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UDK 336.7116(497.5)  
JEL Classification G10, G21, D81, E58  
Izvorni znanstveni članak

## INTERBANK DEPOSIT MARKET RELEVANCE FOR CROATIAN BANKING SYSTEM SUSTAINABILITY

*Existence, functionality and sustainability of the interbank deposit market significantly determinate bank's asset and liability management (ALM) potentials and thus an overall banking sector performance. Among other numerous factors in the banking business, key roles of the interbank deposit market like availability of short-term liquidity sources, ensuring investment and lending opportunities as well as allowing hedging potentials, considerably contribute to commercial bank's risk – return profile formation. In such a manner, the research objectives of this paper are twofold and include theoretical explanation and empirical examination of the impact of the interbank deposit market development to Croatian banking system performance. In addition, key relations between the interbank deposit market and connected risks are imbedded in developed model. Direct dependence of Croatian banking sector's sustainable development on the interbank deposit market's stability is evidenced on the empirical data from the 2002-2009, with remark that the presence of high-rated foreign owned banks significantly decreased related risks. Even in the absence of the extreme risk events on the interbank deposit market, Croatian banking system is constantly vulnerable on the systemic risk in a form of fund transfer prices' growth. Therefore, empirical results of this research and presented conclusions might be useful for management structures of commercial banks as well as for the national banking authorities.*

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The first version of the paper was received on July 1st 2010, and the final one on Nov 25th 2010.

*Key words: interbank deposit market, banking system sustainability, systematic risk, financial fragility, crisis management.*

## **1. Introduction**

Sustainable development of banking system presumes existence and functionality of the interbank deposit market. Interbank deposit market is a source of credit potential of commercial banks and financial system's liquidity. Moreover, it is operationally necessary for the asset and liability management (ALM) implementation. Interbank deposit market determines benchmark values in implementing internal economy in the bank through fund transfer pricing policy as well, and is thus, related to bank's interest rate policy. Concerns about the interbank market stability are understandable in global financial crisis' surrounding. Disruptions on this section of the financial market might disrupt the liquidity of the economy, support additional credit rationing, immobilize national savings' activity, increase financing costs of economic entities, and thus deepen the crisis or pour it on the particular economy. Shocks from the interbank market could encourage systemic failure, i.e. systemic risk occurrence in a form of bank run (Diamond, Dybvig, 1983), burst of assets' prices and solvency disturbs (Edison et al., 1998) or inter locking exposures among financial institutions (Allen, Gale, 2000). Therefore, interbank deposit market performance serves as an indicator of overall financial system's strengths or weaknesses and of real economy's potential opportunities and threats. Accelerated credit growth, dependence on the external financing funds from the international interbank market because of generally foreign-owned banking system significantly contributes to the sensitivity potentials of Croatian economy connected with a stress on the interbank deposit market. The latter has to be taken into consideration when creating economic policy, especially in anticipation of more intensive financial crisis. Thereby, this paper provides model development of individual bank relations with banking system on the interbank market and extends the model with related risks. Finally, numerical evaluation of the related risks is derived from the real fund transfer price risk of the Republic of Croatia in the global systematic risk era that sustains an issue and challenge in the near future.

## **2. Commercial bank and financial (dis)order: interdependent determination**

Revision of economic and financial crises in the history of economic thought continuously indicates the role of the banking system as a (in)direct determinant

of economic instability. Representative of the monetary theory of economic cycles, Wicksell clarified importance of the bank lending process in investment cycles and inflation spirals' supporting (Wicksell, 1901), while Hawtrey concluded that the instability of credit cycles originates economic cycles (Hawtrey, 1937). Even non-monetary theories of economic cycles retain explanation on the crucial role of banks in financing economic boosts (Hobson, 1923) during the process of financial accumulation (Marx, 1972).

Supplementing Fisher's analysis of Great Depression (Fisher, 1933), most authors agree that banking crisis will happen following excessive crediting (Minsky, 1991; Kindelberger, Aliber, 2005) when credit risk growth exceeds the prices of financial assets (Eichengreen, Portes, 1989). The presence of self-supporting process of increasing the value of collateral, increases the credit ability of debtors for additional financing (Allen, Gale, 2000). When the process reaches its climax, the prices are separated from their fundamental value and the system becomes sensitive to stress. Weaknesses of the debtor are transferred to banks, the quality of banking assets declines, a new bank's capital adequacy is required, and their credit potential decreases, which further deepens the problems of debtor. In extreme situations, loss of confidence in the safety of the banking system can lead to the immobilization of savings and bank runs. Attempts to find indicators that would announce the arrival of banking crises in the economy were made using the experiences from the past (Borio, Lowe, 2002). Using a sample of 40 crises, which occurred in 27 countries from 1960 to 1999, the aforementioned authors suggest that the key indicators of banking sector instability are the ratio of bank loans to GDP, the cost of capital in the broadest sense of the word and changes in the exchange rate. In the case of cumulative deviations of the aforementioned indicators over a longer period, the arrival of financial instability with uncertain date of its origin should be announced with a high likelihood. The crises that emerged over the past and/or present century in the U.S. (White, 1991; Krugman, 2009), Scandinavian countries (Dress, Pazarbasioglu, 1995), Latin America and the Far East almost confirm previous conclusions.

Financial liberalization is an additional incentive to transfer the financial instability between national economies due to the ownership connections of financial institutions and sources of credit potential from international markets of interbank loans and deposits. Contrary to traditional banking crisis, the new potential sources of disturbance to the banks have evolved simultaneously with the structural changes in the financial sector, which is determined by mergers and acquisitions on the global financial system level and by new businesses and markets for banking activities. Moreover, the development of a modern banking system, demands that prudential analyses of banks develop in order to try to protect the bank from omnipresent and advanced risks of business activities. Influx of small depositaries according to the experience of recent years was small. However, bank

liabilities are sensitive to the withdrawal of funds of great depositaries what increases bank's liquidity risk. Depth of interbank market funds on the levels of individual economy and of the entire international financial system should discard concern because the contagion transfer from the global financial system is amplified (Bliss, 2001; Winkler, 2009). In such a manner, Winkler (2009, p. 94) points out that a strategy of financial development in some transitional economies based on foreign entry and capital inflows that foster credit growth is no guarantee for a smooth process of development, then a path to rising interest rates, slower growth, and overture to "a significant deterioration in loan portfolio quality in the region, compounding the credit crunch triggered by the turbulences in mature economies".

In addition, banks are also exposed to risk from the financial derivative market which blossom in their assets, so new capital requirements for present risks, which national and supranational banking regulatory authorities will have to rethink about, are required.

### **3. Interbank deposit market contribution to banking sector sensitivity**

Interbank market is dominantly a money market section reserved for multiple and extensive interbank relationships that can generally take place on three divisions: spot and term deposit and loan markets, and financial derivative markets. Spot market is related to intraday transactions in payment systems, overnight and short term lending and borrowing, i.e. is assigned for short-term liquidity purposes. Term market deals with lending (and borrowing) conducted for investment and other ALM purposes. Contingent claims such as interest rate and exchange rate derivatives stand for financial derivative market. Commercial banks and central banks are exclusive participants of this mechanism established for encountering demand and supply of dominantly short-term funds at equilibrium indicating referent money price significant for direction and intensity of financial asset pricing on otherwise financial markets' sections. Hence, as major providers of liquidity to the economy, banks play an important role in stabilizing the overall economy and spreading the confidence effect from the financial sector to the real sector (Sinkey, 1998). Moreover, interbank deposit market is the channel of financial system liquidity which consists of mutually dependable central bank liquidity, funding and market liquidity (interbank and asset market). That is, "the central bank would provide the "neutral" amount of liquidity, markets would ensure its re-distribution and recycling, and funding needs its efficient allocation among the agents" (Nikolaou, 2009, p. 21).

Interbank deposit market acts as provider of bank's funds (above deposit potential), i.e. it supports the financing of the permanent expansion of bank's assets. Banks without core deposits and savings highly depend on interbank deposit market in order to satisfy customer loan demand related to outstanding loans. On the other hand, retail oriented banks (in collecting savings) with underdeveloped corporate business act as a counterpart on the latter market by lending funds, while realizing interest income. Beside banks, central banks are potential source of funding liquidity. With higher bank dependence on sources from this market, liquidity risk connected with interbank deposit market increases.

Stability of the interbank deposit market is prerequisite for the banking sector sustainability. Banks are linked by a common market for liquidity, so the importance of interbank market in banking system functioning is undoubted. If liquidity problems occur, they could be solved by selling assets or purchasing funds on money and deposit markets (Bhattacharya, Fulghieri, 1994). Liquidity problems followed by fire sales, inability to fulfill loan demands of existing prime customers, dependence on central banks liquidity provision lead to decreased bank's rating in terms of safety, confidence, customers' reliability, creditworthiness during which risk premium rises. Therefore a disturbance on the interbank market of deposits, loans and other balance or off-balance banking transactions prevent effective management process in the bank, make it fragile and at worst encourage or deepen the crisis of the banking or financial system in its entirety (Kaufman, 1998). There are several basic causes and mechanisms of origin and transfer of stress from the interbank market to the national financial system.

In accordance with current banking practice, the interbank transactions regardless of their nature are not collateralized or insured against counterparty risk, and individual bank failure may trigger a chain of subsequent failures inside the financial system (Schwartz, 1992). Practice justifies the fact of not ensuring receivables in interbank relations by adopting the principle of "too big to fail" whereby the authorities of the last resort must not allow the bank insolvency in order to protect the financial system. In the process of interbank borrowing and lending counterparties are not familiar with the intended use of funds and assessment of debtors' financial capacity is missing. At the time of positive trends in the economy, investments in the rated banks, or non-rated banks with good reputation, are considered as a safe one. This approach causes the absence of bank monitoring, while asymmetric information and moral hazard exist in the same form and volume. Even when the interbank market participants are well informed about the creditworthiness of banks, disturbance from the market supports the financial crisis, which, consistent with experience, makes banks' lending more uncertain due to banking system fragility connected with counterparty bank creditworthiness (Flannery, 1996; Pojatina, 2004). Capital adequacy requirements are not enough in case of market distress because interbank commitments require a lower rate of

capital requests. Based on the experience from the past and mostly on the recent global financial crisis, the regulators of the banking system will have to redefine risk exposure of banks in transactions related to the interbank market in the name of stability and security of the financial system, which will in the near future require additional capital requirements.

Next type of transfer of disorders from interbank market onto the domestic financial system arises from its liquidity function (Bernard, Bisignano, 2000). "Liquidity risk is endemic in the financial system and can cause a vicious link between funding and market liquidity, prompting systemic liquidity risk" (Nikoleau, 2009, p. 5). Liquidity sources from the interbank market provide banks with investment opportunities and the optimal liquidity risk management with satisfactory price and the economic system with a discipline in the settlement of matured liabilities (Goodfriend, King, 1998). Along with permanently present deficits in the economic system, banks as financial intermediaries increase the level of crediting in times of economic progress by reducing lending requirements on the credit standing of debtors. In the absence of national savings, interbank term deposit and loan market are banks' funding sources.

In case of interbank deposit and loans outdraw, a commercial bank has to refinance its loosed position. Interbank deposits and loans outdraw may be a consequence of individual bank liquidity needs, borrower's market distress, lender's market instability or worldwide financial recession.

If there is no noise signal of individual bank or global market distress, bank can refinance its position at acceptable prices. In other case, ALM will be conducted with lower efficiency or higher liquidity obtaining prices. Under quality asset transformation problem, banks that may need to sell assets will face significant cut of price. The lack of market liquidity causes the downfall of financial instruments' prices below their fundamental values. Bank can face losses in case of inert lender of last resort. Stresses on the interbank market may lead to immobilization of savings, which deepens the instability of the entire banking system. Practice shows that the crisis on the international interbank market is not rare even in cases of general economic stability (Furfine, 2001). At present, when the banking sector is partly responsible for the world financial crisis, the issue of the interbank deposits and loans becomes more important.

Under the conditions of free money and capital flows, relationships on the interbank market are an integral part of interest rates policy, which is developing operationally within internal economy of banks, that is a key part of transfer price policy. Respecting banking practice and more significant shift towards the commercial logic of the banking industry, all debt sources of credit potential are the perfect substitutes if prudential authorities do not specify otherwise. Disturbance of prices on the market of interbank funds requires alternative financing because

of the limited domestic savings. Increase of demand for savings will increase its price, so the increased interest expenses have to be paid by higher interest income loans, which cause interest rates to increase, that is, they are transferred to clients. Increasing interest rates on loans are potential sources of banking risks due to debtor's loss of creditworthiness because of the increased costs of financing (Holmstrom, Tirole, 1997). A further restriction on offered credits follows, so that in the process of their rationing equilibrium is set on higher interest rates levels (Stiglitz, Weiss, 1981). Demand for loans will greatly exceed the supply, and banks will be less and less willing to finance the economy, corporate or financial sector for fear of adverse cyclic movement. Finally, liquidity problems will increase, bad debt loan provision will rise and the lender of last resort will have to be involved as a short run stabilizer of banking sector. Central bank interventions can provide temporary injections of liquidity, which would aim to break the loop between market and funding liquidity risk, so that downward liquidity spirals would fail to further distress market.

#### 4. Model development of interbank deposit market relations

Customer loans in commercial bank (L) are usually funded with customer deposits (D) and equity (E). Liquidity risk caused by quality asset transformation obligates bank to hold liquid assets (LA) and interbank deposits (LB). In the absence of customer deposits, additional funds, in going concern conditions, arrive from the interbank market (DB). In such a manner, balance sheet of commercial bank could be expressed with the following equation:

$$L + LA + LB + F = D + DB + E + P \quad (1)$$

where F – bank's fixed assets, and P – net profit (loss).

Under assumption that bank's profit is originated from the interest related business, rather than fee related business, minimum condition in optimization of the bank's utility function (U) has the following form:

$$U(\max) \left[ II \left( \sum_i i_i L_i + \sum_i i_i LA_i + \sum_i i_i LB_i \right) - IE \left( \sum_i e_i D_i + \sum_i e_i DB \right) \right] \quad (2)$$

where II,  $i_i$  - interest income, and IE,  $e_i$  - interest expense.

If there is a probability of default of the counterpart inside the interbank deposit market ( $\lambda$ ), interest income will decrease with a following amount:

$$\sum_i i_i LB_i = \begin{cases} 0 & \text{with probability } \lambda \\ \sum_i i_i LB_i & \text{with probability } (1 - \lambda) \end{cases} \quad (3)$$

Bank can reduce probability of default on the interbank deposit market by increasing monitoring costs (c) or conditionally invest in high-rated banks in order to insure liquidity that is a trade off for negative net interest income:

$$\text{Min} \left[ \sum_i i_i LB_i - \left( h_i \sum_i e_i D_i + h_j \sum_i e_i DB \right) ; c \right] \quad (4)$$

where  $h_{ij}$  – ratio of borrowed deposits used in funding of interbank assets.

Bank might suffer from illiquidity problems when customer or interbank deposits outflow. In short run deficit can be funded with: liquid assets, loan selling with substantial haircut ( $\alpha$ ) or by replacing the liability outflow with additional refinancing costs (RC) that are related to the increased credit risk ( $e_c$ ). Additional refinancing costs are caused with increased systematic risk and related country risk premium ( $e_p$ ) as it follows:

$$\Delta D + \Delta DB = \alpha_i L_i + \alpha_i LA_i + LB \quad (5)$$

$$RC = (e_c + e_p) (\Delta D + \Delta DB) \quad (6)$$

The bank can have opportunity costs, as well, if it is not able to fund additional clients' credit requests. Again, in a short run, the new funds can be available only on the interbank market:

$$OC = \Delta \sum_i i_i L_i - \Delta \sum_i e_i DB \quad (7)$$

Banks' market risk management, management of net open position of interest rate risk ( $NOP_{ir}$ ), and net open position of fx risk ( $NOP_{fx}$ ) of the bank, i.e. an ALM function can not be accomplished without the interbank market assistance:

$$\text{Min} \left[ NOP_{ir} (L + LA - D) - NOP_{ir} (LB - DB) \right] \quad (8)$$

$$\text{Min} \left[ NOP_{fx} (L + LA - D) - NOP_{fx} (LB - DB) \right] \quad (9)$$



If bank has a market risk open position, it is exposed to market risk costs (MRC) in situation of market variables' volatilities:

$$MRC = \sigma_{ir} NOP_{ir} (L + LA - D) + \sigma_{fx} NOP_{fx} (L + LA - D) \quad (10)$$

where  $\sigma_{ir}$  – volatility of interest rates (heterogeneous currency and time structure),  $\sigma_{fx}$  – volatility of fx rates.

Total real and opportunity costs (TC) in situation of the interbank market distress can be summarized with the following equation:

$$TC = \left[ \begin{aligned} & \lambda \sum_i i_i LB_i + \sum_i i_i LB_i - \left( h_i \sum_i e_i D_i + h_j \sum_i e_i DB \right) + c + (e_c + e_p) (\Delta D + \Delta DB) + \\ & + \Delta \sum_i i_i L_i - \Delta \sum_i e_i DB + \sigma_{ir} NOP_{ir} (L + LA - D) + \sigma_{fx} NOP_{fx} (L + LA - D) \end{aligned} \right] \quad (11)$$

Hence, in order to avoid the overall banking system fragility the lender of last resort has to estimate bank's solvency and overtake the interbank deposit market function in a short run.

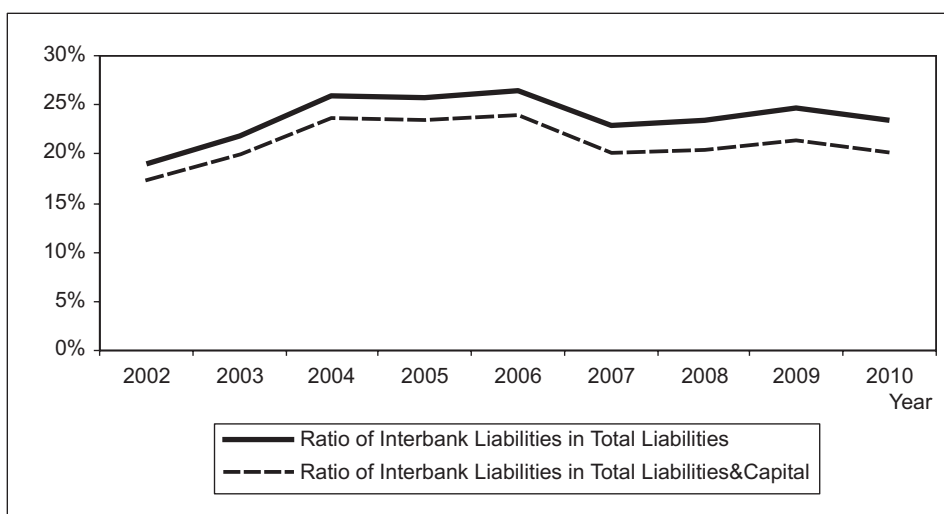
## 5. Empirical evidence and discussion

Ownership and control transformation of Croatian banking sector are causes of its intense integration into global financial flows. Due to these changes, it is exposed to events and consequences of transnational financial crisis and stresses regardless of the character and performance of its own business. Identified systemic risks of Croatian banking sector are partly determined by global flows, and are in larger part of structural nature because of the underdeveloped and uncompetitive national economy, with unsustainable high consumption and high deficits, debt bondage and threatening currency crisis. In dominantly bank based financial markets, the most common sources of production and consumption financing are bank loans, whereby growth in placements outstrips the growth of savings, which directs bank towards international funding source (see Table 3).

Disorder on the interbank market for funds or the outflow of capital from the country due to anticipations of increased systemic risk may make Croatian banking system fragile and have direct negative effects on the overall national economic stability.

Chart 1:

RATIO OF INTERBANK LIABILITIES IN CROATIAN BANKING  
 SECTOR (2002 – 2010).



Source: Croatian National Bank Statistical Reports (2002 – 2010).

The share of interbank funds, with 24% in total liabilities, i.e. 21% in total liabilities and capital at the end of 2009 in Croatian banking sector, is more than significant (see Chart 1). In large part, loans to customers are financed by interbank funds. In Croatian banking sector only 5% of assets are in trade and are available for sale book, and 8% of assets are in form of bank deposits (mostly related to obligatory reserve requirements and limited usage in going concern business conditions) that can be used to finance interbank funds outflow (see table 3 for data)<sup>1</sup>.

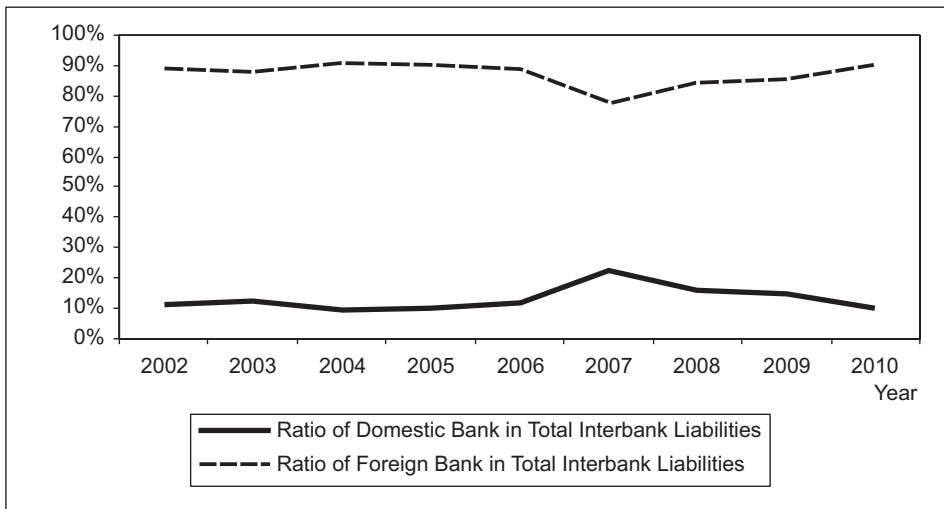
Considering the dominance of foreign ownership in Croatian banking sector, which was 90.5% at the end of 2009, high level of country spread and lower rated Croatian banks, most interbank liabilities come from foreign banks, especially from foreign owners (see Chart 2). Furthermore, the amount of hybrid instrument increased to 0.6% of total liabilities in 2009 (see Table 3). These instruments are

<sup>1</sup> The most of the available for sale and trade portfolio is related to Croatian National Bank (CNB) regulatory measure (Short Term Liquidity Ratio Requirement) and is not available for ALM policy. Minimum reserve requirement deposits can not be used without permission of Croatian Central Bank.

related to long term deposits as result of risk based capital support process as Croatian National Bank (CNB) announced to increase the capital adequacy ratio to 12% from the end of June 2009. However, new capital adequacy requirements were postponed to the end of March 2010.

Chart 2:

DOMESTIC AND FOREIGN INTERBANK LIABILITIES RATIO IN CROATIAN BANKING SECTOR (2002 – 2010).



Source: Croatian National Bank Statistical Reports (2002 – 2010).

The share of foreign interbank funds in the volume of total interbank funds is continuously at level greater than 80% (see Chart 2). Moreover, their temporal structure is favourable. As such, they are instruments of ALM in banks' liquidity profile improvement, and their importance grows when banking crisis is developing or is being expected, and when immobilization or reduction of savings at the level of the entire financial system could take place.

Based on the empirical data and developed model, risk from the interbank market in Croatian banking system will be analysed and quantified in a segment of borrowed activities, lending activities, market risk open position and opportunity costs.

In a short run, interbank market risk in Croatian banking system is dominantly associated to the costs of borrowing funds. If market risk position is closed

(fx and interest rate risk), origin of the interest expense increase is credit spread that is a consequence of an individual bank risk increase or country risk increase.

On assets side of banks in the Republic of Croatia, most of the interbank lending is from legal reserve requirement request without significant counterpart risk.

Finally, opportunity costs of net interest income loss are reduced due to the ownership structure, precisely, interbank relations that are mostly agreed with parent company (high rated foreign banks, see Table 3).

Sources of the interbank market risks and estimation of their costs in a short run are presented in the following table.

Table 1:

INTERBANK MARKET RELATED RISK – ESTIMATION  
 FOR CROATIAN BANKING SECTOR (FOR 31<sup>ST</sup> DECEMBER 2009).

Interbank Market Related Risk	Estimation Effect	Note
$\sum_i i_i LB_i = \begin{cases} 0 & \text{with probability } \lambda \\ \sum_i i_i LB_i & \text{with probability } (1 - \lambda) \end{cases}$	Expected loss = 0	$\lambda = 0^*$
$RC = (e_c + e_p)(\Delta D + \Delta DB)$	$\frac{\partial RC}{\partial e_p} = (\Delta D + \Delta DB) * BP = 6.8$	MIO HRK**
$OC = \Delta \sum_i i_i L_i - \Delta \sum_i e_i DB$	Expected opportunity costs = 0	Open fund line

\* Limes of the probability of default of high rated banks are 0.

\*\* Expected basis point (BP) value change of interest expense on foreign interbank liability balance.

Source: Authors' calculation.

The ratio of interbank assets of banks in the Republic of Croatia is determined with prudential regulation measures: minimum reserve requirements and requirements for banking liquidity monitoring.<sup>2</sup> Based on the regulatory deci-

<sup>2</sup> According to: „Decision on reserve requirements“, “Decision on the minimum required amount of foreign currency claims”, CNB decisions related to central banking operations, ([www.hnb.hr](http://www.hnb.hr)).

sions, the foreign exchange component of reserve requirements needs to be daily maintained (on an average daily balance) in a form of liquid foreign exchange deposits in high rated financial institutions in OECD countries. Satisfactory credit capacity of foreign banks that minimise the risk of lending funds and probability of default of the counterpart in a short run ( $\lambda$ ) tends toward zero (see Table 1).

Costs of the borrowing funds related with interbank market distress and systematic risk are major source of risk of Croatian banking system related to interbank relations. Simulation of the costs is developed on the empirical data from the end of 2009 (volume of HRK 68 billion of foreign borrowed interbank funds) and under the assumption of closed market risk position.<sup>3</sup> Interest rate risk sensitivity is measured with country spread basis point value change that affect on interest expense increase of foreign interbank borrowed funds. With reference to this, estimations are that one basis point value change of credit spread will be followed with HRK 6,8 million interest expense increase (see Table 1).

Risk of expected refinancing opportunity costs is minimized because of the high support of foreign owner bank and the ratio of 86% of total interbank borrowing at the end of 2009 (see Table 3). Thus, high rated owners of banks have to continue funding domestic banks to maintain investment and preserve capital and high level of profits earned even in the announcement of financial crisis (see Table 1 and Table 3).

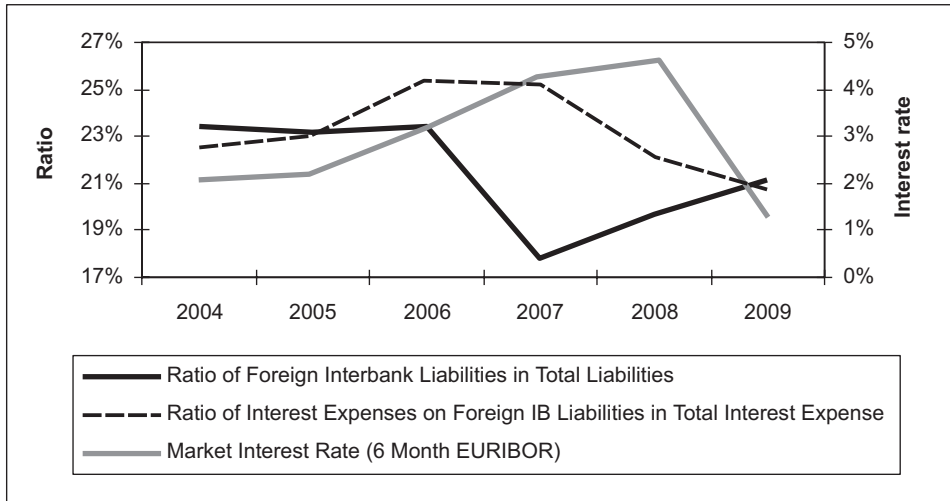
Ex post analysis of the influence of market interest rates on interest expenses of the interbank funds, evidenced significant impact of credit spreads in terms of country risk costs.

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<sup>3</sup> This is regulated and supported by the CNB's market risk related decisions concerning banking supervision: "Decision on risk management", "Decision on liquidity management", "Decision on the limitation of banks' exposure to foreign exchange risk", "Decision on the capital adequacy of banks", "Decision on the management of interest rate risk in the non-trading book" ([www.hnb.hr](http://www.hnb.hr)), and internal risk management policy.

Chart 3:

RATIO OF INTEREST EXPENSES ON FOREIGN INTERBANK FUNDS  
 IN TOTAL INTEREST EXPENSES (2004 – 2009).



Source: Croatian National Bank Statistical Reports (2004 – 2009) and REUTERS<sup>4</sup>.

When comparing ratio of foreign interbank liabilities in total liabilities and their related costs (ratio of interest expenses on foreign interbank funds in total interest expenses), significant influence of interest expense increase is attributed to the market interest rate increase (see chart 3).

High correlation coefficient between market interest rate and interest expenses ratio confirms previous conclusion (see table 2). Referent market interest rate is 6-month euro rate because of the dominance of euro currency structure in foreign interbank liabilities and estimated 6-month reprising period.

<sup>4</sup> More detailed data for 2002 and 2003 were not available, thus data continuity from the previous graphs was not able to follow.

Table 2:

CORRELATION RESULT (INTEREST EXPENSE RATIO  
AND MARKET INTEREST RATES: 2004 – 2009).

Description	Correlation coefficient	Standard Error	df	t
Correlation	0.79	0.30	4	0.61
Critical Value (p=0.1)	-	-	-	2.13

Source: Croatian National Bank Statistical Reports (2004 – 2009); REUTERS; Authors' calculation.

Interest expense increase in comparison with ratio of interbank funds in a period 2007-2008 can be explained with country risk spread increase that remarked 214 basis points in October 2008, 592 in March 2009 and 234 basis points at the end of 2009, if measured by middle term credit default swap rates (CDS rate) (see Chart 4).

Obviously, Croatian banking system's functionality, soundness, stability and profitability largely rely on the efficient interbank market. There are several ways of disorder transfer from interbank market to banking system. The outflow of borrowed foreign funds, which made more than 80% of total interbank liabilities of Croatian banks at the end of 2009, could deepen negative consequences and extend financial crisis. Croatian banks do not possess sufficient liquid assets that could finance that outflow in the real time. 5% of marketable securities and interbank deposits are related to prudential requests and can be used only in stress scenario with CNB's authorization. In addition, residual assets that are insufficiently liquid could be realized with lower prices and substantial haircut. Even if CNB would permit the disposal with banks' reserve requirement, extreme capital outflow could not be funded without support of the lender of last resort. However, the use of CNB's foreign exchange reserves reduces the mechanisms of monetary policy what disturbs financial system stability. Additional problem of Croatian banks in case of interbank funds outflow would be deterioration of banking system liquidity profile because of the absence of sufficient volume of long-term funds. Financing the economy, production, consumption and development would be more difficult in distressed banking sector with negative effects on overall output and income.

## 6. Conclusion

Croatian banking system significantly depends on the international interbank market. Interbank market is the source of credit potential of Croatian banks in financing economic dynamism in the volumes above the available national savings. It is also the source of banking system's liquidity and the mean of ALM implementation inside bank's liquidity profile improvement. Increased systemic risk of the Republic of Croatia, problems on the domestic financial market or in individual bank's owner may cause fragility of Croatian banking sector caused by cross-border channel infection that can be transferred to the real economy. In order to limit or stop the negative spillover effects of the interbank market disorders, prudential authorities can restrict and require restructuration of capital outflow from the system, at least until the expected time of global or national financial stability. Croatian banking system can be protected from some forms of interbank market risks due to the ownership dominance of foreign high rated banks. However, risk related with fund transfer price costs will be continuously present. Banks have to improve their strategies of response to the perceived systemic risk by developing general interest rate policy, altering term structure of loans and changing the level of their involvement in the global interbank market. Finally, central bank needs to take into consideration interbank market conditions and occasionally act as a lender of last resort in order to preserve banking system stability.

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## Appendix

Table 3:

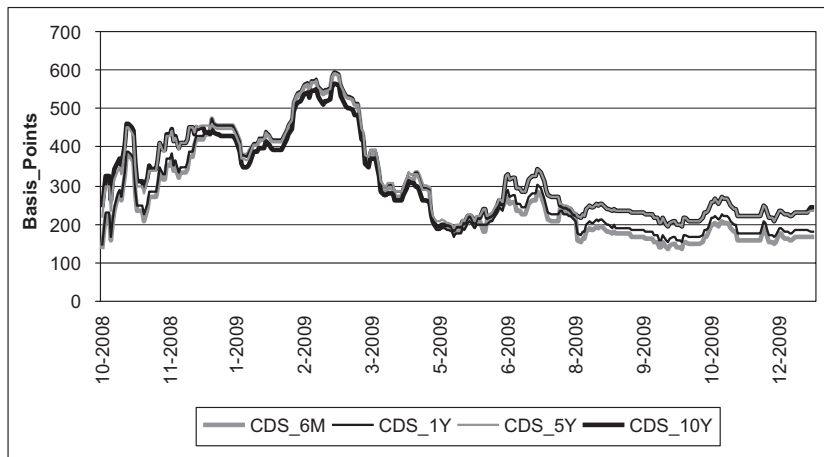
### CROATIAN BANKING SYSTEM: BANK ASSETS, CAPITAL AND LIABILITIES (BILLION HRK).

Position \ Year	2002	2003	2004	2005	2006	2007	2008	2009
Interbank Liabilities of Croatian banking system	29,97	40,53	54,48	61,18	72,50	69,33	75,09	80,72
Interbank Liabilities of Foreign Bank	26,55	35,43	49,26	54,98	64,14	53,88	63,08	68,89
Interbank Liabilities of Foreign Owners	n.a	n.a	26,62	35,93	45,45	39,70	51,96	59,69
Hybrid instruments	2,27	2,26	1,64	0,88	0,55	0,63	2,05	3,01
Deposits from customers	124,63	143,75	155,27	171,73	202,95	233,10	247,81	256,81
Loans to customers	92,45	110,22	125,26	151,95	187,77	216,26	246,64	252,47
Trading Book	11,46	10,86	6,90	10,68	10,33	11,33	8,08	6,12
AFS Book	n.a	n.a	9,17	13,56	16,71	15,69	18,35	20,26
Deposit on CNB's account	19,16	25,04	31,82	39,55	45,68	46,86	37,27	42,24
Deposit in Other Banks	20,07	31,14	33,35	23,15	26,06	35,11	35,96	32,74
Capital (Core capital)	9,79	9,94	10,11	11,52	16,58	25,17	28,28	28,78
Retained Earnings	0,86	1,35	1,89	2,50	3,76	4,21	5,96	7,76
Profit After Tax	2,18	2,73	3,14	3,36	3,39	4,07	4,69	3,41
Total Assets	174,62	204,50	230,29	260,59	304,61	345,08	370,76	378,85

Source: Croatian National Bank Statistical Reports (2004 – 2009)

Chart 4:

## CDS RATES – REPUBLIC OF CROATIA (2008 – 2009).



Source: REUTERS

ZNAČAJ MEĐUBANKARSKOG TRŽIŠTA ZA ODRŽIVOST HRVATSKOG  
BANKARSKOG SUSTAVA

## Sažetak

Postojanje, funkcionalnost i održivost međubankarskog tržišta značajno određuju potencijale procesa upravljanja imovinama i obvezama banke kao i razinu ostvarenih performansi bankarskog sektora. Uz ostale brojne čimbenike bankarskog poslovanja, ključne uloge međubankarskog tržišta poput pristupa kratkoročnoj likvidnosti sustava, omogućavanja procesa posuđivanja i zaduživanja te pružanja mogućnosti zaštite značajno pridonose oblikovanju rizičnog profila i profitabilnosti banke. Stoga su ciljevi istraživanja dvostruki i uključuju teorijsko tumačenje i empirijsku provjeru utjecaja razvitka međubankarskog tržišta na financijski uspjeh bankovnog sustava u Republici Hrvatskoj. Nadalje, ključni odnosi između međubankarskog tržišta i povezanih rizika su uključeni u razvijenom modelu. Izravna ovisnost održivog razvoja bankovnog sektora u Republici Hrvatskoj o stabilnosti međubankarskog tržišta dokazana je na empirijskim podacima iz razdoblja 2002.-2009., s napomenom da je prisutnost prvoklasnih banaka u stranom vlasništvu značajno smanjila povezane rizike. Čak i u odsutnosti ekstremnih događaja na međubankarskom tržištu, hrvatski bankovni sustav je kontinuirano osjetljiv na sistemski rizik u obliku uvećanja troškova eksternog financiranja. Stoga bi empirijski rezultati istraživanja i izneseni zaključci mogli biti korisni za upravljačke strukture komercijalnih banaka kao i za nacionalne bankarske autoritete.

Ključne riječi: međubankarsko tržište, održivost bankarskog sustava, sistemski rizik, financijska krhkost, krizni menadžment.