%. However, all depends on the rating given to foreign issuers and their countries. Previous data and the fact that one part of debt securities of domestic issuers is indexed to foreign currencies - both of them highlight the certain presence of currency risk. Government securities participate with more than 94% in the value of domestic issuers' portfolio, so the credit risk is of little importance. This conclusion is supported by motives of establishing the securities portfolio. Namely, the participation of debt securities held in total securities portfolio till maturity term amounts to about 23%. The rest of it belongs to the commercial portfolio. There is no controversy in the fact that bankers count on capital gain (speculation) primarily from changes in interest rate and currency rate of exchange. On the other hand it is surprising that securities of domestic companies from corporate sector form a negligible part in their portfolio. This reluctance of banks referring to the financial support to corporate sector can be noticed in the context of credit portfolio as well, which deserves a special analytic approach.

3.2. Structure of Credit and Credit Risk

As banks are credit institutions by definition, it is normal that they are most exposed to risk from the credit part of their placements. In addition, the credit risk appears here in its purest form or other risks effects are least attached to it. So, different levels of credit risk in the structure of credit portfolio can be the result of the whole range of factors. While we are following the regulative classification based on logic assumptions and observing real occurrences, let us examine in what way the credit dynamics in each sector could influence the total bank exposure to credit risk.

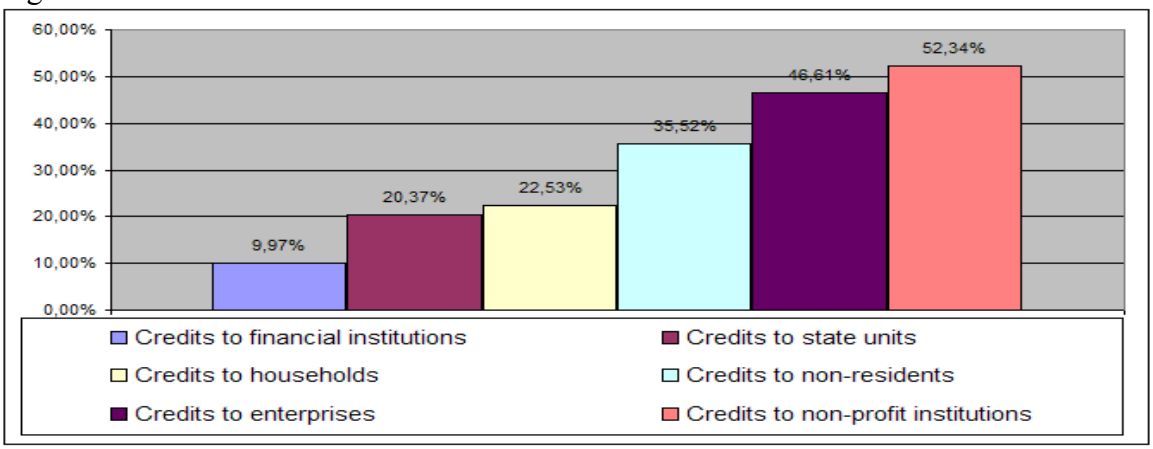
Figure 3.2 **The Structure of Banking Credits by Type of Borrowers'**



1) Local government, banking institutions and non-bank institutions.
Source: CNB, Annual report, different years.

The increase in the participation of credits to central government, local government and to banking and non-bank financial institutions (sector "Others") in total bank credits should have functioned towards the decrease of their exposure to credit risk. Of course this effect could not have large proportions because of their relatively little participation in the total bank credits. It would be logical to presume that the growing participation of households and the falling participation of enterprises in total bank credits could have functioned towards limiting of the credit risk growth on the level of bank system. Namely, the effect of diversification is much more present in the credit financing of households but the effect of other factors exists as well. In this way we do not want to say that credits to households are not very risky, we want to point out that the degree of their risk should be lower comparing to the risk degree of credits to non-financial companies (enterprises). After all, the authors of the Second Basel Accord counted on that in great measure. Namely, under Section 69 referring to a Standard Approach, claims to retail (households and SME) are given about 75% of the risk weight. On the other hand, under Section 66 also referring to the Standard Approach, 100% of the risk weight is given to companies which do not have the rating assessed by some creditable and recognized international agency. A very similar fundamental distinction derives from some other parts of the Second Basel Accord. This does not mean that a claim towards a company cannot have a lower risk degree comparing to the risk degree of claim towards the retail. For, the risk degree of claims towards any borrower depends on defined conditions, concrete circumstances and in the first place the bank's ability to select a debtor. The basic differentiation between claims towards retail and claims towards corporations (enterprises) is not anticipated in the CNB regulation which gives 100% or 125% of the risk weight to both of them. Certainly the most important thing is to answer the question in what way the earlier mentioned, presumed and standardized differences between each sector are confirmed in reality. For this purpose we can arrive to some indicative conclusions by means of data related to matured and unsettled banking credit claims towards each sector's entity – measured in percentage according to their credit obligations.

Figure 3.3 **The share of mature and unsettled credits in total credits**



Source: CNB, Aggregated statistical report, 30/06/2005. Author's calculation

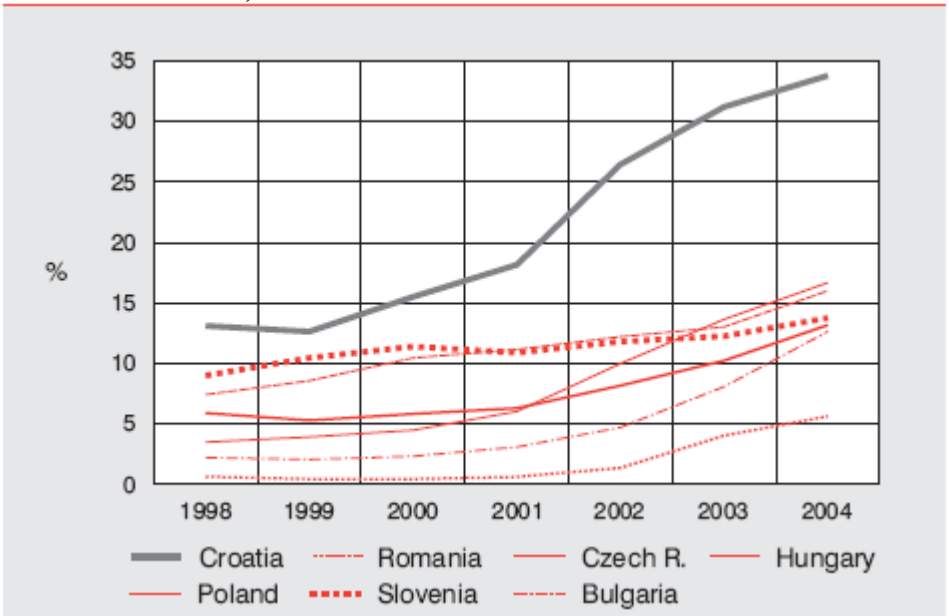
The previous illustration shows the existence of a certain concordance between theoretical and normative risk gradation on the one hand and the position in sector ranking according to real matured and unsettled claims on the other hand. It would be more logical for the state to take more favourable position than financial institutions. For in theory and in standardization state debts are treated as risk-free or with the lowest risk, whereas it is not case with claims among financial institutions which have higher risk due to asymmetric information (private information). Although it is high, the risk degree of banking demands towards enterprises is not questionable. Still some illogical things emerge here. Namely, the share of matured and unsettled obligations of state owned enterprises within their total obligations to banks amounts to 36%, whereas the same share related to obligations of privately owned enterprises towards banks amounts to 51%. This big difference in executing of credit payments could be considered as the result of the expected and stronger trust into privately owned enterprises and/or as the result of an excessive reserve and a strict selection of credit applicants among the state owned companies. From the point of view of indicators of a real (in)discipline in payments it seems that there is a very big difference between the household sector and the enterprise sector in spite of a logic assumption that the first sector is less risky than the second one. The strong growing tendency of household sector participation and the falling tendency of enterprises participation in total banking credits certainly have functioned towards the strengthening of banking exposure to the household sector. Certain growth limits of household credits have to exist out of which the total banking exposure increases directly and indirectly and more intensively. It cannot be noticed by observing of all the matured and unsettled bank claims from debtors in each sector. Among other things, there are time differences inside the very structure of matured and unsettled claims. It is not the same if there is a payment lag of a few days or a few years. After all, this time structure of matured and unsettled claims is taken into consideration together with the prudence regulation of a part related to formation of reserves. There are a lot of other reasons which require the introduction of more analytic approach into the bank exposure to the household sector and enterprises, especially because the credits of these two sectors dominate in total assets.

3.2.1. Banks Exposure toward Households

In spite of the fact that principal indicators show the efficiency (in technical terms - profitability) and stability of Croatian banks business, a lot of domestic analysts point at potential risks hidden in that business (Primorac, 2004; Mihaljek, 2004; Jakovljević, 2005). Particularly pointed out are the dangers which might result from the expansion of credit placements in the retail sector.

Furthermore, after having been taken over by foreign owners, Croatian banks turned to the development of the retail banking with the utmost effort. They have reached all the levels of development of their foreign owners in almost every aspect of this part of business. The most modern distributive techniques of various products to consumers have been introduced followed by an intensive marketing. Cash dispensers have increased in number and at least the biggest banks have installed intelligent windows - on line and home banking. The advertising of products is done in different ways beginning with the mass sending of advertising materials to home addresses, then daily newspapers, electronic media, specialized magazines to direct animating by phone calls. It is often done in poor taste and surely with excessive aggressiveness (and costs). No matter how banks are interested in attracting savings they still draw their attention to attracting of new debtors in the first place. Some of these banks go to such length that they make debit card without your request. The banking credits supply toward consumers is various and is constantly innovated. They are particularly liberal in credit granting through current account. They still act as "a fox in a hen-house". Interest rates tend to decrease influenced by sharp competition, but they are still two-digit numbers. Banks are not so dissatisfied if users have payment lags. In this case a default interest is collected together with an ordinary interest followed by other expense compensations. There is no doubt that banks have found the source of large profit in this sector. Their tendency to final consumers is more accentuated here than in former transitional countries which are the members or candidates for the EU membership.

Figure 3.4 **The share of banks claims from the household sector in USD in GDP (Gross Domestic Product)**



Source: Taken from Macroprudential analysis, CNB, No. 1, July 2005, page 13.

In spite of relatively high indebtedness of Croatian households in banks, which is closer to the indebtedness level of old rather than new members of EU, the CNB analysts estimate that it still cannot be spoken of the households' over-indebtedness. They prove this thesis by certain comparisons of assessed data and general impression which is not so convincing. Firstly, they refer to the share assessment of repayment of the principal with interest in gross disposable income of the household sector which amounted to 6.1% at the end of 2003 in Croatia while in the EU countries it has ranged from 9.5% to 10.5% in last ten years. Such comparisons are not so satisfactory if we consider a lot of other facts especially statistics about development levels and amounts of disposable income which define the household sector creditworthiness. Adducing to the facts of stable nominal exchange rate and the salaries growth, which is faster than the consumer prices growth, can only partly explain the expansion of credit indebtedness of Croatian household sector. Turning towards indebtedness is primarily the result of disintegration into a small number of very rich individuals on the one hand and the predominant mass of lower income classes on the other hand, whose even elementary consumer needs are not met.

It is quite plausible that repayments of the principal with interest put pressure on family budgets of most debtors. Statistics referring to the purpose structure of credits to the household sector confirm that to some extent.

Table 3.3 **The structure of credits to the household sector**
-in percentage-

	2006
Housing credits	39.51
Mortgage credits	2.83
Credits for purchase of cars	9.75
Credit card credits	4.10
Other credits to the household sector	43.82
Total	**100**

Source: CNB, Aggregated statistic report 31/12/2006

It is clear that the high participation of housing credits in credits to the household sector results from the fact that there are no community owned apartments and tenant's rights of tenure any more or they are insignificant in the first place. In the second place there is some state aid under the programme of housing saving, Program for subsidized housing construction (Rajčić, 2002., p.220-224) or some special state participation in the amount of difference between market interest rate and the part paid by users belonging to special social classes such as the younger teaching staff at colleges. It is difficult to expect that the users of housing credits come from the classes of wealthy people. Judging by certain conduct it is more likely that they are important buyers out from their own resources for commercial (speculative) reasons or for the purpose of acquiring of profit from renting. In favour of the first motive there are the earnings from the difference in housing prices (apartment prices) in the circumstances of their significant growth. The second motive lies in high rents which result from unsolved housing problems in urban areas and the growing demand for housing services. In these circumstances the private investments in apartments represent a very lucrative business. It is clear that the increase in apartment prices puts pressure on family budgets of housing credit users. Simply, in the circumstances of growing apartment prices they had to run into debt with large amounts. On the other hand, high rents compel families to willingly turn to credits in order to solve their housing problems even under unacceptable conditions. Until recently effective interest rate (nominal interest rate increased by unpaid interest on borrower's deposit and expenses) was two-digit. In general a variable interest rate and the credit value indexed to the EU exchange rate are agreed upon. One bank has recently offered the lower interest rate on housing credits with the currency clause in Swiss francs and thus induced some commotion in the market. Lots of things have been written about that in various newspapers and there have been various comments. A lot of people are convinced that the bank has seen an advantage in the expectation of future exchange rate changes of Swiss franc with which it would supposedly compensate the lower interest rate. We think that here it is more a question of the bank's advertising trick to attract the attention of public and new clients. Some other banks have reacted quickly offering the similar formula for granting of housing credits and in this way the primary marketing effect has disappeared very soon. Besides, while defining the amount of nominal interest rate banks regularly refer to the non-payment risk and they use that to justify a risk premium taken into account. Except the country's rating and possible change for the worse in macroeconomic conditions, we cannot find a particular reason for including of the risk premium. In other words, credits are covered with the mortgage on apartments which have to be insured and credit users themselves are conditioned to buy a life insurance policy. Values of

apartments evaluated for the purpose of getting a credit are much lower than their market value, and the amounts of granted credits are lower than the evaluations. Practically banks are not exposed to risk in regard to easy chargeability of their demands in the conditions of the rather significant decrease of apartment market value, which is not plausible. Therefore only credit users are exposed to risk because of the possible threat of losing the apartments.

Obviously the relatively little participation of mortgage credits and credit card credits does not expose banks to a significant credit risk. It is also logical to expect that the chargeability of the first ones in relation to the second ones is more likely to happen. While the first ones are insured by real estate, the second ones are uncovered and represent consumers' aspirations as well, so they are closer to the over-indebtedness zone. The demand for more superior goods, which is the case with cars, is probably motivated by effects of demonstration (Duesenberry, 1967, p. 25-32), so the potential focus of over-indebtedness is hidden inside it. This assumption as well as the fact that the participation of credits for purchase of cars is relatively high makes banks exposed to the risk which is not insignificant. However in case of non-payment banks are insured to a certain extent by acquired rights of free use of cars which have to be obligatorily insured. Finally, other credits represent the biggest part in the structure of credits to the household sector. Therefore, considering the structure of debtors and the purpose of credits, banks are mostly exposed to risk. Here, it is a question of current account credits and other credits mainly used for financing of elementary consumer needs. The predominant number of pensioners and employees with very low income in this way provide for additional resources just in order to survive. The two-digit interest rate reveals that banks calculate with a high risk premium because they are faced with negative selection.

This conclusion as well as our previous ones, in regard to the gradation of the risk banks are exposed to when dealing with the retail sector, can be clearly proved by examining the facts of matured and unsettled claims.

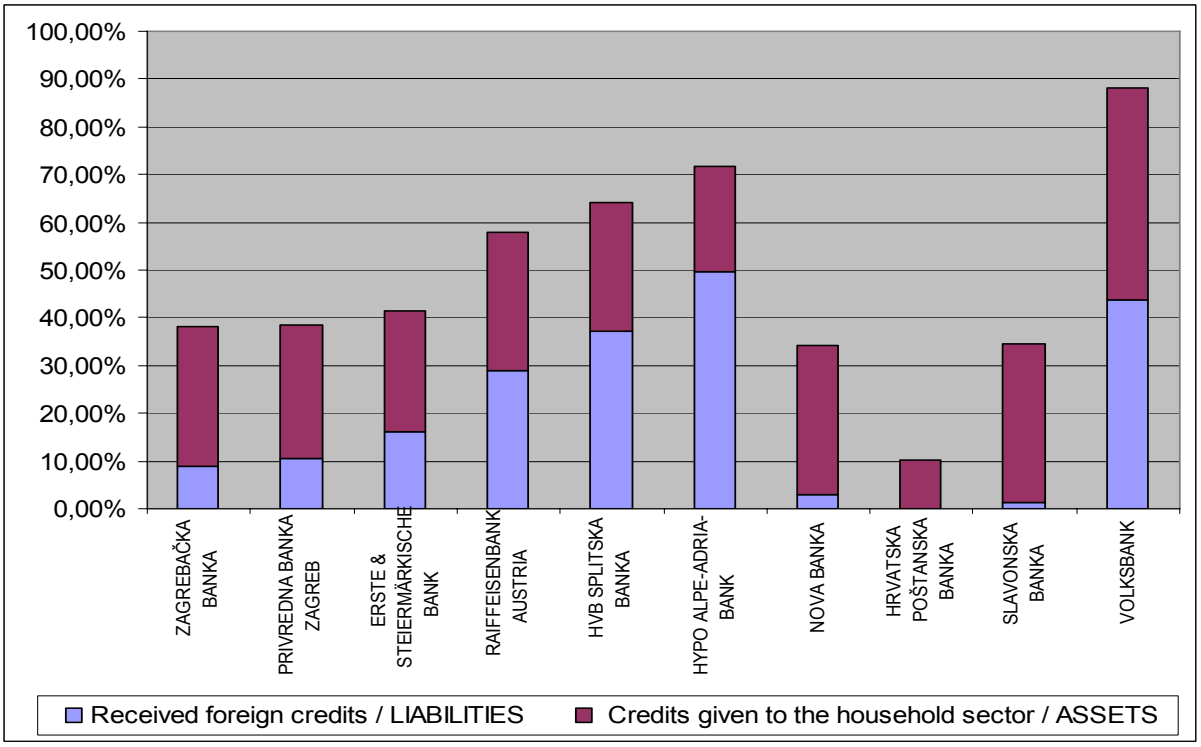
Table 3.4 **The participation of matured and unsettled claims from the household sector**
- in percentages-

	To 30 days	31 to 90 days	91 to 180 days	181 to 365 days	1to2 years	2 to 3 years	Over 3 years	Payments (taken on the average) after[1)]
Housing credits	27.2	24.8	18.0	17.8	17.8	14.4	21.6	102 days
Mortgage credits	7.7	8.4	12.9	5.8	4.7	2.7	2.7	80 days
Credits for purchase of cars	10.3	11.5	11.0	12.9	9.9	10.4	3.6	97 days
Credit card credits	0.4	0.9	1.1	1.6	1.5	1.2	0.4	187 days
Other credits to the household sector	54.5	54.4	56.9	62.0	66.1	71.3	71.7	149 days
Total	100	100	100	100	100	100	100	127 days

1) In order to count up average payment lags we have presumed that matured and unsettled claims are paid up to 5 years.
Source: CNB, Aggregated statistic report 30/06/2005. Author's calculation

When comparing the average number of repayment days in all the credits to the household sector with the CNB classification in risky groups, one could get an impression that the household sector is not in the dangerous zone of riskiness. However the average number of payment lag days and especially the dominating percentage of participation in delayed repayments over 3 years (about 72%) within other credits appear to be disturbing. The participation of payment lags in housing credits over 3 years is not insignificant. The users of this type of credits are under the strong pressure of threats of losing their home, so it is logical that they will do anything to fulfil their obligations of the credit repayment. However, judging upon the recorded banks taking of apartments and selling them, which is the case very often nowadays, all credit users do not succeed in that. Since housing credits are indexed in foreign currency, the correction of the overestimated exchange rate of HRK would expropriate a lot of users of housing credits. It appears that the household sector is on the verge - if not already in the zone of over-indebtedness. In spite of that banks continue to meet the growing consumer demand by credit aid and when domestic sources fall short of they turn to the external indebtedness in great measure.

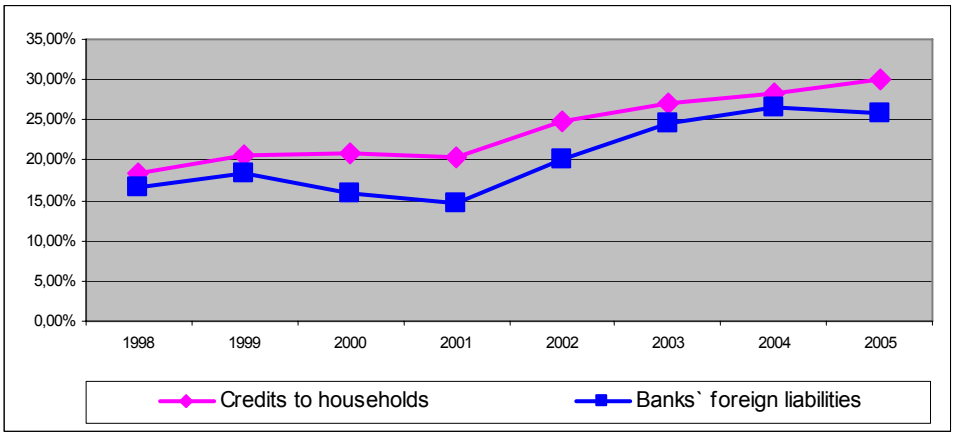
Figure 3.5 **The household sector credits and foreign credits in the liabilities of 10 biggest banks**



Source: Annual reports of banks for 2004. Author's calculation

Two biggest Croatian banks are the most attractive to domestic depositors, which might be the reason for their reduced needs for foreign sources of the consumer sector credit financing. It is very interesting that banks owned by Austrian banks are the biggest users of foreign credits. Nova banka d.d. does not turn to foreign indebtedness so much probably because not until recently it has been owned by a bank from a foreign country which does not abound in cheap savings and placements are given a better premium. The biggest bank in domestic ownership hardly ever runs into foreign debt. It is logical to presume that it is a similar case with other banks in domestic ownership as well.

Figure 3.6 **The household sector credits in assets and banks' foreign liabilities in assets**



Source: CNB, Annual report, different years. Author's calculation and graphic.

At a glance a previous Figure shows that there is a concordance in dynamics of credits to the retail sector and foreign commitments of banks. A correlation coefficient is 0.941827. This tendency surely operates in the direction of aggravation of the balance of payments which has already recorded an unbearable deficit as it is. If this tendency continued, banks might confront with higher credit risk.

3.2.2. Poor Interest of Banks to Grant Credits to Corporate

Credits to the corporate sector that banks grant to their clients belong to the line of credits with the highest risk. In fact, they are used as direct and indirect financing of projects with results that are uncertain by nature. Data analysis in the item 3.2.1. of this thesis clearly shows that Croatian banks prefer credits for financing of consumer needs. Does that mean that they are averse (reluctant) to crediting the corporate sector, insufficiently qualified for credit risk identification and management; or the problem lies in the weak offer of high quality projects - these are the questions that cannot be answered accurately without testing the ground and studying microeconomic data. However, available facts give us at least globally some messages.

According to data from the Figure 3.2, in the period between 1994 and 2006 the participation of credits to corporate sector in the structure of banks credits by type of borrowers' is cut in half (from 81% to 41%). One can get an impression that banks became more and more averse to assumption of credit risk towards the corporate sector. Some other facts are in favour of this conclusion.

Table 3.5 **The Term Structure of Bank Credits to Corporate sector (remaining maturity)**

	To 30 days	31 to 90 days	91 to 365 days	1 to 2 years	2 to 3 years	Over 3 years	Total
State-owned	6.13%	17.12%	27.58%	11.24%	7.59%	30.33%	100%
Others	16.77%	7.90%	26.09%	12.24%	9.00%	28.01%	100%
Total	**15.69%**	**8.84%**	**26.24%**	**12.13%**	**8.86%**	**28.25%**	**100%**

Source: CNB, Aggregated statistic report 31/12/2006. Author's calculation.

The previous data do not give an entirely clear picture of how much banks support development objectives of economy with their credits. Nevertheless, the impression is that they are rather reserved about that. For, the share of credits with the term longer than 3 years in total credits (loans) granted to enterprises does not seem to be so encouraging, even if we suppose that long-term credits for investments into economy prevail among them. It is worth emphasizing that a part of those credits is risk-free for banks. According to statistical data published by the Ministry of finance of Croatia, between 1st January and 31st December 2003 the State issued sovereign financial guarantees on credits to the corporate sector at domestic banks in the value of about 3.1 billion HRK. In the same year those credits increased by about 2.4 billion HRK. Probably the guarantees referred to earlier granted reprogrammed credits as well. In the period between 1st January 2000 and 31st December 2004 credits granted to enterprises amounted to about 22 billion HRK and sovereign financial guarantees on credits about 15.7 billion HRK. Consequently, sovereign loan guarantees covered on an average about 71% of bank credits to the corporate sector. However, these guarantees significantly decreased year by year (about 4,6 billion HRK in 2000 and about 269 million HRK in 2004). It is almost certain that the guarantees had primarily been intended for state-owned enterprises and gradually decreased in the rhythm of their privatisation. In spite of that, we assume that credits to the corporate sector are still considerably covered by sovereign loan guarantees and in this way they represent less risk to banks.

Table 3.6 **The Structure of Bank Credits according to Activities in percentage**
- the situation in the end of 2004 -

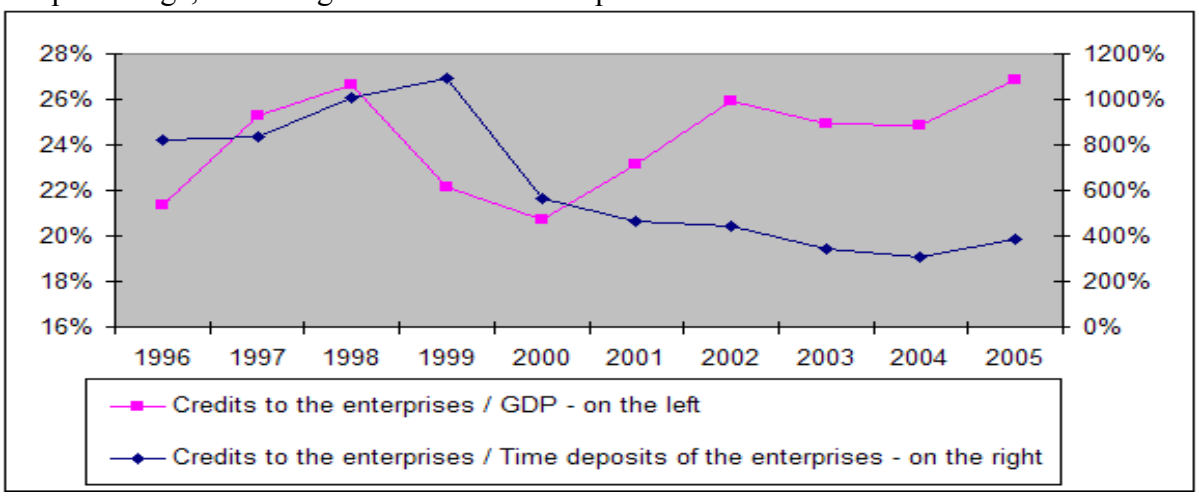
	Industry	Agriculture. hunting. forestry and fishing	Construction	Trade	Other[4)]	Loans to corporate clients
Zagrebačka banka	30.72	3.99	8.21	16.17	40.91	100
Privredna banka Zagreb*	8.11	3.83	6.60	16.38	65.07	100
Erste & Steiermärkische bank*	28.44	2.45	6.95	29.76	32.39	100
Raiffeisenbank Austria* [1)]	20.75	na	7.55	35.85	35.85 [2)]	100
HVB Splitska Banka*	22.77	0.50	5.66	16.74	54.33	100
Hypo Alpe-Adria Bank*	18.13	3.34	7.24	32.80	38.48	100
Nova banka* [3)]	16.35	9.82	12.70	27.75	33.39	100
Hrvatska poštanska banka*	27.76	1.06	3.92	11.34	55.92	100
Slavonska banka*	36.22	13.90	22.32	17.53	10.03	100
Total 9 banks	**22.16**	**na**	**7.72**	**22.36**	**44.52** [2)]	**100**

* Given in gross amounts. The supposition is that reserves are equally arranged in order to get net amounts.
1) Other financial assets are deducted.
2) Other includes Agriculture, hunting, forestry and fishing for Raiffeisenbank Austria.
3) In 2005 it changed its name into OTP bank.
4) Hotels and restaurants; Transport, storage and communication; Financial intermediation; Real estate, renting and business activities; Public administration and defence; Compulsory social security; Education; Health and social work; Other community, social and personal activities.
Source: Annual banks reports, 2004. Author's calculation.

In spite of the fact that the previous statistic illustration is not complete enough due to methodological differences, it still shows that the structure of bank loans according to activities

is not entirely sufficient. Thus, the participation of loans to trade is the same as to industry. Although trade takes part in creating of new value as well, the activity directly connected to production should have the advantage. Presumably, something has to be produced before it can be sold. No doubt that favouring of trade is an additional indicator of excessive consumer tendency of domestic economy.

Figure 3.7 **Banks Credits to the Corporate sector**
- in percentage, according to GDP and time deposits -



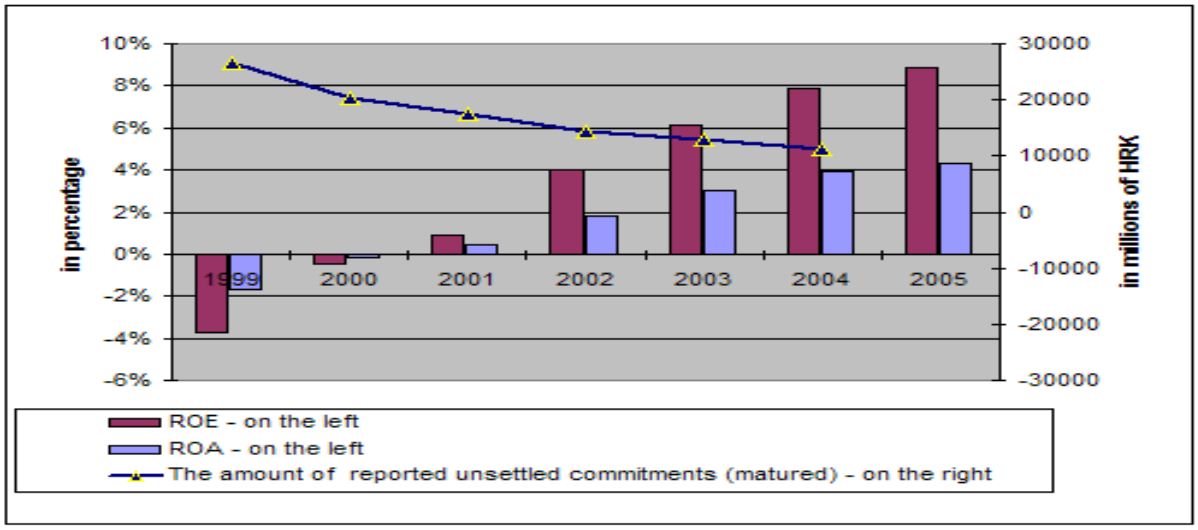
Sources: CNB, Annual report, different years. Author's calculation.
CNB, Bulletin, No.115.

So, the participation of bank loans to the corporate sector fluctuates year by year, but with the growing tendency. As much as this flow is encouraging, it loses its value when we consider data about financial and credit potential of banks. A significant decrease in ratio credits to enterprises / total time deposits in banks discloses that banks turned more and more toward other placements and relatively less toward credit support to the corporate sector of our economy. At the same time the financial and credit potential of banks essentially improved in the quantitative and qualitative sense. Thus, the number of total time deposits increased about 8.2 times in 2005 in relation to 1996. The ratio credits to enterprises / time deposits of enterprises also decreased and came from 1096% in 1999 to 384% in 2005. The growth of time deposits of enterprises represents the sign of improvement of their financial power and thus their creditworthiness. Of course, the creditworthiness of enterprises primarily depends on the degree of their total indebtedness.

According to estimates in the CNB (Macroprudential analysis, May2005, p.15) the participation of total debt of the corporate sector in GDP continually grew since 2001 reaching the level of about 49% at the end of 2004. The conclusion is drawn that : " … the present level of total debt of the corporate sector is not disturbing when compared with the corporate sector debt in EMU, which was gradually rising from about 60% to 63% GDP of the region from the beginning of 2002 till the middle of 2004". We would rather conclude that the low level of indebtedness of the Croatian corporate sector is more disturbing taking into consideration the fact that this sector, unlike the corporate sector in the EU, is less financed out of capital growth created by issuing of new shares. This thesis has its confirmation in the movement of total debt of the corporate sector in their total assets. According to statistics from annual reports of

enterprises (FINA, different years) the total non-consolidated long term debt in total non-consolidated assets of the corporate sector amounted to: 14.18 %, 15.22 %, 14.38 %, 18.15 %, 19.80 %, 21.28 % and 22.48 % from 1999 till the end of 2005. So, the participation varied in significant ranges, without any explicit tendency to grow. However, methodological clearing up performed in the CNB (2005) discloses that the total long-term debt decreased (from 28.5 % in 2001 to 21.5 % in 2003) in relation to total assets of the corporate sector. In the same period the burden of debt amortisation decreased on the basis of interest. The ratio interest expenses / gross revenue of the corporate sector amounted chronologically to: 5.1%, 4.2% (first two years also include exchange rate differentials), 2.3%, 1.8%, 1.5%, 1.6% and 1.6%. The relative decreases of total debt and enterprises debt rate are both the result primarily of the influence of two factors. The first one is falling out from the records of numerous enterprises that became bankrupt and the second one is the decrease of lending interest rates. Thus, lending interest rates on long-term credits to enterprises amounted to 10.8% at the end of 1999 and 6.1% at the end of 2005 (CNB, Bulletin, No.115, p.37). Other statistics, particularly about profitability and liquidity, confirm that the financial condition of the corporate sector has significantly improved in the last years.

Figure 3.8 **Profitability and the Amount of Reported Unsettled Commitments (matured) in the Corporate Sector**



Note: For year 2005 amount of reported unsettled commitments is not included in report.
Source: FINA, The Analysis of financial results of Croatian entrepreneurs' business activities, different years. Author's calculation.

Owing to reform moves and economic recovery, the corporate sector has stepped out of the negative aggregated profitability into the line of positive financial results. Even annual contribution measured through ROA and ROE shows a rising tendency. At the same time, annual amounts of reported unsettled commitments (matured) have a significant falling tendency, which means that the corporate sector liquidity essentially improved as well. Accordingly, their creditors, including banks, became less exposed to the credit risk. The statistics about banks mature and unsettled (non-performing) claims do not show that the corporate sector credits are significantly riskier in relation to banks claims toward other debtors. Actually, at the middle of 2005 enterprises from the corporate sector had payment lags of 190 days on average in effectuating their credit commitments toward banks, while other bank debtors had payment lags of 165 days. It is reasonable to expect even faster continual

decrease of these and other payment lags as well. In fact, since the beginning of this year a new Obligations Act (Official Gazette No. 35/2005) has become operative, which more precisely and rigorously intensifies the debtors and creditors liability in the payment system.

A conclusion which can be drawn is that Croatian Banks are excessively reserved in the area of the corporate sector crediting in the conditions of rising financial discipline and the position of those enterprises. Up to the present they have been able to afford that luxury owing to huge profits from less risky and over-rewarded placements toward the consumer sector. However, as our earlier analysis has already shown, the households have stepped (or are on the verge) into the area of over-indebtedness. Accordingly, banks will have to change their strategy and pay more attention to credit and other support to the corporate sector. It will not be easy, since the selection of debtors from the corporate sector has been a demanding work. In the 5th chapter of our thesis we are going to discuss the level of banks qualification in credit risk management and evaluate the possibility of advance in that area. However, not all of this is up to bankers, no matter how much they are qualified. If there is a poor supply of high quality projects for financing, the bankers are powerless as well. It seems to be a big problem in Croatian economy. Smaller entrepreneurs often complain about difficulties in project elaboration, which represents a main obstacle in the use of resources, even those from the pre-admission EU funds. No doubt that the supply of various project expertise services should be more developed and that managers, not only in banks but in the corporate sector as well, have to make a move.

3.3. Credit Risk in Off-Balance Sheet Operations

Besides operating through the direct lending (assets) and indebtedness (liabilities), banks operate in many other ways, which results in their commitments and rights recorded in off-balance sheet. Here, we are going to note one aspect of these operations particularly those for which banks take on liability in their commitments. With those commitments banks expose themselves to the credit risk. The risk can be higher or lower depending on whether those commitments are certain or uncertain, whether they are executable on fixed dates or unanticipated ones, whether they are revocable or irrevocable. These kinds of operations are usually classified as those which result in payment and lending commitments, by rates and indexes, and they are connected to custodial business.

Payment commitments include closed (fixed) commitments to pay or to buy, from Guarantee and endorsements, from Warrantees and indemnities. Before all, those commitments derive from Documentary letters of credit in which banks appear as guarantors to suppliers (mainly in export business) for account of their clients (importers). In this category there are also bank Acceptances, Outright forward purchase or Repurchase agreement. Unlike the previous type of commitments, with the Guarantee or endorsements the payment of a commitment can be effected casually by a bank depending on its client's capacity to pay the commitment or not. The simplest form of the Guarantee is a certified cheque needed for certain payments. Guarantees appear vis-à-vis the public administration as well, for example in the form of Customs and tax bonds and Guarantee or endorsements which are given by banks to other

banks and financial institutions for granted credits. The third type of commitments consists of Warrantees and indemnities given by banks to national or foreign administration or big corporations in case of large orders and completions of works lasting for a longer period.

Banks often make themselves liable to lend their funds to their clients under earlier fixed conditions or under the conditions which will be fixed at the moment of credit realization. First of all it is a question of an Undrawn (authorised) overdraft facility with a bank undertaking to place a granted amount at its client's disposal according to his choice of time along with the accrued interest on debt only. Stand-by credit line or Facilities in behalf of a client and Multi-option facility belong here as well. The Multi-option facility enables clients to insure Facilities in many ways in terms of instruments (a standard credit or the sale of securities), rates and foreign currency. These commitments can be revocable and irrevocable and they include different kinds of commission and interest on used funds as well. The commission represents a premium for the inevitable "prudence" undertaken by a bank to insure an immediate fulfilment of demand for the credit realization. Besides those previously mentioned, banks also grant Facilities when issuing securities. In these cases banks undertake to list securities for which their issuer client has not found the sufficient number of underwriters. Commitments for a short term or a Note Issuance Facility are mainly used. Although gradually abandoned, there are commitments connected to guarantees of bank syndicates in traditional issues of "large government loans". A variant of these bank commitments is a Revolving Underwriting Facility.

Nowadays banks have numerous and big opportunities to use different innovations in financial markets among which derivative products stand out. Except for their own account, banks perform operations with derivative instruments for account of their clients for protection or speculation. When they do that for account of their clients it is clear that they expose themselves to the off-balance sheet risk. In fact commitments always expose banks to payment risks and consequently to the credit risk. According to the classification of the Committee for rules and practice of banking operations control of BIS – in this kind of off-balance sheet operations belong: Forward foreign exchange transaction, Forward rate agreement, Rate swaps, currency swaps, currency and interest rate swaps, currency futures and interest rate futures, stock index futures, currency option, interest rate options and stock index options, guarantee of currency rate of exchange and interest rate. The derivatives on credit risk have been recently introduced (Neal, S.R., 1996, p.15-27).They represent the group of option contracts or swap contracts designed to separate the credit risk from other risks and to transfer it to the third party. The most used are credit default swaps and the total rate of return swap.

Finally, banks offer the services of Custodial business, Portfolio management, consulting or intermediation in different operations. Those services also are not totally risk-free. Thus a bank can take the consequences if it forgets to collect coupons, makes some negligence in managing of portfolios or gives a wrong advice in the financial engineering. In the last case it is really difficult to identify the risk which thus cannot figure outside off-balance sheet.

During the last three decades off-balance sheet operations values increased by higher rates than the growth rate of balance sheet value, at least in bigger banks which operate in developed financial markets. There is a proof for that in the growing participation of non-interest income (commission and the like) in the total income of banks (Košak et al., 2003, 432-435). It is understood that the credit risk on this basis was growing together with the growth of off-balance sheet operations. For this reason CCF's (Credit Conversion Factors) were defined in the Basel Accord from 1988. They were amended in the Second Basel Accord in the paragraphs 82-87 of standard and the paragraphs 310-317 of basic (F-IRB) and advanced approach (A-IRB) to internal rating defining. The CNB has generally accepted earlier solutions, and new regulations are going to be introduced.

Table 3.7 **Off-balance-sheet operations in Croatian banks**
-in percentage with respect to assets-

Operations	1999	2000	2001	2002	2003	2004	2005	2006
Classical	16.17	14.65	13.12	14.45	12.79	13.62	18.02	20.12
Derivative instruments	2.38	1.53	2.43	4.53	6.16	10.34	14.84	24.45
Total	**18.55**	**16.18**	**15.55**	**18.98**	**18.95**	**23.96**	**33.86**	**44.57**

Source: CNB, Aggregated statistic report, different years, Author's calculation

Off-balance sheet operations fluctuated in short ranges except in the last year. The changes in their structure could have functioned in the direction of the strengthening of market risk.

Table 3.8 **The classical off-balance-sheet items in Croatian banks**
- in percentage-

	1999	2000	2001	2002	2003	2004	2005	2006
Guarantees	70.82	54.78	47.78	36.28	35.34	33.87	32.71	28.65
Letters of credit	9.23	7.12	6.13	5.39	5.01	4.38	3.55	2.88
Backed bills	1.20	2.50	0.21	0.30	0.11	0.08	0.02	0.17
Overdraft and financing obligations and other off-balance-sheet items	18.74	35.60	45.87	58.03	59.54	61.68	63.71	68.30
Total classical off-balance-sheet items	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: CNB, Aggregated statistic report, different years, Author's calculation

The falling tendency of the portion of classical items in total off-balance-sheet operations could have functioned in the direction of credit risk decreasing. On the other hand, the change in their structure, primarily significant growth of the overdraft credits portion, probably tempered the fall of that risk.

Table 3.9 **The derivative financial instruments in off-balance-sheet items in Croatian banks**

- in percentage-

	1999	2000	2001	2002	2003	2004	2005	2006
Swaps	9.17	7.89	21.14	12.02	27.30	31.82	22.69	37.01
Futures. forwards and options	4.52	20.80	58.90	79.81	68.57	59.46	70.83	58.60
The obligation of purchase and sale of securities. credits and other assets	0.79	1.42	1.00	0	0	0	0	0
Other	85.52	69.89	18.96	8.17	4.13	8.72	6.48	4.39
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: CNB, Aggregated statistic report, different years, Author's calculation.

Although market risk is characteristic for derivative instruments, credit risk is not excluded. Thus, in forwards and swaps, one of the counterparties might not effect payment or delivery. However, all those risks are relatively less significant in spite of the increase of derivative instruments. Simply, the operations value is at low level, the domestic organized derivative market does not exist (futures and option) and the supply of instruments is not heterogeneous enough either. No doubt, the derivative market should be more evolved. Its role in the expanding of supply and demand for instruments of credit risk protection is particularly important.

3.4. Risk Interaction of Assets and Liabilities

In the section 2.4 of this thesis we have discussed the asymmetric information in bank assets and noted the different footholds of the financial intermediation theory which gives banks preference in risk management. The banks' advantage in relation to the market as well as the problems of the asymmetric information in liabilities are explained and interpreted in detail by Diamond and Dybvig (1983, p.401-419). Indeed, deposits ensure better liquidity to their owners than securities particularly in the conditions of the inefficient functioning of the financial market. Likewise, in case of the placement in deposits there is no loss (a nominal value is obtained), while the prices of securities in the financial markets can fall below the value of initial investments. There is a problem of the asymmetric information between a bank and depositors because only depositors know the time they will withdraw their invested resources, and not the bank. Therefore depositors' bank runs are quite possible and they are interpreted by Diamond and Dybvig as the consequence of variables of unidentified origin – like sunspots. They see the solution of depositors' bank run problem in deposit insurance. Without going further into theoretical analysis, it is a fact that the specific quality of risk lies in interactions between risks connected to assets and risks which result from the nature and characteristics of liabilities.

As it has already been pointed out, banking activity stands on the transformation (maturities, risks and profitability). On the other hand, the activity of transformation makes banks fragile

because they are subject to liquidity crisis and/or solvency. The liquidity risk is characteristic for the transformation activity as bank assets are less liquid than its liabilities and the premature liquidation of assets leads to extra losses. In this context the liquidity risk can be independent from the bank assets risk because a perfectly healthy and solvent bank can come up against the liquidity risk. Finally, Diamond and Dybvig presumed that bank assets are risk-free.

The crisis starting point of pure liquidity is the conduct of a certain number of depositors who can unexpectedly withdraw their deposits for various reasons. If a bank can respond to that excessive and unexpected demand by debt financing from other banks or the central bank, it stands to reason that the deposit withdrawal has no grave consequences. In case of failure, a bank can be compelled to liquidate a part of its assets at the price of loss. Losses can be so big that they can lead a bank to serious difficulties or even bankruptcy. After all, the non-fulfilment of a contract by one bank can arouse panic and force other depositors into the bank run in order to save their assets completely or partially in case of threat to their assets. Then the global liquidity crisis begins, which can threaten the whole banking system. Recently there have been similar situations in a few countries, developed ones and especially emergent.

The solvency risk is added to the pure liquidity risk. It is the consequence of an uncertain profitability of bank assets and depositors who are not well-informed of that profitability. The assumption of a double uncertainty referring both to the demand for aggregated liquidity and to the profitability of investment projects is surely realistic. Furthermore, as we have already pointed out, that assumption is the natural affirmation of bank intermediation showing the superiority of deposit contracts in relation to contracts available in the market. After all it shows the way for better understanding of the internal instability of bank deposits and the strengthening of deposit insurance importance. The bank panic phenomena appearing in that context are usually provoked not so much by the uncharacteristic conduct of a part of depositors as by their inability to differentiate withdrawals which result from a demand shock and withdrawals which result from the objective information about the poor bank solvency. In this context the absence of deposit insurance can multiply the bank panic phenomenon, which might be really fatal for an economy and bank system.

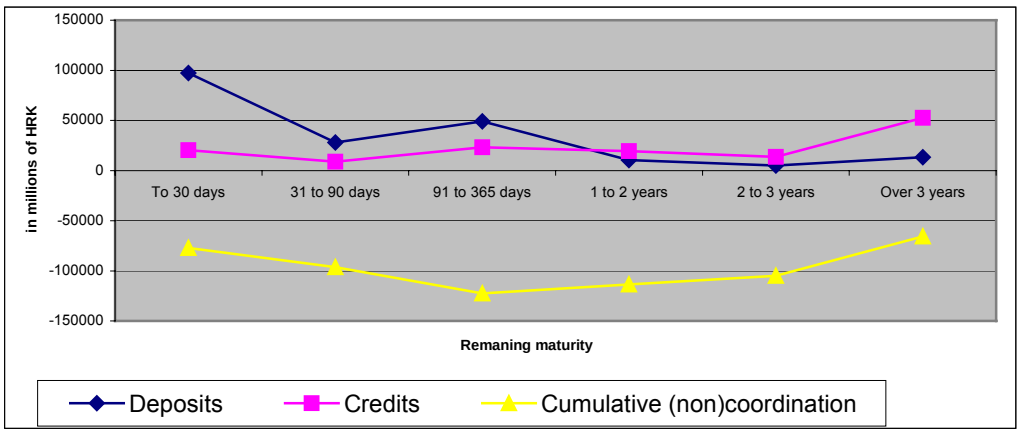
It seems that the system of deposit insurance connected to the state intervention functioned well at least in some cases. Owing to that the crises of pure liquidity were avoided. However, each mechanism has its corrupted effects. No doubt that the creation of money by the Central bank makes a natural solution in the case of liquidity crisis. Still it is generally possible to differentiate the pure liquidity crisis from the solvency problem, at least in the first moments. In other words, a question arises here whether there any good prospects for economic recovery of a bank and whether there is any guarantee of its ability for a long survival. Therefore the state is generally confronted with the difficult problem of choice. By investing it can compensate the bank's lost funds (undercapitalized) but with a risk to pass into the dangerous zone of inflationary sliding. Or, it can leave banks to their destiny in the game of natural selection, which means to leave healthy banks to be destroyed by liquidity crises at the price of danger for the financial system to fall into a significant crisis. In majority of cases the first

solution has the advantage - at least when the risk of infection or "domino effect" proves to be serious.

This has insufficiently been applied in Croatia as well. The CNB estimated which banks were able to survive and which ones had to be left to bankruptcy. If we judge upon observations of privately owned banks which were liquidated, we have to wonder whether the CNB performed its task in the best way. One must be under the impression that the logic "too big to fail" was applied here. In Croatia the deposit insurance has already been introduced but it does not function for deposits over 100,000 HRK. That warns depositors to monitor banks' activities and to give advantage to the most solvent banks. In other words, the deposit insurance system has its shortcomings, and there have been discussions about its improvement in Croatian banking business (Galac, 2004, p. 2-14). Although premium rates for savings deposit insurance (which are now 0.5 % at annual level) have decreased, our banks still pay nominally one of the most expensive premiums for deposit insurance. (Ognjenović, 2005, p. 35)

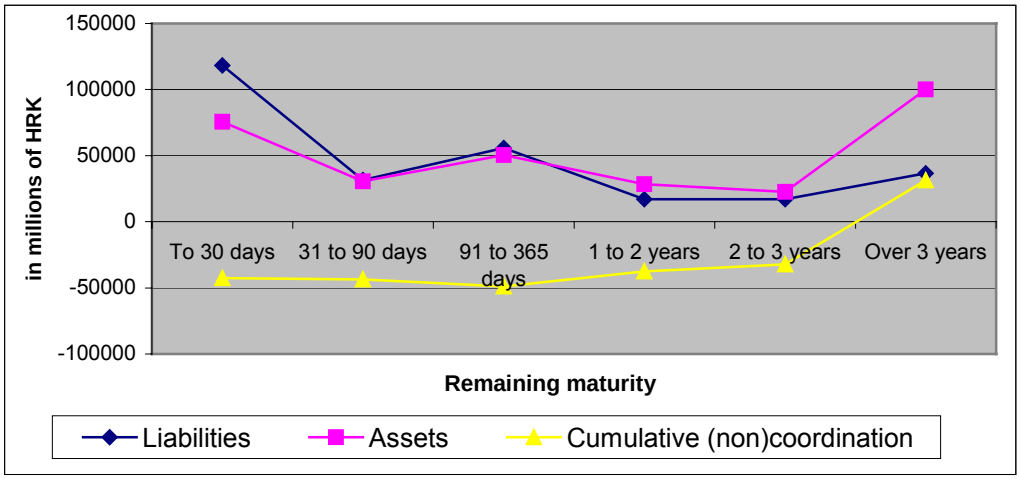
As we have already emphasized, the term transformation is characteristic for banking function. Croatian banks also make long term placements with a part of their sources. (Figure 3.9 and 3.10) They are able to do this owing to the continuous growth of demand deposits (at sight) and term deposits with the contract clauses for automatic renewal. Thus, a part of deposits, though formally short-term, remains in banks for a longer period of time. By using the term transformation, banks strive to improve their profitability. But in this way they expose themselves to liquidity risk. How to reconcile these two contradictory goals - is the question which can at least be partially answered.

Figure 3.9 **The term structure of deposits and credits**



Source: CNB, Aggregated statistic report 31/12/2006. Author's calculation.

Figure 3.10 **The term structure of liabilities and assets**



Source: CNB, Aggregated statistic report 31/12/2006. Author's calculation.

The problem of Croatian banks liquidity has not occurred in the recent years. Standard liquidity indicators have been relatively stable. Between 2001 and 2006 the ratio of short-term loans to total short-term deposits and loans received fluctuated within 32.2% and 35.7% whereas ratio loans / deposits and loans received fluctuated within the limits of 58% - 75.1%. The indicator of kuna's (HRK) liquidity surplus amounted to about 7.22% at the end of 2003 and about 5.04% at the end of 2004. It seems that it is more the result of prudence than of any wise liquidity policy. This judgement may be proved by capital adequacy rates. This rate amounted to 13.2 % in 2006, which means that it was significantly higher than the obligatory one. At the end of 2001 ROAA amounted to 0.9% and to the end of 2006 about 1.5%. At the same time ROAE increased from 6.6% to 12.7%. All these "results" were achieved in the conditions of banks tendency towards less risky placements (the household). While considering other facts such as the absence of securitization and the inadequate use of derivative instruments for the purpose of protection, one can get an impression that banks did not sufficiently use transformation opportunities. In the first place we think of the managing of assets and liabilities durations which can respond to the aims of liquidity and profitability insurance by turning to surmountable risks from placements to companies. Various sources of information have convinced us that even the biggest Croatian banks do not engage in assets and liabilities durations. Our conclusions are confirmed by aggregated data on the dynamics of term structure of sources and bank placements.

3.5. Banking Sector Restructuring and Credit Risk Managing

Croatian banks restructures surely reflected on their credit risk management. Those restructures proceeded with different intensity and success. According to the criterion of successful credit risk management there were two main periods: the time before and the time after taking over of domestic banks by foreign banks. The liberalization of economy at the beginning of transition brought to light all the problems banks and their clients were confronted with. It is known that banks were burdened with bad claims towards non-performing enterprises and that banks were undercapitalized. It was a result of influence of various factors demonstrated primarily in complete disregarding of credit risk. Several interventions followed and they were extended

during some period (Jankov, 2000, p.1-9). First, the state took over the banks debt based on foreign currency savings and distributed bonds to big export enterprises which paid off their debts to banks. Meanwhile, the number of privately owned banks and other lenders of funds increased. The competition went in wrong direction by enormous raising of deposit and credit interest rates. The initial government interventions in the state controlled banks did not produce any result. Then new interventions followed through the State Agency for Deposit Insurance and Bank Rehabilitation (DAB). They did not move banks toward better risk management either. In the middle of 1990's the process of resolute detailed inspection through banks balance sheet started by their rehabilitation or bankruptcy. After a big crisis in 1998 and failing of a great number of privately owned banks and other funds lenders, the process of sale of the remaining state owned banks to foreign owners intensified. That incited the polarization of expert community in two groups: those who approved of that process and those who thought that was a wrong move. Such public debates have continued even to these days in world (Haas and Lelyveld, 2006, p.1927–1952). In spite of various remarks for which we have found arguments in the previous analyses, Croatian banks still operate in a stable way - which means that they manage risks much better. Some poll prognoses of Croatian bankers are confirmed to a great extent (Galac and Kraft, 2001, p.1). It seems that an improvement in credit risk management could have been influenced by economies of scale and scope. On the other hand the concentration and diversification of activities within bank groups could have intensified the asymmetric information and incited problems on the level of supervisors' prudential function.

3.5.1. Possible Effects of Economics of Scale and Scope

The concentration and diversification of bank activities surely can influence the credit risk management just the same as risk management abilities can influence the technical (the maximizing of profit) and economic (the optimum allocation of resources) efficiency of banks. To what extent the concentration and diversification of bank activities can operate in the direction of the increase of efficiency including a better credit risk management is the question that cannot be answered exactly without taking into consideration the broad spectrum of influences of various factors - and nobody has succeeded in that yet. The financial intermediation theory emphasizes with good reason that banks are much more competent in the credit risk management and generally in the function of funds transfer (lower cost, higher degree of mobilisation of saving, etc.) than in the direct and individual establishment of debtor-creditor relations. Therefore, in this sense the positive effect of concentration is indisputable. The less plausible but still realizable assumption of this theory is that any bank will be more efficient with the growth of its volume and its more heterogeneous activities than if it remains within the same levels and programmes of its production. In that way we are slowly coming into an uncertain zone full of questions about banks prospects in the realization of economics of scale and scope.

The economics of scale can exist only if banks succeed to reduce long-term average total costs by growing in their volume. Referring to this, numerous empiric researches were carried out, first of all in the USA, with different results (Humphrey, 1990, p. 38-50; Berger et al., 1993, p.

221-249; Miller and VanHoose, 1997, p.259-269). It was brought to light that the curve of long-term average total costs can assume the shape of a flattened letter U. In other words the fall of that curve to its bottom point represents the use of economics of scale, while its rise from that point shows diseconomies of scale. However, if there is an agreement concerning the form of that curve, there is also a disagreement concerning the position of its bottom point. It is generally believed that the growth of smaller banks to a certain volume can realize the economics of scale. Beyond that limit, or better to say that border-line belt, the growth of banks volume results in the diseconomies of scale. The reasons for that turning point are connected to the problems of managing bigger banks "X-efficiency" (Fung, 2006., p. 2857–2874) and regulatory effects (Jagtiani and Khanthavit, 1996., p. 1271-1287).

The realization of the economics of scope is ascribed to the opportunities of influence of two main factors. The first one results from the principle of diversification, which is one of the footholds of the modern portfolio management theory (Markowitz, 1952, p.77-91). Briefly, the expanding of production programme should increase the number of negative co variations among earnings from various products and consequently minimize the total risk of a bank. The second important factor can be found in the possibilities of cost reduction thanks to the expanding selection of bank products (Mercieca, 2007., p.1975–1998). The effects of economics of scope will be greater if fixed costs can be allocated on greater number of products. Generally, those are the costs of infrastructure for distribution and network of windows, managing of relations to clients and information costs. Thus, some information necessary for one type of products can be used for the production of other products under lower additional cost. Besides arising from production, synergies can also result from consumption. Consumers can prefer to perform their financial operations in one bank only if total costs are lower than the costs resulting from the use of the services of a few banks.

Table 3.10 **Number of banks, their units and cash dispensers**

	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06
Number of banks:	50	54	58	60	60	53	43	43	46	41	37	34	33
- domestic. state-owned banks	26	14	10	7	8	10	3	3	2	2	2	2	2
- domestic. privately-owned banks	23	39	43	46	42	30	20	16	21	20	20	18	16
- foreign-owned banks	1	1	5	7	10	13	20	24	23	19	15	14	15
Number of bank branches and front offices	na	na	na	784	813	822	756	879	956	1022	1037	1114	1118
ATM	na	na	na	221	285	523	736	999	1330	1611	1913	2307	2641
The participation of 4 biggest banks in banks total assets	na	68	60	53	53	58	62	60	59	62	65	65	64
The participation in total assets of													
- banks with domestic ownership	na	99.0	99.0	96.0	93.3	60.1	15.9	10.7	9.8	9.0	8.7	8.7	9.2
- banks with foreign ownership	na	1.0	1.0	4.0	6.7	39.9	84.1	89.3	90.2	91.0	91.3	91.3	90.08

Sources: CNB, Web site.
CNB, Banks bulletin, different years.

Two characteristic periods in the development of Croatian banks network can be noticed, the first one till 1998 and the second one after that. In the first period, a very intensive growth in the number of privately-owned banks is recorded. Private entrepreneurs' motives for a powerful entrance into the banking business are well known. Since there was a lack of saving and since the old way of financing the companies "according to needs" was not ceased, interest rates on credits grew enormously, often assuming a character of usurious interest. No profit was bigger or easier than banks profit. By disregarding the credit risk, the majority of these banks became insolvent. Public costs of banking intermediation grew so much that it did not give almost any advantage in relation to direct connections between savers and borrowers. Instead of any further comment, it is sufficient to remind of one of Schumpeter's thoughts (quotation, p.116), which is: "… traditions and standards may be absent to such a degree that practically anyone can drift into the banking business, find customers, and deal with them according to his own ideas … This in itself … is sufficient to turn the history of capitalist evolution into a history of catastrophes." The second period of the Croatian banks network development seems to be better.

The period since 1998 has had a few distinctive features: a strong tendency of decreasing in the number of banks, of increasing in the number of front offices and cash dispensers and the growing participation of 4 biggest banks in banks total assets. So, these facts disclose the presence of a strong concentration on the one hand and the geographic diversification of banks activity on the other hand. To what degree could the economics of scale and scope be the result of these facts - is a big question, especially because numerous and more serious researches in the world did not give entirely exact answers. Puzzling is the result of one domestic research, according to which the smallest and the biggest Croatian banks are the most efficient (Jemrić

and Vujčić, 2002, p.15). The decreasing number of banks and the more intensive participation growth of the biggest banks in total assets allow us to presume the existence of a certain effect of the economics of scale. On the other hand, the increasing number of branches and front offices has suggested high expenses for costs of infrastructure (room, new technologies etc.), employees and advertising. Additional personnel costs resulted from indemnities to older employees who retired and expenses for education of the existing and newly accepted ones. The number of employees increased and their salaries were significantly higher than average ones in the business sector. In order to attract clients, especially big banks intensified their advertising and increased their costs in that way. In spite of banks efforts to break the mentality of back office by opening front offices and employing young people to do various jobs (specialists of general practice), they failed to succeed. Old habits die hard, and long queues in front of bank windows diminish slowly. The rapid growth in the number of cash dispensers seems to be a payable investment thanks to a fact that Croatia is an important tourist destination. Since the supply of services has been essentially expanded, it could lead to the assumption of the economics of scope's existence. Indeed, the structure of instruments and services in the Croatian banking business has almost come up to one which exists in more developed banking business. But there are great differences in realization of quantity within the structure of banking products. Generally, the fact that banks primarily put the utmost effort into development of retail banking does not lead us to the conclusion that banks achieved important economics of scale and scope. The overcapacity of this part of banking market has already been noticed. In the growing competitive environment this overcapacity will lead to decreasing of margins, so banks ought to be orientated towards intensifying of development of various activities from the contents of Corporate banking.

Some evidences of weak presence of the economics of scale and scope in the world and especially in the Croatian banking business probably lie in the motives of concentration and diversification of activities. Particularly in the 1990's mega-mergers in the bank industry were done, which supplanted Japanese banks and brought American and European banks to the top (The Banker, 2006, p.50). Among all the countries in EU the number of banks decreased and in this way they grew in size. Mergers and acquisitions of banks in national areas represented an answer to the strong competition pressure. In this way banks tried to block the entrance of new institutions into domestic markets and to protect their margins and profitability. It is mentioned in the literature that there are also other originators (drivers) of the concentration, among which the following ones are pointed out: the decline of margins due to the overcapacity of a particular segment in the market, searching for cash flows in order to augment the effect of banks leverage in the markets of liquid funds and finally rewards to bank managers, which is more in correlation with the bank's size than with the realized profitability (Scialom, 1999, p.37-38). Some motives mentioned here, particularly the decline of margins, are the reasons for the entrance of foreign banks into Croatian market - which still gives opportunities for high profit. Consequently, the concentration of Croatian banking industry, which is mainly in the foreign ownership (over 91% of total assets), and the diversification of activities only in some less risky segments of the market certainly were not motivated by the economics of scale and scope. The transition of Croatian banks into foreign ownership surely stimulates the transfer of know-how, especially in the area of bank management and partly in the area of risk

management. In the Board structure and other managerial positions in banks there are representatives of their foreign parent companies. In organizational structures of banks the departments for risk management were introduced, within which credit risk management managers primarily operate. At least the biggest banks use the debtor rating models received from their foreign parents. The modernization of the information systems intensified. However, this one and other expensive acquisitions of infrastructure are still not sufficiently used. Obviously, this is the consequence of an unsatisfactory level of knowledge. The main problem of the introduction of sophisticated models for risk management is hidden here. Thus, it is not surprising that banks turn to less risky but still very profitable placements. Some optimistic prognoses about attracting of foreign direct investments, developing of financial markets etc. (Galac and Kraft, 2001, p.1) proved otherwise. Generally, some special synergic effects are not seen. On the other hand some new kinds of asymmetric information are present and difficulties in monitoring as well.

3.5.2. Bank Groups and Problems of Prudential Control

The development of bank groups in Croatia, especially their integration into powerful foreign financial groups, has brought to light some asymmetric information which harmfully influences the allocation of disposable resources. This asymmetric information is visible in the relation bank groups - supervisor, and between banks and authorized persons and other stakeholders (shareholders, managers, personnel, creditors, debtors, authorities and communities).

At first sight it seems that the asymmetric information and the discrepancy of interests are the least between managers and bank owners. The managers who are capitally rewarded are grateful executives of strategies determined by foreign institutional owners. It cannot be denied that drafting and realization of these strategies essentially contributed to development, stability and efficiency of the domestic bank sector. However, as our former analysis of various data has already shown, those strategies were more inspired by the stimulation to meet the consumers' desires and needs than by the development of corporate sector. Some disagreements between managers and shareholders are possible at the level of considering the strategy changes. The asymmetric information is not excluded, especially in the circumstances when a bank or a foreign group it belongs to faces some problems. For example, in the situation of drastic fall of profit, managers can argue for some strategies which are riskier than those chosen by shareholders. Furthermore, they can offer services to potential raiders of a bank if a bank group that a particular bank belongs to gets into troubles. It is not clear what kind of role domestic managers have played during a recent attempt of repeated joining of Splitska banka to the bank group UniCredito. The CNB succeeded to stop that acquisition with lots of difficulties, referring to certain norms of allowable limits of concentration. In other words, often changes of Croatian banks ownership structure do not contribute to stability and development of long-term goals of the financial system.

Besides asymmetric information there are different interests between banks and their stakeholders that have been emerging recently. Thus, there are lots of uncertainties in keeping

jobs for some employees, while other more competent ones want to improve their skills and rise in hierarchy. The employees' level of qualification is higher, but first of all in sale rather than in creation of new products and risk management. There is no direct connection between banks on the one hand and schools and universities on the other hand. The results of all bank polls, which will be separately discussed, disclose that a great number of banks do not have any employees dealing with risks, while the number of such employees in the biggest banks is inadequate for an efficient response in that sector. For that reason the asymmetric information between banks and other authorised persons persists. However, information can be much better even at the present level of personnel qualification. In fact, banks have developed advertising systems to a great extent. Messages and invitations directed to consumers for purchasing of credit products are so well packaged that one can get an impression that credits do not have to be paid off. These days a bigger bank has offered interest-free credits. But it has not advertised the fact that those credits are conditioned by other credits (housing credits), that they can be used for purchasing of durables exclusively at specified retailers and that the bank charges an extra compensation for processing of credits etc. More frequently media draw our attention to potential pitfalls hidden in banks offers. Our national television has recently organized a panel on hardships of credit users' guarantors. In one bigger bank 20% of credits are being paid off by guarantors. They are very indignant and they complain for not being informed and for being deceived. The CNB has been trying for a long time to compel banks to advertise not only the nominal interest rate but the effective interest rate as well. We have already mentioned some instability influences that result from the credit supplying of domestic banks by their foreign parents. There are also other insufficiently transparent business relations between domestic banks and the foreign bank groups they belong to. These relations will surely expand more and more and some new asymmetric information can be the result of that. Therefore, the domestic banks supervisor is confronted with new challenges.

Actually, the development of international bank groups and financial conglomerates has imposed the need for expanding of cooperation between bank supervisors and supervisory authorities of other financial organizations (security Hauser, insurance companies, etc). A financial conglomerate is defined as: "any group of companies under common control whose exclusive or predominant activities consist of providing significant services in at least two different financial sectors (banking, securities, insurance)". (BIS, 1995, p.1). These financial groups have especially become powerful in Europe and have drawn the attention of supervisory authorities to a great extent. They represent structures suitable for the arbitration of regulation and supervision due to different levels of regulation coercion and control among various types of financial intermediation and among countries for the same type of company. The risks derived from those arbitrations can be numerous. Thus, there is a possibility of manifold accounting reports of one and the same capital. The companies that represent a financial conglomerate might respect their individual regulated capital adequacy ratio but at the same time the group itself can be under-capitalised. The risks inside the group can derive from direct or indirect demands that are held by different parts of the conglomerate on balance sheet or off-balance sheet. The Second Basel Accord anticipated various possibilities in which those risks can appear and regulated the ways of prevention.

The findings of Croatian financial institutions supervision are influenced by institutional criterion prevailing in the world. It means that a special supervisor is assigned to each type of financial institution (banks, securities houses, insurance companies, etc.). A discussion has recently been started about the idea of forming an agency for supervision of all non-bank financial organizations. This initiative seems to be quite reasonable. Since various financial activities are performed within Croatian bank groups and since those products will continue to expand, there are justified reasons for combining regulation and supervision within one agency which would include bank supervision as well. There are similar cases in Austria, Sweden, Denmark, Norway, etc. This concentration and direct communication is probably more acceptable for smaller countries in the function of advancement of supervision efficiency. Some bigger countries, such as England, have already accepted such solutions or are about to introduce them.

It would be favourable if supervisors in Croatia were engaged in control of a certain domestic conglomerate instead of monitoring something that is served by foreign bank groups. Apart from that inadequate control, a potential domestic financial conglomerate might make good use of a new opportunistic situation in a more profitable way and more easily adapt to unexpected turning-points than some single firms. It would be a suitable response to competitive banks in foreign ownership and to numerous innovations that agitate the domestic financial system. It is still not late. Two state-owned banks, one of the banks in domestic private ownership and the biggest insurance company could form such a conglomerate.

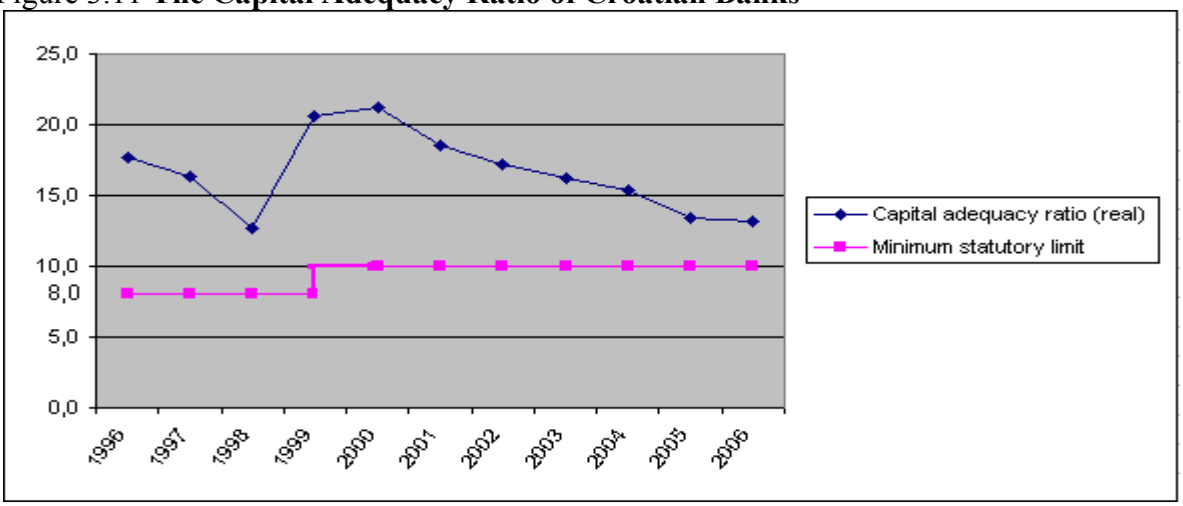
3.6. Credit Risk and Capital Requirements of Croatian Banks

The previous analyses of facts lead us to the conclusion that Croatian banks are exposed to credit risk. A more accurate estimate discloses that the credit risk makes about 95.7% of total risks in Croatian banks (Maletić, 2005). It means that their own funds generally cover their credit exposure. It is known that the banks' own funds have the function of insurance for depositors and other creditors as well as the function of financing of their profitable investments. At the macroeconomic level their main role is to stop the spreading of bank crises. Therefore, the legislator and/or the supervision authority regulate their level known as Capital adequacy. Capital adequacy represents the percentage participation of own funds (core capital + supplementary capital) in the bank assets weighted according to risk degrees. Regulated own funds can be distinguished from economic own funds. Economic or optimal own funds are those funds whose level allows the bank's maximal profitability without diminishing its rating by creditors (depositors).

If the regulated minimal Capital adequacy is higher than the optimal one, own funds can be considered excessive. In other words, own funds of every company, as well as of a bank, make resources more expensive than the indebtedness. First of all, shareholders demand higher profitability in the form of dividends and excess value (surplus) from the difference in stock price because they take the risk of bank bankruptcy. Secondly, unlike dividends, the interest, which banks settle with their creditors, allows fiscal deduction which reduces their real costs.

Principally, the increase in the ratio of own funds with the simultaneous decrease in the ratio of debts to third persons diminishes a "leverage effect" and the banks profitability. Naturally, the decrease in the ratio own funds / debts to third persons should function towards the increase of banks profitability. But this ratio can be diminished only to some level. This level is determined by the conduct of depositors and other banks creditors. If depositors and other creditors understand the decrease of that ratio as deterioration in quality of banks assets and in this way their solvency, then they will demand higher rewarding of their capital. In that case, a decrease of banks profitability will occur. It can be clearly concluded that the searching for optimal level of own funds is in the closest connection with the banks' ability for credit and other risks management. However, whatever efforts might be made by banks' managements in that direction, the asymmetric information will not only persist but it will also change due to unexpected events, especially in the credit market. For that reason the regulated own funds can be approximate to economic funds only by chance in specific moments. It is important to aim at that optimum, which is the main preoccupation and the main goal of the Second Basel Accord. The regulated capital adequacy and the fluctuation of real ratios of Croatian banks' own funds give us at least indicative conclusions in that sense.

Figure 3.11 **The Capital Adequacy Ratio of Croatian Banks**

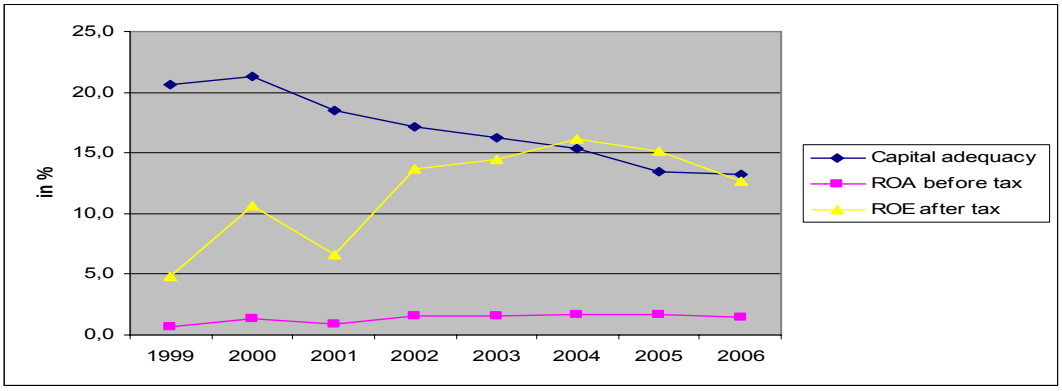


Source: CNB, Web site. Author's own graphic.

The increase in the regulated minimal rate of Capital adequacy from 8% to 10% in April 1999 can be regarded as a result of the lack of transparency in the assumption of bank risks. At the same time it is a sign of the tacit supervisor's acknowledgment concerning earlier negligence in performing of his supervision function. Actually, in the period between 1991 and 1996 numerous interventions were made on account of the rehabilitation and restructuring of the state-owned banks that have capital under-utilisation (Jankov, 2000, p.2-5). However, "… one continued its poor selection of debt financing and practically went on along the lines of insolvency. It was joined by a large number of private banks. Only in 1996 did the more comprehensive control of bank balances commence, resulting in rehabilitation or bankruptcy. The operation mainly involved writing off bad receivables by debiting bank reserves and equity capital, with the rest, up to the required solvency ratio, being covered by government bonds." (Pojatina, 2002, p.61-67). A part of banks' receivables was covered by sovereign guarantees. After that the rehabilitated banks were sold to foreign investors. It is clear that a

drastic decrease in the real rate of Capital adequacy in the period between 1996 and 1999 was a result of a very thorough estimate of assets quality and writing off bad receivables by debiting bank reserves and the capital of rehabilitated or bankrupt banks. Moreover, a significant increase in the real rate of Capital adequacy between 1999 and 2001 was the result of government takeovers of banks' bad receivables and capital investments of new owners. The investments of new owners are partly a consequence of transfer of liabilities and probably motives related to gaining trust for the purpose of attracting new clients. Following that, there is a constant fall in the real rate of Capital adequacy, which can be a result of better risk management in banks and improvements in the supervision function of the CNB. This conclusion can be confirmed by the facts from classification of placements and contingent liabilities of banks according to risk groups (CNB, Annual report 2006). Between 2001 and 2006 the participation of fully recoverable placements in the total bank placements grew continually. At the same time the ratio of partly recoverable placements (4.4%, 3.5%, 3.5% and 2.8%, 2.4% and 2.0%) and irrecoverable placements (2.8%, 2.3%, 1.6%, 1.8%, 1.5 and 1.2) fell. Better risk management led to fewer needs to form own funds and in this way to possibilities for higher banks profitability. Due to lack of data for the calculation of own funds ratios for the whole period we will use real rates of Capital adequacy. It stands to reason that the return on equity (ROE) is an adequate indicator of investment profitability for shareholders.

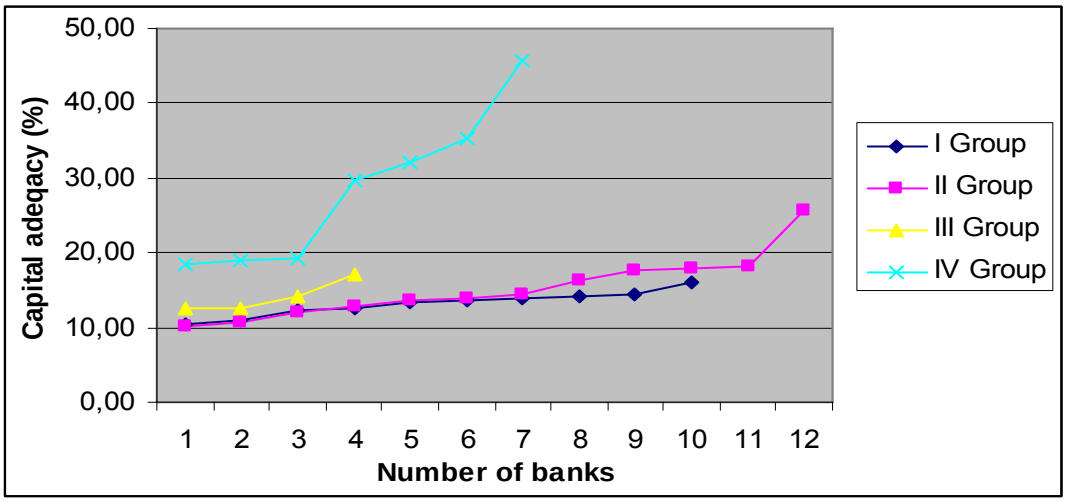
Figure 3.12 **Capital Adequacy Ratio, ROA and ROE of Croatian Banks**



Source: CNB, Web site. Author's own graphic.

The fall of Capital adequacy ratio since 2000 and the increase of ROA and especially ROE after taxation lead to the conclusion that banks managers are in search of the optimal level of (core) capital. Naturally, this presumption is more plausible for biggest banks that are the best in risk management and generally have a more efficient business policy. This is mainly proved by a survey of banks Capital adequacy ratio classified in groups according to their size.

Figure 3.13 **Capital Adequacy Ratio in Banks Groups for 2006**[1)]



1) I Group (Assets more than 5.000 millions of HRK), II Group (Assets more than 1.000 and less than 5.000 millions of HRK), III Group (Assets more than 500 and less than 1.000 millions of HRK) and IV Group (Assets less than 500 millions of HRK);
Source: CNB, Web site. Author's graphic.

On each curve of the previous graph there are points of annual Capital adequacy ratio of each bank belonging to the same group according to the amount of assets. Differences in Capital adequacy among banks of the same group might be the result of the influence of various factors that could be approximately isolated only by more serious research of different facts from business transactions of each bank. However, it is logical to presume that their possibly bigger or smaller distance from the level of optimal own funds is partly the result of different abilities in risk management. This is partly proved by different Capital adequacy ratio among bank groups. As it can be seen in the graph, taken on average those rates are the lowest in bank groups with the highest assets and vice versa they are the highest in bank groups with the lowest assets. Bigger banks probably use economies of scale including better risk management, which has already been discussed in the item 3.5.1. The smallest banks hardly cope with the competition of bigger banks in attracting deposits and clients. Therefore, they offer higher deposit interest rates, which can be seen in the Appendix A2 of this thesis. More expensive financing sources compel them to charge higher interest rates on credits. Probably they are compelled to grant credits to riskier clients. In spite of the existing deposit insurance institution they seem to be riskier. It is difficult to find other rational causes for their keeping of high rates of capital adequacy.

Finally, the hypothesis that the banks Capital adequacy ratio, especially in bigger banks, will probably continue to decrease is plausible. But, how intensive would that process be is a big question. No matter how much it depends on factors that will determine a stable economic growth, the role of banks in development of their activities and methods of risk management will be essential. Surely, banks could come nearer to the optimal level of their own funds after fulfilment of conditions for the application of the Second Basel Accord. It means that the regulated minimal Capital adequacy rate should decrease at least to 8%.

4. Credit Cycles and Credit Risk

At the level of theoretical approach there is no agreement in regard to possible connection between credit cycle and credit risk. According to the traditional theory of perfect market and rational selection, which is enriched with new findings of the rational anticipation school, money as well as various financing forms are neutral. Crises are explained as a consequence of accidental external shocks such as wars, natural disasters etc. Another approach has also been present for longer period of time. That approach emphasizes more or less financial instability which is considered inseparable from economy functioning. Recent numerous theoretical and empiric researches especially have brought to light certain situations in which credit agitates real economy. The credit influence on real economy is explained by different reasons including difficulties in credit and other risks management. To what extent are those reasons relevant in explaining the credit influence on the real flows in Croatian economy - is the question that will be answered in this part of our thesis. Before that, it is important to note some basic points of these different approaches.

4.1. Theoretical Controversies and Experience

Traditional thesis about the neutrality of financial structure is best presented in the theory Modigliani - Miller (1958, p.261-297). According to these authors' propositions, enterprises are indifferent to financing from their own sources, financing through borrowing from banks or through issue of securities. They support their point of view by several assumptions. In the first place, neither research costs nor transaction costs that result from making contracts are generated by access to external financing. Secondly, there is no problem in enterprise control. Thirdly, there is no discriminative tax that would prefer one particular source of financing enterprises to others. Finally, economic entities share identical and perfect situation. Consequently, the way conditions that prevail in financial markets are seen leads to conclusion that the selection of financing forms should not have any influence on real economy.

However, most assumptions of perfect market as well as the assumption of perfect substitutability of internal and external financing sources have become questionable. Thus, one peculiar theoretical analysis gives a very convincing proof that there is no agreement between desires for debt and desires for borrowing and lending (Gurley and Shaw, 1960). These authors also have subtly explained the connections existing between financial and real flows. Among other things their "Primary Issues - Income Ratio" (p. 97) represents the reciprocal value of Keynesian investment multiplier. They emphasize an essential role of financial intermediaries in transformation of characteristics of financial assets towards maturity, risk and profitability. In their earlier papers there is the assumption of financial instability in which the behaviour of banks plays an essential role (Minsky, 1964, p.173-380). According to this interpretation there is an interdependence of financial (financing through market and bank credits) and economic fluctuations. Accordingly, these connections are components of endogenous cycle of boom and bust. The renewed theory of financial intermediation, which has given various evidences for banks' advantages in relation to other financing sources of enterprises, includes a study of

relation between credit and economic cycle. The essential condition for credit channel functioning is found in the fact that there always are enterprises dependent on banks. This condition is fulfilled in countries where the financing of enterprises through financial markets is the biggest. In the USA for example, between 1970 and 1996, external financing sources of the non-financial corporations were realized through bank credit with about 40%, through credits from other financial institutions with about 15%, through bonds with about 36% and through issues of shares with only 9% (Smidt, 2001; According to Mishkin and Eakins, 2005, p.372). Among various new interpretations of the relation between credit and economic cycle, which emphasize the credit risk management, two of them are often quoted. The first one refers to credit rationing (Stiglitz and Weiss, 1981, p.393-410) and the second one to disaster myopia (Guttentag and Herring, 1986; Herring, 1999, p.63-79). The credit rationing is explained as a consequence of asymmetric information ex ante in the imperfect market. Banks do not have at their disposal any instruments to find out in advance which borrower will not perform its credit obligations. In this way banks are confronted with adverse selection. If they increased interest rate on credit, the best borrowers would refrain from borrowing. Banks could compensate a falling demand by extending credit supply to risky companies. By changing the structure of credit portfolio in favour of claims towards riskier borrowers, together with higher moral hazard threat, the probability of borrower's non-payment would increase. The increased probability of non-payment would diminish the expected profitability of bank portfolio. Therefore banks should not increase their interest rates despite the fact that credit demand surpasses credit supply at the higher interest rate. In this case, it is said that there is credit rationing. If banks satisfied the credit demand (balance), the cost of capital would turn out to be higher than one noticed in the perfect credit market. So, the credit rationing as well as the increased cost of capital in balance must have an influence on global demand and consequently on consumption, investments and stocks.

In the disaster myopia approach bank managers know that there is a probability of loss realization. Nevertheless, they do not have at their disposal enough information in order to extrapolate that probability. In addition, they systematically tend to judge available information as something that supports superior thinking. During the growing phase of the cycle these subjective probabilities of loss can decrease. That dominant view stimulates banks to loosen the brakes seen in the activities of credit granting to a wider number of borrowers, estimated as very risky in the previous cycle, that is, they can more easily get a credit in the phase of expansion. Accordingly, the quality of credit portfolio can deteriorate and become riskier in the phase of cycle maturity. In the context of disaster myopia, the quality of banks assets deteriorates whether banks have consciously decided to accept a higher level of risk or not. The process continues until it comes to distrust regarding the solvency of a borrower. Then a credit crisis follows, which could be quite fierce. Banks start to behave in a different way and consequently support the formation of systematic risk. In fact, they reduce the credit supply drastically. They do that in an insufficiently selective way and consequently contribute to the growth of debtors difficulties. After dynamics of over-borrowing, the contraction of credits follows. Thus, the credit crisis threatens the real activity and intensifies the economic cycle.

There are some other explanations of bank credit channel functioning, including shocks resulted from monetary policy changes. According to certain interpretations the influences of monetary policy do not only end on liability side (deposits), but adjust bank credit supply as well. These modifications of pro-cyclical nature often have qualification of Credit crunch (Bernanke and Lown, 1992, p.205-239). Numerous empiric researches, also based on asymmetric information between a borrower and a lender, apart from bank market include other credit markets as well (Fazzari et.al., 1988, p.141-195; Gertler and Gilchrist, 1994, p.309-340; Bernanke et al., 1996, p. 1-15). They try to prove that external financing is more expensive than self-financing due to costs of agency, especially in the case of credit without collateral. That difference decreases with the growth of net wealth and increases proportionally with the growth of borrowing. Ill-fated shock which threatens the net wealth of borrowers increases the cost of external financing and restricts their access to external financing. That could inspire them to diminish the costs of equipment, personnel and production.

Finally, the facts from developed and emergent countries have clearly confirmed that markets of credits and assets functioned pro-cyclically and that they contributed to the frequency of bank crises (BIS, 1998, p.117-141; BIS, 2001, p.123-141). Credit cycles and assets prices are often simultaneous and they intensify each other. Rises in prices of assets stimulate economic activity, and by inflating the value of guarantees they enable easier and cheaper access to financing for the private sector. The accelerated economic growth as well as the growth of credits incite a more intensive rise in price of assets. The interaction between credits and assets can be even stronger when the assets prices decrease and economic conditions become worse. The falling of guarantee value can cause losses to banks and can make them reduce credit supply substantially. The movement of real estate prices, especially real estate of enterprises, has played an important role in the most striking financial cycles. The rise in prices of shares principally goes with the increase of credits, although it is noticed that this connection is weaker in relation to one with real estate prices.

4.2. Statistical testing of relationship and predictions

Since the dependence of economic cycle towards credit cycle and risk is theoretically well established and clearly proved in numerous market economies (Bernanke, B.S., 1983, p. 257-276; Bernanke, B.S. and Lown, C.S., 1992, p.205-239; Mishkin, F.S., 1999, p.3-20; Avouyi-Dovi, S. et al., 2006, p.1-9; Jiménez G. and Surina J., 2006, p.65-98) , it is logical to presume that it is possible in Croatian economy as well. There are several reasons for this assumption. First, due to lack of developed self-financing and financing through issue of securities, enterprises turn to credit sources. Secondly, the economy is liberalized to a great extent in the country and toward abroad as well. Thirdly, structural reforms of the legal system and privatization have not been finished yet. Fourthly, there are some problems in economic policy managing. Finally, there is a lot of space for development of risk management skills in banks and other business companies. In such circumstances even the changes in the structure of bank credits could function in pro-cyclic way. We presume that the credits to enterprises (generally bearing a greater risk) should have had more influence on economic activity and results than

credits to households (generally bearing a smaller risk). This presumption will be examined statistically further in our work.

4.2.1. Credits to Enterprises and Industrial Production

In the observed period between January 1995 and July 2005 (monthly observations) we were analysing if there was any dependence of industrial production from credits given to enterprises and how strong it was. We took one-year-shift supposing that at least medium-term credits could not directly have an influence on production. The series of statistical data regarding industrial production are given in basis Indexes (January 2000 = 100). By means of software package SPSS we got the results of a single regression assessed by Least Squares method (see Appendix B1-1). The model as whole and individual parameters turned out to be statistically significant. However, Durbin-Watson (DW) statistics shows that residuals are not mutually interdependent, in other words, DW statistics close to zero (0,059) shows that there is a problem of positive autocorrelation of residuals. In order to check which degree of correlation (first or other levels) of residuals it is, we tested the significance of autocorrelation (ACF) and partial autocorrelation coefficients (PACF) by means of Box-Ljung statistics. We presented them by means of correlogram in the Appendix B1-2. Since the ACF decreases and PACF disappears after the first time shift, we have concluded that residuals follow the AR(1) process, so we can describe them by model ARIMA (1,0,0). Therefore, the best thing is to include residuals into the initial model, so that two equations could be assessed simultaneously. In econometric analysis, the most used method for assessing the parameters of equation systems is Two Stage Least Squares, because the use of Least Squares method would result in inconsistent assessment of parameters. After application of Two Stage Least Squares we have obtained the following system of equations[4]:

$$y_t = 60.5447 + 0.0013 \cdot X_{t-12} + e_t$$
$$e_t = 0.9662 \cdot e_{t-1} + \varepsilon_t$$

The parameter next to the variable X_{t-12} shows that with the growth of credits given to enterprises (with one-year-shift) of 1 million HRK, we can expect the monthly growth of industrial production by about 0.13% in relation to January 2000 (base), supposing that other variables do not change. The model has been essentially improved after application of the Two Stage Least Squares method, not only because of the measures of representative quality but because of DW statistics which shows that there is no problem of autocorrelation.

We need to point out that we have only analysed and proved the existence of (positive) relation between credits given to enterprises and Indexes of industrial production, while in the chapter 4.3. we will analyse the influence of credit risk on economic growth and vice versa.

[4] Since we could not use the Two Stage Least Squares method in the ARIMA model with SPSS, we used EViews. See Appendix B1-3. "You can adjust your TSLS estimates to account for serial correlation by adding AR terms to your equation specification. EViews will automatically transform the model to a nonlinear least squares problem, and estimate the model using instrumental variables" (Fair, 1984, p 210-214)

4.2.2. Credits to Enterprises and GDP

We have been studying what kind of influence the credits given to enterprises have on GDP (quarterly observations). As in the period between the first quarter of 1997 and the first quarter of 2005 GDP has explicit seasonal character, we have calculated quarterly seasonal indexes, i.e. factors, seasonal adjusted values of GDP (Appendix B2) by means of multiplicative model of decomposition (non-parametric method). When the seasonal influence is removed, the increasing trend of seasonal adjusted GDP values can easily be noticed. It can be explained by the fact that due to seasonal influence GDP was 7.3% higher in the third quarter (July - September), while in the first quarter (January - March) it was 6.4% lower. Regardless of seasonal character of GDP, we have not formed it by means of ARIMA model, because it turned out that in this case there is no problem of autocorrelation since DW statistics is 2.18. Therefore we have used classic regression model to establish the dependence of seasonal adjusted GDP values. The following results have been obtained:

Model Summary [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,942[a]	,887	,884	2438,06745	2,180

a. Predictors: (Constant), Loans to enterprises

b. Dependent Variable: Seas adj ser for GROSDOMESTICPRODUCTmarketprices from SEASON, MOD_2 MUL EQU 4

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	9798,903	2043,090		4,796	,000
	Loans to enterprises	,807	,052	,942	15,627	,000

a. Dependent Variable: Seas adj ser for GROSDOMESTICPRODUCTmarketprices from SEASON, MOD_2 MUL EQU 4

The model runs like this: $\hat{Y}_t = 9{,}798.903 + 0.807 \cdot X_t$ The parameter next to the independent variable shows that we can expect the growth of GDP for 0.807 units if there is no seasonal influence and if the credits to enterprises increase by 1 million HRK quarterly, supposing that other variables do not change.

4.2.3. Credits to Households and GDP

As in the previous case, we have used the classic[5] regression model in order to establish the dependence of seasonal adjusted GDP towards total credits to households (in millions of HRK) since DW statistics (1.623) enters into the area where it is not possible to make a decision. The observed period runs from the first quarter of 1997 to the first quarter of 2005. The following results have been obtained:

[5] Linear univariate regression model.

Model Summary [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,981[a]	,962	,961	1408,48057	1,623

a. Predictors: (Constant), Loans to households

b. Dependent Variable: Seas adj ser for GROSDOMESTICPRODUCTmarketprices from SEASON, MOD_2 MUL EQU 4

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	28747,240	500,204		57,471	,000
	Loans to households	,392	,014	,981	28,171	,000

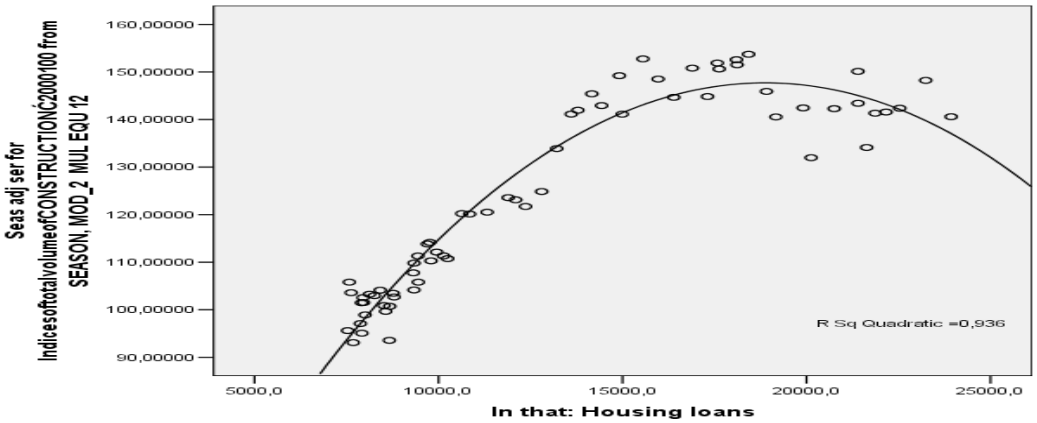
a. Dependent Variable: Seas adj ser for GROSDOMESTICPRODUCTmarketprices from SEASON, MOD_2 MUL EQU 4

The model runs like this: $\hat{Y}_t = 28{,}747.24 + 0.392 \cdot X_t$ The parameter next to the independent variable shows that we can expect the growth of GDP by 0.392 units if there is no seasonal influence and if total credits to households' quarterly increase by 1 million HRK, with other variables unchanged.

4.2.4. Housing Credits and Production in Construction

In the observed period, between January 2000 and July 2005 (monthly observations), we have studied whether there is any dependence of construction production (∅2000=100) towards housing credits (in millions of HRK) and how strong it is. However, before any further analysis, the physical volume indexes of realized construction had to be seasonally decomposed since they show strong periodical repetition in the course of 12 months (Appendix B4-1).

In this example we have not formed the dependence between the observed variables by classic linear stochastic ARIMA models because we have noticed that the relation between construction and housing credits does not behave in linear way, but in non-linear way, that is concave. The following dissipation diagram (scatter-diagram) shows that.



The dependence between observed variables can be described by polynomial of second degree, that is, by parabola. We have obtained the assessments of parameters by using the Least Squares method (Appendix B4-2). Since the empirical level of significance of constant

(intercept) term amounts to 84.5 %, which is more than standard 5%, we have re-estimated the model without constant term (in that way the determination coefficient increased from 0.936 to 0.998, in other words by 6.2 %). The following results have been obtained:

Model Summary and Parameter Estimates

Dependent Variable: Seas adj ser for IndicesoftotalvolumeofCONSTRUCTIONĆ2000100 from SEASON, MOD_2 MUL EQU 12

	Model Summary					Parameter Estimates	
Equation	R Square	F	df1	df2	Sig.	b1	b2
Quadratic	,998	19748,646	2	65	,000	,016	-4,1E-007

The independent variable is In that: Housing loans.

The model without constant term runs like this: $\hat{Y}_t = 0.016 \cdot X_t - 4.1 \cdot 10^{-7} \cdot X_t^2$ The parameter β_1 shows that we can expect the average monthly increase in the construction activity of 1.6 % in relation to the average in 2000 (without seasonal influences) if placements of housing credits increase by 1 million HRK. However, after a while that increase becomes lower and lower since the second differences are negative ($\beta_2 = -4.1 \cdot 10^{-7}$). It can be explained by the fact that the construction function increases digressively and then it reaches its maximum, so that in the future we cannot expect it will change to a great extent.

4.2.5. Credits to Households and Trade Turnover

Since the resources for purchase of flats (and houses) can be considered a long-term investment and not a consumption, we have left it out of the analysis. Therefore, our intention has been to establish the existence of relation between trade turnover and credits given to households (without housing credits). As the trade turnover showed a distinctive seasonal character in the period between July 1999 and July 2005, we have calculated monthly seasonal Indexes, in other words seasonal adjusted values of time series as well as trend-cycle values (Appendix B5). After ACF and PACF testing it turned out that the most adequate model would be ARIMA model (1,0,0)x(1,0,0)12, together with fulfilled conditions of stationarity and invertibility. In fact, it is a question of a non-seasonal part of auto-regression process of the first rank AR(1) and a seasonal part of auto-regression process of the first rank $AR(1)_{12}$ with the period of 12 months. After application of Two Stage Least Squares we have obtained the following system of equations:

$$y_t = 3{,}733.639 + 0.0832 \cdot X_{t-12} + e_t$$
$$e_t = 0.7596 \cdot e_{t-1} + \varepsilon_t$$

The parameter by the variable X_{t-12} shows that on an average we can expect the increase of trade turnover of 83 million HRK if credits to households (without housing credits) increase by 1 billion HRK supposing that other variables do not change. All the parameters by given variables are statistically important as the empiric level of significance amounts to approximately 0.00%. DW statistics amounts to 2.44.

4.2.6. Credits to Enterprises and Trade Turnover

We have used the same procedure as in the previous example to establish if there is any dependence of seasonal adjusted trade and credits given to enterprises (with one-year-shift) in the period between January 1998 and July 2005 (monthly observations). We have found that the relation between the mentioned variables exists, but only at the significance of 14.7%. Thus, by the application of Two Stage Least Squares we have obtained the following system of equations:

$$y_t = 1.923{,}088 + 0{,}1109 \cdot X_{t-12} + e_t$$
$$e_t = 0{,}947 \cdot e_{t-1} + \varepsilon_t$$

With the increase of credits given to enterprises (with one-year-shift) of one billion HRK we can expect the increase in the trade turnover on an average of 110 million HRK, supposing that other variables do not change. Regardless of this explanation, the credits given to households have a bigger influence on the realized trade turnover than credits given to enterprises since the relation between the trade turnover and credits to enterprises is significant at only 14.7%.

4.2.7. Conclusion

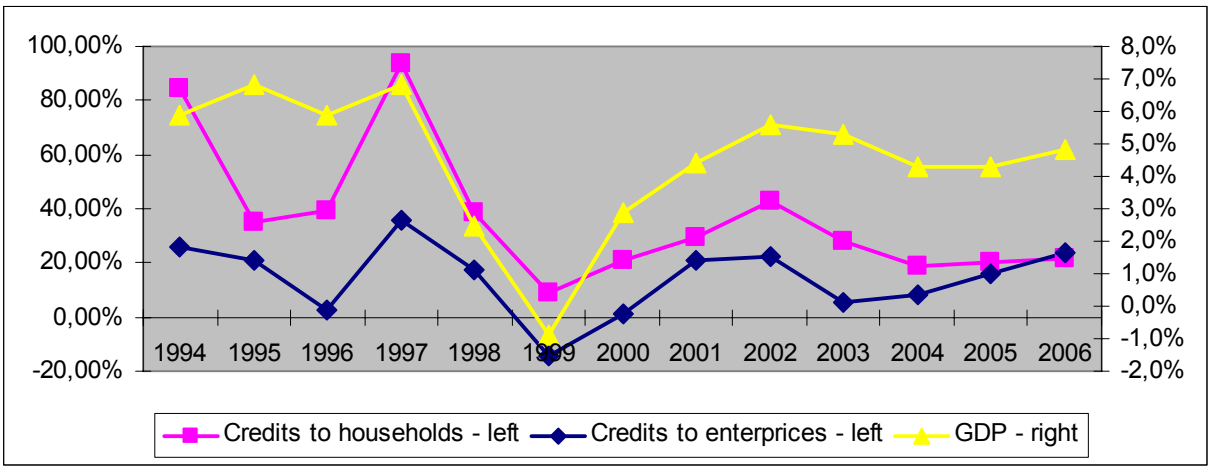
If we compare results of regression analysis we can conclude that there is greater influence on GDP by credits to enterprises than by credits to households although the coefficient of determination is lower by 7.5% (0.887 in comparison to 0.962). Namely, the parameters themselves show that the increase in units of credits to enterprises will increase GDP (on an average by 0.807 units for each quarter) more than the same increase in units of credits to households (on an average by 0.392 units for each quarter). Nevertheless, we have not been able to assess the parameters of multiple regression in which we observe the dependence of GDP simultaneously on both - credits to households and credits to enterprises because the problem of multicolinearity would appear. In other words, both independent variables would be in strong (according to intensity) and positive (according to direction) correlation (+0.969). Therefore, we will trust parameters of partial regressions which are statistically very important, because the empiric level of significance almost amounts to 0.00%. It is logical that the influence on the realised trade turnover is bigger by credit to households than by credits to enterprises. This means that quality of GDP growth is not encouraging since it is based on faster increase in consumption.

4.3. Credit Risk, Boom and Bust

Despite the fact that the previous econometric analysis confirmed the existence of positive relation between the dynamics of bank credits and economic growth, it has not shown anything about possible influence of credit risk factors on that growth and vice versa. However, the results of our earlier researches, especially in the third chapter, suggest that the presence of this

factor should not be disputable. It is the question of intensity of influence it has on financial and economic stability and growth.

Figure 4.1 **Growth rates of credits and GDP**



Source: CNB, Web page. Author's calculation.
CNB, Bulletin no. 132, 2007. Author's calculation.

The illustration clearly discloses the existence of two characteristic periods in which a credit boom and more or less important positive rates of economic growth are recorded. The first period lasts till 1998 and the second one begins in the year 2000. Between two of them there is a period of credit bust with simultaneous and drastic decrease of economic growth rate. As there were credit restrictions and economic recession at the time of bank crisis, one could get an impression that there was a strong connection between neglects in the credit risk management and the fall of economic activity. However, the poor credit risk management could be only one of the factors of the bank crisis. In addition, it is understood that economic activity is not determined only by changes in credit policy of banks. Generally speaking, influences of different financial and real factors of static and dynamic nature interwove here. Of course, it can also be applied to the period since 2000. At first sight the present condition of banking system appears to be stable. It is partly the result of improved skills in the credit risk management. A credit expansion together with acceptable rates of economic growth can be seen as well. However, as our earlier analyses have already shown, the situation in Croatian banking system is not so idyllic. There are some traces of its vulnerability. Some of them are permanently present, while some others have appeared recently. Therefore, it is necessary to remind of the circumstances when the first credit boom and bust happened.

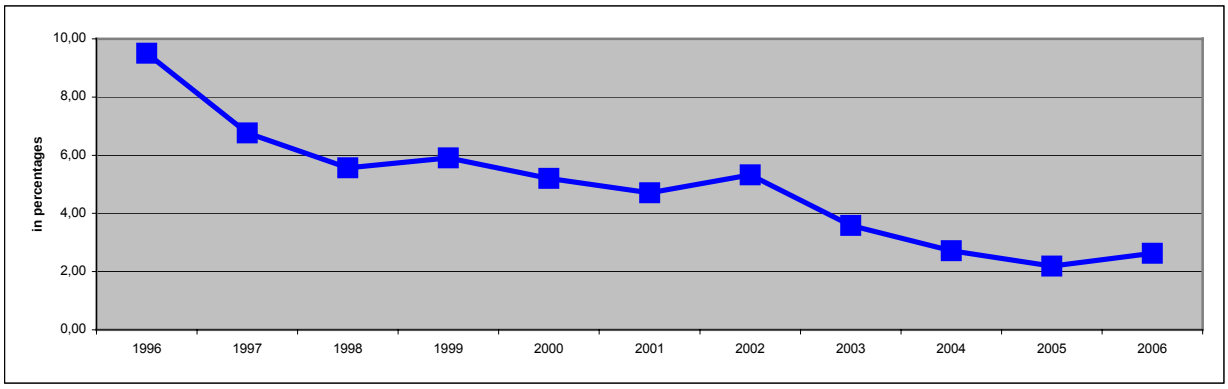
4.3.1. Credit Risk, Bank Crisis and Recession

The manifestation of bank crisis in the market economies is always and basically the same. It is regularly preceded by credit expansion and increasing credit risk. According to some opinions the bank crisis usually follows if the credit expansion exceeds 5% of GDP (Demirgüc - Kunt and Detragiache, 1997, p.16-30; Cottarelli et al, 2005, p.83-104). Depending on the expanse and depth of crisis, a stronger or a weaker fall of economic activity rate is recorded. Such was a scenario of bank crisis and its consequences in Croatia. However, the credit boom and bank

crisis in Croatia cannot be explained, or at least predominantly explained, by the consequence of influence of factors described in the item 4.1. The specific circumstances that preceded the first credit boom have to be taken into consideration.

Principally, the factors of liberalization, the suspension of quantitative credit limitations and administrative interest rate management, or the removal of barriers for entrance of new banks into the market - all create good conditions for credit expansion and development of disaster myopia. The liberalization of economy started before and continued after Croatia became independent. In addition, after the Government's first intervention regarding the solution of the problem of blocked savings in foreign exchange in 1991, the inherited bad bank claims were substituted by government bonds. Some state-owned banks were privatized under strange circumstances. Nevertheless, after adopting stabilisation and inflation reduction programme in 1993 it was found that balance and off-balance potential losses of large regional banks significantly surpassed regulated amounts of their own funds and reserves. Therefore some new interventions with government bonds followed. It was written about some quiet rehabilitations as well. But all of this gave poor results. One of the two biggest banks together with three big regional banks remained insolvent. They were main participants of a large demand in the interbank market, which induced the rise of interest rate above the level of 30%. This interest rate was substantially reduced (to approximately 9%) in the beginning of 1996 after takeover and additional capitalization of problematic big banks by the government. Till that period the banks' lending activity had been narrowed due to some other reasons including the state of war. However, besides the rehabilitation of major banks, some other conditions for the start of credit boom had been created before that. Thus, the Banks and Savings Institutions Law from 1993 anticipated low capital requirements and relatively easier conditions for bank founding. Interest rate formation was liberalized as well. Those two reasons, together with some other, provoked a powerful entrance of new participants into the bank market. Between 1990 and 1997 the number of banks increased almost by 3 times (from 23 to 60). Banking business became the most attractive activity as big differences between lending interest rate and borrowing interest rate enabled high profits.

Figure 4.2 **The difference between lending and borrowing interest rate***



* Banks' lending interest rates on HRK credits indexed to foreign currency and on credits in Euros (total average)
Banks' borrowing interest rates on HRK deposits indexed to foreign currency and on foreign currency deposits (total average).
Source: CNB, Bulletin, no. 132, 2007.

Although the entrance of new banks had a certain influence on the size of the bank system and growth of credits, "the entrance itself was not the main factor of expansion of available credits" (Kraft and Jankov, 2005, p.110). On the rank-list of 15 biggest banks in 1997 there were 5 new banks that participated with only 10.6% in the total bank assets. According to these two authors the liberalization of interest rate, which was an important presumption for development of market society, had a very strong effect. That policy enabled the development of banking activities based on the principle of profit maximization, in distinction from the earlier dictated political priorities. Banks' freedom in determining the amount of deposit rate made the growth of credit sources possible. The significant rise of deposit rate followed primarily because some new banks tried to achieve their fast growth in that way. Naturally, to some extent that affected the reallocation of deposits among banks themselves. However, interbank competition left its mark. Other banks followed fast-growing banks, so that it came to general rise of deposit rate and accordingly of lending interest rate. The interest rate spread in Croatian bank market increased much more than one recorded in majority of bank systems in West-European countries. In this way, in the circumstances of rigid monetary policy the growth of total banks sources occurred. The growth of total banks sources is caused by growing inflow of savings in the first place. The growth of savings is mainly explained as a result of more attractive deposit rewarding. That could attract especially the savings of Croatian returned emigrants. Deposits growth probably derived from tesauration of money, savings earlier directed abroad and increasing number of rich individuals or big depositors. Anyway, the growth of total banks sources gave opportunity for the expansion and overheating in the credit market. The epilogue was the bank crisis.

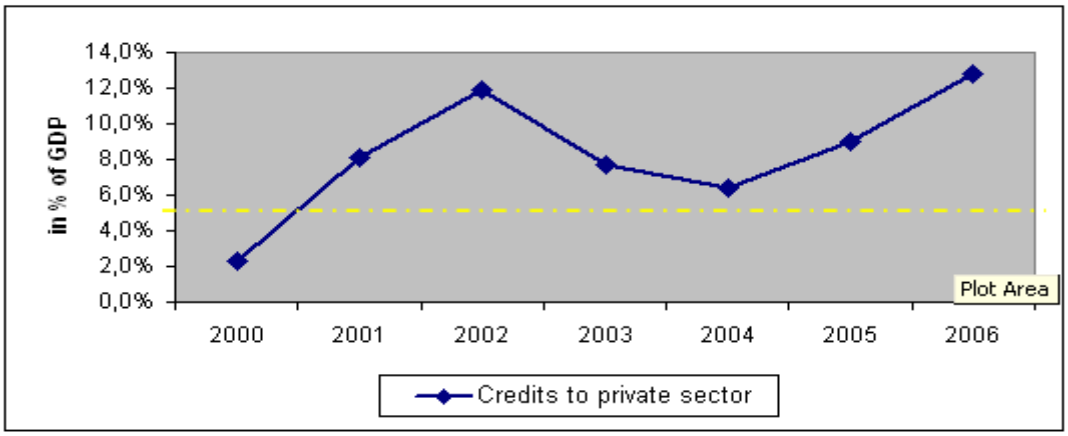
The bank crisis started in the beginning of 1998 with the collapse of one fast-growing bank and reached its culmination by the end of the first quarter of next year. During that period 16 banks, which participated with nearly 16.2 % in total assets of the bank sector, were ruined. Due to that occurrence and to decreasing of credit activity of other banks a negative credit growth rate was recorded in 1999. The reasons for the bank crisis were directly connected to weaknesses in performing institutional reforms (legal system etc.) and to the privatization process which resulted in "tycoon empires". Ownership correlation of private banks to the corporate sector resulted in mutually connected lending. The lending throve due to the weaknesses of banking regulations and the central bank's supervision. Loans to insiders are thought to have been the biggest part of problematic bank credits (Kraft and Jankov, 2005, p. 112). After all, weaknesses of the credit risk management in the phase of credit boom led to the bank crisis and credit bust.

Finally, in spite of statistically clearly proved relation between credit and economic cycles, it cannot provide a complete explanation. Some other factors, which have macroeconomic and microeconomic characteristics, influenced changes in the GDP rate of growth. Some of them, which are supposed to be the main factors, were present in the second credit boom as well.

4.3.2. Potential Dangers of Banking Distress

A new credit boom, which started in 2000, occurred in altered circumstances. After banks had been conveyed upon foreign proprietorship, they intensified activities in qualitative and quantitative sense (Haas and Lelyveld, 2006, p.1927–1952). As our previous analyses have shown, banks improved their risks management and solvency ratios seem to be satisfactory. They are efficient in technical sense as well. However, one thing is functioning here - it is a credit channel from growing inflow of foreign short-term capital that gives preference to final consumption. According to some statements banks might become vulnerable because of excessive expansion of total credits to private sector, decrease of differences between lending and borrowing interest rate, and possible slowing down of economic activity (Mihaljek, 2004, p.93-119; Égert et al, 2006, p.29-30).

Figure 4.3 **Credits to private sector**
- in percentage according to GDP -



Source: CNB, Web page. Author's calculation and graphics.

The statement that a bank crisis develops in the circumstances of growth of credits to the private sector above 5% of GDP cannot be abandoned. As between 2000 and 2006 those rates were 2.3%, 8.1%, 11.9%, 7.7%, 6.4%, 9.0% and 12.8% a credit bust should have already begun. If it has not happened yet, it does not mean that it will not happen. Our opinion is that the growth of credits to private corporate sector should not be problematic if a good credit risk management is applied (Cebenoyan and Strahan, 2004, p. 19–43). As we have already emphasized, Croatian banks have enough space for improving risk management methods. What disturbs even more is an excessive growth of credits granted to consumer sector in the conditions of poor domestic sources of saving.

In the growing bank competition, the decrease of differences between lending and borrowing interest rate under a certain limit could threaten the effectiveness of their business. On the other hand, the Figure 4.2 shows that it has not happened yet. Finally, banks have really high profit, even at existing differences between these two rates.

Table 4.1 **Net margins**

- in percentage -

	1998	1999	2000	2001	2002	2003	2004	2005
Net interest margin	4.71	4.09	4.21	3.58	3.28	3.33	2.97	2.87
Net non-interest margin	1.76	2.14	1.94	0.96	1.40	1.16	1.30	1.21
Net business margin	6.47	6.23	6.15	4.54	4.68	4.49	4.27	4.08

Source: CNB, Annual report, different years. Author's calculation.

Although net business margin has a decreasing tendency, it is still considerably above the one realized in banks of Western Europe. Thus, in 1999 this margin came to 1.77 in Belgium, 1.8 in France, 2.09 in Germany, 2.65 in Norway, 2.78 in Sweden, 2.87 in Switzerland etc. (Košak at al., 2003, p.432-435). In addition, in banks in some of these and some other countries net non-interest income represents a bigger part than net interest income. In the period between 1998 and 2005 the percentage share of non-interest income in total income of Croatian banks chronologically were: 27.1; 34.3; 31.6; 21.2; 29.9; 25.7 and 37.1 (CNB, Annual report, different years). That means that Croatian banks have big opportunities for developing off-balance activities, especially in the area of financial market operations (issue of securities for the corporate sector etc.). Rationalization can be also found within administrative costs.

It seems that banks might be the most vulnerable to possible decrease of economic activity rate. The circumstances in which existing rates of GDP growth occur are not very optimistic. Macroeconomic indicators disclose that to a great extent.

Table 4.2 **Crucial macroeconomic indicators**

	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06
GDP - year-on-year rate of growth (in %, constant prices)	5,9	6,8	2,5	-0,9	2,9	4,4	5,6	5,3	4,3	4,3	4,8
Average year-on-year inflation rate	3,5	3,6	5,7	4,0	4,6	3,8	1,7	1,8	2,1	3,3	3,2
Current account balance (as % of GDP)	-4,8	-12,3	-6,8	-7,0	-2,4	-3,6	-8,5	-7,1	-5,1	-6,4	-7,8
Outstanding external debt (as % of GDP)	27,0	38,0	47,6	54,5	61,4	61,4	61,9	75,8	80,0	82,4	85,3
Imports of goods and services (as % of GDP)	48,0	56,8	49,1	49,3	52,3	54,6	56,4	57,9	56,5	55,9	57,3
Consolidated central government deficit (as % of GDP)	-	-	-	-7,1	-7,5	-6,8	-4,9	-6,2	-4,8	-4,0	-3,0

Source: CNB, Bulletin, no. 132, 2007.

Is the current economic growth sustainable or not - that is the question, because it is based on the consumption which depends on export (Zbašnik, 2005, p. 201-218). Besides the expansion of bank credits to households, the consumption is also backed by overrated exchange rate. That can be clearly proved through growing deficit of the balance of payments, fast-growing external debt and budget deficit. The relation between balance of payments deficit and GDP growth is more than obvious. The balance of payments deficit is mostly the result of

commodity exchange deficit. Therefore, some national economists propose the depreciation (devaluation) of the national currency (Lovrinović, 2005; Santini, 2006; Jurčić, 2007). On the other hand, more serious analyses give a range of arguments that are not in favour of that particular move. In general, a positive effect on the balance of payments, from the depreciation of exchange rate (increase of export and decrease of import), could be neutralized in different ways. Among other things, increase of inflation rate would follow, then decline of employment in non-export sectors and of national real income, increase in payment of the indexed internal debts and burden of external debt payment (Stručka, 2004, p.24). However, an efficient economic policy is not a simple task. The decrease of tax pressure and budget deficit is necessary but it cannot be done painlessly. Our country's external debt almost exceeds the limit of endurance, so that some cuts have to be done especially in public investments out of these sources. The final consumption will have to adapt itself to domestic production opportunities. Although the CNB has the right policy in limiting banks' external debt, it is still not enough. Of course, it is necessary to create conditions for capacitating domestic production. It certainly cannot be done easily and quickly. Anyway, banks should act in that direction. Otherwise they themselves will become vulnerable. Efficient economic allocation of sources and fight against credit and other risks are their first and permanent tasks.

5. Models for Managing Credit Risk in Croatian Banking

Since the credit risk is the biggest and the most wide-spread risk, often combined with other risks, its identification, measurement and management is very complex and demanding. In distinction from market financial instruments, credit assets generally are not negotiable or homogeneous. In the case of first assets the value of issuers is estimated by the market, and in the case of credits it must be done by a lender. Granting a credit by banks includes several steps beginning with establishing dossier, then checking and analysis of various data, finally observation and supervision of debtors. These activities are constantly improved, especially in the area of information gathering and processing, refining of known methods and creating new methods and models of credit risk evaluation and monitoring. Despite the fact that Croatian banks have essentially improved their credit risk management, there is still enough space for introducing different innovations in this area.

5.1. Prerequisites for Good Managing

It is necessary to fulfil numerous preconditions in order to improve the credit risk management in the Croatian banking system. The first unavoidable and the most important precondition refers to their own relevant data bases that banks have recently started to create more or less successfully. Some preparatory activities have been carried out for organized data exchange between banks as well. Except for certain attempts of FINA and its supply of incomplete information in the forms of "BON1" and "BON2", in Croatia there are no agencies for evaluation of creditworthiness of smaller and medium-sized enterprises, nor any specialized

agencies for corporation rating. Finally, organizing internal control and supervision has a special and important role in the struggle against excessive credit and other risks.

5.1.1. Internal Data Bases

Croatian banks regulated, with their internal acts, the content of information that a credit applicant is obliged to ensure. Also, banking legislation and the CNB decisions including the Instruction for keeping records of credit documents (Gazette, No. 36/1999) specify the content of minimal number of data that has to be on banks' disposal for each debtor. There are some bigger or smaller differences among banks themselves regarding this content and organizing method of accessibility. These data bases can help to evaluate personal characteristics of debtors more or less successfully, their financial past and present, if they fulfil legal conditions and how external factors influence their economic and financial position.

As to the debtor's quality important features are: their character, morality, professional skilfulness, communicativeness and transparency, health conditions, and if they used to settle their payments correctly or not in the past. Establishing (gathering) data on the financial past and present of debtor's enterprise appears to be a demanding task.

The risk of an enterprise is evaluated by means of data from their balance of payments and income statement. The questions about the appropriateness of accounting standards are often posed, there are some disputes connected to analysis of "stock" and "flows" etc. It is often necessary to revaluate certain on-balance-sheet items. Real estate, commercial funds, brands, patents and generally intangible assets are most of the time underestimated in balance sheets. Bankers often rely on balance sheets and profit and loss account from the last two years, which is insufficient and can be dangerous. Lots of facts can be found out on the basis of systematized data: the scope of business result, cash flows (cost/profitability), debt-equity ratio, and calculation of other ratios which disclose the financial condition of enterprises. With regard to legal demands it is necessary to have data about borrower's legal power, about fulfilment of borrower's contract obligations and especially about total debt ceiling and compliance of borrower's activities with laws and regulations. Thus, a bank can expose itself to excessive risk if it disregards data and allowed coefficients on the total debt per client, a group of associated enterprises, sectors or regions. In absence of balance sheets, modern accounting software can provide almost on monthly basis a simplified review of the situation in smaller enterprises that often require credits. Finally, a bank should have perfectly updated data on exchange rate fluctuation, competition in debtor sector, conjecture, monetary stability etc. which pay attention to the external factors of risk.

In majority of Croatian banks, employees who are in charge of processing credit applications for natural persons gather information through standardized questionnaires, then they use documentation to check the authenticity of information and keep electronic records of it. Installed programmes process the recorded data so that a computer answers the question whether or not to grant a credit. Recently smaller banks have started introduction of automatic

analysis and deciding upon granting credits to natural persons. Some banks have introduced sophisticated programmes for processing credit applications of smaller and medium-sized enterprises (SME). Finally, several biggest banks managed to introduce programmes for credit rating of big enterprises. In all cases, especially in the case of credits to enterprises, the final decision derives from subjective assessment made by the committee in charge of credit granting. On the basis of some publicly available information and direct contacts we have got an impression that Croatian biggest banks also need to make an effort in order to complete data bases, which is a prerequisite for the implementation of sophisticated methods and models in selection of new debtors as well as in observation of creditworthiness of current debtors. Completing of internal data bases includes exchanges of information about debtors stability (if they are good payers or not).

5.1.2. Interbank Exchanges of Data

Pieces of information delivered to banks by a borrower are more or less incomplete. The most important among them is the information that helps banks to find out if borrowers used to settle their debts correctly (in time). If a borrower has been in debt and has had its account and other business relations in the same bank, then it stands to reason that the question of information problem does not appear here. But, if a borrower is a new client that might have turned out to be a "bad payer" in the past, then it is necessary to ask for information from other lenders. However, this channel of additional information gathering regularly turns out to be ineffective. Experiences show that banks reluctantly exchange that kind of information and even when they give it by request the information is not trustworthy enough. Simply, in constant fight between banks to attract new clients, banks reluctantly expose themselves to their competitors. In this case they often refer to the need for protection of their clients' privacy and to business secret even in the areas where legally it is not expected.

On the other hand, in many countries the solution has been more or less found through establishing of the so-called "risk head offices" which collect and sum up loans of one and the same debtor with various creditors. Those pieces of information are distributed by request of banks and possible other members. The running of risk head offices is commissioned to the private agencies or the Central bank which has a possibility to control the accuracy of information. Characteristics and practices of these head offices considerably vary from country to country. They often differ in various factors – in terms of debtors list (individuals and families, foreign and/or domestic enterprises…), participation of creditors' categories (banks, insurance companies…), types of debts (different types of credits, leasing, aval, down payment, derivative products…), periods of taking inventory of debts and use of information (shorter or longer periods or in continuity), etc. Certain countries mutually exchange information on debtors within the frame of the EU risk head office. They have also worked on the convergence of main characteristics of EU members' risk head offices as well as the cross-border extending of information exchange (EMI, 1996, p.94).

In January 2005 twenty domestic banks founded a company called Croatian register of credit commitments - HROK (it is a Croatian "credit bureau"). The system of information exchange about natural person's overdue payments had been introduced before that, the so called "black list". Media published unofficial information that 150.000 citizens were allegedly found on that list and that bank debits collection was improved after introduction of the list. HROK should give information on all credits of each individual debtor, sub debtor and guarantor. In the beginning only the founder banks should be exclusive providers and users of HROK information. The information provided by HROK is also to include the debts at credit card companies and leasing companies and it is estimated that all this could motivate its users to debt rescheduling for their over-indebted clients (HROK, Web page). However, at this moment these are just plans. In addition, HROK's activities should expand over all forms of debts not only in banks but also in other financial institutions.

5.1.3. Need for Establishing Credit Assessment Institutions

Banks can use services of external institutions for credit assessment of borrowers. There are a large number of such institutions which differ from each other in terms of their characteristics and activities – whether they assess only some types of bank claims or all of them, credit and/or other risks etc. Some of them are very well known and have big international reputation such as Moody's and Standard & Poor's. They are privately owned; they consist of independent experts and are appointed (licensed) for debtor rating assessment by authorities. Their rating covers 20 debtor categories - from the best ones to those in bankruptcy. While assessing the rating of enterprises they take into consideration 3 categories of factors: the risk of an enterprise itself, the risk of a sector the enterprise belongs to, the development of regulation frame and finally the risk of a country. They assess the rating of all debtors and issuers of securities (enterprises, banks, other financial organizations etc.) and in that way enable better selection of both debtors and issuers to banks and all investors. They have developed their reputation due to their qualified personnel and some other factors including a privileged access to information.

On the other hand, even the agencies for debtors and issuers of securities rating assessment with best reputation are not impeccable. There are numerous reasons for their inaccurate assessments of problems which debtors had to face (The Economist, 1995, p.61-62) resulting in the Mexican crisis, the ruin of American savings banks, troubles that faced lots of European banks, the Asian crisis, the Enron case etc. Thus, the rating agencies with the best reputation did not inform creditors in time about the declining financial situation in banks or financial groups originating from Asia in 1997. Agencies themselves admitted that they had not anticipated the Asian crisis (Davies and Luce, 1997, p.24). Or, rating agencies had assessed Enron with good credit rating only 4 days before this company went into bankruptcy by the end of 2001. The credit rating of one Croatian company has been recently reduced by one prestigious agency although that company improved business results and was evaluated by domestic experts as promising. Problems regarding credibility of rating agencies drew the

attention of European Commission as well, so that they announced they would keep those agencies in sight.

So far domestic business entities have had to use the services of recognized rating agencies in case of being indebted abroad. Of course, the use of those services incurs costs for debtors (issuers). On the other hand, credit assessments in those cases include, among other things, the country's risk and higher compensation (award) of creditors. As we have already pointed out, our national economy has entered the area of over-indebtedness. In the last 3 years the participation of banks in gross foreign debt increased by 10% and the participation of other enterprises by 3%. The corporate sector increased their foreign debt mostly through issue of bonds and commercial papers. In the 2nd chapter of our thesis we have clearly proved that the problem with the lack domestic saving resources does not exist to a great extent, whereas the problem with the supply of negotiable securities by the corporate sector really exists. The turning of enterprises towards domestic financial market implies, among other things, the supply of services by rating agencies. Different reasons, including manipulation with the country's risk in domestic debtor-creditor relations, suggest the need for establishing Croatian agency for credit assessment of economic agents. According to the Standardised Approach of the Second Basel Accord, "…banks can use external credit assessment institutions (ECAI) recognized by national control authorities for calculation of their own funds…" (Paragraph 52). It would be really unacceptable for domestic enterprises to be compelled to ask foreign agencies for credit assessment while applying for a credit at domestic banks. Finally, in lots of countries there are domestic privately owned agencies or other institutions for credit assessment of enterprises. Thus, German private agency "Creditform" assesses the rating of smaller and medium-size enterprises very fast and in detail. In some countries, for instance in France, the Central bank assesses the rating and sends it to banks at their request. FINA's experiences with "BON1" and "BON2" can be useful to some extent. Certainly, the CNB, other control authorities, banks, financial institutions and even entrepreneurs are expected to make a move.

5.2. From Traditional to New Methods of Borrowers Selection

The selection of borrowers in Croatian banks is mainly done in traditional way. It means that each credit application is separately processed (checking and analysis of various data) and followed by subjective evaluations and decisions. Some banks have recently started with the development of systems for automatic analysis, classifying of borrowers, and decisions. The methods of scoring in procedures of credit granting to natural persons and to smaller and medium-sized enterprises have been introduced more or less successfully. Also, some bigger banks have tried to introduce programmes for credit rating of corporations. However, after skimming over some instructive literature and some direct contacts with banks employees it seems that subjective evaluations of corresponding committees have a final decision in all cases. Therefore, total automatism in credit granting still does not function even when it refers to consumers.

5.2.1. Debtors Selection from Consumer Sector

Generally, the borrowers' selection from consumption sector has essentially improved thanks to appearance and improvement of the credit scoring method. There are some efforts to use this technique in order to synthesize the risk of credit non-payment by means of one score. The credit score is primarily based on a discriminatory analysis. The discriminatory analysis includes three consecutive procedures: establishing solvency criterion, total score and cut-off score.

First, the sifting through all pieces of information appearing in borrowers' files needs to be done. Those pieces of information are: address, age, profession, family status, income, bank information etc. The information relating to the fact of being a good or bad payer is also taken into consideration. Then, a certain identity of criteria for each borrower's class emerges. In other words, good payers are flat owners, who have been working in the same company for more than ten years, who are married and have two children, have a bank account etc. On the other hand, bad clients are subtenants, who have been working in their company for less than six months, who are less than 30 years old, divorced or single, who do not have a bank account etc.

The second step leads to total score establishing. First, one score is added to each associated criterion - the score represents the weight of its importance respectively. The discriminatory analysis shows that some criteria are more significant than others. The total score is obtained by adding associated score of solvency criterion to each of them.

The last step means establishing of one cut-off score under which there is more probability for a borrower to be insolvent. This is fundamental in credit score technique. In other words, despite a lot of caution while choosing the criteria and weight establishing, a certain percentage of bad (in default) payers can always be found in the circle of payers with good rating or vice versa. That is confirmed by results from the research of clients' behaviour in one bigger Croatian bank (Appendix C2). Consequently, in order to define the cut-off score it is necessary to do a statistic analysis that helps to find out in what way debtors, assessed as good or bad, really effect their payments. In fact, this analysis is used to evaluate a contribution to the bank's profit by every well or poorly assessed debtor. Naturally, the contribution to the bank's profit by good payers is positive, while the contribution by bad payers is negative. Accordingly, the cut-off score or optimal score will be chosen. It will be the score which has the most performable influence on bank's profit.

While studying internal acts and other available materials of Croatian banks which introduced the credit scoring for natural persons, we got an impression that even those banks did not use everything this method offers. Despite a considerable improvement, this debtor selection technique has its drawbacks. It means that some new methods should be introduced such as: linear and non-linear regression and neural networks (Mays,1998, p.88-111; Mramor, 2006)

5.2.2. Automatism in Classifying of SME

Automatic evaluation of credit risk by scoring method is largely used for preventive diagnosis of enterprise's problems. Namely, traditional methods of approach to risk, especially ratio methods, are too expensive and have big gaps: evaluation criteria are weighted subjectively and ratios are interdependent. The basic idea is to find the most significant ratios of solvency in order to predict enterprise's problems. Once these ratios are defined, it is sufficient to calculate their values for the specific enterprise and compare them to ratios of enterprises faced with troubles or even bankruptcy. The comparison is not made ratio by ratio, but globally. In fact, ratios aggregate one function called score function (Z) which enables adding one score to each enterprise (Altman, 1968, p.589-609). The problem of relative weight allocated to each ratio is determinant because every ratio is weighted depending on its power to discriminate "bad" from "good" enterprises. One of the last versions of score function (Altman, 2002, p.17-18) was as follows[6]:

$$Z'' = 6.56 \cdot (X_1) + 3.26 \cdot (X_2) + 6.72 \cdot (X_3) + 1.05 \cdot (X_4)$$

Where:
X_1 = working capital/total assets
X_2 = retained earnings/total assets
X_3 = EBIT/total assets
X_4 = book value equity/total assets

When "Z" is less than 3.75 there is a big probability of non-payment by an enterprise. If "Z" is more than 6.25 there is a poor probability of non-payment. A grey zone is situated between 3.75 and 6.25.

Numerous versions of enterprise's credit score based on discriminatory analysis have been developed. Despite the fact they have enriched traditional analyses through ratios certain limits are associated with them. These limits can be found in stochastic structure of score function itself. Working sample should be broad enough; basic facts should be specified and homogeneous in order to avoid stochastic sinuosities. The period of acceptance needs to be long enough in order to comprehend the evolution of enterprise's behaviour and to measure effects.

The latest version of credit score includes logistic regression instead of discriminatory analysis. (Altman and Sabato, 2006, p.1-44). The authors allow the use of additional criteria, together with selected solvency ratios, because it can lead to improvement in prognosis. In fact, a well selected version is considered to be very useful in measuring bankruptcy risk only for SME.

Owing to supports (not without charge) of their foreign parents, some Croatian banks have already started to use the score method for SME credit granting. While studying the implementation of one version of this method, which uses 4 types of data[7] (Appendix C4), we

[6] Adapting the model for non-manufactures and emerging markets. In the emerging market (EM), Altman added a constant term +3.25.
[7] In one of the biggest Croatian banks.

are not under the impression that "famous" automatism really works. There are still lots of unknowns. Different reasons convinced us that there is a need for creating an adequate method which would be used in all domestic banks. This is in accordance with our idea of creating one risk centre or rating agency. Anything else would represent unnecessary waste of strength and resources with an uncertain outcome.

5.2.3. Practical Example for Corporate Selection (case study)

Being inspired by the model implemented inside a big European banking group, a part of which is one Croatian bank, we will try to show with a simplified example how the enterprise's financial rating can be defined. In the Second Basel Accord, ratings are defined by the PD (probability of default) of borrower's enterprise. First, we have formed a portfolio similar to bank's portfolio, but made up of considerably low number of enterprises.

Table 5.1 **Analysis of data taken in analysis**

THE NUMBER OF ENTERPRISES (Revenue > 10 mil. HRK)	SECORS	CONDITION
59 enterprises	22 Production	49 nondefault
	37 Trade	
		10 default

Note: A default is considered to have occurred with regard to a particular obligor if it is past due more than 90 days on any material credit obligation to the banking group (for more details see BIS, 2005, Paragraphs 452-457)

Six indicators, which are used for defining financial rating of borrower's enterprise in domestic bank, are included in the analysis. The determining of null point follows, in other words the point in time when the default begins. Then, according to definition of default we define a reference year in order to take out financial reports for calculating the six indicators. Enterprises are defined as default in August 2005 and consequently we should use August 2004 as reference figures for these enterprises. As there are no annual reports in August, we take those from the 31st December 2003. By analysis of data quality we have found out that there are no missing values, zeros, no problems with signs, but there are some outliers. Since it has been difficult to find out which observations are mistakes and which are extreme values, we have reduced all outliers to the extreme value which is acceptable to us, and that is $\pm 2\sigma$. Statistic data analysis can be seen in the following table.

Table 5.2 **Summary statistics for the selected financial ratios**

Variable	In		Nondefaulters		Defaulters	
			Mean	Median	Mean	Median
Total Operating Revenue	000 EUR	r1	15,075	3,380	5,226	2,737
P&L Cash Flows / Liabilities (net)	classical coeff.	r2	22.09	10.26	-3.8	-2.22
(Pre tax) Profit / Total assets		r3	1.81	0.58	-10.14	-7.52
EBITDA / Interest expenses		r4	68.62	3.52	-10.91	0.79
Equity / Total assets	%	r5	33.11	28.27	3.99	5.14
(Current assets - Inventory) / Short term liabilities	%	r6	95.66	81.84	33.46	22.37

Due to the nature of dependent variable, we cannot take into consideration linear models because of three reasons: non-linear characteristic, heteroskedasity and linear model that can give us final values out of intervals (0, 1). For these reasons we have decided to use the logistic regression in the development of default prediction model. Accordingly, we can generally write:

$$Y_i = \begin{cases} 0 & \text{for nondefault} \\ 1 & \text{for default} \end{cases} \quad ; \qquad \hat{Y}_i = \frac{\exp(\beta_0 + \beta_1 X_1 + ... + \beta_i X_i)}{1 + \exp(\beta_0 + \beta_1 X_1 + ... + \beta_i X_i)}$$

Where:

Y_i = nondefault or default for i-th enterprise

$\hat{Y}_i$ = expected probability of default for i-th enterprise $\langle 0, 1 \rangle$

β = unknown coefficients that should be estimated according to empirical sample

X = financial ratios

We have used a statistic packet STATA[tm] 8.0 in calculation of coefficients next to the financial ratios. In the following table (Figure 5.1) we can see that three out of six indicators are statistically significant (their significance is less than 10%). The reason could be the small number of enterprises taken for the model as well as the fact that when a foreign parent created the model, it did not use Croatian enterprises in the portfolio because of a small share the Croatian bank has in the assets of the foreign parent.[8]

Figure 5.1 **Model summary statistics**

Logit estimates — Number of obs = 59; LR chi2<6> = 33.92; Prob > chi2 = 0.0000; Log likelihood = -9,888141; Pseudo R2 = 0.6317

pd	Coef.	Std. Err.	z	P>|z|	[99% Conf.	Interval]
r1	-.0000625	.0000998	-0.63	0.531	-.0003196	.0001946
r2	-.2546637	.146787	-1.73	0.083	-.6327619	.1234346
r3	-.1041698	.1133293	-0.92	0.358	-.3960869	.1877472
r4	.0328331	.0188986	1.74	0.082	-.0158464	.0815126
r5	-.0479236	.0299985	-1.60	0.110	-.1251947	.0293475
r6	-.0435189	.0249927	-1.74	0.082	-.1078957	.020858
_cons	2.159822	1.445571	1.49	0.135	-1.563722	5.883365

We have decided that the cut-off line is 25%, that is - when $\hat{Y}_i$ is in the interval $\langle 0,\ 0{,}25 \rangle$ we will grant a credit, and in the opposite case we will reject a credit application. At this cut-off line the model has correctly classified 91.53% (for goodness-of-fit test, contingency table, summary statistics after logistic regression, ROC curve as well as AUC, Sensitivity/specificity plot see Appendix from C3-2 to C3-5). By the process of calibration PD is added to each rating class. We can define financial rating borders (limits) by obtaining nearly the same default rates as for example in S&P for each rating.

[8] We have found this out in conversation with the bank's employee.

5.3. Prospects of Implementing Advanced Credit Risk Models

In the last two and a half decades new techniques or tools for portfolio credit risk evaluation were created and they are usually called advanced credit risk models. Those models were first used in big banks in the most developed countries, before all in the USA where they originated. Medium-sized banks also became interested in them, especially for internal rating in calculation of regulatory capital provided in the Second Basel Accord. We will pay our attention to important points of the most popular models, their advantages and disadvantages, and then we will estimate the prospects of their implementation in Croatian banks.

5.3.1. Risk Adjusted Return on Capital Model (RAROC)

RAROC measures the return a business provides relative to the amount of capital necessary to support the risk of doing that business. The degree of risk of the business in question determines the capital amounts needed. The risk factor can be assessed by various techniques. The group Bankers Trust, which first adopted RAROC model in 1979, takes into consideration 3 principal risks: credit risk, market risk and operational risk (Annual report, 1994, p.24-26). The group was followed by big international banks in the first place and then by numerous other banks from developed countries.

RAROC model can be of much help to banks management in order to (1) define the price of a product, (2) measure profitability per a client, (3) form optimal own funds and (4) reduce or put a stop to activities whose profitability is below the previously determined profitability minimum or capital cost. However, the model hides some significant disadvantages as well. It gives a point-in-time picture of a bank's risk exposure and does not allow by itself for the calculation of Value-at-Risk (VaR) or the formulation of "what-if" and stress scenarios to estimate potential future risks. It does not take into consideration the existing correlations between different related industries and thus lacks the dynamics and depth offered by more sophisticated models. Further, it does not give weight to historical changes in credit ratings, nor does it update its data requirements to take into account the current business cycle, thus somehow weakening the accuracy of the model.

According to the already quoted CNB survey, 7 out of 38 Croatian banks stated that they used the models developed by their foreign mothers to define economic capital for credit risk, 1 bank stated it used its own model and the rest of banks used none. It was impossible to find other sources of more precise information. Since RAROC model does not require very sophisticated computer programming nor complex calculations, probably there is a chance of expanding its implementation in Croatian banking.

5.3.2. CreditMetrics™ model

CreditMetrics was launched in 1997 by J.P.Morgan and his co-sponsors (CreditMetrics, Technical Document, 1997, p. 1-141). It represents the extension of RiskMatrics model that operates with Value-at-Risk (VaR) for market exposures. VaR expresses the maximal undervaluation with given probability resulted from the change of market price of one asset (portfolio) during one period. It is based on two key variables: average of changes in values (P) of assets or portfolio and standard deviation σ of changes of these values. Since credits and some other debts are not negotiable, that is they do not record market prices, some other pieces of information are used in CreditMetrics. The information refers to debtors credit rating, probability of rating change within one-year period, chargeability of bad credits (loans) and realised revenues from specific credit. On the basis of this information the hypothetic value P and σ as well as VaR is calculated for any individual credit and total credit portfolio.

The CreditMetrics methodology consists of several stages (Technical document, 1997, p. 1-141). First of all different exposure profiles and dynamics for each exposure type on a comparable basis are calculated. The model differentiates between different credit types, such as receivables, bonds and loans, commitments, financial letters of credit, and market-driven instruments. Some have fixed exposures, while others create exposures that can vary either due to upgrades and downgrades (such as commitments) or to market rate movements (such as swaps and forwards). It continues with calculation of the volatility of value due to credit quality migration for each individual exposure. This stage consists of 3 substages. First, credit quality migrations are estimated based on a "transition matrix", such as those provided by rating agencies. CreditMetrics does not provide or advocate any particular credit rating method. The user has the choice of using any rating system, including a proprietary methodology. Second, each instrument is revalued in every different state of credit quality, using a different type of revaluation for default and up(down)grade. The default recovery rates used depend on the seniority class of the debt and whether they are secured or unsecured. The revaluation upon upgrade or downgrade applies a straightforward present value calculation at the time horizon, using forward zero-curves for each rating category to calculate the appropriate credit spreads. Third, the volatility of value due to credit migration can be computed, and is measured as the standard deviation of all values in each state of credit quality at the time horizon. Finally, in the last stage calculation of the volatility of value due to credit quality migration across the entire portfolio is made.

CreditMetics has its good features, but it has some drawbacks as well (Saunders, 1999, p.40-53; Crouhy et al., 2000, p.62-85; Servigny and Renault, 2004, p.233-235). Regarding advantages, this approach enables the model to clearly identify the nature of the contribution of each asset to portfolio risk, helps to quantify concentration risk, enables the credit administrator to easily set risk-based exposure limits and it can be used as a risk-based capital allocation. However, this approach is complex and requires special attention to various parameter estimates used at different stages of the modelling process. The Monte Carlo simulation method extensively used in the model is flexible but computationally intensive. Its

portfolio approach does not provide a direct risk assessment of existing individual exposures, but rather marginal risk statistics that show the change in total portfolio risk upon the addition of a new exposure. Among other things, certain elements used by the model pose additional estimation difficulties, such as revaluation in default.

5.3.3. CSFB CreditRisk+

The model uses mathematical techniques used in the insurance industry to model the sudden event of an obligor default (CreditRisk+, Technical document, 1997, p. 4). It also provides a methodology to calculate economic capital for credit risk, establish provisions on an anticipated basis, and measure diversification and concentration effects to assist in portfolio management. CreditRisk+ is capable of handling all types of credit exposures including bonds, loans, financial commitments, letters of credit, and credit derivatives. It follows an actual approach to credit risk and only captures default events. Changes in prices, spreads, and migrations are ignored. The issue is not whether specific securities in the portfolio default, but rather what proportion of obligors will default in sector and will default at the portfolio level. Facilities are grouped in homogeneous buckets with identical loss given default. The default rate in a given sector is assumed to be stochastic.

The model implies certain inputs and the credit risk is measured in two stages. Needed inputs are: individual credit exposure profiles, yearly defaults rates per industry or category of assets, default rate volatilities and an estimate of recovery rates (assumed constant in this model). Assuming that probabilities of default are small and time-homogeneous, the probability of default in a given sector can be approximated by Poisson distribution with mean μ such that the probability of n defaults is (Technical document, 1997, p. 35)

$$\mathrm{P}(n \text{ defaults}) = \frac{e^{-\mu}\mu^{n}}{n!}$$

CreditRisk+ assumes that mean default rate μ is itself stochastic and gamma-distributed. By introducing the probability generating function (PGF), it is possible to express the PGF of the default losses in each bucket and to aggregate them into the probability generating function of portfolio losses. An algorithm then allows us to derive the distribution of portfolio losses from the PGF, thereby providing a fast analytical solution to the calculation of economic capital and other risk measures. Factor correlations are not modelled in CreditRisk+. In that model the factors are the defaults rates in the buckets, which are assumed to be independent.

5.3.4. KMV Model

The consultant firm KMV derives the actual probability of default, the Expected Default Frequency (EDF), for each obligor based on a Merton (1974)'s type model of the firm. The probability of default is thus function of the firm's capital structure, the volatility of the asset returns and the current assets value. By applying option theory, EDF aims at giving a solution to the problems faced by other models in measuring default probabilities, in particular the considerable variation in default probabilities across firms, loss given default and default correlations. It is based on the idea that market prices, by their nature, are inherently forward looking in that they reflect investors' willingness to buy and sell. Default measurement derives from models that use both market prices and financial statements. EDF adopts the option pricing-based approach, which recognizes equity as a call option on the underlying assets of the firm with a strike price equal to the book value of the firm's liabilities. If the market value of equity is available, then the underlying asset value and volatility implied by the market value, volatility of equity and the book value of liabilities can be directly derived using an option pricing-based approach.

Determining of firm's default probability has three stages (Crouhy et al., 2000, p.87). First, market value and volatility of the firm's assets from the market value and volatility of equity and the book value of liabilities are assessed. Second, distance-to-default is calculated by means of the following formula:

$$\frac{(\text{Market Value of Assets}) - (\text{Default Point})}{(\text{Market Value of Assets}) \cdot (\text{Assets Volatility})}$$

Finally, it is necessary to calculate the default probabilities by an empirical mapping between the various levels of distance-to-default already calculated and historical data on default and bankruptcy frequencies. The use of historical data is due to the difficulty in measuring the future distribution of the distance-to-default, while the likelihood of large adverse changes in the relationship between asset value and the firm's default point is critical to the accurate determination of default probability.

As any other model, the KMV model has its good and bad characteristics too. EDF gives a straightforward measure of default risk for each individual firm, and complements the credit monitoring process at banks by providing focused information needed for provisioning, valuation and performance measurement. Its attractiveness lies in its reliance on market prices, which reflect the current position of a firm in the credit cycle, and represent the best source of information on the credit quality of a firm. This feature allows the model to avoid complex calculations needed to measure default risk. It also enables the model to use the firm's equity beta to estimate the effect of a market down-turn on the firm, instead of having to approximate correlations and solve for their own inherent statistical problems. However, this model could be useful for determining of firm's default probability in the circumstances of efficient functioning of capital market. The results of its implementation in the circumstances of the emergent markets functioning are uncertain. The KMV model has other drawbacks as well.

First of all, those are difficulties related to defining of theoretical event distributions, equalisation of different kinds of debtors financial products in the firm's resources and disregarding of collateral as well (Saunders, 1999, p.32).

5.3.5. Credit Portfolio View

Credit Portfolio View (CPV), also named "McKinsey & Co.-Wilson Model" after its authors (cit. Caouette et al., 1998, p.297), is recent one too. In distinction from some other Credit Risk Models, which use historical data to determine an average default rate, CPV relies upon data from current macroeconomic surroundings. A logical assumption is that the debtor's default probability is higher in the recession than in the period of stable economic growth or boom. Finally, researches done on the example of 18 biggest banks in the USA showed, among other things, that default credit rates are very sensitive to business cycles (Saunders, 1999, p.58).

This model observes macroeconomic factors such as GDP growth rates, unemployment rates, the level of long-term interest rates, the state cost and aggregated savings rates. There are two ways of getting logit function: parametric and non-parametric method. In order to calibrate default probability by parametric method, first of all, for each selected macroeconomic variable it is assumed that it follows the autoregressive process of the second rate (AR2) to obtain parameters $a_{k,t}$. Macroeconomic variables ($X_{k,t}$) generated in this way are then introduced into equation of macroeconomic index $Y_{i,t}$ which represents the weighted sum of macroeconomic variables (which have been generated by AR2 process). Finally, the index is transformed into default probability by logit function ($P_{i,t}$).

$$X_{k,t} = a_{k,0} + a_{k,1} \cdot X_{k,t-1} + a_{k,2} \cdot X_{k,t-2} + ... + \varepsilon_{k,t}$$

$$Y_{i,t} = b_{i,0} + b_{i,1} \cdot X_{1,t} + b_{i,2} \cdot X_{2,t} + ... + \nu_{i,t}$$

$$P_{i,t} = \frac{e^{Y_{i,t}}}{1 + e^{Y_{i,t}}}$$

The other way of getting logit function is MonteCarlo simulation (non-parametric method). First, random innovations ($\varepsilon_{k,t}$) are generated by random number generators (RNG) as if they are normally distributed. The generating of macroeconomic variables ($X_{k,t}$) follows so that their values with the lag are introduced into their equations together with random innovations generated in the previous step. The macroeconomic index ($Y_{i,t}$) is obtained by inserting generated macroeconomic variables obtained in the previous step. Default probability is calculated according to logit function, and then default probability distribution is generated by repeating these steps at least 1 000 times (the bigger number of repetitions, the better).

5.3.6. Models' Limits and Specific Implementation Problems

As we have already pointed out, there are problems relating to efficiency of implementation of Portfolio Credit Risk Models. These models cannot fit all the various characteristics of obligors and the different economic circumstances that affect their creditworthiness. It is neither possible to forecast the exact time of occurrence of any one default, nor the exact numbers of defaults. Default rate can significantly increase in high and low of the credit cycle, which implies that average default rates used in some models do not present an effective measure of default risk. Despite major improvements in modelling techniques to take account of changing default probabilities over time, the varying methodologies used by different methods still attest to the diverging views with regard to the estimation procedures. Simply, all Credit Risk Models have their limits. Numerous types of uncertainty appear in the process of modelling. Among them, model error, is usually the most difficult type of uncertainty to identify and track. Despite the fact that these models cannot accurately replicate actual events and processes, they provide valuable tools to support human judgment and they are useful to banks' managers in decision-making. In particular, models offer the convenience of transparency, consistency and better comparability among different types of exposures. The continuous evolution of credit risk measurement techniques allows for the development of an increasing array of applications, ranging from credit risk management, to provision and loss estimation, to capital allocation, to profitability analysis and pricing. After all, these models are largely used in big and medium-sized banks in the most developed countries. As we have already mentioned, this is not the case with Croatian banks, at least regarding implementation of sophisticated portfolio credit models.

There are lot of hindrances in the process of implementation of sophisticated portfolio models in Croatian banks. Among other things those are: absence of historical data bases, poor qualification of employees, low level of credit culture, high costs of new credit risk management techniques and underdevelopment of domestic financial market. Lack of comprehensive historical default data bases seems to be the biggest problem for introduction of advanced Portfolio Credit Risk Models. Although there are signals from some bigger banks connected to creating of data bases, that is not enough. We see the solution of this problem in the context of suggestion in the item 5.1 of our thesis. Banks discharge old employees and engage new ones, but additional education is needed in order to overcome dominating intuitive way and subjectivity in identification and management of risks. The costs could be reduced with growing tendency to commercialize data modelling and to create centralized data bases for debtors of all banks. In the conditions of undeveloped financial market it is possible to apply actuarial and econometric models. These models enable more precise measure of default probability in business with traditional credit instruments. Criteria of credit modeling and parameters should become more important in calculation of credit risk with the implementation of the Second Basel Accord. Those banks which succeed in that will ensure their advantage in competition.

6. Regulatory Aspects for Credit Risk and Prudential Function

Banking regulations are traditionally justified by presence of externalities. Positive externalities are connected to the issue of money and the role of banks in good functioning of payment system. Negative externalities are associated with bankruptcy of banks. As we have already mentioned, especially in the item 2.4., the importance of asymmetric information is added to that because it threatens bank contracts and represents a hindrance for depositors to estimate correctly bank's solvency. So, regulations are suitable for clients protection as well. The generalization of systems of public deposit insurance (or guarantee) has contributed in relieving the threats of falling apart of payment and credit system.

On the other hand, banks that are protected in that way took more risks, so that the disappearances of insolvent banks were multiplied in last decades. The effects were shown in the form of instability of financial systems. Also, deposit insurance agencies and countries (taxpayers) had huge costs. Those disfunctions showed that the solvency of insured banks should be supervised by regulatory authorities with the constant tendency of timely discovering of changes in their risks profile. Lots of efforts have been made in that sense, especially by the Basel Committee. The forming of basic regulatory framework for banks has been a very challenging task. In fact, a banking industry has gone through significant transformations caused by deregulation of financial markets. At the same time, risk management and risk transfer have become more and more complex. Regulators have to cope simultaneously with two different problems. The first and the most important thing for them is to define the exact over-indebtedness limit suitable for banks in order to avoid macro and micro shocks. Beside this, their aim is the education of banks in order to form a set of common principles for risk management inside a financial community.

6.1. The CNB's Intensification of Strictness in Supervision Criteria

There is a direct connection between the changes in prudential regulation and supervisory efficiency of the CNB on the one hand and the efficiency in credit risk management in Croatian banks on the other hand. For the first time in 1993 Bank and Savings bank Act introduced a minimum capital adequacy ratio (8%), special reserves as an insurance for potential losses, limits referring to big or the biggest credit to each borrower, then investments in real estate, in equipment, etc. The CNB was entitled to regulate and supervise banks. However, the credit risk management did not improve and the results that emerged from that situation were described in bank crises. The CNB excused itself by declaring that "…its rights and obligations had not been defined in more detail, as well as the method of performing the supervision…, and the method of undertaking measures to eliminate established irregularities and illegalities in banking business." Nevertheless, this gap was filled with the Bank Act (The Banking Law) in 1998, the Croatian National Bank Act in 2001 and the Bank Act in 2002. With its additional, versatile and more thorough regulations and the essential improvement of supervision function, the CNB has proved that it is the institution which holds key for credit risk management.

The CNB has passed several new Decisions which regulate credit risk management starting from defining the bank's own funds to the contents relating to direct prudential supervision. Among the things that have been introduced there are new deduction items from core capital (intangible assets etc.). The components of supplementary capital are enriched by introducing hybrid and subordinated instruments and new deduction items. Furthermore, there is the calculation of regulatory capital and capital adequacy ratio (10%) on the consolidated and non-consolidated basis. In the system of assets weighing and off-balance- sheet risk items the weights and the basis have been changed (placements are reduced by special reserves for identified losses) and conversion factors for off-balance- sheet items have been introduced as well. Two new criteria are used in the system of the classification of placements into risk groups. Those are the debtor's creditworthiness (so-called subjective criterion) and the collateral quality (prime, adequate and other high-grade insurance instruments). Fixed-rates for the account of special reserves for identified losses cover are replaced with the range of rates for each risk group. In 2005 the coordination of regulations with the IAS created the possibility of assessment and formation of identified losses reserves on the group-wide basis and out from the supplementary capital account while the reserves for non-identified losses were excluded. Some other regulations were adopted as well starting with engaging banks to keep credit records, then elaborating the contents of obligatory reports and finally the introduction of possible use of internal models for credit risk management in banks. These regulations were followed by more precise implementation guidance, which had not been the case before.

Finally, the efficiency of the CNB in supervision of credit risk management essentially improved thanks to new internal organization, personnel planning and training. The Sector of Prudential Regulation and Bank Supervision Area have been created together with five directions (sections) including the Direction for direct risk management supervision. The CNB's report reveals that a great number of supervisions have been done, so that credit risk management has shown a substantial improvement thanks to the resoluteness in sanctioning. Nevertheless, the CNB stands in front of numerous challenges, especially those related to preparations for the Second Basel Accord implementation and to EU regulatory solutions.

6.2. Second Basel Accord

The implementation of the First Basel Accord contributed to safety and stability of bank institutions. On the other hand, numerous problems discovered were the result of negligence in prudential regulation. First of all the risk classification of four categories, which depended only on geographical origin, nature of a borrower and corresponding fixed risk weight, did not take into account sufficiently a real credit quality. What is more, it was possible for banks to come to arbitrage among potential risks. Thus, banks had a tendency to prefer acquiring assets considered risk-free (sovereign securities) in order to reduce the burden of immobilisation of their own funds. Therefore, they reduced granting credits for financing of business firms' projects that were riskier but at the same time a presupposition of development. Second, in the situation of credit portfolio set-back, due to the decrease of conjuncture, banks often did not

have any solution for improvement of their solvency ratio. They preferred to put a stop to credit granting, rather than increasing their own funds level, which contributed to deepening of recession. In the First Basel Accord new risk reduction techniques such as credit risk derivatives, credit securisation etc. were not anticipated. Among other things, durations and diversifications of portfolio were not integrated and operational risks were ignored. The solutions in the Second Basel Accord were designed as an attempt to eliminate these and other omissions in the prudential regulation.

In distinction from the First Basel Accord which laid stress upon the level of own funds, the Second Basel Accord prefers measuring and managing of main bank risks. In fact, a new solution insists on taking into consideration increased complexity of banking activity and new techniques of risk management. The intention is to make demands for own funds more dependent on credit and other risks. The aim is to compel the banks to have larger responsibility. For this purpose banks are offered, using their own judgement, to choose among numerous options in order to establish the minimum of own funds necessary for covering of their losses. The services provided by private rating agencies are taken into account for evaluation of default risk. Banks that use modern internal control instruments for their risk management were rewarded by demands for relatively smaller own funds. Stronger transparency is demanded through obligations of publishing information about risk portfolio, risk management portfolios and recording into capital. Market should play the role of additional momentary supervisor, which means it can penalize a bank.

6.2.1. Credit Risk in First Pillar

The Second Basel Accord stands on three pillars in which credit risk (new calculations), market risk (invariable) and operational risk (innovation) are treated. The first pillar represents the methodology of gathering and use of quantitative data to determine minimal demands for own funds. The other two pillars refer to supervision of regulatory authorities, transparencies and market discipline. They are as important as capital calculations.

The first pillar offers a new aspect in the form of sensibility of own funds to credit risk, which takes into account the quality of brought collaterals apart from borrower's solvency. Furthermore, according to the new accord, banks have an opportunity to choose one application among three options. Banks can use evaluations of acknowledged external credit assessment institutions to determine the level of demanded own funds. It is hidden under the name - Standardised Approach. Banks can also use their own models for risk evaluation or so called Internal Rating Based Approach - IRB. Within this model they can choose between simple (Foundation; F-IRB) and complex approach (Advanced; A-IRB). Minimal demands for own funds depend on corresponding categories of counterparties and their specific risks: big enterprises, sovereigns and public administration, banks, individuals, small enterprises and participations. It is clear that own funds coefficient (own funds / assets) protects banks from insolvency risk. Its inversion is equity multiplier (EM). Beside this, through return on equity (ROE) bank's stockholders assess the profitability of their investments. Because of given return

on assets (ROA) two previous coefficients are tied to each other through equation: ROE = ROA x EM. We can illustrate this with one example.

Let us suppose that there are two banks whose assets portfolios are equal and that they realized the same ROA. Their assets amount to 200 million Euros and ROA by 2%. Furthermore, the first bank's own funds amount to 10 million Euros and the second bank's funds amount to 20 million Euros. What derives from this is that the first bank records the equity multiplier of 200/10=20 and the second one 200/20=10. The return on equity of better capitalised bank is 0,02 x 10 = 0,2 or 20% while the ROE of less capitalised bank is 0,02 x 20 = 0,4 or 40%. So, the stockholders of poorly capitalised bank obtain profitability that is twice bigger than those from well capitalised bank. Therefore it is logical that stockholders want their bank to immobilize as little capital as possible. Considering ROA, the more bank's own funds are poorer the more profitability of stockholders is increased. Motivated by a wish to improve their profitability, stockholders can demand a minimal coefficient of their own funds and in that way put pressure upon management to take additional risks. In order to avoid that negative impulse a regulator needs to weight assets according to their risk and according to that it needs to coordinate the obligation of earmarking into own funds. This is the very aim of own funds weighted by the risk that the Second Basel Accord tried to define.

6.2.2. Standardised Approach

According to Standardised approach the capital adequacy rate of at least 8% remains the same as in the First Basel Accord. Also, national control authorities have a freedom to regulate higher rate of minimal capital. Naturally, the checking is done in the following way: total capital is divided with assets weighted according to a risk. The definition of capital remains the same as in the First Basel Accord. As to weighing of assets according to a risk, it is more differentiated comparing to the previous solution. Higher sensibility of capital demands towards risks is obtained in this way. To determine weights, banks can use assessments of external credit assessment institutions (ECAI) on condition that they are acknowledged by national control authorities. According to the Paragraph 91 of the Second Basel Accord one ECAI should meet 6 criteria whose contents are specified. Ratings, which are determined on the basis of Export Credit Agencies (ECAs) data, can also be accepted when information is available. The standardised weight of 100% is applied when borrowers do not have external references of their creditworthiness. Nevertheless, there is a possibility of using other adjusted coefficients that would reflect real levels of credit risk connected to each contract party. In the presentation of the Second Basel Standardised Approach credit risk weight assessments are used and they are done by Standard & Poor's.

Table 6.1 **Weights under Standardised Approach**

Counterparty			Assessment from ECAIs						
			AAA to AA-	**A+ to A-**	**BBB+ to BBB-**	**BB+ to BB-**	**B+ to B-**	**Below B-**	**Unrated**
Sovereigns			0%	20%	50%	100%	100%	150%	100%
Banks	Option 1		20%	50%	100%	100%	100%	150%	100%
	Option 2		20%	50%	50%	100%	100%	150%	50%
	Option 2 for short-term		20%	20%	20%	50%	50%	150%	20%
Corporates			20%	50%	100%	100%	150%	150%	100%
Retail		75%							
Claims secured by residential property		35%							
Claims secured by commercial real estate		100%[1)]							
Securitisation			20%	50%	100%	350%	Deduction	Deduction	Deduction
Other assets (with exceptions)		100%							

1) The Committee, however, recognises in exceptional circumstances preferential risk weight of 50% (for more detail see BIS, page 24)

Source: BIS, November 2005, (paragraphs: 53, 63, 66, 69-71, 72, 74, 81 and 567)

In distinction from the earlier solution which defined for sovereigns and banks weight application according to the fact if the sovereigns are members of OECD or not, in a new solution weights are determined on the basis of ECAI assessments. For claims towards banks two options are offered, but only one can be applied for all banks under the jurisdiction of national control authorities. The weight for the Retail includes exposure up to 1 million Euros towards individuals and enterprises. The Standardised Approach includes lots of other innovations such as the possibility of credit risk mitigation (CRM) considering collateral, balance sheet netting, guarantees and credit derivatives. We can conclude this part with the example of minimal capital calculation.

Let us suppose that a bank needs to increase its own funds to cover a credit granted to a certain enterprise to the amount of 1 million Euros. This entry into capital depends on rating given to the enterprise. If the given rating is 20%, a bank will have to increase its own funds at 32.000 Euros (8% of 400.000 weighted credit risk). If the rating of the borrower's enterprise islower than "B-", a credit should be weighted by 150% and covered to the amount of 240.000 Euros (8% of 3 million Euros). If the enterprise does not have external rating, which is the case with small and medium-sized enterprises, a bank has to apply the weight of 100% and increase its own funds to the amount of 160.000 Euros. This example can be followed by numerous simple and complex cases from practice.

6.2.3 Internal Ratings-Based Approach

Internal Ratings-Based Approach represents something new in prudential regulation. It is designed for banks witch posses the certain know-how in the area of risk measurement and management, but their approach has to be acknowledged by their control authorities. It can be appealing because it allows the formation of lower level of capital requirements comparing with the Standardised Approach. The decrease of capital immobilisation depends on placements quality in bank's portfolio. This decrease is limited. During the first year of

introducing IRB a requirement can be at least 90% of capital requirement from the previous year, and during the second year at least 80%. To determine risk weighted assets (RW) it is necessary to calculate four parameters. They are: exposure at default (EAD), probability of default (PD), loss given default (LGD) and expected maturity (M). Risk weighted assets are presented as: RW = K x 12,5 x EAD. The capital requirement (K) is determined as the product of multiplication of other parameters, which means that: K = PD x LGD x *f*(M,b). In the Foundation IRB Approach (F-IRB) a bank itself evaluates the probability default (PD) of its debtors and uses the values given by control authorities for other parameters of risk calculation. In the Advanced IRB Approach (A-IRB) a bank itself evaluates all parameters.

According to default conditions, which are defined by the Basel Committee, a borrower probably is not able to fulfil requirements. Either it is a question of a credit case which can result in deferred payment (or cancellation of payment) of mature interest or principal with a lag of more than 90 days or a borrower becomes bankrupt. In each case it is a question of probability default for a given counterparty in a given perspective. Due to the shortage of observations, PD is not determined directly but through bank's evaluation. PD corresponds to a function that integrates the effect of correlation. Second Basel Accord determines different correlation levels for various asset classes as a function of the PD of the obligor. It uses a simple one-factor portfolio model. Function mapping the probability of default to the capital requirement is concave.

EAD corresponds to the sum owed by a counterparty in the moment when default occurs in an adequate perspective used for PD. As for a credit, it represents the capital that remains a commitment in given perspective and possibly mature interest for the same time. EAD are precisely defined in the Accord. Unlike in the standardised approach, collateral is not deducted from EAD.

In the F-IRB approach, the conditions of LGD assessment for every exposure towards enterprises, banks and sovereign borrowers are defined fully and with precision (Paragraphs 286-305). Thus, one LGD of 45% is ascribed to the senior claims that are not secured by recognized collateral, while one LGD of 75% is ascribed to all subordinated claims. In the A-IRB approach banks use their own LGD value assessments but only when certain minimal regulated demands are fulfilled. LGD and K are connected in linear way, which means that the growth of LGD increases K in the same percentage regardless the starting level. Therefore LGD factor has a great influence on capital requirements.

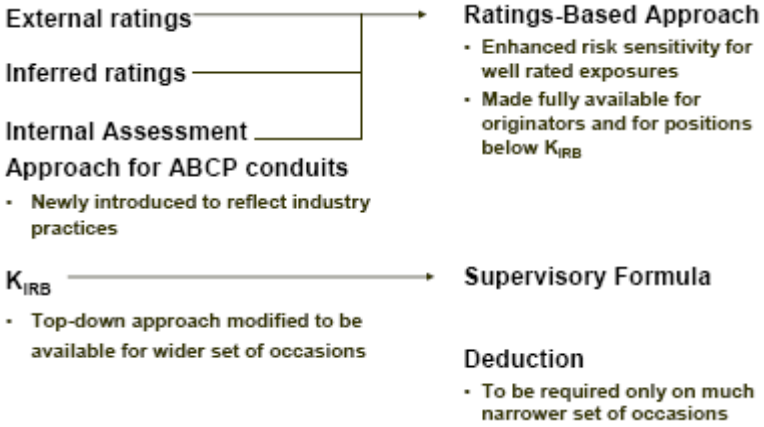
Effective maturity is considered to be a time-limit in which a borrower has to effect its payment. The last term of the capital requirement equation represents credit maturity function (M) and maturity adjustment factor (b) depending on the probability of default. Under the foundation approach for corporate exposures, M is defined on 2.5 years, except for repo-style transactions (M = 6 months). Under the A-IRB approach, the capital requirement formula is adjusted for M of every facility, depending on the level of the probability of default.

Finally, expected average loss equals to the product of multiplication of EAD, LGD and PD. This expected loss has only a general meaning when it is calculated for total claims portfolio. In fact, the loss calculated in the individual level will never be realized.

6.2.4. Securitisation Treatment

The problem of incomplete information for establishing credit risk is especially emphasized in securitisation where different banks play different roles (originator, investor, etc). The Second Basel Accord has made a significant progress in that sense. Risk transfer through securitisation is recognized as a risk mitigation tool and accordingly capital requirements too. Banks' exposures to a securitisation can include but are not restricted to the following: asset-backed securities, mortgage-backed securities, credit enhancements, liquidity facilities, interest rate or currency swaps, credit derivatives. The capital treatment of a securitisation exposure must be determined on the basis of its economic substance rather than its legal form. The Second Basel Accord distinguishes between traditional and synthetic securitisation. In the case of traditional securitisation, the assets located in the vehicle are isolated from the bank transferring credit risk. In the case of synthetic securitisation, where credit risk of an underlying pool of exposures is transferred, in whole or in part, through the use of funded or unfunded credit derivatives or guarantees that serve to hedge the credit risk of the portfolio. In determining the risks associated with securities, the Accord offers a standardized approach, as well as the option of using a more sophisticated internal rate based approach.

Figure 6.1 **Securitisation: parameters and approaches**



Source: Ryozo Himino, Basel II - towards a new common language, BIS Quarterly Review, September 2004, p. 47.

The capital reserve requirements depend on the approach used. When banks are choosing the standardized approach, the various weights are incorporated as shown earlier in Table 6.1. The ratings provided by external agencies still play a major role, for both the standardized and the IRB approaches. In the IRB approach, the K_{IRB}, which is the amount of required capital, becomes the central concept. Practically, there are two ways to calculate the amount of required economic capital: the ratings-based approach (RBA) and the supervisory formula (SF) approach. The former uses predetermined risk weights associated with the ratings of each tranche, and the latter s based on a parametric formula determined by the Basel Committee.

Although securitisation aims to mitigate credit risk, there often still remains a "securitisation exposure" that could result in credit loss. For example, if a bank securitizes home loans, so that investors buy bonds based on homeowners' mortgage payments, it passes much of the risk onto these bondholders. However, the bank still would not want massive defaults on its home loans, so it would give implicit support to the these mortgage-backed securities. Therefore, the bank still faces a risk and should keep some capital aside. Also, banks themselves hold securities such as bonds and this presents a credit risk in and of itself. Nevertheless, by approaching its methods to the practice of the profession, the Second Basel Accord has succeeded in simplifying the solutions of securitisation in the way that the use of available information has reached its optimum.

6.2.5. Advantages and Disadvantages

How much does the Second Basel Accord really represent a qualitative progress with its new regulatory content of bank prudence - that is the question which can be answered with precision only after some period of its practical use. On the other hand, as we have already mentioned, insisting on preferring the risk measurement and management (new techniques and models) gives (a bank an opportunity to select among numerous options in order to determine the level of minimal own funds and other innovations, might at least strengthen bank's motivation in accepting the best practices of credit risk management. According to the pleaders of new prudential solutions within Directive (CRD), adjusted to the Second Basel Accord, the capital adequacy requirements should have a positive influence on the banks from EU countries. Also, the results of certain model simulations give an impression that significant positive macroeconomic effects could be obtained (PWC RM, 2004, p.10-11 and 77-116). Actually, the GDP level of EU members could increase for about 0.07% capital requirements could decrease for about 5% (between 80 and 100 billion Euros) and in that way enhance the annual profit of banks for about 10 to 12 billion Euros. However, this optimism is not present everywhere, or at least it does not exist when the Second Basel Accord is applied in other countries including the USA as well (Sevigny and Renault, 2004, p.407-413). Among lots of open questions concerning the new solution the problem of complexity, procycliness and inadequate market discipline is especially emphasized.

Implementation of the Second Basel Accord is not simple even for well developed American banking. It was announced that new ratios would be used but only in ten big banks with significant international activity (Ferguson, 2003, p.1). Generally speaking, by reason of very complicated solutions, majority of banks are not able to apply new techniques of risk measurement and will continue using standardized methods. Even if they could perform complex calculations, there would be the question whether it is good to encourage some kind of competition in risk assessment among banks and to enhance arbitrage costs or not. The arbitrage among evaluations of the probability of default might be the source of additional moral hazard. The question is whether the new system is useful at all or not because of some other reasons. Thus, if the average capital level of bigger banks is raised to a higher level than

regulated one, for example to 12%, new instruments will be needless because they have already been used in spontaneous enhancement of capital through regulated requirements.

The good thing is that advanced techniques enable more sophisticated analysis of credit risks. But higher sensibility of own funds towards risks deriving from banking activities can cause excessive variability on cyclical fluctuations of economy. Due to inverse variability of own funds levels, market trends and influences that spread unstability in economic activity intensify. If this hypothesis is approved after the implementation of new techniques, then there will be a conflict of interests between the aim of the improvement of risk management and macroeconomic aim of the maintaining of financial stability. Indeed, there are some possibilities to correct those distorted effects by using risk evaluation methods for long periods (the whole of cycle) and by formulating of additional funds in relation to regulated ones. The former could reduce abrupt changes in anticipations, but the problem how to define the beginning, the duration and the end of a cycle still remains. The latter could play the role of contra cyclical shock-absorber, but that is a question of market demands for more intensive transparency.

The Second Basel Accord insists much more on development of the first pillar, especially in relation to the third pillar that scarcely participates in the market discipline. There are some methods of intensifying market discipline and it is believed they could contribute to larger complementary substitutability of regulators' supervision. Those methods are forcing of more intensive transparency, evaluation of banks' sources structure in favour of unsecured bonds and using of market information about interest spreads on bank's bonds which are good indicators of bank solvency. Nevertheless, the question is to what extent these methods can respond to the task relating to procycliness. They treat microeconomic features of banks and do not pay attention to macroeconomic management of bank crises and maintaining of financial stability.

6.3. Croatian Banks expecting the Second Basel Accord

There was no urgency in coordinating Croatian banking prudential regulation with the Second Basel solutions. It seems that there was a great deal of optimism relating the date of admittance of Croatia into the membership of EU. Furthermore, a simple transplantation of solutions from the Re-casting Directive (CRD) was something which was expected to count upon. Finally, the results of our research so far, particularly in the fifth chapter, undoubtedly prove that it is necessary to fulfil lots of conditions in order to get an opportunity to essentially improve the risk management and prudential function. More or less that would be a direction to objectives of the Second Basel Accord and CRD.

The CNB initiated the discussion and animated bankers with a survey about the Second Basel Accord (Appendix D). The explanation was published and an opinion given on answers to the survey questions. (Martinjak, June, 2005). Some remarks regarding methodology can be addressed to the questionnaire in terms of a small number of questions, problematic formulations etc., which diminishes the validity of general evaluation. Another main remark

refers to the interpretation of results which takes into account only the opinions and data of interviewees. Even without that survey the CNB as a supervisor should have at its disposal lots of relevant data that would be helpful for better general evaluation. Finally, the Basel Committee was continually inviting supervisors to contribute in the formation of the final version of the Accord with their remarks and suggestions, which includes implicitly a substantial knowledge of domestic banking practice at least. We do not believe that this CNB's preoccupation was the reason of delay of the discussion about the Second Basel Accord. The Bank of Slovenia published a similar survey in March 2002. Finally, there are significant contradictions in the answers.

The CNB estimates that answers to the first question (knowledge of the Second Basel's contents) "are not promising". Taking into consideration the structure of banks in terms of their size and some other facts, and assuming that answers to that question were really sincere and authentic, one should think that bankers deserve a better grade. However, in our opinion their findings are questionable. Even the best educated bankers who have studied the regulations of the Second Basel Accord can easily conclude that it is an extremely complex matter and that a lot of time is necessary for its thorough comprehension. Furthermore, there is a huge problem in observing the consequences of its possible use. On 3 and 4 July 2006 the CNB organized an instructive workshop about the basic contents of the Accord and CRD, which revealed the real competence of bankers. It is not clear what the sense is of posing the second question, if it is not known when the solutions of the Second Basel Accord and/or CRD will be incorporated into the domestic banking prudential regulations.

It is surprising how much optimism springs from answers given by numerous banks to some questions from the survey. For instance, as to the Question 5, ten banks decide in favour of the Standardized approach, seventeen banks in favour of F-IRB and five banks in favour of A-IRB. How can banks count on the Standardized approach if the services of ECAI are not used enough (Question 12) and similar domestic agencies still do not exist. Are Croatian enterprises willing to ask for ECAI services because of additional costs connected to credit application, especially because on the list of the best 500 there are 375 enterprises whose revenue is less than 50 million Euros (IBI, 2005)? The number of seventeen banks inclined to F-IRB and five banks inclined to A-IRB is really impressive. Are those banks really aware of the tasks that are in front of them, even more so if they point to the presumption from the Question 15 as a big problem? There are some contradictions between the Questions 5 and 9 as well. No one has ever forbidden banks to use internal models for risk management, so the Second Basel Accord is not relevant in that sense. After the implementation of the Second Basel Accord lots of banks see the chance of lower capital requirement for credit risk. Referring to that we can ask the following question: Why do Croatian banks have capital adequacy ratios that are significantly higher than the regulated ones (see the item 3.6. of our thesis)? It would be interesting to find out what kind of advantages can be ensured by ten banks through smaller direct dependence on regulators. They might count on supervisors' inadequate qualifications which has been confirmed by some cases of delayed CNB's reactions to the moves of bigger banks in foreign ownership. After all, smaller dependence on regulators implies bigger obligations and responsibility. It seems that the person who comments the questions from the survey

excessively emphasizes the role (the support) of foreign parents of Croatian biggest banks concerning the implementation of the Second Basel Accord and / or CRD. We do not deny such advantages, but still there is a question of relation between the paid prices and benefits obtained from the transferred models (7 banks) and those that will come from other countries. There is an insufficient transparency in that matter and in a lot of other things. Therefore we sustain opinions given by external experts and quoted earlier about the importance of the third pillar in the Second Basel Accord. This does not suit Croatian because they decide in favour of integrated system of publishing data on exposure to credit. Naturally, the bankers' opinion should be listened to and the cooperation between them and supervisors is extremely important. But apart from individual interests, there are some common interests which must be protected by supervisors at any cost.

Our short review of banks' attitudes should not be conceived as an implication that everything is bad and that nothing good has been done so far. The Second Basel Accord has certainly raised dust among bankers. In the 5th chapter of our thesis we have pointed out that even small banks doubled their efforts to provide new data bases and the improvement of credit risk management was also noticed.

Regarding that the CNB made a substantial progress in 2007 by offering suggestions for new regulations. The draft proposal of an Act of Credit Institutions (ZOKI) that includes lots of innovations was offered for discussion in July 2007. The biggest part of its new regulations refers to the field of credit risk management. In October 2007 the CNB offered the suggestions of its Decisions for discussion and among them the Decision on the capital adequacy for credit institutions was the most comprehensive one. That Decision mainly represents the copy of CRD. The dates of passing and implementation have not been defined yet. The ZOKI and Decisions are expected to be implemented early in the year 2009. The CNB announced that it would "conduct the quantitative study of effects made by the implementation of the suggested draft Act and Decisions on the banking system." For that purpose, on 11th December 2007 the CNB sent to banks some questionnaires for gathering certain information and data (at 31.12.2007) but without any note regarding the time-limit until which the data should be sent back. Thus, the time is unknown when this simulation of implementation (standard or IRB) could be performed. Considering the current circumstances, the question is how useful this simulation can be. The biggest problem is the impossibility of gathering the reliable data. For example: How can the banks use more favourable weights if the CNB has not licensed any ECAI yet? There are also a number of other statistic problems that hamper correct classification of credit exposure into groups. Nevertheless, the things are put in motion at a rapid pace.

7. Conclusion

Despite the growing role of the market and financial institutions and instruments in the Croatian financial system, banks and credits are still dominant and consequently credit risk as well. Besides, it is important to emphasize that new financial institutions originated mainly within bank groups. A major part of corporative debt securities has been placed abroad. The credit risk is also present in leasing that had high rates of growth last years. The share market inadequately fulfils its basic function and that is the financing of economic development. The issue of shares of non-financial companies generally motivated by privatisation and restructuring of government enterprises shows the tendency of decrease. The capital of enterprises remains closed. Therefore, the potential financiers come up against the asymmetric information to a greater extent than those in developed capital markets. Especially in those circumstances the financial intermediaries gain an advantage over direct finances. Banks have an additional advantage at their disposal owing to the diversity of services they provide to their clients, which represents the source of information control. Particularly, their function of account servicing and management of payment instruments is the basic element of borrower's special quality evaluation. Bilateral relations between a bank and its clients really supply it with huge data. Previous credit connection, fluctuations and balances of different accounts managed by a bank, possible payment disarrangements etc. represent bank's internal information which is intransferable in the market.

The Croatian banking system seems to be stable and is surely effective in technical sense. That is primarily the result of improved credit risk management. Matured and unsettled bank claims stay within tolerable limits. Nevertheless, the credit policy in the context of risk is not satisfactory. Thus, the increasing proportion of credits to households, which is especially supported by banks' borrowing from their parent banks abroad, has exceeded the decreasing proportion of credits to enterprises in total credits. A well-known fact is that the financing of projects from the corporate sector is highly hazardous, but the economic progress is not possible without that. This situation together with some other reasons already generates a hazard of excessive exposure to households sector although this type of credits should be less risky (diversification effect, easier processing of credit applications etc.). Profitability and general performance of Croatian enterprises are on the increase, so the reluctance of banks towards financing of this sector can be considered as a result of excessive aversion to corporate risk and inadequate bank's qualification in debtors selection. Bankers will have to turn into another track if they count on profits which become thinner and thinner. The presence of derivative instruments, whose most important task is risk protection, is rather poor within off-balance sheet and particularly balance sheet operations. Banks do not suffer from insolvency any more. But in the circumstances of intensive deposits growth, the possibilities of balance sheet terms structure to improve profitability are insufficiently used. Prudential management of risk interactions between assets and liabilities represents thorough and systematic dealing with durations but even the biggest Croatian banks do not do that. Banking restructurings, including the economics of scale and scope effects, have surely contributed to better risk management. But the inclusion into powerful foreign financial groups has brought to light certain asymmetric information (relations: banks - supervisor, banks - other subjects interested in their

work) which affects the allocation of available resources. Capital adequacy rates, though decreasing, are still more or less much higher than the regulated ones, depending on a bank. The level of economic (optimal) own funds could be obtained only by better management of bank risks. Among other things, this includes the anticipation of cyclical movements in economy.

Credit markets are imperfect. There are asymmetric information, moral hazard, adverse selection, disaster myopia and some other phenomena that explain the pro-cyclical nature of movements in credit markets, financial and economic instability. Between 1995 and 2004 there were two credit booms and between them one credit bust in the Croatian banking system. During the credit bust, which was a result of a bank crisis, the rates of economic growth decreased drastically partly showing negative values. As the bank crisis was the consequence of poor credit risk management and supervisor's neglect, there should be no doubt that there is a connection between credit risk and cycle on the one hand and economic cycles on the other. Everything shows that a new credit bust could follow and according to the IMF estimate even a financial crisis. Balance of payments deficit and commercial balance deficit, external debt and budget deficit have become intolerable. Existing GDP rates of growth, mostly based on the growth of consumption, cannot be sustained. Limitation of deficit and slowing down of economic activity could make the banks even more vulnerable. In such situation credit risk management becomes more complex.

The improvements in credit risk management assume, among other things, gathering and interbank exchange of information, creating of domestic agency for rating assessment of borrowers and selection of most suitable methods and models for credit risk management. Banks have intensified their efforts, but there is still enough space for completing relevant data bases particularly on enterprises. Croatian register of credit commitments (HROK) has been founded and it is to include other lenders to consumers. The formation of domestic ECAI has not been considered yet. A significant number of banks use the credit scoring method for consumers and SME, but final assessments are subjective. More reliable methods might be used for this kind of bank clients. Some of the biggest banks have introduced methods for automatic classification of corporate borrowers, but their final decisions are still subjective. Of course, there are series of more advanced models for credit risk assessment but their implementation is limited. Nevertheless, some of these models might be used in Croatian banks but under the wing of their foreign parents.

Incomplete regulation and the CNB's vaguely defined supervision function both belong to main reasons of poor credit risk management and bank crises Croatia had to face in 1990's. Since then numerous interventions into banking legislation have followed and some Decisions relating the credit risk management have been amended. These Decisions were followed by more precise implementation guidance (Instructions and Forms), which had not been the case before. Finally, the efficiency of the CNB in supervision of credit risk management essentially improved due to a new internal organization, personnel planning and training. Nevertheless, the CNB faces numerous challenges, especially those related to preparations for the Second Basel Accord implementation and to the EU regulatory solutions. The new solution insists on

taking into consideration increased complexity of banking activity and new techniques of risk management. They were subject to harsh criticism but at the same time they give hope for significant improvement in credit risk management. The CNB has carried out a poll among banks and organized different workshops. It seems that all bankers have not been fully aware of the difficult tasks ahead of them and there have also been expressions of excessive optimism. At this moment the draft proposal of the Act of Credit Institutions (ZOKI) is being discussed as well as some Decisions that are to become operative nobody knows when. Bankers are busy filling in the questionnaires with a lot of data which should serve to simulate the effects of new solutions. It seems that the quantitative study will be to no purpose as it will not be based on good classification of statistic data and because of some other reasons.

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Appendix A

Appendix A1 **Interests rates (on loans)**

Credit to households %	Overdrafts on current account		Non purpose loans		Housing credits	
for May 2005	allowed	not allowed	NIR[1)]	EIR[2)]	NIR	EIR
I group of banks						
Erste	14,95	15	9.45-9.55	10.69-11.45	4.99-6.85	5.59-7.17
HVB Splitska banka	13.0-15.0	15	5.50-9.49	6.17-10.75	4.89-6.59	5.13-6.95
Hypo Alpe-Adria Bank	14.5	15	9.5-11.50	10.87-13.61	3.99-7.25	4.17-7.63
Nova Banka	14.99-16.06	15.0-16.08	8.99-11.49	10.07-13.96	5.99-8.39	6.26-8.92
Raiffeisen banka	8.45-13.95	15	8.95-9.75	9.85-10.73	4.50-6.35	4.70-6.66
Zagrebačka banka	14.99	18	9.50-12.49	10.19-14.11	6.8-9.5	6.9-10.07
II group of banks						
Istarska kreditna banka	13	15	8.85	9.92	4.95-6.30	5.46-7.21
Jadranska banka	16.5	18.5	10.50-12.90 (clients) and 13.90	na	na	na
Volksbank	13.80-14.80	15	6.00-10.15	7.34-13.68	4.40-6.70	5.00-7.34
III group of banks						
Banka Sonic	8.5	15	7.5	9.88	na	na
Centar banka	14.5	15	12.95	16.13	8.50-9.00	8.84-9.38
Kreditna banka	14.5	15	9.49-9.99	do 13.83	7.75-8.50	do 9.64
Partner banka	14	15	lis.13	11.42-14-81	na	na
Slatinska banka	14.5	15	9.0-11-50	11.43-17.19	8.50-9.0	9.98-10.40

IV group of banks						
Banka Brod	na	na	9.99	16	8.9	15
Banka Splitsko-dalamatinska	na	na	11.9	17.89	na	na
Gospodarsko kreditna banka	15	na	na	na	na	na
Nava banka	na	na	8.5-10.5	9.0-11.0	8.0-9.0	8.7-9.7
Požeška banka	14.95	18	9.75-12.0	10.14-12.17	6.0-10.0	6.93-10.19

1) NIR stands for Nominal Interest Rate
2) EIR stands for Effective Interest Rate
Source: BANKA ,June 2005, p.124-125.

Appendix A2 **Interests rates (on deposit)**

Natural Deposit %		HRK				EUR			
for May 2005	Interest rate	A vista	6M	12M	24M	A vista	6M	12M	24M
I group of banks									
Erste	fixed	0.5	4.35	5	5.6	0.35	2.90-4.10	3.30-4.70	3.85-4.95
HVB Splitska banka		0.1/0.2	4.5	5	5.25	0.1/0.2	1.9-3.0	2.4-3.5	2.8-3.8
Hypo Alpe-Adria Bank	fixed	na	4.25	4.75	5	na	2.75-3.5	3.25-3.75	3.5-4.25
	variable	1	4.75	5.25	5.5	0.5	3.0-3.75	3.5-4.25	4.0-4.75
Nova banka	fixed	na	na	na	na	na	2.6-on agreement	2.95-on agreement	na
	variable	0.4	4.1	4.6	5.1	0.3			
Raiffeisen banka	fixed	na	na	na	na	na	2.65-3.85	3.15-4.10	3.40-4.50
	variable	0.7	4.3	4.7	5.1	0.3	2.65-3.85	3.15-4.10	3.40-4.50
Zagrebačka banka	fixed	na	3.3	3.8	4	na	1.45-2.30	2.0-2.85	2.40-3.30
	variable	0.00-0.75	4.3	4.8	5	0.15	2.45-3.30	3.00-3.85	3.40-4.30
II group of banks									
Istarska kreditna banka	fixed	na	na	na	na	na	2.5-on agreement	3.0-on agreement	na
	variable	0.60-0.80	4.3	4.8	5.5	0.3	3.0-on agreement	3.5-on agreement	4.0-on agreement
Jadranska banka	fixed	na	na	na	na	na	2.20-3.10	3.10-3.90	3.80-4.40

	variable	1.3	3.5	4.5	5.5	0.6	2.4-3.30	3.30-4.10	4.00-4.60
Volksbank	fixed	na	na	na	na	na	2.50-3.25	3.0-4.0	3.20-4.20
	variable	0.00-0.75	4.3	4.8	5	0.15	2.45-3.30	3.00-3.85	3.40-4.30
III group of banks									
Banka Sonic	fixed	na	5.25	7.5	na	na	4	5.25	na
	variable	0.5	5.5	7.75	8	0.5	4.25	5.5	6
Centar banka	fixed	na	4.5	5	na	na	3	4	na
	variable	1	5.5	6	7	0.75	4	5	6
Kreditna banka	variable	1	3.5	4.5	5	0.75	2.5	3.5	4
Partner banka	fixed	na	na	na	na	na	2.8	3.8	on agreement
	variable	0.5	5.2	5.8	6.5	0.5	3.8	4.8	5
Slatinska banka	variable	0.8	5.5	6	6.5	0.6	3.80-4.50	4.30-5.0	4.50-5.30
IV group of banks									
Banka Brod	fixed	2	6	7	8	1	5	6	7
Banka Splitsko-dalamatinska	fixed	na	5.2	6.7	6.9	na	3.2	3.9	4.5
	variable	0.5	5.5	7.75	8	0.5	4.25	5.5	6
Gospodarsko kreditna banka	variable	na	3	3.5	4	na	2.0-3.0	2.50-3.50	3.50-4.50
Nava banka	fixed	1	4.0-5.0	5.0-6.0	6.0-6.5	1	4.0-4.25	4.25-4.50	4.50-5.0
Požeška banka	fixed	1.5	5	5.5	6.2	na	na	3.0-5.0	3.80-5.80
	variable	1.5	5	5.5	6.2	na	na	3.50-5.50	4.30-6.30

Source: BANKA ,June 2005, p.124-125.

Appendix B

Appendix B1 **Credits to Enterprises and Industrial Production**

Appendix B1-1 Results of a single regression assessed by Least Squares method

Model Summary(b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,917(a)	,841	,840	4,3574	,059

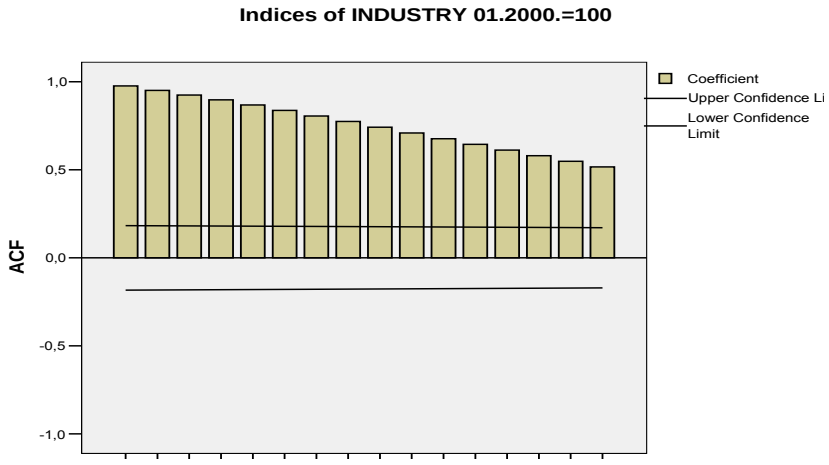
a Predictors: (Constant), LAGS(Loanstoenterprises,12)
b Dependent Variable: Indices of INDUSTRY 01.2000.=100

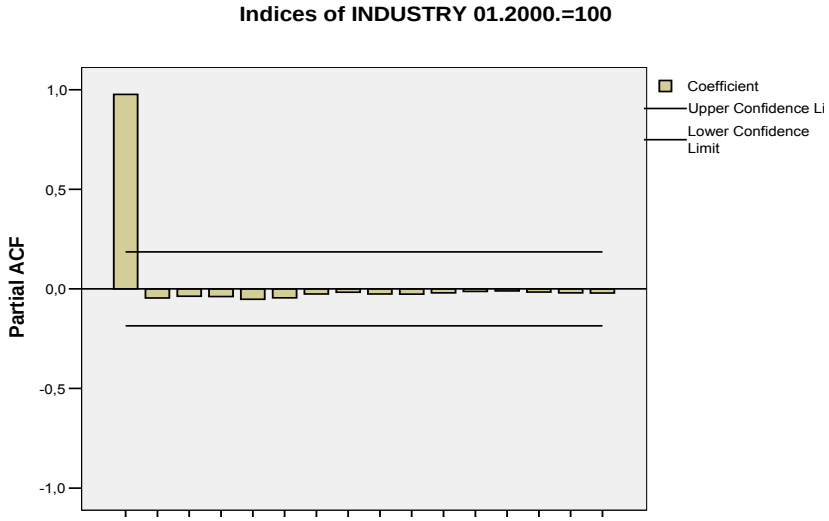
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	70,262	1,549		45,366	,000
	LAGS(Loanstoenterprises,12)	,001	,000	,917	24,599	,000

a. Dependent Variable: Indices of INDUSTRY 01.2000.=100

Appendix B1-2 Testing ACF and PACF for Indices of Industry





Appendix B1-3 By using Two Stage Least Squares we have obtained the following results:

Dependent Variable: INDUS
Method: Two-Stage Least Squares
Included observations: 115 after adjustments
Convergence achieved after 5 iterations
Instrument list:
Lagged dependent variable & regressors added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	60.54472	15.63716	3.871849	0.0002
LOTOENT(-12)	0.001343	0.000362	3.711303	0.0003
AR(1)	0.966230	0.023590	40.95993	0.0000

R-squared	0.986702	Mean dependent var	107.1900
Adjusted R-squared	0.986465	S.D. dependent var	10.82092
S.E. of regression	1.258926	Sum squared resid	177.5081
F-statistic	4204.113	Durbin-Watson stat	1.531522
Prob(F-statistic)	0.000000		

Inverted AR Roots	.97

$$y_t = 60{,}5447 + 0{,}0013 \cdot X_{t-12} + e_t$$
$$e_t = 0{,}966 \cdot e_{t-1} + \varepsilon_t$$

Appendix B2 **Credits to Enterprises and GDP**

Seasonal Factors

Series Name: GROS DOMESTIC PRODUCT (market prices)

Period	Seasonal Factor (%)
1	93,6
2	99,6
3	107,3
4	99,5

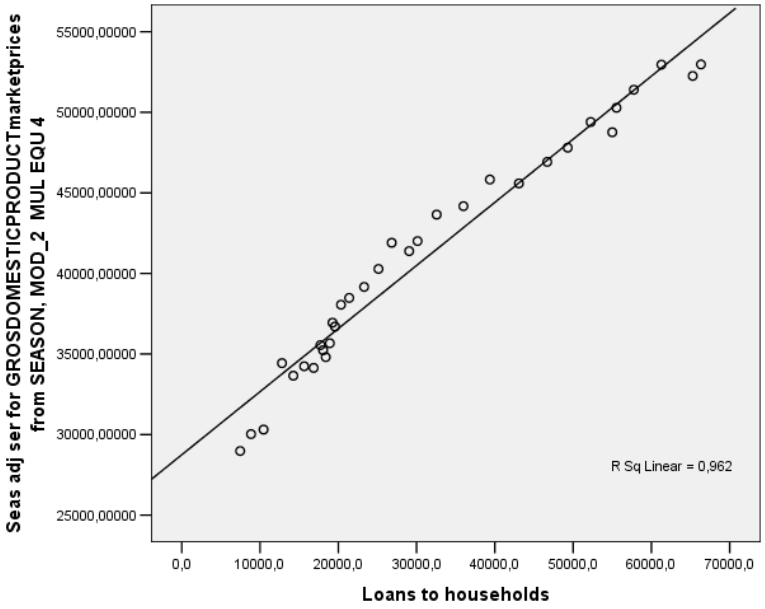
Appendix B3 **Credits to Households and GDP**

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2E+009	1	1574312547	793,577	,000[a]
	Residual	61498343	31	1983817,509		
	Total	2E+009	32			

a. Predictors: (Constant), Loans to households

b. Dependent Variable: Seas adj ser for GROSDOMESTICPRODUCTmarketprices from SEASON, MOD_2 MUL EQU 4



Appendix B4 **Housing Credits and Production in Construction**

Appendix B4-1 Indexes of realized construction had to be seasonal decomposed since they show strong periodical repetition in the course of 12 months

Seasonal Factors

Series Name: Indices of total volume of CONSTRUCTION Ć 2000 = 100

Period	Seasonal Factor (%)
1	77,6
2	87,2
3	101,5
4	105,6
5	108,9
6	105,6
7	109,0
8	101,9
9	105,8
10	108,3
11	100,7
12	88,0

Appendix B4-2 By using Least Squares we have obtained the following results:

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	25312,462	2	12656,231	465,901	,000
Residual	1738,563	64	27,165		
Total	27051,025	66			

The independent variable is In that: Housing loans.

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
In that: Housing loans	,016	,001	3,961	16,552	,000
In that: Housing loans ** 2	-4,2E-007	,000	-3,114	-13,010	,000
(Constant)	-1,242	6,329		-,196	,845

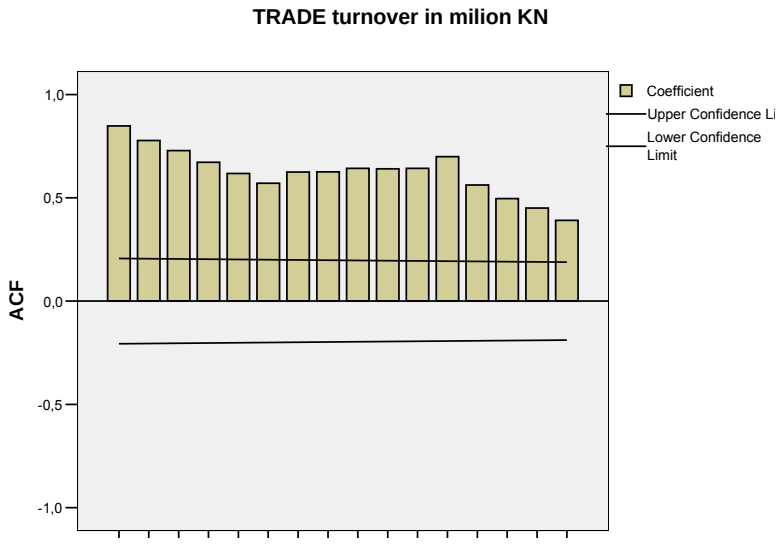
Appendix B5 **Credits to Households and Trade Turnover**

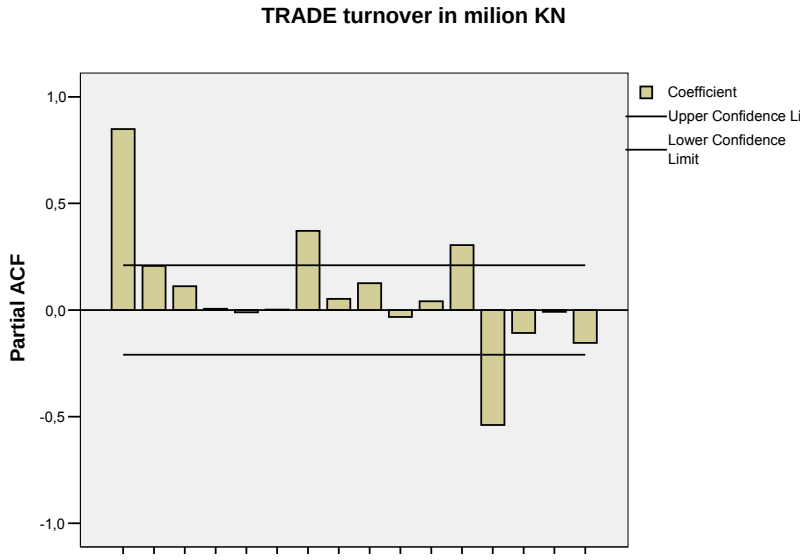
Seasonal Factors

Series Name: TRADE turnover in milion KN

Period	Seasonal Factor (%)
1	80,5
2	81,7
3	95,3
4	99,4
5	102,4
6	103,2
7	112,6
8	109,8
9	105,2
10	104,3
11	95,3
12	110,4

Testing ACF and PACF for Trade





By using Two Stage Least Squares we have obtained the following results:

Dependent Variable: DESEZ
Method: Two-Stage Least Squares
Sample (adjusted): 2 73
Included observations: 72 after adjustments
Convergence achieved after 4 iterations
Instrument list:
Lagged dependent variable & regressors added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3733.639	225.8024	16.53498	0.0000
LOTOHW	0.083247	0.007137	11.66352	0.0000
AR(1)	0.759678	0.073212	10.37642	0.0000

R-squared	0.975996	Mean dependent var	5972.753
Adjusted R-squared	0.975300	S.D. dependent var	1070.771
S.E. of regression	168.2843	Sum squared resid	1954052.
F-statistic	1398.730	Durbin-Watson stat	2.437661
Prob(F-statistic)	0.000000		

Inverted AR Roots	.76

Appendix B6 **Credits to Enterprises and Trade Turnover**

Dependent Variable: DESEZ
Method: Two-Stage Least Squares
Sample (adjusted): 14 91
Included observations: 78 after adjustments
Convergence achieved after 6 iterations
Instrument list:
Lagged dependent variable & regressors added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1923.088	3565.352	0.539382	0.5912
LOTOENT(-12)	0.110939	0.075702	1.465467	0.1470
AR(1)	0.947134	0.042451	22.31107	0.0000

R-squared	0.970203	Mean dependent var	5807.014
Adjusted R-squared	0.969408	S.D. dependent var	1179.825
S.E. of regression	206.3582	Sum squared resid	3193778.
F-statistic	1230.151	Durbin-Watson stat	2.607510
Prob(F-statistic)	0.000000		

Inverted AR Roots	.95

Appendix C

Appendix C1 **Score points for physical persons' using behaviour analysis** (data obtained from one bigger Croatian bank)

	score points
Age in years	
0 - 29	-25
30 - 37	0
38 -	-5
Gender	
Female	10
Male	0
Number of children	
0	-10
1	10
2	0
3+	-15
Marital status	
Married	0
Divorced	-10
Single	-10
Life partnership	0
Widowed	0
Unknown	0
Profession	
Employee	15
Manager	25
Worker	-10
Civil servant	15
Student	0
Pensioner	0
Housewife	0
Basic military, police	0
Doctor	25
Self employed	-10
Others	0
Employer's industry	
Agriculture	-15
Fishing	-15
Mining	-15
Manufacturing	-30
Electricity, gas, water	0
Construction	-30
Wholesale, retail	-20
Hotels and restaurants	-15
Transport, storage, communication	-5
Financial intermediation	0
Real estate, renting, business activity	0
Public administration	0
Education	0
Health and social work	0
Other social and personal services	-10
Pensioner	0
Others	0

Accomodation

Owner of house	15
Owner of flat	15
Tenant	0
With parents (owner)	10
With parents (tenant)	0

Loan / income

0	-	7,40	-5
7,41	-	10,60	0
10,61	-		-20

Monthly payment / income * 100

0	-	20,60	-5
20,61	-	25,80	0
25,81	-		-25

Appendix C2 **Results from the research of clients' behaviour** (data obtained from one bigger Croatian bank)

Fine Interval	# Goods	% Goods	# Bads	% Bads	# Total	% Total	G/B Odds	G/B Index		Bad Rate
	311	4,4%	55	14,7%	366	4,9%	5,7	336	B	15,0%
	336	4,7%	36	9,6%	372	5,0%	9,3	204	B	9,7%
	833	11,7%	61	16,3%	894	11,9%	13,7	139	B	6,8%
	858	12,0%	51	13,6%	909	12,1%	16,8	113	B	5,6%
	385	5,4%	19	5,1%	404	5,4%	20,3	107	G	4,7%
	1057	14,8%	40	10,7%	1097	14,6%	26,4	139	G	3,6%
	535	7,5%	17	4,5%	552	7,4%	31,5	166	G	3,1%
	870	12,2%	43	11,5%	913	12,2%	20,2	107	G	4,7%
	547	7,7%	16	4,3%	563	7,5%	34,2	180	G	2,8%
	634	8,9%	27	7,2%	661	8,8%	23,5	124	G	4,1%
	423	5,9%	4	1,1%	427	5,7%	105,7	556	G	0,9%
	336	4,7%	6	1,6%	342	4,6%	56,0	295	G	1,8%
TOTAL	7125	100,0%	375	100,0%	7500	100,0%	19,0	100	B	5,0%

	# Goods	% Goods	# Bads	% Bads	# Total	% Total	G/B Odds	G/B Index		Bad Rate
Stop Zone	2549	35,8%	208	55,5%	2757	36,8%	12,3	155	B	7,5%
Red Zone	1704	23,9%	87	23,2%	1791	23,9%	19,6	103	G	4,9%
Green Zone	1952	27,4%	65	17,3%	2017	26,9%	30,0	158	G	3,2%
Top Zone	920	12,9%	15	4,0%	935	12,5%	61,3	323	G	1,6%
TOTAL	7125	100,0%	375	100,0%	7500	100,0%	19,0	100	B	5,0%

Appendix C3 **Example for Corporate Selection**

Appendix C3.1 Summary statistics of financial ratios

```
  ___  ____  ____  ____  ____ tm
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/    8.0
  Statistics/Data Analysis

      Special Edition

Notes:
      1.  (/m# option or -set memory-) 10.00 MB allocated to data
      2.  (/v# option or -set maxvar-) 5000 maximum variables

. use "C:\Documents and Settings\Kristina\My Documents\financial rating 2003.dta", c
> lear
. summarize r1, detail

                            r1
-------------------------------------------------------------
      Percentiles      Smallest
 1%           799           799
 5%           978           966
10%          1645           978       Obs                  59
25%          2161          1115       Sum of Wgt.          59

50%          3348                     Mean            10244.56
                        Largest       Std. Dev.        17569.8
75%          8458         46779
90%         41407         52969       Variance        3.09e+08
95%         52969       79509.58      Skewness        2.743516
99%       79509.58       79509.58      Kurtosis        9.943112

. summarize r2, detail

                            r2
-------------------------------------------------------------
      Percentiles      Smallest
 1%           -26           -26
 5%        -10.19        -12.25
10%         -5.75        -10.19       Obs                  59
25%          1.07          -8.8       Sum of Wgt.          59

50%          8.71                     Mean            15.71919
                        Largest       Std. Dev.       23.62779
75%         24.18         76.898
90%         50.87         76.898       Variance        558.2726
95%        76.898         76.898       Skewness        1.307221
99%        76.898         76.898       Kurtosis        4.190931

. summarize r3, detail

                            r3
-------------------------------------------------------------
      Percentiles      Smallest
 1%       -17.102       -17.102
 5%        -11.83       -17.102
10%         -8.14        -11.83       Obs                  59
25%         -4.09        -11.82       Sum of Wgt.          59

50%           .24                     Mean            .1237119
                        Largest       Std. Dev.       7.335911
75%          2.52          15.57
90%         11.64         17.011       Variance        53.81558
95%        17.011         17.011       Skewness        .2633039
99%        17.011         17.011       Kurtosis        3.677422
```

```
. summarize r4, detail

                            r4
-------------------------------------------------------------
      Percentiles      Smallest
 1%           -60            -60
 5%           -60            -60
10%           -60            -60       Obs                  59
25%          1.39            -60       Sum of Wgt.          59

50%          2.93                      Mean            13.77971
                      Largest           Std. Dev.       113.8579
75%          5.09          19.05
90%         16.01          41.92       Variance        12963.63
95%         41.92          54.15       Skewness        7.043549
99%       857.323        857.323       Kurtosis        52.86015
. summarize r5, detail

                            r5
-------------------------------------------------------------
      Percentiles      Smallest
 1%        -28.89         -28.89
 5%         -2.74          -8.07
10%          1.86          -2.74       Obs                  59
25%          8.81            .32       Sum of Wgt.          59

50%         22.05                      Mean            29.03373
                      Largest           Std. Dev.       26.15935
75%         46.02          80.86
90%         70.31          81.16       Variance        684.3116
95%         81.16          82.87       Skewness        .5269752
99%         84.25          84.25       Kurtosis        2.575737
. summarize r6, detail

                            r6
-------------------------------------------------------------
      Percentiles      Smallest
 1%          8.19           8.19
 5%         13.57          13.41
10%            20          13.57       Obs                  59
25%         42.99          15.39       Sum of Wgt.          59

50%         69.63                      Mean            81.34864
                      Largest           Std. Dev.       53.66423
75%        104.78         192.85
90%        172.86         214.28       Variance        2879.85
95%        214.28         218.18       Skewness        .9964557
99%        218.18         218.18       Kurtosis        3.395708
```

Appendix C3.2 Model summary output

```
  ___  ____  ____  ____  ____ tm
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/    8.0
  Statistics/Data Analysis

      Special Edition

Notes:
      1.  (/m# option or -set memory-) 10.00 MB allocated to data
      2.  (/v# option or -set maxvar-) 5000 maximum variables

. use "C:\Documents and Settings\Kristina\My Documents\financial rating 2003.dta", cle
> ar

Iteration 0:   log likelihood = -26.849664
Iteration 1:   log likelihood = -16.481215
Iteration 2:   log likelihood = -13.198284
Iteration 3:   log likelihood = -11.362967
Iteration 4:   log likelihood = -10.270465
Iteration 5:   log likelihood = -9.9291185
Iteration 6:   log likelihood = -9.8890109
Iteration 7:   log likelihood =  -9.888142
Iteration 8:   log likelihood =  -9.888141

Logit estimates                                   Number of obs   =         59
                                                  LR chi2(6)      =      33.92
                                                  Prob > chi2     =     0.0000
Log likelihood =  -9.888141                       Pseudo R2       =     0.6317

------------------------------------------------------------------------------
          pd |      Coef.   Std. Err.      z    P>|z|     [99% Conf. Interval]
-------------+----------------------------------------------------------------
          r1 |  -.0000625   .0000998    -0.63   0.531    -.0003196    .0001946
          r2 |  -.2546637    .146787    -1.73   0.083    -.6327619    .1234346
          r3 |  -.1041698   .1133293    -0.92   0.358    -.3960869    .1877472
          r4 |   .0328331   .0188986     1.74   0.082    -.0158464    .0815126
          r5 |  -.0479236   .0299985    -1.60   0.110    -.1251947    .0293475
          r6 |  -.0435189   .0249927    -1.74   0.082    -.1078957     .020858
       _cons |   2.159822   1.445571     1.49   0.135    -1.563722    5.883365
------------------------------------------------------------------------------
```

Post estimation

Appendix C3.3 Goodness-of-fit test

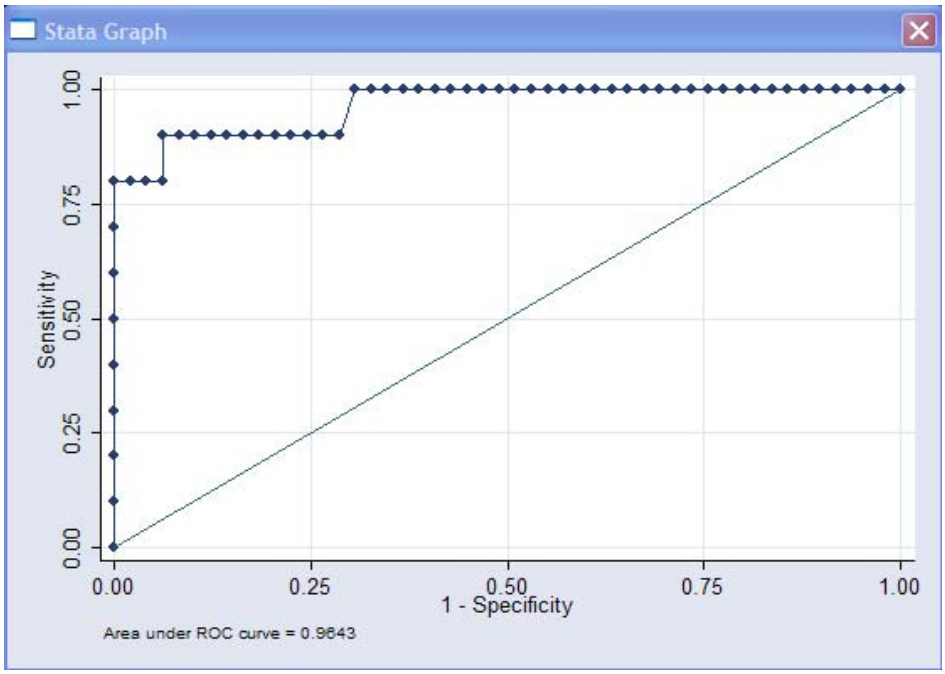
```
. lfit

Logistic model for pd, goodness-of-fit test

      number of observations =        59
 number of covariate patterns =        58
            Pearson chi2(52) =     35.59
                 Prob > chi2 =      0.9601
```

Appendix C3.4 Summary statistics after logistic regression

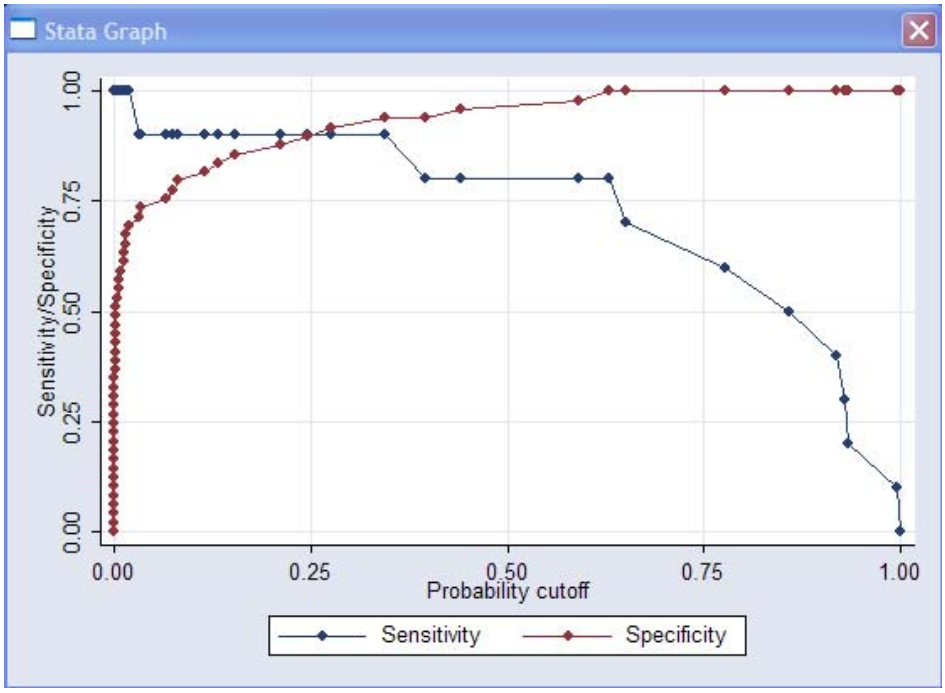
```
. lstat, cutoff(0.25) all

Logistic model for pd

                 True
Classified |         D          ~D |      Total
-----------+----------------------+-----------
         + |         9           4 |         13
         - |         1          45 |         46
-----------+----------------------+-----------
     Total |        10          49 |         59

Classified + if predicted Pr(D) >= .25
True D defined as pd != 0
-------------------------------------------------
Sensitivity                     Pr( +| D)   90.00%
Specificity                     Pr( -|~D)   91.84%
Positive predictive value       Pr( D| +)   69.23%
Negative predictive value       Pr(~D| -)   97.83%
-------------------------------------------------
False + rate for true ~D        Pr( +|~D)    8.16%
False - rate for true D         Pr( -| D)   10.00%
False + rate for classified +   Pr(~D| +)   30.77%
False - rate for classified -   Pr( D| -)    2.17%
-------------------------------------------------
Correctly classified                        91.53%
-------------------------------------------------
```

Appendix C3.4 ROC curve after logistic regression

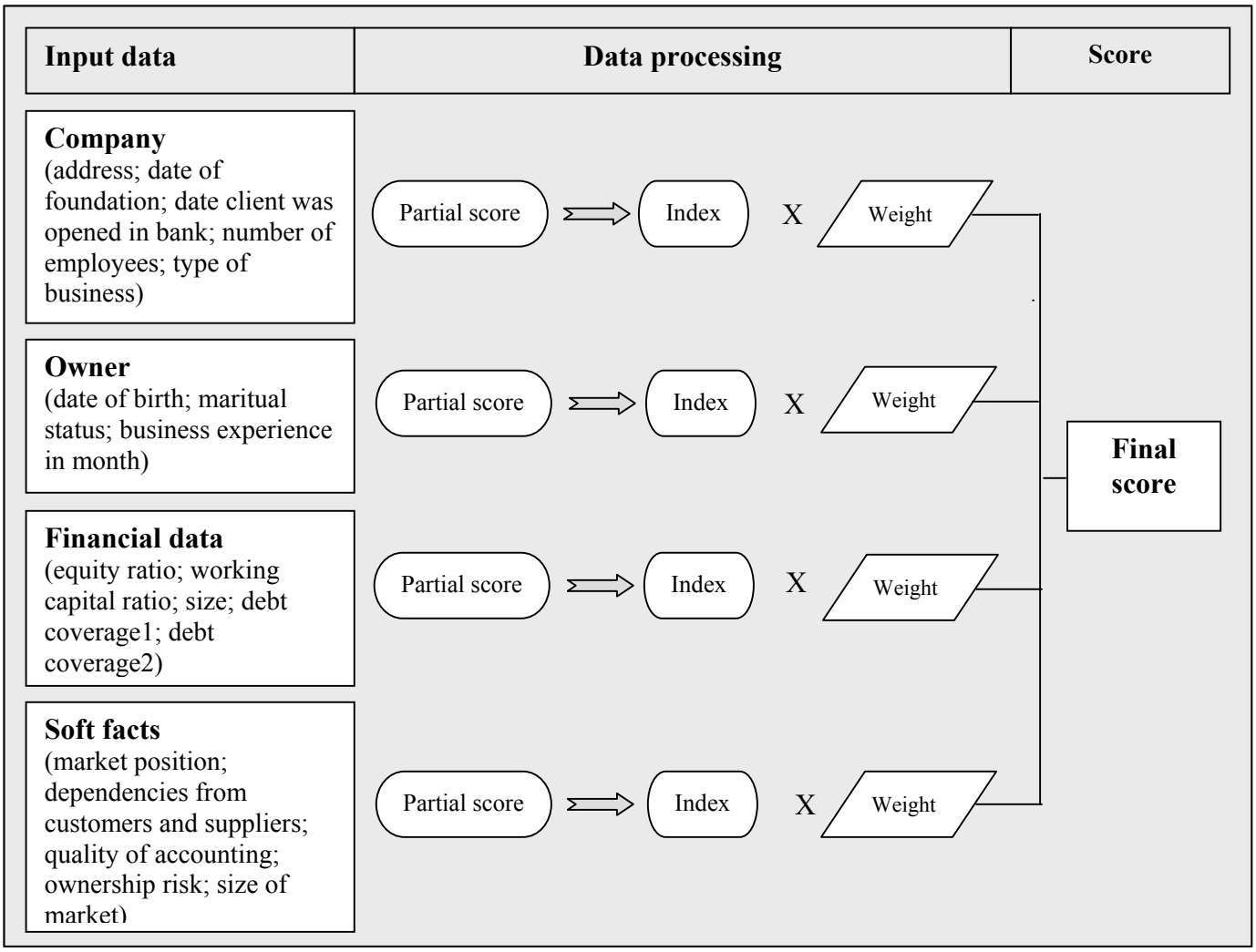
```
. lroc, all

Logistic model for pd

number of observations =        59
area under ROC curve   =    0.9643
```



Appendix C3.5 Sensitivity/specificity plot



Appendix C4 **Overview of construction and scorecard mythology** (obtained from one bigger Croatian bank)



Appendix D

REZULTATI UPITNIKA O NOVOM BAZELSKOM SPORAZUMU O KAPITALU (BASEL II)

	NAZIVI PITANJA IZ UPITNIKA	UKUPNO (sa stambenim štedionicama)
	I. POZNAVANJE PODRUČJA I PRIMJENA BASELA II	
1.	**Kako ocjenjujete poznavanje sadržaja Novoga bazelskog sporazuma o kapitalu (Basel II) u Vašoj banci?**	
	1. Dobro.	7
	2. Zadovoljavajuće.	19
	3. Loše.	12
	Ukupno	38
2.	**Jeste li već započeli s pripremama za provedbu Basela II?**	
	1. Da, jesmo.	14
	2. Uskoro ćemo započeti.	7
	3. Ne, još nismo.	17
	Ukupno	38
3.	**Na koji način Vaša banka provodi edukaciju vezanu uz Basel II?**	
	1. Edukacija je organizirana na razini grupacije kojoj banka pripada.	10
	2. Edukacija se provodi putem inozemnih seminara.	4
	3. Angažirani su vanjski konzultanti.	3
	4. Ostalo.	21
	Nije popunjeno.	7
	Ukupno	45
4.	**Koji će organizacijski dijelovi biti zaduženi za provedbu projekta primjene Basela II (upravljanje rizicima, financije....)?**	
5.	**Koji bi pristup mjerenju kreditnog rizika bio najprimjereniji Vašoj banci?**	
	1. Standardizirani pristup temeljen na ocjenama rejting agencija *(standardised incl. simplified standardised approach).*	12
	2. Interni sustav raspoređivanja – osnovni pristup *(foundation internal ratings – based approach).*	17
	3. Interni sustav raspoređivanja – napredni pristup *(advanced internal ratings – based approach)* – napredni pristup.	5
	Još nije odlučeno.	4
	Ukupno	38
6.	**Koji bi pristup mjerenju operativnog rizika bio najprimjereniji Vašoj banci?**	
	1. Pristup temeljen na osnovnom pokazatelju *(basic indicator approach).*	17

	2. Standardizirani pristup *(standardised incl. alternative standardised approach).*	9
	3. Pristupi naprednog mjerenja *(advanced measurement approaches – AMAs).*	5
	Još nije odlučeno.	7
	Ukupno	38
7.	**Kada bi i u kojem obuhvatu trebalo primijeniti Basel II u Vašoj banci?**	
	1. Još nije odlučeno.	28
	2. Već je odlučeno.	10
	Ukupno	38
8.	**Ako je Vaša banka članica grupe banaka, hoćete li biti obvezni primijeniti Basel II pri izračunavanju konsolidirane adekvatnosti kapitala na razini banke matice?**	
	1. Da (navedite kada).	10
	2. Ne.	2
	Nije primjenjivo.	26
	Ukupno	38
9.	**Kakve prednosti za Vašu banku proizlaze iz primjene Basela II?**	
	1. Mogućnost razvoja i primjene internih modela za upravljanje rizicima.	17
	2. Niži kapitalni zahtjevi za kreditni rizik.	16
	3. Manja neposredna ovisnost o regulatorima.	10
	4. Ostalo (navedite što).	5
	Ukupno	48
10.	**Kakve probleme očekujete u vezi s primjenom Basela II u Vašoj banci?**	
	1. Potreban dodatni kapital za kreditni rizik.	2
	2. Potreban dodatni kapital za operativni rizik.	10
	3. Izgradnja informatičke podrške (modeli i baze podataka).	26
	4. Nezadovoljavajuća pripremljenost nadzornika.	3
	5. Ostalo (navedite što).	6
	Ukupno	47
	II. STUP 1. MINIMALNI KAPITALNI ZAHTJEVI	
11.	**Koja je Vaša glavna metodologija raspoređivanja dužnika/plasmana kojom se koristite za interne potrebe?**	
	1. Koristimo se metodologijom za raspoređivanje dužnika/plasmana, koja se temelji isključivo na metodologiji koju je propisala Hrvatska narodna banka.	23
	2. Imamo svoju metodologiju za raspoređivanje dužnika/plasmana.	15
	Ukupno	38
12.	**Koliko se koristite vanjskim rejtinzima (S&P, Moody's, Fitch ...) pri raspoređivanju plasmana? Navedite i nazive agencija čijim se ocjenama koristite!**	
	1. U velikoj mjeri.	1
	2. Osrednje.	1

	3. Malo.	19
	4. Uopće ih ne rabimo.	16
	Ukupno	37
13.	**Koliko bonitetnih/rizičnih skupina rabite pri raspoređivanju?**	
	1. 3.	6
	2. Od 4 do 6.	18
	3. Više od 6.	14
	Ukupno	38
14.	**Kakvim se statističkim podacima koristite pri procjeni kreditnog rizika?**	
	Statistike o lošim dužnicima *(default)*	28
	1. Za razdoblje od 3 godine.	20
	2. Za razdoblje od 5 godina.	4
	3. Za razdoblje duže od 5 godina.	4
	Statistike o naplati potraživanja *(recovery rate)*	28
	1. Za razdoblje od 3 godine.	25
	2. Za razdoblje od 5 godina.	2
	3. Za razdoblje duže od 5 godina.	1
	Ništa od gore navedenog.	8
15.	**Kakvim se modelima koristite za utvrđivanje ekonomskoga kapitala za kreditni rizik?**	
	1. Vlastitim – interno razvijenim.	1
	2. Modelom koji je razvila banka matica ili neka druga članica grupe.	7
	3. Kupljenim modelom (navedite naziv modela).	0
	4. Ničim od gore navedenog.	30
	Ukupno	38
16.	**Koliko dugo je u Vašoj banci uspostavljen program pisanih poslovnih politika i procedura za upravljanje operativnim rizikom?**	
	1. Nije uspostavljen.	6
	2. Manje od jedne godine.	22
	3. Jednu do dvije godine.	6
	4. Dvije do tri godine.	1
	5. Više od tri godine.	3
	Ukupno	38
17.	**Koliko dugo mjerite operativni rizik te kakvu ste vrstu evidencije uspostavili za praćenje gubitaka proizašlih iz operativnog rizika?**	
	1. Još ne mjerimo operativni rizik.	25
	2. Manje od jedne godine.	8
	3. Jednu do dvije godine.	2
	4. Dvije do tri godine.	0
	5. Više od tri godine.	2
	Ukupno	37
18.	**Na koji je način organizirano upravljanje operativnim rizikom u Vašoj banci?**	
	1. U banci je uspostavljena posebna služba/radna skupina za operativni rizik.	2
	2. U banci još nije uspostavljena posebna služba/radna skupina koja	9

je zadužena za razvoj, mjerenje i upravljanje operativnim rizikom.	
3. Trenutačno smo u procesu uspostavljanja posebne službe/radne skupine.	10
4. Namjeravamo uspostaviti posebnu službu/radnu skupinu.	10
5. Ne namjeravamo uspostaviti posebnu službu/radnu skupinu jer je upravljanje operativnim rizikom organizirano na drugačiji način.	7
Ukupno	38
19. Kakvim se modelima koristite za utvrđivanje ekonomskoga kapitala za operativni rizik?	
1. Vlastitim – interno razvijenim.	0
2. Modelom koji je razvila banka matica ili neka druga članica grupe.	5
3. Kupljenim modelima (navedite naziv modela).	0
4. Ničim od gore navedenoga.	32
Ukupno	37
III. STUP 2. NADZOR NAD ADEKVATNOŠĆU KAPITALA	
20. Koja će područja Stupa 2 predstavljati najveći izazov kod implementacije u vašoj banci?	
IV. STUP 3. TRŽIŠNA DISCIPLINA	
21. Koja će područja Stupa 3 predstavljati najveći izazov kod implementacije u vašoj banci?	

Source: HNB, Web page.