Part Three

CRITERIA FOR EVALUATION OF THE SYSTEMIC RISK UNDER CURRENCY BOARD***

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CRITERIA FOR EVALUATION OF THE SYSTEMIC RISK UNDER CURRENCY BOARD

"the word *krisis* is of Greek origin and it means 'decision'"

Abstract: This research paper comprises the following topics: general concepts of systemic financial risk and systemic financial crises; identification of the shocks, giving rise to systemic financial crisis; identification of the crisis channels and dynamics; building up indicators for supervision of the banking system and the currency board situation (balance sheet monetary indicators, macroeconomic indicators of instability and indicators, deducted from the consolidated balance sheet of commercial banks); there is a review on the basic guidelines for preventing and securing against the systemic crisis.

INSTEAD OF INTRODUCTION: A GENERAL SURVEY OF THE BIBLIOGRAPHY ON SYSTEMIC FINANCIAL RISK AND SYSTEMIC FINANCIAL CRISES

The systemic financial crises and systemic financial risk form a relatively new field of research and analysis. They have been brought about by the globalization and internationalization of financial flows, as well as by a number of financial disruptions in the developed and developing countries.[1]

Most of the quoted bibliography dates from 1995 onwards, with the last two years being characterized by greater interest in the systemic nature of the financial system, which accounts for the numerous publications and research papers, issued both by representatives from the academic spheres and different financial institutions.

At the end of this report there is a list with an almost complete bibliographic survey of publications, concerning the systemic crisis and systemic risk. The various sources of information can be approximately grouped in the following way:*classical and conventional analysis of financial crises:*Minsky H. (1975, 1977), Diamond D., Dybvig P. (1983), Bernanke

[1] Here we can refer to the collapse of the savings banks in the USA, the chain downfalls of financial houses in Japan, the problems of Credit Lyonnais in France, of Banesto in Spain, the English BCCI and Barings, of numerous Japanese banks, the financial crisis in Mexico, the banking crises in the Baltic countries and the Czech Republic, the collapse of pyramids in Albania and Romania, etc. Bulgaria made no exception to the rule,

B. (1983), Aharony J., Saunders A., Swary I. (1986), Bernanke B., Lown C. (1992), Lindgren C., Garcia G., Saal M. (1996), Kindleberger C. (1994), Demsetz R., Strahan P. (1995), Aglietta M. (1993, 1995), Aglietta M., Moutot P. (1993), Edwards S. (1996), Demirguc-Kun A., Detragiache E. (1997), Consalez-Hermosillo B. (1996), Caprio G., Klingebiel D. (1996), Latter T. (1997), etc.; *analysis through asymmetry of information, the interrelation principal-agent:* Modigliani F., Jaffee D. (1969), Stiglitz J., A. Weiss A. (1981), Mishkin F. (1969), Aoki M. (1996), Kane E. (1996), Rochet J. (1992), Tirole J. (1994), Kaufman G. (1996), Eisenbeis R. (1997), etc.; *analysis of the crisis as regards its self-fulfilling and multi-equilibrium dynamics:*Azariadis C., Guesnerie R. (1982), Aglietta M., Orlean A. (1984), Aglietta M. (1990, 1993) , Orlean A. (1986, 1990, 1992, 1993), Topol R. (1991), Banerjee A. (1992, 1993), White E. (ed.) (1990), Arthur A., Lane D. (1989), Aharony J., Swazy I. (1996), Shiller R. (1989), Guttentag J., Herring R. (1986), Jaklin C., Bhattacharya S. (1988), Bikhchandani S., Hirshleifer D., Weltch I. (1992), etc.; *speculative attack of the fixed exchange rates*: Goldberg L. (1991, 1994), Grilli V. (1990), Miller V. (1996, 1996), Obstfeld M. (1984, 1986, 1996, 1997), Svensson L. (1994), etc.; *the systemic crisis under currency board:* Hanke S., Shuler K. (1991), Liviatan N. (1993), Williamson, J. (1995), Camard W. (1996), Perry, G. (ed.) (1997), Balino T., Enoch C. (1997), Enoch C., Guilde (1997), etc.; *analysis of the correlation banking crisis - currency crisis:* Mishkin F. (1996), Consalez-Hermosillo B. (1996), etc.; *forecasts and management of the financial crisis:* Fink S. (1986), Mishkin F. (1996), Frosdick S. (1997), Goldstein M., Turner P. (1996), Consalez- Hermosillo B. (1996), Honohan P. (1997), Latter T. (1997), Whitt J. (1996), Forgues B. (1995, 1996), Forgues B., Thietart R. (1995), etc. As regards Bulgarian authors, the theoretical framework of the systemic crisis is represented by Nenovsky N. (1997), where the special emphasis being put on the *non-economic aspects of the crisis.*

I. SYSTEMIC FINANCIAL RISK

As paradoxical as it may sound, the term "systemic risk" was brought forward in Bulgaria, along with the systemic collapse of the financial structure. The introduction of a currency board arrangement itself is the inevitable result of a financial crisis, whereby *the institutional organization* of money management has thoroughly changed. The analyses on the systemic risk became popular after being presented in the IMF official documents, when the

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which is evidenced by the deep bank crisis at the end of 1996 and in the beginning of 1997. The investigation of these reasons is beyond the scope of our research.

currency board came into effect.[2] The systemic risk notion has become popular, when due to the lack of a lender-of-last-resort, the opportunities for intervention are least of all.

The currency board has altered the respective causes, dynamics and ways for surmounting the systemic crisis. The automatic nature of the currency board functioning (other things being equal) should make the systemic risk less likely to emerge. However, the rather static character of the currency board impedes the ability to react in a proper way, after the crisis has already arisen. Despite the limited possibilities, there are certain channels, both for exerting preventive measures and offering assistance to commercial banks, facing liquidity difficulties. Resorting to the residual deposit of the Banking Department, constituting a part of the liabilities of the Issue Department balance sheet, is just one possible way to react in case of systemic risk.

There is a necessity to establish a general set of supervision indicators, and specific procedures to be undertaken, when the systemic crisis spills over the banking system.

Working definition: The notion of risk implies the idea that a certain event is likely to happen. Therefore the systemic risk should be given the following definition: ***The systemic risk indicates the probability of the systemic crisis to emerge, i.e. a crisis, whereby the accumulation of local effects leads to chain downfalls in the whole financial system.The systemic crisis gives a typical evidence of the chaotic nature of the financial relations (strongly integrated), wherewith inconsiderable local signs of disequlibrium lead to the collapse of the whole former system, or to the emergence of new structures[3] . It gives evidence of the self-fulfilling principles, governing the economic system.***

The systemic financial crisis is *an information crisis*, whereby the channels for transferring information have been interrupted , the supply and demand for information have been deformed, and the blank spaces have been filled up with inaccurate data, rumours, beliefs, etc. In fact, it is a loss of information.

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[2] It proves that the financial and banking system management is completely lagging behind the contemporary processes and investigations in the developed countries. Hypothetically the lack of any studies on the systemic risk can be considered a result of the misguided opinion, that the Central Bank is capable of protecting the financial system against bankruptcy by injecting liqudity in case of difficulties, and by apllying strict administrative and preventive measures. The intellectual level of the management elite in Bulgaria can be viewed as a corresponding consideration.

[3] The crises can be viewed as a source, serving the purposes of learning and furthering the institutional changes. According to the psychologist May (1958), the crisis is necessary in order to break off the dependence of people on a certain dogma, which is external and not liable to their control.In this case such a doctrine stands for the necessity to establish a discretionary Central bank or eventually a currency board. According to the French psychologist Piaget, the crises are characteristic of the developing organism.

For the purposes of our analysis the systemic financial crisis should be viewed as having two constituent parts: ***banking crisis (including the crisis of non-bank financial intermediaries) and currency crisis.*** The underlying notion of *banking crisis* is a chain reaction, whereby a greater part of commercial banks go bankrupt, due to illiquidity and insolvency problems. A commercial bank is considered to have undergone an economic crash in the following situation - its fixed capital becomes negative, so it cannot carry out financial operations without impairing its fixed capital. This is the precise moment, when the market value of its assets is lower than the market value of its liabilities[4] . The same rule refers to the other financial intermediaries. The underlying notion of *currency crisis* under the currency board arrangement (CBA) is the moment of imposing pressure on the fixed exchange rate, due to which the monetary authorities resort to devaluation of the domestic currency.

The analysis of the systemic financial crisis can be realized through the tools of research, applied by *the industrial economy:* transaction costs, management structures, partial contracts, the financial intermediary as a nucleus of contracts, etc.

Causes: There is always **a *certain shock***, underlying every crisis: external or internal in respect of the system. The probability of such a shock is indicated by the systemic financial risk itself. The shocks can be explained by the whole gamut of relations "agent - principal", the asymmetry of information (adverse selection and moral hazard), the externalities and the availability of inseparable profits.

The shocks can be divided into *two* groups: 1) macroeconomic and microeconomic and 2) exogeneous and endogeneous.

The macroeconomic shocks are principally as follows: abrupt alterations of interest rates, shock on the demand for money, great volatility of the money multiplier (and/or the tendency towards the demand for banknotes), dynamics of the internal credit, crisis of the balance of payments, sharp alterations in the terms of trade, disintegration of the public real sector, problems regarding the settlement system and deposit guarantee system, loss of confidence, etc. *The microeconomic* shocks can be summed up to the following: disproportionate balance sheet structure of certain big banks (maturity and currencies), asymmetry of information about the operations of financial intermediaries, reflected in the liabilities and assets within the balance sheet, bank panic, misappropriations.

[4] If there is an active financial market, the difficulties of a given financial institution can be found out in the spread between the market value and the book value of shares .

Exogeneous shock is that shock, which is caused by external factors as regards the economic agents - for example, amendments in the legal framework on capital adequacy and liquidity, changes in the deposit guarantee scheme, etc., while *the endogeneous* shock is due to *the imitative* self-regenerating and self-fulfilling dynamics of economic agents[5] , as for example the panic-stricken depositors, unable to differentiate the healthy banks from those, facing problems.

The theoretical model: The overall systemic risk **Rs** can be represented in an agreggate form:

$$\mathbf{R_S|W = R_S\,(\mathring{a}\,i,T,W)}$$

wherein **W** is the multitude of the available data on the economic situation as a whole (including information about the state of particular financial intermediaries), **i** is the vector of *stochastic* variables, specific for each bank and **T** - the vector of *stochastic* variables, affecting the whole financial system.

Therefore, if there is a *consequence* in the series of shocks, the overall probability of a systemic crisis can be measured as a sum of the individual degrees, to which a certain shock is likely to arise p_i:

$$\mathbf{R_S = \mathring{a}^{\,n}_{i=1}\,p_i}$$

When the shocks occur *simultaneously,* the overall probability is estimated as a product of the individual degrees of likelihood:

$$P_S = \mathbf{P}^{\,n}_{i=1}\,p_i$$

Since in fact the shocks are both *parallel and consequent,* the overall risk, associated with the systemic risk probability, is an elaborate combination of conditional Bayes probabilities[6] (due to the complex nature of the crisis).

The objective of the research paper is to identify, as far as possible, the two components of the systemic risk - **å i** and **T**, as well as the elements of the disposable information **W**. Therefore it will be possible to develop indicators, regarding the financial system situation and the ways for preventing the systemic crisis.

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[5] It should be explicitly pointed out, that the systemic crisis can result from a shock, unprecedented in the past, i.e. the existing *uncertainty*. As it is well-known, the uncertainty is not to be described by a law on probability degrees and it is unpredictable. The specific distinction between risk and uncertainty was drawn by F. Knight. The examples of such a shock are - times of war, earthquakes, sharp fluctuations in the prices of power resources on the international markets, etc. In our research paper we highlight that financial crisis, which can be forecasted.

[6] The notion of Bayes' conditional probability indicates the extent, to which a given event is likely to occur when another event is being realized.

II. IDENTIFICATION OF THE SHOCK, CAUSING THE SYSTEMIC CRISIS UNDER CURRENCY BOARD

We can definitely maintain the opinion, that the discretionary monetary policy and the classical central bank contribute to *a greater degree* of systemic crisis probability, as compared with the currency board arrangement. It is due to the following fact: the central bank through its elaborate, uncontrollable and subjective instruments, deforms both the monetary and financial system, thus eventually increasing the asymmetry of information and the market disproportions. The credit from a lender of last resort actually *contradicts the market practice*, since it aims at eliminating the discontinued financial turnover in the economy, by monetizing the losses in separate economic sectors.

Nevertheless even under the currency board (where the cases of money misappropriation are supposed to be fewer), there is still a risk of financial crisis. The shocks can emerge from various sources, which we aggregate in two groups:

Macroeconomic

The main shocks, undermining the stability of the currency board can be traced along four channels: *real:* generating losses in the public sector and difficulties in the budget deficit financing; *monetary:* sharp fluctuations in the demand for money (especially as regards the money in circulation), the demand for credit; *external:* variations of particular components in the balance of payments, dynamics of the real foreign exchange rate, fluctuations of the macroindicators and the specific foreign currency, to which our domestic currency has been "pegged" and *non-economic*: political upheavals, loss of confidence in the official authorities, alterations in the legal regulations on financial relations, natural disasters, etc.

Microeconomic

The microeconomic shock affects the individual financial intermediary (commercial banks in particular). That is a local shock, which due to the systemic character of the banking system can very easily lead to an overall crisis. From the point of view of *the particular* commercial bank, greater importance is assigned to the variation of the effective fixed capital values, both the net deposit flows and net assets flows. These fluctuations are interlinked with disruptions, affecting such variables as the real interest rate, the foreign exchange rate (under currency board it is $/DM), as well as the behaviour of both depositors and debtors. Due to the

disproportionate balance sheet of commercial banks, the shock is more likely to give rise to insolvency and illiquidity problems.[7]

A special emphasis should be put on the following issues: the eventual shock, caused by the change in the monetary behavior of the public - abrupt alterations in the preferences towards cash/deposits and domestic currency/ foreign currency respectively.

Under *the fixed foreign exchange rate arrangement,* the public confidence in its maintenance is of considerable importance. If there are rumors about devaluation, as well as some drop of foreign currency reserves below a certain critical threshold, the foreign exchange rate is being subjected to a speculative attack, displayed in the process of mass converting of deposits and other lev - denominated assets first into cash, and then foreign exchange. In that case the cash/deposits ratio **c** can be expressed through the following model:

$$c=c_0 + s(c),$$

wherein c_0 is the long-term trend, indicating the public preference towards cash and $s(c)$ shows the upward tendency of this preference during speculative attacks, and it is a function of the fixed foreign exchange rate credibility, expressed as a rising function of the forex reserves **c**[8]

III. IDENTIFICATION OF THE SYSTEMIC CRISIS CHANNELS AND DYNAMICS

The systemic crises lead to financial markets disintegration, thus aggravating the problem of the asymmetry of information (adverse selection and moral hazard), whereas the financial markets cannot direct properly the savings towards more effective investment projects. This is displayed by the following processes - rationing and segmenting of investments. In that way systemic crises are logically followed by the economic activity decline.

Our firm opinion is that there are *two main channels,* through which systemic crises emerge and develop.

the first mechanism: from macro to micro

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[7] A commercial bank is considered to have undergone an economic bankruptcy, when its fixed capital is negative, or it is not able to perform its functions any more, without impairing its fixed capital. This requirement is met, if the effective value of assets is less than the effective value of liabilities. Under an active stock market, the spread between the market and book value of the share is a very important indicator.

[8] Another hypothesis about **c** presents the notion of its behaviour as a random walk, i.e. its present value depends entirely on its former value.

$c_t = c_{t-1}+\varepsilon_t$ Such a non-stationary process can hardly serve as a basis for forecasting **c**.

In this case the macroeconomic shocks (abrupt fluctuations of interest rates, high internal credit growth rate,crisis of the balance of payments, sharp alterations in the terms of trade, disintegration of the real public sector, great volatility of the money multiplier, problems regarding the settlement system, loss of confidence, etc.) lead to *deterioration* of commercial banks balance sheets. All this sharpens the problems, related to the asymmetry of information, the escape from domestic currency investments (implying the restructuring of the economic agents portfolios and the withdrawing of their deposits from commercial banks). The loss of deposit mass additionally impairs the commercial banks balance sheets, since they have to sell long-term high-yield bearing illiquid assets at a value, which is below the market prices (in order to ensure the liquidity, required for covering the withdrawal of deposits).

the second mechanism: from micro to macro

In this case the emergence and dynamics of the systemic crisis develop in the opposite direction, i.e. microeconomic shocks (displayed as disproportions in the balance sheet structure of commercial banks, asymmetry of information about the operations of financial intermediaries, reflected through the liabilities and assets within the balance sheet, misappropriations, etc.) impair the commercial banks balance sheets. Bank panic spreads over the whole system, whereby due to the asymmetry of information depositors cannot discriminate between solvent and insolvent banks, and consequently withdraw their deposits. This restricts the effective functioning of financial markets and brings about the collapse in the real sector. Subsequently these banking crises develop into foreign exchange rate crises, especially in those countries under a fixed exchange rate regime, having pursued inconsistent monetary policy in the past.

It is quite difficult to precisely identify and discern the channels and dynamics of the systemic crisis process, since the macroeconomic and microeconomic shocks are interlinked, they usually emerge simultaneously, and the cause-and-effect connection is hardly noticeable.

the systemic crisis as a chain reaction

By virtue of definition the systemic crisis is a chain crisis, which is due to the interdependence of economic agents. This mutual commitment creates channels, through which the shocks, sustained by one agent, affect the other agents within the system. The personal and institutional balance sheets comprise assets, which in their turn are liabilities of other agents, or their value depends on the behaviour of other agents. If there is a decline in the value of assets, owned by a certain economic agent, his consumer behaviour is going to change, thus influencing the yield and value of assets, held by other economic agents. The economic agents cannot fulfil

their debt obligations, in the cases when the depreciation of their assets exceeds the value of their own funds. It leads to a drop of the assets value, reflected in the creditors balance sheets, therefore generating the following reaction - a chain reduction of consumption and avalanche crashes.

Due to the incessant process of exchanging funds, commercial banks are financially more closely interlinked as compared to other types of companies. For that reason, they are exposed to systemic risk to a greater extent. The shocks, undergone by a certain bank, have great impact both on the other banks and the whole financial system. The negative cumulative effects of the initial shock intensify, considering the fact, that bank deposits constitute a great part of the money supply.The impact of money supply reduction can be offset, only if the deposits in solvent banks increase or the central bank injects additional reserves (which are reduced to a minimum amount under currency board).

problems related to the identification of "unhealthy" and "healthy" banks

The systemic crisis dynamics depends largely upon the depositors' ability to discriminate between solvent and insolvent commercial banks. If they are capable of identifying the solvent banks in the system, they re-deposit their funds in the respective banks, whereas the withdrawal of deposits from the banking system will have a relatively insignificant impact. In this case there is no reduction of deposits and credits in the banking system *as a whole*.

If depositors are unable to discern the solvent banks, the process of withdrawing deposits spreads over the whole system, thus affecting both the insolvent and solvent banks. In that case these funds can be transformed into a safe investment - non-bank securities, mostly government securities. The deposits, withdrawn from the banking system, are directed to the sellers of these securities, whose behavior determines to a great extent the further stages of the systemic crisis. If the government securities sellers can identify "the healthy" commercial banks, they will sell their government securities and deposit the funds obtained thereby with these banks. This alternative of the systemic crisis process is again characterized by a lack of change in the total volume of deposits and credits within the banking system, while the deposits are just transferred to new acquirers. This scenario of the systemic crisis process has a more unfavorable effect in comparison with the first model. It is displayed by the following consequences: the relations between commercial banks and their clients are impaired, with the initial demand for government securities leading to an increase in their prices (as well as a decrease in the interest rates on public securities, as compared to private securities). The above mentioned process is accompanied by a tendency of transferring investments from the private to

the public sector. This deepens “the crowding out effect”, when private assets are being replaced by less efficient government investments.

currency crisis

In case of currency crisis the funds, withdrawn from the banking system, are not re-deposited.The rising amount of foreign currency, held by individuals, causes a decline in the total bank reserves, thus inducing a multiplying effect on the reduction of bank assets and deposits.

During the process of immediate sale of illiquid assets, aimed at ensuring liquidity, commercial banks endure serious losses, whereby the banks, facing liquidity problems become insolvent. Such banking crises usually go along with a trend of escape from the domestic currency and grow into currency crises. The dynamics of currency crises depends on the internal money market conditions. Under high internal credit growth rates, the money market equilibrium can be recovered through the compensatory reduction of foreign exchange reserves in the central bank or through the exchange rate alterations. Under the fixed foreign exchange rate regime, while the foreign currency reserves are at a level, which is higher than the *established critical level*, the monetary authorities can successfully protect the exchange rate against the speculative attacks. The alternative solutions are determined by the expectations and tactical behaviour of the economic agents and the central bank. If the economic agents expect, that the attack on the fixed exchange rate and the central bank reserves will violate the commitment about fixed exchange rate and cause the domestic currency devaluation, they will restructure their portfolios, preferring assets, which are denominated in foreign currency. In that case the negative aftermaths of the banking crisis and the concurrent currency crisis are displayed in a continual chain process of commercial banks bankruptcies. There is a decline in both money supply and economic activity, and a sharp increase of unemployment.

The various scenarios of the systemic crisis can be represented in the following way:

(See: Table 1 in the appendices, enclosed herewith)

IV. MEASURING AND FEASIBLE EMPIRICAL ANALYSES OF THE SYSTEMIC RISK UNDER CURRENCY BOARD

The forecasts and quantitative analyses of systemic financial crises can have just *a limited scope.* This limitation is caused by a number of factors. All in all it is determined by the *chaotic dynamics* of the financial crisis itself: when slight and hardly noticeable disequilibriums in particular parameters on the financial system (even referring to a single and inconsiderable financial agent) lead to great and destructive disproportions in the whole

system. This limitation results also from the presence of a kind of *self-regenerating, self-fulfilling* tendency and the imitative rationality of the bank and currency panic.

Despite all the limitations, a system of indicators can be developed and a number of econometric experiments can be realized.

For the purposes of our analysis we divide *the indicators* into three groups: balance sheet indicators of the currency board, macroeconomic (on the basis of variation or average quadratic deviation of main macroeconomic variables) and indicators, deducted from the consolidated balance sheet of commercial banks (microeconomic indicators).

Indicators

A. Balance sheet monetary indicators on the currency board situation

On the basis of *the weekly I*ssue Department balance and *the weekly* BNB monetary report, we can build up the following indicators, regarding the currency board situation and the hazard of systemic crisis emergence.

· *indicator of currency board stability and systemic crisis risk (the indicator of G. Calvo)*[9]

IC=(M3-M1)/R

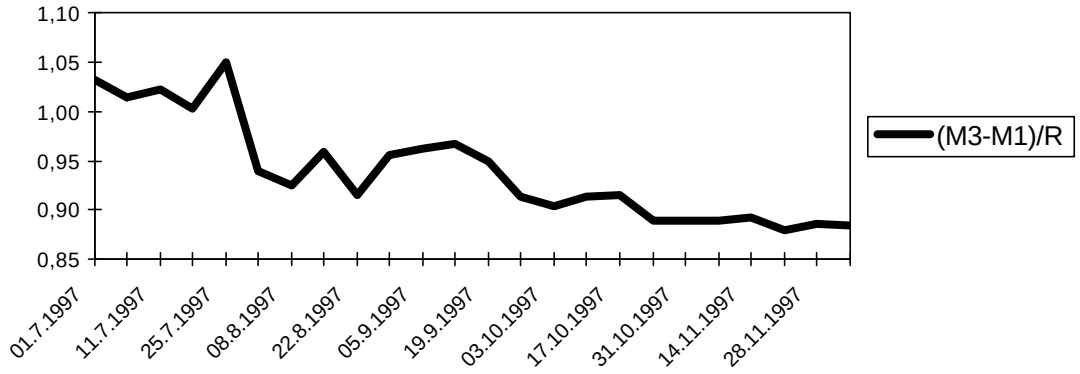
wherein M1 and M3 are monetary aggregates, while R - the currency board assets. Actually (M3-M1) indicates that part of the money supply (quasi-money), which can be immediately transformed into central money, and therefore into reserve currency. *The index should approximate one unit of measure.* If it considerably exceeds 1, the problems about servicing the transformation of quasi-money into ready money (cash) are likely to increase. On the other hand, if the index considerably falls below 1, it is a sign of the low confidence of depositors, as regards the banking system and domestic currency. The available data on Bulgaria is displayed in Table 2 and Graph 1, illustrating the Index of Systemic Crisis Risk.

Table 2 Index of systemic crises risk

	01.7.1997	04.7.1997	11.7.1997	18.7.1997	25.7.1997	01.8.1997	08.8.1997	15.8.1997	22.8.1997	29.8.1997	05.9.1997	12.9.1997	19.9.1997	26.9.1997	03.10.1997	10.10.1997	17.10.1997	24.10.1997	31.10.1997	07.11.1997	14.11.1997	21.11.1997	28.11.1997	05.12.1997
(M3-M1)/R	1,03	1,02	1,02	1,00	1,05	0,94	0,93	0,96	0,92	0,96	0,96	0,97	0,95	0,91	0,90	0,91	0,92	0,89	0,89	0,89	0,89	0,88	0,89	0,88

[9] See. Whitt J., (1996).

Graph 1



On the whole the index varies around one measuring unit, slightly deviating in November and Decmber. However, in general, according to this indicator the currency board seems stable at present.

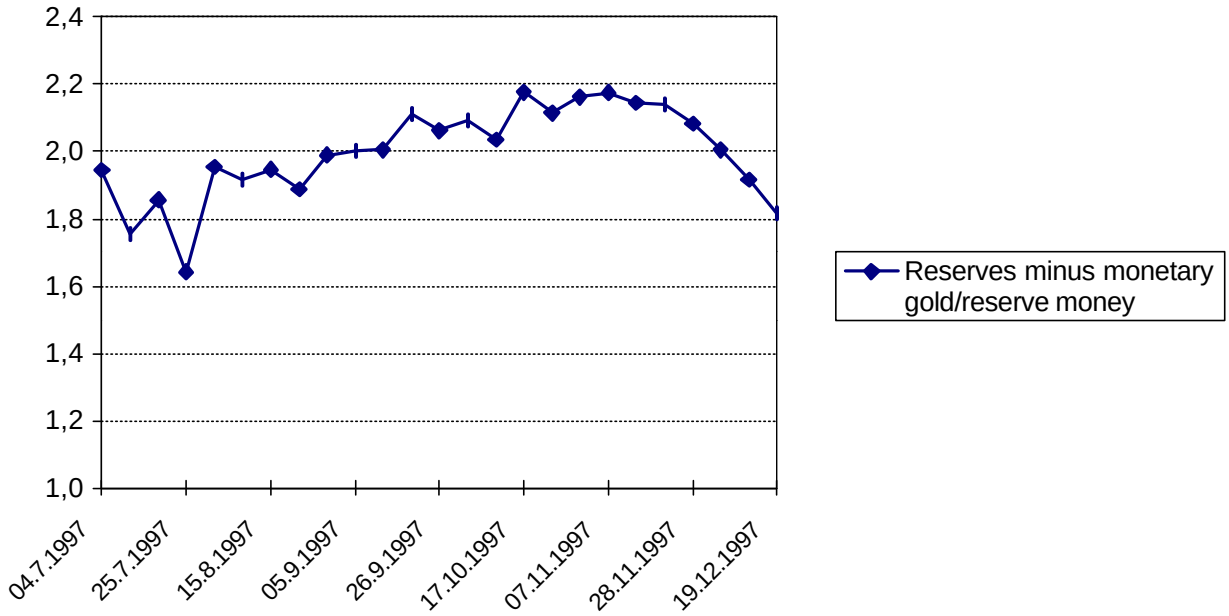
- *The ratio between central bank reserves (reduced with the amount of monetary gold) and reserve money*[10] can be considered a basic, standard index, reflecting the monetary rule of the currency board. A similar index has been applied in the countries, having introduced currency board arrangement**s**. The extending of this index above values above one is indicative of the alternative ways, in which the central bank can react under bank and currency crises. In fact the index may be below one, since the reserves amount has been reduced with the monetary gold. At present its dynamics can be presented in Table 3 and Graph 2 , illustrating the Index of the Reserve Coverage.

Table 3 Reserve coverage index

	04.7.1997	11.7.1997	18.7.1997	25.7.1997	01.8.1997	08.8.1997	15.8.1997	22.8.1997	29.8.1997	05.9.1997	12.9.1997	19.9.1997	26.9.1997	03.10.1997	10.10.1997	17.10.1997	24.10.1997	31.10.1997	07.11.1997	14.11.1997	21.11.1997	28.11.1997	05.12.1997	12.12.1997	19.12.1997
Reserves minus monetary gold/ reserve money	1,9	1,8	1,9	1,6	2,0	1,9	1,9	1,9	2,0	2,0	2,0	2,1	2,1	2,1	2,0	2,2	2,1	2,2	2,2	2,1	2,1	2,1	2,0	1,9	1,8

[10] The central bank reserves are reduced with the amount of monetary gold, since minimum intact reserve is considered to be available.

Graph 2

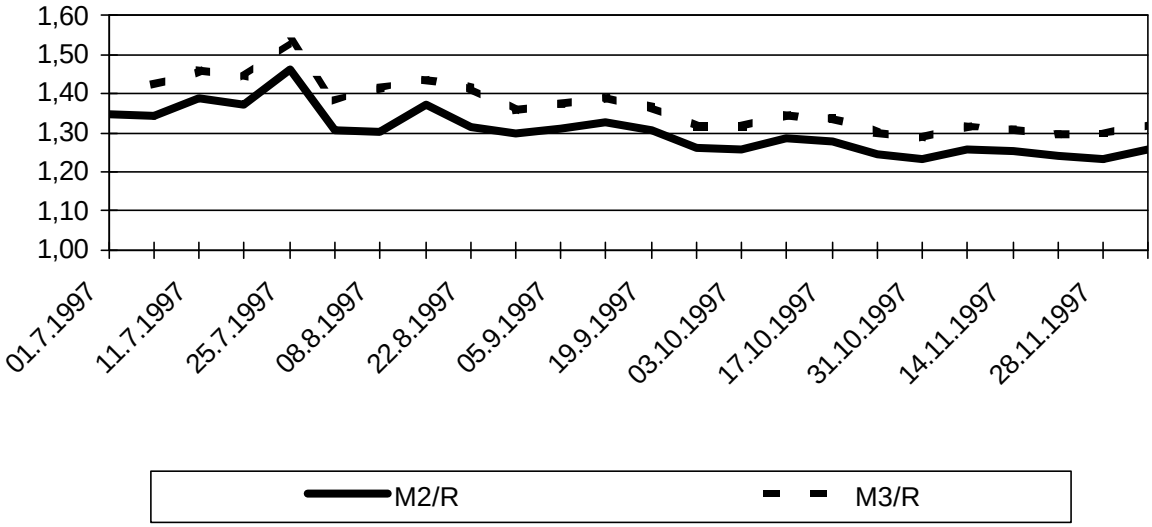


• We can develop another, more comprehensive index IC_1=M2/R (and IC_2=M3/C). M2 comprises besides quasi-money, the quickly transferrable into liquid assets money M1. The rising tendency of this index value ensures the safe functioning of the currency board. For the time being, its dynamics proves the concept about the currency board effective functioning. It is illustrated by Table 4 and Graph 3- Broad index of systemic crisis risk

Table 4 Broad index of systemic crises

	01.7.1997	04.7.1997	11.7.1997	18.7.1997	25.7.1997	01.8.1997	08.8.1997	15.8.1997	22.8.1997	29.8.1997	05.9.1997	12.9.1997	19.9.1997	26.9.1997	03.10.1997	10.10.1997	17.10.1997	24.10.1997	31.10.1997	07.11.1997	14.11.1997	21.11.1997	28.11.1997	05.12.1997
M2/R	1,35	1,34	1,39	1,37	1,46	1,31	1,30	1,37	1,31	1,30	1,31	1,33	1,31	1,26	1,26	1,29	1,28	1,24	1,23	1,26	1,25	1,24	1,23	1,26
M3/R		1,42	1,46	1,44	1,53	1,38	1,42	1,44	1,42	1,36	1,38	1,39	1,37	1,32	1,32	1,34	1,34	1,30	1,29	1,32	1,31	1,30	1,30	1,32

Graph 3

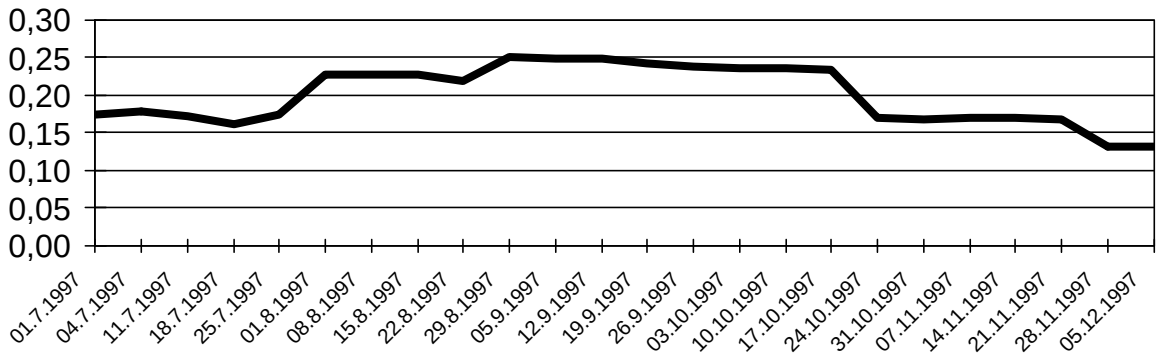


• An interesting indicator is the ratio between the Banking Department deposit and the overall balance of the Currency Board. The rising tendency of this ratio increases the possibilities for performing refinancing operations under a systemic crisis. It can be traced in Table 5 and Graph 4 - Banking Department deposit-to-Currency Board balance Ratio

Table 5 Banking Department deposit-to-the Central Bank balance ratio

	01.7.1997	04.7.1997	11.7.1997	18.7.1997	25.7.1997	01.8.1997	08.8.1997	15.8.1997	22.8.1997	29.8.1997	05.9.1997	12.9.1997	19.9.1997	26.9.1997	03.10.1997	10.10.1997	17.10.1997	24.10.1997	31.10.1997	07.11.1997	14.11.1997	21.11.1997	28.11.1997
BD`sD/R	0,18	0,18	0,17	0,16	0,17	0,23	0,23	0,23	0,22	0,25	0,25	0,25	0,24	0,24	0,24	0,23	0,23	0,17	0,17	0,17	0,17	0,17	0,13

Graph 4



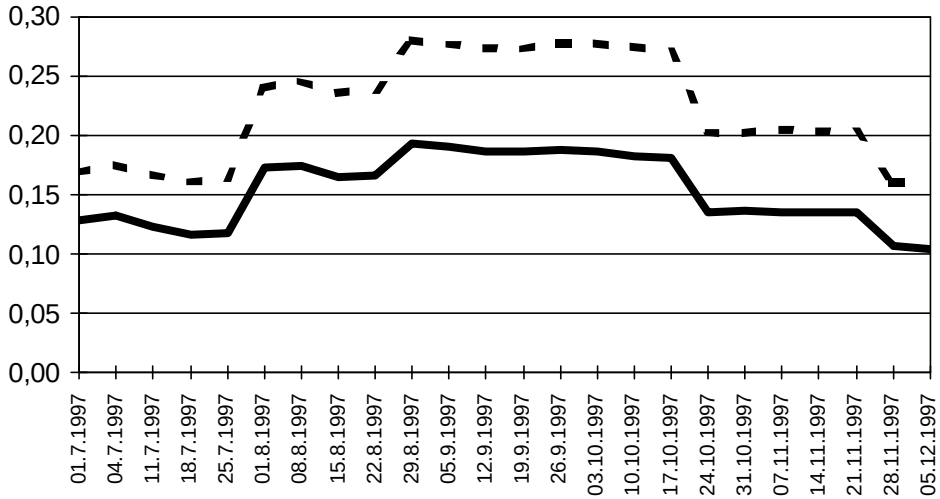
In November and December this ratio displays a downward tendency. This is a relatively hazardous trend, taking into consideration the big size of foreign debt payments in the beginning of the year. The risk is connected with the high speed of the banking crisis transformation into currency crisis and/or vice versa.

- *The ratio of the Banking Department deposit towards quasi-money or M2 is also indicative of a certain trend* . This indicator should be as high as possible. The data on Bulgaria is displayed in Table 6 and Graph 5 (See: Appendices, enclosed herewith)- Banking Department deposit-to-quasi-money and M2 Ratio

Table 6 Banking Department deposit-to-quasi-money and M2 ratio

	01.7.1997	04.7.1997	11.7.1997	18.7.1997	25.7.1997	01.8.1997	08.8.1997	15.8.1997	22.8.1997	29.8.1997	05.9.1997	12.9.1997	19.9.1997	26.9.1997	03.10.1997	10.10.1997	17.10.1997	24.10.1997	31.10.1997	07.11.1997	14.11.1997	21.11.1997	28.11.1997	05.12.1997
BD`sD/Quasi mone	0,17	0,18	0,17	0,16	0,16	0,24	0,25	0,24	0,24	0,28	0,28	0,27	0,27	0,28	0,28	0,27	0,27	0,20	0,20	0,21	0,20	0,20	0,16	0,16
BD`s/M2	0,13	0,13	0,12	0,12	0,12	0,17	0,17	0,17	0,17	0,19	0,19	0,19	0,19	0,19	0,19	0,18	0,18	0,14	0,14	0,14	0,14	0,13	0,11	0,10

Graph 5



The rising tendency of the index in August is also in line with the expressed standpoint about the currency board stability.

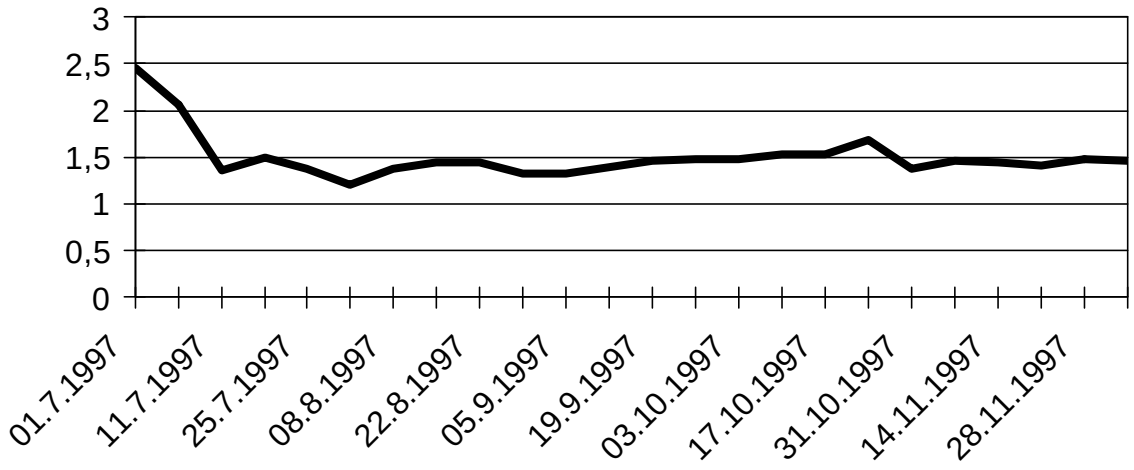
- There is another very informative index, showing the hazard with the shortest duration, (short-term coverage of liabilities) for the CB, i.e. the currency board liabilities with the highest liquidity (banknotes and coins in circulation + current accounts and deposits of banks + deposits of the government and budgetary organizations), related to the assets with the

highest liquidity (available cash, denominated in foreign currency). It can be seen in Table 7 and Graph 6 (See: Appendices, enclosed herewith) - Short-term Coverage Index.

Table 7 Short term coverage index

	01.7.1997	04.7.1997	11.7.1997	18.7.1997	25.7.1997	01.8.1997	08.8.1997	15.8.1997	22.8.1997	29.8.1997	05.9.1997	12.9.1997	19.9.1997	26.9.1997	03.10.1997	10.10.1997	17.10.1997	24.10.1997	31.10.1997	07.11.1997	14.11.1997	21.11.1997	28.11.1997	05.12.1997
	2,46	2,07	1,36	1,5	1,37	1,2	1,37	1,45	1,45	1,33	1,33	1,39	1,47	1,48	1,49	1,53	1,54	1,68	1,39	1,46	1,44	1,42	1,49	1,46

Graph 6



B. Indicators of stability (instability) on the basis of variation of main macroeconomic variables

The sharp *fluctuations* of key nominal and real macroeconomic variables lie at the root of that shock, which brings about the systemic financial crisis. The crises are underlain by the abrupt changes, not the absolute levels. The fluctuations can be approximated through *the variation* (or *the average quadratic deviation)* of the given variables.[11] In its turn the co-variation shows the mutual interaction of two or more variables' fluctuations.

The following are considered such variables:

Var (i_N) - variation of the nominal interest rate

Var (r) - variation of the real interest rate

Var (M0) - variation of the reserve money

[11] If X is a random quantity, showing mathematical expectation E(X)=μ, therefore the variation of X is:

Var (M3) - variation of the broad money

Var (m) - variation of the multiplier

Var (c) - variation of the preference towards money in circulation (c=C/D)

Var (CR) - variation of the domestic credit

Var (e_R) - variation of the effective currency rate

Var (DB) - variation of the Banking Department deposit

Var (R) - variation of the Issue Department reserves

Var (M^d-M^s) - variation of the liquidity, measured through the difference between money demand and money supply

Var (i_{lv}-i_{dm}) - variation of the interest differential between BIR and interest rates on the three-month German government securities

The above mentioned variations can be estimated by data on daily, weekly or monthly basis, as regards a specific period (for example a week - by daily, a month - by weekly, a year - by monthly data respectively, etc.). We have chosen periods, comprising separate years since 1993 till now, as well as periods with a larger scope. The data are characterized by monthly or weekly frequency. The variations of chosen indicators in nominal and real value (deflator CPI) - *the average quadratic deviation as percentage of the average quantity for the chosen period* - are displayed in Table 8 on Instability Indicators in Nominal Value and Table 9 on Indicators in Real Value.

Table 8 Instability indicators in nominal term

Variation of reserve money	8,70%	17,41%	15,70%	28,14%	47,69%	163,09%	29,90%	13,32%
Variation of broad money	13,16%	17,09%	10,52%	27,68%	27,62%	134,74%	32,56%	13,33%
Variation of credit	13,47%	13,36%	3,21%	38,82%	15,94%	120,73%	45,22%	11,13%
Variation of money in circulation	12,84%	14,71%	19,08%	27,49%	57,42%	178,33%	35,56%	18,87%
Variation of money in circulation-to-deposit ratio	2,59%	5,48%	9,84%	3,79%	44,68%	39,00%	8,18%	8,35%
Variation of money multiplier	7,13%	5,07%	6,65%	4,36%	31,23%	15,47%	7,14%	8,10%

Var (X)=σ^2_x=E(X-μ)^2 .

Table 9 Instability indicators in real term

	1993	1994	1995	1996	1997	01/93-10/97
Variation of reserve money in real term 92=100	8,93%	9,81%	9,63%	25,10%	33,22%	38,37%
Variation of broad money inn real term	2,25%	9,99%	4,04%	25,69%	31,53%	35,28%
Variation of credit in real term	2,26%	20,93%	4,54%	15,57%	53,20%	46,76%
Variation of money in circulation in real term	3,41%	11,74%	12,59%	24,29%	41,73%	34,74%
Variation of money in circulation-to-deposit ratio in real term	2,59%	5,48%	9,84%	3,79%	44,68%	39,00%
Variation of money multiplier in real term	7,13%	5,07%	6,65%	4,36%	31,23%	15,47%

The dynamics of indicators confirms in a telling way the hypothesis, that exactly the fluctuations of main monetary variables underlie the crisis at the end of 1996 and in the beginning of 1997. This tendency can be traced especially by the nominal indicators. The nominal quantities are more indicative of the instability due to the fact, that *the economic agents within an emerging economy are liable to "the nominal illusion"* and cannot forecast the development of real economic indicators.

An interesting phenomenon can be observed. During 1995 and 1996 "the non-behavioural" variables such as reserve money, broad money, credit, money in circulation show greater volatility, while "the behavioural" ones - multiplier and money in circulation/deposit ratio are relatively steady. However, the abrupt fluctuations of monetary and credit aggregates have led to changes in the behaviour and expectations of economic agents, with 1997 being characterized by sharp variations in the multiplier and the money in circulation/deposits ratio. *This conclusion proves the hypothesis, that the shock has been caused by the misguided and discretionary policy.* The dynamics of real quantities is more or less similar, and the fluctuations are slighter.

Concise and instructive conclusion: The awareness of the instability of the system has been generated by the banking system and especially BNB. People were striving to remain calm, but they were not given that opportunity. By way of this thesis, the following lemma can be deduced:

Lemma: The discretionary policy usually gives rise to monetary cataclysms.

The ratio of credits to deposits is considered an interesting indicator (frequently applied in forecasting systemic financial crises). The high values of this indicator imply that if the deposit mass is likely to decrease, the commercial banks are supposed to collect the credits promptly. The untimely collection of credits and liquidation of assets generate losses for the

banks, thus having impact on the real economic activity. The dynamics of this indicator (as shown in Graph 7 in appendices, illustrating Credits-to-Deposits Ratio), referring to the period January 1996 - November 1997, confirms the theoretical interpretation stated above. This indicator is characterized by a lasting tendency of steady growth, starting in the middle of 1996, and reaching maximum values in the beginning of 1997 under the monetary crisis.

The following two points should be *further analysed:*

1) The estimation of the "shadow" exchange rate S, defined as a currency rate, capable of reinstating the money market equilibrium in the country after a speculative attack, which would reduce the forex reserves of the currency board to the critical threshold (chosen at random). The degree, to which a certain speculative attack is likely to succeed at the current moment t Pr(t), can be formulated:

$$Pr(t)=Pr[S(t+1) - F(t+1) >0 \mid \xi (t)],$$

wherein F(t+1) is the level of the fixed exchange rate after the speculative attack and it is equal to F(t), if the level prior to the attack is being retained. $\xi(t)$ is the information disposable before the speculative attack. The above mentioned correlation indicates the extent, to which the exchange rate, anticipated after the attack, will be higher than the fixed exchange rate or the devaluation, declared in advance.

2) Estimation of the fuction of *money demand,* considered a variable including *the bad, uncollectable claims* of commercial banks. The evaluation of the demand for liquidity, obtained in that way, can be applied in analysing the dynamics of $Var(M^d - M^s)$.

C. Indicators, deducted from the balance sheets of commercial banks

A number of indicators can be deducted from the consolidated balance of commercial banks: bad loans dynamics, liquidity indicators, parameters, regarding the capital adequacy, the interest revenues as percentage of the total assets, held by commercial banks, non-interest revenues, constituting a part of the overall revenues of commercial banks, etc.

The low values of the indicator *gross interest revenues as percentage of total assets* signalize the incapability of commercial banks to generate profits by performing one of their fundamental activities, and indicate the risk of further banking crises. In its turn the high values of the ratio between *non-interest revenues and overall revenues* of commercial banks can be considered a sign of potential incapacity, as regards the financial intermediation or an evidence of the fact, that commercial banks prefer the sources of proceeds, characterized by great fluctuations and strong competitiveness present on the market of such services.

Table 10 displays the following correlations - interest revenues as percentage of total assets and non-interest revenues as percentage of overall revenues. They prove the theoretical interpretation of these two parameters. The conspicuous downward tendency of a continuous drop in interest revenues, forming percentage of the total assets, and the upward trend of non-interest revenues as a part of the overall revenues of commercial banks, starting from 1993 till June 1997 can be indicative of the banking crisis, having emerged in the country.

Table 10

	1993	1994	1995	1996	Jun.1997
Interest revenues as % of total assets	13.9 %	20.6 %	16.0 %	14.8 %	9.2 %
non-interest revenues as % of overall revenues	14.7 %	39.0 %	60.4 %	88.4 %	96.8 %

The interbank market situation can give grounds for developing certain indicators.

The first indicator should refer to *that part of banks, not having actual access to the interbank market and/or borrowing funds at a very high interest rate* (including a high risk premium). The limited number of banks, as well as the great number of banks, borrowing funds at a high interest rate, are indicative of problems in the banking system.

Second, of considerable importance is *the information about interest rates on fixed deposits with great face value, offered by commercial banks.*

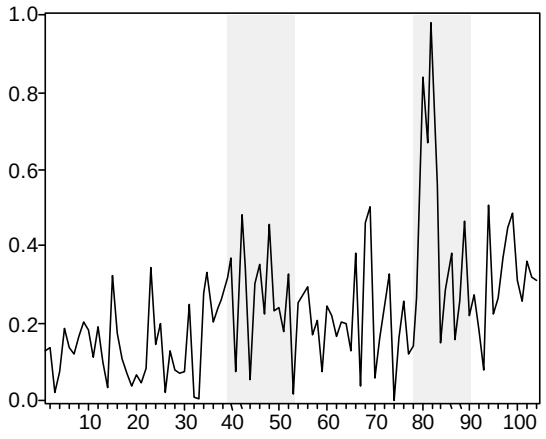
In general the difficulties within the whole banking system can be approximated with a parameter on the *payments in arrears*. This indicator is at the basis of Regulations N6, which is under consideration. It stipulates the procedure for guaranteeing the credits, extended to commercial banks on the part of the banking department at the BNB. The definition of liquidity risk is presented in article 2. The hypothesis in force is the following: if the documents for payments in arrears exceed 10% of the overall amount during the last two days, therefore there are difficulties in the settlement system.

The maturity of extended funds is a traditional indicator of the liquidity on the interbank money market. On the basis of weekly data about the interbank market dynamics for the period January 1996 - December 1997, we can build up three graphs. They prove the fact, that *under banking crisis the volumes of short-term funds have a rising tendency, while those, extended for longer term display an abrupt falling tendency.* The periods of banking disruptions are hatched on the graphs, illustrating the following correlations. Graph 10 -

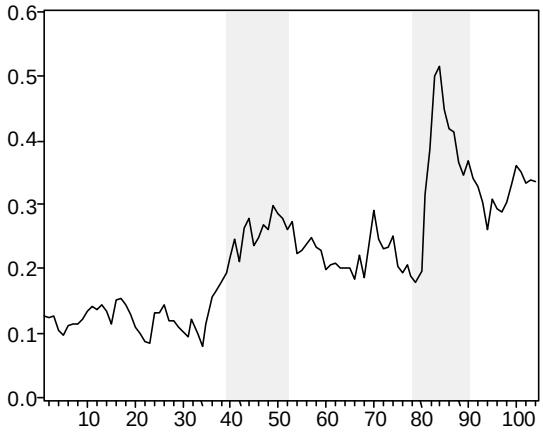
Dynamics of the one-day funds' part, ofered on the interbank market as % of its total volume; Graph 11 - Dynamics of the part of funds, extended for 1 week to 1 month, offered on the interbank market as % of its total volume; Graph 12 - Dynamics of the part of funds, extended for over 1 month, offered on the interbank market as % of its total volume.

Graph 10

Dynamics of the one-day funds' part, offered on the interbank market as % of its total volume

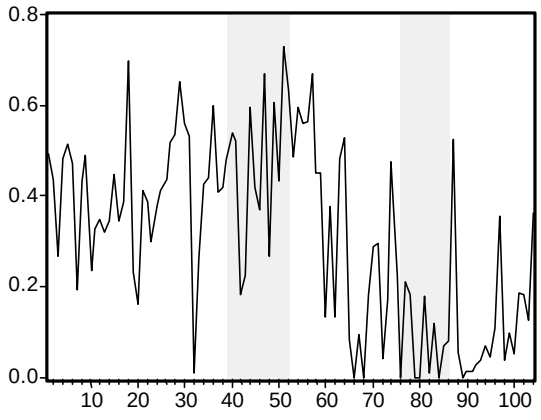


DAY- percentage of the total

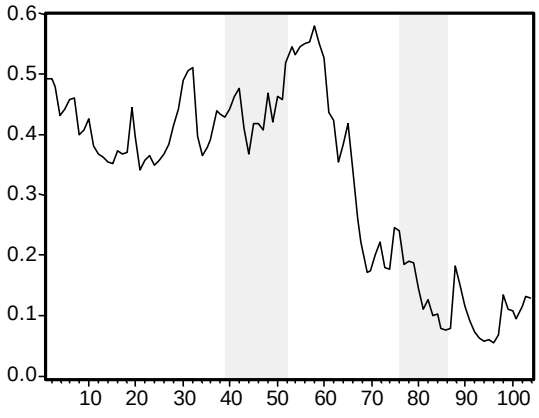


DAYSM - exponentially

Dynamics of the part of funds, extended for 1 week to 1 month, offered on the interbank market as



WEEK - percentage of the total

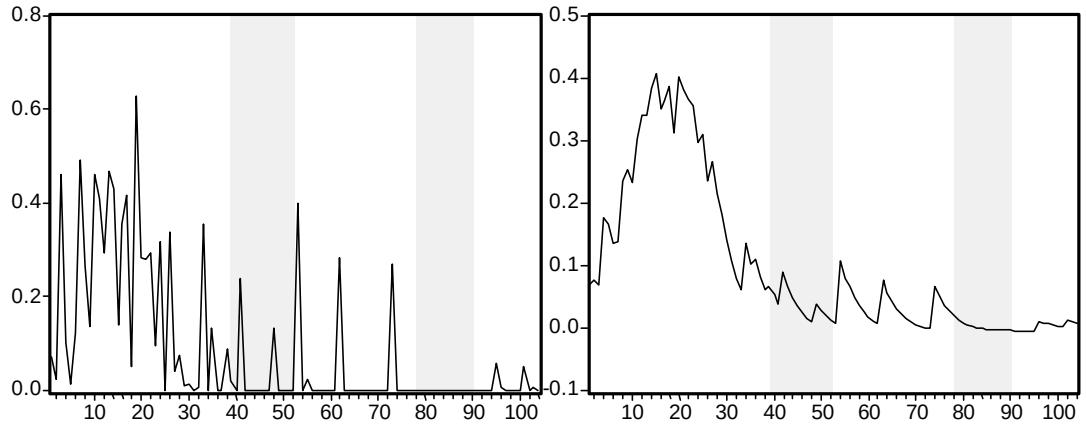


WEEKSM - exponentially

Graph 11

Graph 12

Dynamics of the part of funds, extended for over 1 month, offered on the interbank market as % of its



MONTH - percentage of the total MONTHSM - exponentially

The modeling of certain main behavioural correlations will be further analysed: Such as the impact of the interest differential (between BIR and three-month BUNDS), of money in circulation/deposits ratio, of foreign exchange substitution, of external debt payments' dynamics and of transfers, received from abroad, upon the dynamics of the Issue Department reserves. As well as the reverse correlation: the impact of the Issue Department reserves upon the confidence in the Bulgarian currency and banking system.

V. GUIDELINES FOR PREVENTING THE SYSTEMIC CRISIS UNDER CURRENCY BOARD

Both the systemic crisis and systemic risk comprise an element, which *cannot* be controlled and avoided. No doubt, certain legal regulations and mechanisms can be set up, in order to alleviate and even secure us against the crises. The different organizations in charge of money management: *discretionary central bank, central bank with monetary rules, curency board and a system of private sector money* outline different aspects of the systemic crises prevention and management. The term "issue management"[12] has been explicitly introduced into the theory of crises management. The basic elements of *crises management* can be ascribed to three stages: prior to the crisis, during the crisis and after the crisis.

[12] Forgues B. (1996).

The main phases of managing the systemic crisis can be represented by *phase of precautions, phase of reaction and phase of learning.*

Generally speaking, *three lines of preventive measures, of reaction and of crises' analyses* could be traced*:* administrative, economic and socio-psychological precautions.

1. Administrative precautions

The above mentioned set of systemic risk *indicators* should be improved and further developed. This is the first step, aimed at preventing the systemic risk. The accepted parameters should be regularly *maintained and supervised.* A group of experts can be established with a view to operational analyses of the financial system situation. There are such groups even within all the great industrial and financial organizations of the developed countries (we dare state they exist in our country too).

A legal framework, resistant to passage of time, should be regulated and adopted, as regards the financial intermediaries. The legal regulations must be in force as longer as possible. Their frequent substitution can turn out to be that shock, which is likely to give rise to the systemic crisis[13].

The administrative policy measures include also *the financial supervision, control and diagnostics.* The systematic surveillance and control, imposed upon the financial intermediaries, account for their cautiousness in performing respective activities.

The free circulation and transparency of information as regards the state and behaviour of intermediaries imply the rational performance of economic agents. The publication of consolidated balance sheets and profit and loss accounts of commercial banks, as well as separate balance sheets and profit and loss accounts of particular banks, provides the depositors with additional information. Therefore commercial banks are less exposed to assuming high risks, because their long-term survival depends on the confidence of their depositors.

The example of Chile can be very instructive, in view of the consolidated and specific information about commercial banks, published in four versions. First, monthly detailed accounting balance, consisting of 63 items in the assets side and 69 items in the liabilities side. Second, monthly profit and loss account, comprising 47 subcategories in the

[13] For example, according to a number of authors, the level of regulations largely determines the level of competitiveness as well. Some authors (M. Aglietta, 1993) share the opinion, that the regulations governing the banking market should make it an oligopoly, which is ineffective from the microeconomic perspective, but this is the optimal structure, aimed at preventing the systemic risk. The libertarian Salin P. (1990, 1991) states similar viewpoints.

revenues side and 71 subcategories in the expenditures side. Third, indicators of liquidity, capital adequacy, non-operating assets and internal credits, concerning the commercial banks as a whole, and each bank in particular. Fourth, analysis of the borrowers, divided into 11 categories[14] .

Penal amenability and legal proceedings should be effective and prompt[15] .

2. *Economic precautions*

In general the economic and monetary policy should be "consistent" and comprehensible to the economic agents (if there is any real necessity for such a policy at all). This consistency itself prevents the systemic crises. The aspects of monetary policy should be stipulated in legal regulations, according to which, those, who violate the law, to bear responsibility.

The currency board arrangement requires strict observation of the adopted rules and does not allow any alterations in the exchange rate level. Although both the theory of games and the economic science aspects, investigating monetary rules, emphasize the Central bank's *dominating position*, allowing the violation of rules (standpoint of Stakelberg), we should be cautious of every change in the currency board regulations, since it eventually undermines the already fragile confidence in our monetary aithorities.

A specific element of the economic policy is *the insurance of deposits* and the notion of *lender-of-last-resort*[16]. Undoubtedly, the systemic risk is higher if there is a lender of last resort. The lender-of-last-resort itself can bring about the systemic crisis (as have been already shown), but it is more efficient (although in the short-term run) in bringing to an end the crisis, having already emerged.

It can be firmly stated, that the deposit insurance system, involving the payment of insurance premiums by commercial banks as percentage of their deposits, aggravates the moral hazard problem and leads to investing in assets, carrying a greater risk. We suggest the following solution to this problem: the insurance premiums, payable by commercial banks, to be determined in view of the risk of their assets.

We should be unbiased, when reconsidering our attitude towards *the minimum reserve requirements of commercial banks*. The reduction or abolition of minimum reserve

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[14] See. Honohan P (1997).

[15] It is well known, that during 1980s in Chile there were banking legal courts, performing extrtemely strict and punctual operations.

[16] The insurance of deposits can be public or private, institutionalized or functional, explicit or implicit (Merton R., Bodie Z., 1992, Goyeu D., Tarisi A., 1993, Kyei A., 1995, Tirole J. 1994, etc.).

requirements[17] can be applied as an additional economic precaution. The efficiency of this measure depends on the shift of emphasis, regarding the monetary policy (conducted according to strictly defined monetary rules) from control of the reserve money supply towards control of the short-term interest rates. On the other hand, the reduction or abolition of the minimum reserves diminish the systemic crisis risk due to the fact, that the minimum reserves are a kind of taxation upon depository institutions, which impairs their competitiveness, as compared with the other financial intermediaries. Therefore, the commercial banks, having become less competitive, have to undertake greater risks, hereby making the systemic crisis more likely to emerge, due to the deteriorated balance-sheets of commercial banks[18] .

3. *Socio-psychological precautions*

The mass-behavior features of the systemic crisis dictate the necessity of undertaking a whole range of "social" precautions. Such as the following: conducting information policy, fighting rumors and misinformation, applying mechanisms for influencing the public reaction, etc[19] .

IN CONCLUSION:

Striking a balance as regards the research paper: we have laid down the foundations, underlying a set of indicators about the financial system and currency board situation. We are going to concentrate our further efforts on the structure of the banking system at a microeconomic level.

A concise general conclusion and debatable statement: This research explicitly proves, that the discretionary monetary policy is detrimental, therefore it should not be pursued. The currency board arrangement, which is actually a monetary rule, is a better alternative of money management. But this is not comprehensive enough: ***we maintain the opinion, that the system of free banking and decentralized monetary issues ensures the highest possible stability of the financial system. But let us leave the discussion open. We just want to point out, that our analyses are performed along these lines. We hope to find financial support on behalf of private or non-governmental institutions, such as the Institute for Market Economy.***

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[17] Some countries like Germany, England, France and Japan reduce considerably the percentage of minimum reserve requirements in the post-war years, while others like Canada and New Zealand abolish this instrument in 1992 and 1989 respectively.

[18] See in detail Sellon G., Weiner S. (1996, 1997).

[19] As illustrated by the theory of games, sometimes concealing the information makes the economic agents act in a more rational way and take co-operative decisions. (see. Guerrien B. 1997).

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