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## UPRAVLJANJE RIZIKOM U SISTEMIMA PLAĆANJA

### Rezime

Upravljanje rizikom u sistemima plaćanja (sistemima elektronskih plaćanja) je stalni posao i funkcija NCB - Nacionalnih Centralnih Banaka, a generički se uloga NCB ključno vezuje za upravljanje SVP - Sistemom velikih plaćanja i očuvanjem stabilnosti nacionalnog finansijskog sistema. Cilj rada je da prikaže procese koji su pod kontrolom NCB (u Srbiji NBS), znači oba procesa koja određuju smer upravljanja i funkcionisanja: NCB je regulator ekonomske efikasnosti sistema plaćanja (SVP/RTGS) i ukupne likvidnosti i istovremeno regulator monetarne stabilnosti, a na taj način vlasnik oba globalna procesa upravljanja i njihove međuzavisnosti, odn. kauzalne povezanosti procesa, što logički implicira da su značajni uticaji u oba smera, sa jedne strane finansijski uticaj SVP na realizaciju ciljeva monetarne politike, a sa druge strane materijalne posledice monetarne nestabilnosti na Sistem velikih plaćanja - SVP (RTGS).

Sa ciljem objašnjenja pojave rizika i procesa upravljanja u radu se razmatra i analizira model i šema upravljanja rizikom u sistemu plaćanja, pojava ključnih poremećaja u funkcionisanju sistema, modeli i mere za smanjenje rizika u smislu BII, tj. implicira moguće promene BII i nacionalnih regulatornih mehanizama, analizira nastale promene u ponašanju NCB i preduzete mere za realizaciju finansijskih programa i mera. Analiza svetske finansijske krize sve više pokazuje nedostatke u upravljanju sistemima plaćanja, nacionalnim finansijskim sistemima, a posebno dokazuje značaj primene modela za upravljanje rizicima i potrebu konstantne sinhronizacije regulatornog okvira.

**Ključne reči:** SVP - Sistem Velikih plaćanja, SMP - Sistem Malih Plaćanja, ISO - International Standards Organization, IBAN - International Bank Account Number, BIC - Bank Identifier Code, verovatnoća neizvršenja obaveza (PD - Probability of default), veličina mogućeg gubitka (LGD - Loss given default), izloženost riziku pri neizvršenju obaveza dužnika (EAD - Exposure at default), ročnost (M - maturity), Deadlock - blokada na nivou RTGS, Gridlock - blokada na nivou učesnika u sistemu plaćanja, CLS - sistem poravnanja za Fx transakcije (Continuous Linked Settlement)

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# REAL TIME GROSS SETTLEMENT SYSTEM RISK MANAGEMENT

## Summary

The *RTGS* - Real Time Gross Settlement System risk management is a fundamental and constant activity of the *NCB* - National Central Banks, but taking it as a generic process, the role of the NCB is linked to the management of the RTGS and protective function for the national financial system stability. This paper's objective is to present the processes monitored and managed by the NCB (in Serbia *National Bank of Serbia - NBS*), that influence the basic functions of the NCB. The National Central Bank is the main regulator of the economic efficiency of the RTGS and of the total liquidity, and at the same time the regulator of the monetary policy and stability. Thus, based on the defined roles, the NCB is the owner of the mentioned processes, their mutual relationship, i.e. causal interdependence, which logically implies that the influences in both directions are equally significant and are used to balance, on one hand, the financial influences of the RTGS on the achievement of the monetary policy goals, and on the other hand, the material consequences of the monetary instability that causes the disturbances in the RTGS.

Aiming to facilitate better understanding of the risks and management processes in the payment system, the authors have offered a model and a management scheme for a detailed analysis of the key risk factors and possible failures, as well as the models for risk reduction in line with *Basel II*, i.e. in terms of indicating the potential BII and national legal framework changes, analyzing the existing change in the NCB behaviour and the actions taken to implement the financial programmes and measures. The global financial crisis has shown an increasing number of drawbacks in managing payment systems operations, and in the national financial systems, especially proving the importance of risk management models implementation and the need for constant legal framework synchronization.

**Key words:** *RTGS* - Real Time Gross Settlement System, *LVPS* - Low Value Payment System, *ISO* - International Standards Organization, *IBAN* - International Bank Account Number, *BIC* - Bank Identifier Code, *PD* - Probability of default, *LGD* - Loss given default, *EAD* - Exposure at default, *M* - Maturity, *Deadlock* - shortage of liquidity in the overall payment system, *Gridlock* - inappropriate distribution of liquidity between the participants, *CLS* - Continuous Linked Settlement

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U savremenom finansijskom i bankarskom poslovanju pojavljuju se brojni rizici od kojih su najčešći **rizik likvidnosti, kreditni rizik, sistemski rizik, rizik kamatne stope, devizni ili valutni rizik** (rizik deviznog kursa), **tržišni rizik** (promene cene hartija od vrednosti kojima se trguje), **rizik nesolventnosti**, rizik plaćanja, **rizik zemlje, operativni rizik, pravni rizik** (legal risk) itd. (1). Među ovim rizicima izdvaja se rizik koji pogađa praktično sve učesnike u domaćim i međunarodnim finansijskim transakcijama, a to je rizik plaćanja.

## Model infrastrukture za upravljanje rizikom u sistemima plaćanja

Upravljanje sistemima velikih plaćanja, šematski prikaz (slika 1.), u velikoj meri zavisi od modela infrastrukture, mehanizama upravljanja, instrumenata plaćanja, sistema razmene poruka i zakonske regulative, odn. propisanih obaveza banaka (nacionalni regulatori i kontrolori propisuju način identifikacije izvora rizika, e.g. Narodna banka Srbije<sup>1</sup>) da identifikuju izvore mogućih rizika, kreditnog, likvidnosti, operativnog i dr. oblika rizika, evidentiraju pojavu rizika, preduzete mere za smanjenje i prikazu nastale gubitke, sa obavezom redovnog izveštavanja NBS o gubicima nastalim kao posledicama rizika. Posebna vrsta rizika, operativni rizik (vrsta rizika koja do sada nije bila značajna za procese upravljanja rizicima), kao i ostale vrste tržišnih rizika koji mogu tako nastati, a koji ugrožavaju nivo sigurnosti kapitala banke, postali su predmet procesa upravljanja sistemom plaćanja, a sve u skladu sa obavezama da **CAR** (Capital Adequacy Ratio) bude min 8% definisanim okvirom BII, (I stub (Pillar) - Minimal Capital Requirements).

U smislu zakonskih obaveza radna grupa UBS (Udruženja banaka Srbije) je napravila predlog: "Metodologija za evidentiranje i praćenje operativnog rizika<sup>2</sup> u banci"<sup>3</sup> sa obavezom banaka da prate operativni rizik

(značaj ove vrste rizika je uveden preporukama Bazelskog komiteta u okviru BII), saglasno preporučenoj metodologiji za praćenje, merenje i upravljanje operativnim rizikom (koja po definiciji uvodi grupe tehničkih rizika vezanih za komponente informacione tehnologije: infrastruktura plaćanja, kadrovi, aplikacije, mreža i servisi podrške) i u određenim rokovima podnose operativne izveštaje na nivou grupe i NBS.

Metodologija predviđa identifikaciju izvora operativnog rizika, praćenje gubitaka po osnovu operativnog rizika i to po osam linija poslovanja (mapiranje linija poslovanja preuzeto iz Bazelskog sporazuma II, BII).

Predložena metodologija, kao i većina preporuka Bazelskog komiteta (recommendations), nije obavezna za banke (ali kada je propiše nacionalni regulator, npr. NBS, može postati zakonska obaveza sa svim elementima sankcija), što u slučaju predmetne metodologije još nije slučaj, znači da je pitanje bančinog izbora. Proces upravljanja sistemima plaćanja i saglasno pojavama rizika u njima, bazira se na međunarodno i nacionalno utvrđenim standardima (važnost standardizacije i definicija poslovnih događaja), a primena preporuka Bazelskog komiteta predstavlja najvažniji metodološki okvir, koji diktira sama važnost preporuka i izbor pravilnog pristupa merenju rizika i uporedivosti podataka, a krajnji cilj je snižavanje troškova po osnovu identifikacije, praćenja i evidentiranja rizika.

(Slika 1. strana 80)

Proces upravljanja rizikom u sistemima velikih plaćanja, u najvećoj meri bazira na upravljanju infrastrukturom (HW, SW, bazama podataka i ljudskim resursima), bankarskim i finansijskim instrumentima, zakonskom regulativom (obaveze subjekata u sistemu plaćanja, oblici garantovanja, kaznene mere) i implementiranim modelima predviđanja rizika u okvirima bančnih strategija i strategija nacionalnog regulatora i kontrolora.

Sistem velikih plaćanja, pored nacionalnog

<sup>1</sup> Odluka o upravljanju rizicima ("Sl. glasnik RS, br. 57 od 30.06.2006.)

<sup>2</sup> BIS Basel, "Operational risk transfer across financial sectors", avgust 2003, Basel Committee on Banking Supervision

<sup>3</sup> UBS, Radna grupa za upravljanje rizicima, septembar 2006. godine

In the modern financial and banking businesses a number of risks arise, most frequent of them being: **liquidity risk, credit risk, systemic risk, interest rate risk, foreign currency risk, market risk** (i.e. the price change of the securities traded on the financial markets), **insolvency risk, payment risk, country risk, operating risk, legal risk**, etc. Among the listed risks the most prominent is the risk that affects practically all participants in the local and international financial transactions, that is the payment risk.

### Payment model infrastructure for rtgs risk management

RTGS risk management, as schematically presented (figure 1.), is to great extent dependent on the payment infrastructure, management logic and processes, payment instruments, message exchange system and the legal framework, i.e. regulatory requirements for banks (national regulators and supervisors prescribe the manner for identifying the risk sources, e.g. in Serbia the National Bank of Serbia<sup>1</sup>) to identify the sources of possible risks, i.e. credit, liquidity, operational and other types of risks, record risk occurrence, undertake risk mitigation measures, disclose the losses and regularly report to the NBS about the losses suffered as a consequence of these risks. A particular type of risk, operational risk (the type that until recently was not relevant for the risk management processes), as well as the other types of market risks that may emerge and jeopardize the safety level of the bank's capital, became the object of the payment system management process, all in line with the obligation that Capital Adequacy Ratio remains min 8% as defined by the BII framework (Pillar 1 - Minimal Capital Requirements).

In line with the regulatory requirements, the Working group within the ASB - Association of Serbian Banks - has prepared the so-called "Methodology for operating risk<sup>2</sup> assessment and monitoring in commercial banks"<sup>3</sup> (consistent with

BII revised framework), imposing obligation on commercial banks to monitor operating risk (the significance of this type of risk was introduced in the Basle Committee recommendations within BII), in accordance with the recommended methodology for monitoring, assessing and managing operating risk (which by definition introduces groups of technical risks related to the information technology components, such as payment infrastructure, IT staff, software applications, network and support services), and to submit operating reports within the prescribed deadlines both to the Working Group and to the National Bank of Serbia.

The Methodology proposes identification of the operating risk sources, monitoring of the losses in respect of operating risk, according to eight business lines (mapping of the business lines is taken from the BII recommendations).

The proposed methodology, as the majority of Basel Committee recommendations, is not mandatory for commercial banks (except when prescribed by the national regulator, e.g. NBS, when it becomes legally binding including sanctions). Since this is not the case with the methodology concerned, commercial banks have a choice whether to follow it or not. The process of payment systems management and relevant risk occurrences are based on the internationally and nationally prescribed standards (the importance of standardization and the definition of business events), and the implementation of the BII recommendations represents the most important methodological framework, imposed by the significance of the recommendations themselves, and by the choice of the appropriate approach to risk assessment and data comparability, with an ultimate goal of reducing the cost in respect of risk identification, monitoring and recording.

#### (Figure 1. page 81)

The risk management process in the RTGS systems is mostly based on the payment system infrastructure management (hardware, software, databases, network and human resources), banking and financial instruments, legal framework (e.g.

<sup>1</sup> Decree on risk management ("Official Gazette of the RS, No.57, 30th June 2006)

<sup>2</sup> BIS Basel, "Operational risk transfer across financial sectors", August 2003, Basel Committee on Banking Supervision

<sup>3</sup> ASB, Working Group for risk management, September 2006

okvira, često (finansijska i tržišna integracija EU i nacionalnih sistema velikih plaćanja - TARGET, TARGET 2), zahteva i kontrole plaćanja u međunarodnom platnom prometu (cross border transakcije, koje se u delu realizacije transakcija završavaju u nacionalnim platnim prometima: transakcije trgovanja devizama, ukamaćivanje sredstava iz potencijala banaka, plaćanja u poslovanju HOV). Činjenica da se vrši realizacija transakcija u međunarodnom platnom prometu iz nacionalnih platnih sistema, uvodi i novi segment upravljanja rizikom, a to je mogućnost kontrole transfera rizika (prenos rizika iz jednog SVP u drugi sistem, transfer kreditnog rizika - credit risk transfer), posebno značajnog za zemlje u tranziciji i kontrolu njihovih finansijskih kapaciteta. Sa ciljem analize upravljanja rizikom, generalno sagledavanja pojave mogućih rizika, koji narušavaju stabilnost sistema plaćanja, definisana je struktura koja će konceptijski i operativno biti korišćena za istraživanja pojave, uticaja i modela za smanjivanje rizika.

(Slika 2. strana 82)

Model za istraživanje i kasnije generisanje opšteg modela upravljanja rizikom (predmet drugog rada), definisan je nad infrastrukturom (šematski prikaz procesa plaćanja u sistemima plaćanja), a pruža eksperimentalne mogućnosti za uočavanje ponašanja subjekata u sistemu plaćanja, regularno i u uslovima pojave rizika, bez obzira da li je proces upravljanja vezan za SVP, kliring (SMP) ili SSS - sistem plaćanja vezan za poslovanje HoV.

Strateški posmatrano, upravljanje rizikom, nad definisanom šemom sistema plaćanja, je dinamički (vremenski ciklus) definisan na strukturi i relacijama samog lanca plaćanja i nivou upravljanja lancem plaćanja:  $\rightarrow KB_i \rightarrow NCB_i \rightarrow KB_j \rightarrow$  koja implicira i zakon procesa upravljanja, odn. mesta rizika i moguće posledice (gubitke). SVP je dovoljno upravljiv, ako je strukturno, regulatorno i informatički dobro organizovan i uređen. Proces upravljanja

rizikom u SVP je u najvećoj meri koncentrisan na dvema ključnim relacijama modela:

međubankarska poravnanja u sistemu plaćanja posredovanjem centralne banke (CB) kao agenta SVP:

1.  $KB_i \rightarrow NCB_i$  (NCBi kao Receiver naloga/ poruke za plaćanje od banke S (KBi))
2.  $NCB_i \rightarrow KB_j$  (NCBi kao Sender naloga/ poruke za plaćanje banci R (KBj))

Prva instanca u modelu lanca plaćanja ( $C_i \rightarrow KB_i$ )<sup>4</sup> i poslednja instanca u lancu plaćanja ( $KB_j \rightarrow C_j$ )<sup>5</sup> su praktično manje bitne za proučavanje nastanka i upravljanja rizikom globalno, ali svakako značajne za kompleksno sagledavanje mehanizama i načina upravljanja rizikom u RTGS.

### Upravljanje otkazima (deadlock<sup>6</sup>, gridlock<sup>7</sup>)

U SVP pojava rizika, odnosno vrsta blokade koja se može pojaviti u sistemu plaćanja, nastaje kao stanje (fenomen) "deadlock" odn. "gridlock"<sup>8</sup> (slika 3.) scenario u kome SVP neizvršava ni naloge odobrenja (incoming payments) niti naloge zaduženja (outgoing payments), jer su banke u lancu poravnanja nelikvidne, odn. nema dovoljno sredstava za izvršenje naloga (stanje RTGS računa nema pokriće za nalog zaduženja koji banka treba da emituje).

Ako pojavu blokade posmatramo u modelu sa 3 banke (prethodno model 4 banke, koji je postao model sa 3 banke) posle **unwind** procesa, eliminisanje nelikvidne banke iz sistema plaćanja i njenih transakcija, znači eliminacija nelikvidne banke **B4**, SVP (RTGS) ne izvršava plaćanje banke **B1** prema banci **B3** ( $B1 \rightarrow B3$ ), ali ne izvršava ni nalog **B2** prema **B1** ( $B2 \rightarrow B1$ ) i konačno ne emituje ni nalog **B3** prema **B2** ( $B3 \rightarrow B2$ ) (slika 3.).

Sistem Velikih Plaćanja je u stanju blokade, nelikvidne banke su uticale na izazivanje blokade i u principu, nastalo stanje ne može

<sup>4</sup> Siniša Rankov: "Upravljanje rizikom u sistemima velikih plaćanja", dr disertacija, MEGATREND FM Valjevo, 2008

<sup>5</sup>  $C_i \rightarrow KB_i \rightarrow NCB_i \rightarrow KB_j \rightarrow C_j$  predstavlja lanac plaćanja u RTGS,  $C_i$  - firma nalogodavac,  $KB_i$  - banka nalogodavca,  $NCB_i$  - Nacionalna centralna banka,  $KB_j$  - banka krajnjeg korisnika,  $C_j$  - firma krajnji korisnik

<sup>6</sup> Deadlock - nedovoljna likvidnost ukupnog sistema plaćanja (shortage of liquidity in the overall payment system)

<sup>7</sup> Gridlock nedovoljna likvidnost banaka u sistemu plaćanja izazvana neodgovarajućom distribucijom likvidnosti između samih članica sistema plaćanja (inappropriate distribution of liquidity between the participants)

<sup>8</sup> D. Shepard, "Payment Systems", Bank of England Handbooks, 1998

payment system participants' obligations, collateral management, sanctions, etc.) and the risk forecast models incorporated into the banks' strategies and the strategies of the national regulator and supervisor.

RTGS system, besides the national framework for risk management and control (*financial and market EU integration including all national payment systems within Target and Target2*), often requires overall transaction controls in the international payments (*cross border transactions, which, in a part of the transaction implementation, end within the national payment systems, e.g. foreign currency transactions, money market transactions, foreign currency trading and interest bearing deals, payments in securities business as a cash leg transaction*). The fact that the payment transactions of the cross border type come from the national payment systems and are finalized in multinational payment infrastructure introduces the new segment in risk management, and that is the possibility of risk transfer control (*the risk transfer from one into another RTGS system, credit risk transfer*), which becomes particularly important for the transition countries and control of their financial capacities. To better analyze and manage risk, for a general overview of possible occurrences of risks that may jeopardize the stability of a payment system, the payment infrastructure has been defined, which will conceptually and operationally be used in risk occurrence, impact and risk mitigation models research.

(Figure 2. page 83)

The model that has been used to study and subsequently generate the overall risk management model (*the topic for the next paper*), is defined above the payment infrastructure (*presented as the payment transaction scheme exchange used to operate the RTGS system*), and it provides experiment possibilities for studying the behaviour of the payment system participants in regular operating environment and in risk situations, regardless of whether the management process is related to the RTGS, clearing (*LVP - Low Value Payment System*) or

securities settlement system (SSS).

Strategically, the risk management process, over the defined payment infrastructure, is, in fact, a dynamic time cycle defined on the basis of structure and relations of the payment chain itself and at the payment chain management level:  $\rightarrow KB_i \rightarrow NCB_i \rightarrow KB_j \rightarrow$  which implies the logic and validity of the same risk management process, i.e. the critical risk source and the potential losses. RTGS is easy to manage if it is structurally well-organized, based on proper legal framework and supported by the information and communication technologies. The nature of the RTGS risk management process is based on two key model relations: interbank settlements in RTGS controlled and operated by the Central Bank (CB), which, as an agent for the settlements and the key agent for message exchange, plays a dual role of a manager and an operator at the same time (first as a receiver of the settlement messages coming from commercial banks and secondly as a sender of the received messages routed to the receiver of the sent messages to the final instance of the exchange process). Therefore, the relations are as follows:

1.  $KB_i \rightarrow NCB_i$  (NCBi as a receiver of the payment messages/payment orders being sent by the sender bank of the payment messages  $S(KB_i)$ )
2.  $NCB_i \rightarrow KB_j$  (NCBi as a sender of the payment messages/payment orders to the receiver bank  $R(KB_j)$ )

The first key payment chain relation described in the model ( $C_i \rightarrow KB_i$ )<sup>4</sup> and the last payment chain instance ( $KB_j \rightarrow C_j$ )<sup>5</sup> are practically less important in terms of analyzing risk occurrence and management in RTGS in general, but are certainly important for the complex examination of RTGS risk management mechanisms and methods.

### Management of the payment system failure (deadlock<sup>6</sup>, gridlock<sup>7</sup>)

The occurrence of risk in the RTGS system,

<sup>4</sup> Siniša Rankov, "Upravljanje rizikom u sistemima velikih plaćanja", dr disertacija, MEGATREND FM Valjevo, 2008

<sup>5</sup>  $C_i \rightarrow KB_i \rightarrow NCB_i \rightarrow KB_j \rightarrow C_j$  represents the payment chain in RTGS,  $C_i$  - company - sender,  $KB_i$  - sender's bank,  $NCB_i$  - National Central Bank,  $KB_j$  - end beneficiary's bank,  $C_j$  - company - the end beneficiary

<sup>6</sup> Deadlock - *shortage of liquidity in the overall payment system*

<sup>7</sup> Gridlock - *inappropriate distribution of liquidity between the participants*

da se reši ni na jedan od bankarskih načina (hibridni SVP mogu, jer je sistem plaćanja istovremeno i sa funkcionalnostima SVP i kliringa - SMP: npr. SIC SVP).

Šta tehnologija Sistema Velikih Plaćanja nudi kao rešenje?

SVP praktično kao rešenje ima opciju eliminacije nelikvidnih banaka (B1 i B2), ali i isključivanje i banke B3, koja se nalazi u lancu banaka za poravnanje, znači sve banke u procesu poravnanja: B1, B2 i B3 banka (na slici opcija pod <A> grid i deadlock u RTGS).

Da li je moguće rešiti status blokade po navedenim stereotipovima rizika ("deadlock" odn. "gridlock"), stanje koje RTGS ne može da reši na bazi postojećih mehanizama za upravljanje rizicima?

Sistem koji se nalazi u blokadi izaziva i određene materijalne posledice za banke koje su isključene iz poravnanja (izvršenja datih naloga), što ima za posledicu prenošenje rizika i na druge lance plaćanja u sistemu plaćanja (dinamičko izvršavanje obaveza u poravnanjima između članica sistema plaćanja), a u krajnjoj instanci može da izazove pojavu sistemskog rizika (systemic risk), odn. totalne blokade SVP (deadlock).

(Slika 3. strana 84)

Centralne Banke, u našem sistemu plaćanja Narodna banka Srbije - NBS, za slučajeve finansijskih poremećaja u SVP imaju i određene preventivne mere (utvrđivanje limita, collateral, liquidity pooling mehanizam, kredite za premošćavanje dnevne likvidnosti na bazi zaloga HoV i dr.), koje sprečavaju da se pojavi situacija u kojoj banke zbog nedovoljne likvidnosti ne mogu da izvrše obaveze u dnevnom plaćanju u realnom vremenu, ali ipak samo kao opcija zaštite, jer pojava rizika ne može biti isključena, što u velikoj meri pokazuje i trenutna svetska finansijska kriza.

Proces upravljanja rizikom je jedan od načina da se definisanjem metodologije, funkcija i procedura SVP stavi pod stalni nadzor u smislu pojave rizika i aktiviranja određenih mehanizama za njegovu kontrolu i u krajnjoj instanci njegovo eliminisanje. NBS je, sa ciljem

stalne kontrole poslovanja banaka i upravljanja rizikom, odn. rizičnom aktivom (RWA - Risk Weighted Assets) donela niz kontrolnih mera i preporuka, odluka i procedura radi smanjenja pojava rizika u regularnom poslovanju banaka. Primena logičkih modela putem kojih se vrši istraživanje fenomena pojave rizika, slučajevi modela sa 3 banke, modela sa 4 i više banaka (koje diktira analitički scenario iz realnog sistema), daju dobre praktične rezultate i mogu se (kao regulatorni model za upravljanje rizikom zasnovan na informatičkim kapacitetima i resursima: baze podataka, aplikacije, tehnologije upravljanja, mrežni resursi i kontrola kontinuiteta poslovanja) koristiti kao simulacioni modeli za istraživanja rizika, identifikaciju, evidentiranje, upravljanje i analizu podataka sa ciljem efikasnije zaštite poslovanja banaka, njihovih klijenata i ukupnog sistema plaćanja.

### Rizik plaćanja kod deviznih transakcija (FX settlement risk)

Rizik plaćanja kod deviznih transakcija posebno se povećao sa porastom obima i iznosa transakcija na međunarodnim deviznim tržištima, koji je 1992.g. dnevno iznosio 820 milijardi dolara, a 2007.g. 3.210 milijarde dolara<sup>9</sup> (7). Najveći deo deviznih transakcija koje su se dnevno obavljale u 2007.g. odnosi se na **valutne svopove** (1.714 milijardi dolara) i **spot transakcije** (1.005 milijardi dolara), pri čemu je učešće prekograničnih deviznih transakcija (cross border transactions) u ukupnim transakcijama bilo 62%, a transakcija sa devizama na domaćim tržištima 38% (8). Volatilnost deviznih kurseva koja se u poslednjih nekoliko godina u velikoj meri ispoljava dodatno multiplicira rizik plaćanja kod deviznih transakcija, ali i sa mogućim finansijskim implikacijama kod konverzije deviznog priliva u dinarska plaćanja, što znači da se transakcije realizuju kroz RTGS i na taj način povećavaju rizik u međubankarskom poravnanju.

Trgovina na finansijskim tržištima zahteva

<sup>9</sup> BIS, "Triennial Central Bank Survey Foreign Exchange and Derivatives Market Activity in April 2007", Basel, September 2007., str. 5

i.e. the type of failure within the payment system, appears as the so-called phenomenon of “*deadlock*” or “*gridlock*”<sup>8</sup> (figure-3), a scenario which implies that the RTGS does not perform the basic tasks of payment system messages exchange either for incoming (*credit of the participants accounts-credit based transfers*) or outgoing payments (*debit of the participants accounts-debit based transfers*) because the banks in payment chain are illiquid, i.e. there are no sufficient funds for the payment transactions to be conducted (the RTGS accounts are “empty”, so there is no cover for debits that CB has to issue (*the system primarily checks for debit transactions*)).

If we analyze the failures within the payment system in a 3-bank model (*which was previously a 4-bank model before becoming the 3-bank model*) after the **unwind** process, the situation is the following. Eliminating an illiquid bank from the payment system and its transactions means eliminating the illiquid bank **B4**. The RTGS does not effect the payment of bank **B1** in favour of bank **B3**(*B1->B3*) but neither does it effect payment order of **B2** in favour of **B1**(*B2->B1*), and, finally, the orders of **B3** in favour of **B2** (*B3->B2*) are not effected, either (figure 3.).

Therefore, the RTGS system is blocked, because the illiquid banks brought about the occurrence of blockade and, in effect, the newly-emerged situation cannot be solved in any of the banking methods (*hybrid payment systems can, given that such payment systems concurrently contain the functions of both RTGS and LVP*).

The question is: *What does the RTGS technology offer as a solution to these failures?*

RTGS system has the option of eliminating the illiquid banks (*in the model example: B1 and B2 banks*), but the net settlement eliminates B3 bank as well, which is in the payment settlement chain, so all banks in the net settlement process without sufficient funds are excluded: B1, B2 and B3 bank in the 4 bank model simulation (*the situation given as an option< A >in the gridlock and deadlock state in RTGS system study, shown in figure 3.*).

Is it possible to resolve the failure (*the risk incurring losses*) using the “*deadlock*” or

“*gridlock*” stereotypes or the RTGS system could not bridge the failure based on the current risk management mechanism?

The RTGS system which went into the gridlock or deadlock has consequently inflicted financial losses for the group of banks being the subject of the unwind operations (*the postings are stopped by the RTGS system*), what further implies the risk transfer to other payment chains in the RTGS or to another RTGS if we deal with the cross boarder transactions (*dynamic net settlement processes between the members of the different RTGS systems*), which, as a final consequence, might imply systemic risk, i.e. the total RTGS system payment operations are blocked (*deadlock*).

**(Figure 3. page 85)**

Central banks, in our national payment system the National Bank of Serbia - NBS, have a set of preventive measures and instruments for the financial failures in the RTGS system (*such as: debit payment limit, collateral - guaranties for payments, liquidity pooling mechanism, intraday credit facilities based on short term securities as a collateral, etc.*), which prevent failures in the payment chain when the banks with insufficient liquidity cannot cover the payment obligations in the daily net settlements (*in case of RTGS in on-line real time payments*). However, this can be taken only as a protection instrument, since risk in general cannot be completely avoided, as illustrated by the current global financial crisis.

Risk management process is one of the possible ways to permanently supervise the occurrence of risk by defining the RTGS methodology, functions and procedures, and activate certain mechanisms for its control, and, ultimately, its elimination. With a view to establishing constant control and supervision of the banks’ operations and the risk management tasks, i.e. to manage the RWA - Risk Weighted Assets, the NBS has enacted a set of control measures and recommendations, mandatory decisions and procedures to mitigate risk in the regular banks’ operations. The logical models implementation and use serves for risk source and risk occurrences investigations in order to

<sup>8</sup> D. Shepard, “*Payment Systems*”, Bank of England Handbooks, 1998



poravnanje kroz isporuku aktive od strane njenog prodavca i plaćanje za nju od strane njenog kupca (9). Tržišta deviza se u tom pogledu, u principu, ne razlikuju, s tim što poravnanje zahteva dva plaćanja tj. plaćanje (isporuku) jedne valute za drugu valutu. Iako se devizno poravnanje (FX settlement) (10) često smatra kao rutinska aktivnost koja je manje interesantna od same trgovine (uključujući i deviznu arbitražu), ona ipak zahteva odgovarajuću pažnju zbog rizika koji se tom prilikom mogu pojaviti, a pre svega rizika da jedna strana u trgovini devizama plati određeni iznos u jednoj valuti da bi dobila određeni iznos u drugoj valuti, ali da taj iznos kupljene valute ne dobije. Ovaj rizik nastaje iz toga što korišćenje tradicionalne metode poravnanja između trgovaca devizama ne sadrži mehanizam koji osigurava da se plaćanje jedne valute u zamenu za drugu valutu izvrši samo ako je i ona plaćana, tzv. mehanizam plaćanje za plaćanje (payment versus payment - **PVP**<sup>10</sup>). Obe strane u transakciji se obavezuju da izvrše plaćanje u valuti koja se prodaje pre nego što su sigurni da su primili valutu koju kupuju. Pri tome tradicionalni proces poravnanja u trgovini devizama može da bude relativno spor, što znači da ugovorne strane mogu da budu izložene riziku i u dužem vremenskom periodu, često dužem od jednog dana. Na primer, procenjuje se da 39% izloženosti kod deviznih transakcija počinje jedan ili više dana pre dana poravnanja i da oko 87% izloženosti traje najmanje do narednog radnog dana (7).

Rizik deviznog poravnanja je stopa primarno rizik izvršenja obaveze druge ugovorne strane - izvršeno je plaćanje u valuti drugoj ugovornoj strani bez garancije da će plaćanje u valuti druge ugovorne strane biti izvršeno. Kao takvo ono uključuje "**rizik glavnice**" (principal risk) - može se desiti da kontra plaćanje u valuti X uopšte ne bude izvršeno i da se izgubi ceo plaćeni iznos u valuti Y, kao i "**rizik likvidnosti**" (liquidity risk) koji je u ovom kontekstu rizik da čak i ako druga ugovorna strana izvrši plaćanje to plaćanje stigne kasno, u pogrešnoj valuti, ostavljajući vas bez valute

koja vam je bila potrebna u vreme kada vam je bila potrebna.

Kada se radi o deviznim transakcijama u bankarskoj praksi poznat je tzv. Herstat rizik nazvan po **Herstat banci (Bankhaus Herstatt)** iz Kelna, Nemačka koja je zbog toga juna 1974. godine i bankrotirala, ali i dovela do kaskade neizvršenja naloga i obaveza plaćanja kod čitavog niza banaka, što je sve prouzrokovalo za to vreme rekordni gubitak od 620 miliona dolara u samo jednom danu zbog nastupanja tzv. rizika u međuvalutarnim poravnanjima (**cross-currency settlement risk**) (11).

Na dan 26. juna 1974. godine veliki broj nemačkih banaka je izvršio plaćanje u nemačkim markama na račun Herstat banke u zamenu za američke dolare koje je trebalo transferisati u Njujork. Međutim, banka Herstat<sup>11</sup> nije po osnovu dobijenih sredstava u nemačkim markama izvršila transfer sredstava u američkim dolarima, zbog razlike u vremenskim zonama, tako da se ta sredstva nisu našla na dolarskim računima nemačkih banaka u SAD i zbog toga one nisu mogle da izvrše dalje svoje neopozive obaveze u američkim dolarima. Na taj način je neizvršenje jedne banke u lancu međubankarskih plaćanja izazvalo tzv. lančanu reakciju međusobnih neizvršavanja plaćanja (**chain reaction of cross-defaults**).

Nezavisno od konkretnog slučaja, sistemski gledano ovaj rizik nastupa kada se dva toka devizne transakcije u različitim valutama tzv. "noge" (**legs**) izvršavaju u različitim vremenskim zonama. Na primer, ako ne postoji klirinški sistem za američke dolare u Hong Kongu i banka A iz Hong Konga želi da proda hongkonške dolare banci B u Hong Kongu za američke dolare, plaćanje u hongkonškim dolarima se može odmah realizovati u klirinškom sistemu u Hong Kongu. Međutim, ako je u Hong Kongu tada radni dan, to još nije slučaj sa SAD i plaćanje u američkim dolarima banke B za banku A se može realizovati tek kada počne sa radom američki platni sistem, satima kasnije. Zbog vremenskog raskoraka između dva transfera banka A koja je doznačila

<sup>10</sup> PVP (payment versus payment) sinhronizovano plaćanje u procesu kupoprodaje Fx transakcija, CLS uključuje sistem PVP

<sup>11</sup> Dr Predrag Kapor, "Komerrijalno i investiciono bankarstvo", Poslovni biro, Beograd 2008

learn more about the risk nature by simulating the processes and introducing a 3-bank, 4-bank, and more bank models, and more complex payment configuration for the chosen case studies (*which the real time analytical situation requires*), give excellent results (*as regulatory and risk management model based on the IT capacities and resources: databases, applications, management IT and banking technologies, network resources and principles of business continuity*), and can be used to provide simulation results, risk identification, risk statistics, payment system management and analysis of the collected data, in order to protect banks' operations, customer base and the entire payment system.

### **Risk in foreign exchange payment transactions (FX settlement risk)**

Risk of FX settlement transactions has increased with the payment transactions volume and amount processed on the international FX currency markets, which in 1992 had a daily assets volume turnover of 820 billion US dollars, and 3,210 billion US dollars in 2007<sup>9</sup> (7). The most of the daily transactions volume in 2007 was accounted for by **currency swap** transactions (*1,714 billion USD dollars*) and **FX spot transactions** (*1,005 billion US dollars*) with the share of cross border FX currency transactions in total amounting to 62%, whereas the share of transactions on the domestic market amounted to 38% (8). The foreign exchange rate volatility, recorded in the last few years, additionally multiplies payment risk in FX transactions, but also bears financial implications for FX inflow conversion into local currency payments, meaning that the transactions are conducted through RTGS, thus increasing the risk in interbank settlement.

The trade on the financial markets requires settlement through assets delivery from the sale side (*seller of the assets*) and payment from the purchase side (*buyer of the assets*) (9). In this respect, FX currency markets are essentially not different, but require two payments within

the net settlements, i.e. delivery of the sold FX currency and receiving of the bought FX currency. Even though FX currency settlement **(10)** is often considered to be a routine activity which is less interesting than the trade itself (*including FX arbitrage*), it still requires some due attention because of the possible risk which may appear, i.e. the risk that the delivery of the bought FX currency is not effected even when the sold FX currency has been settled. This type of payment risk practically exists because the traditional FX currency settlement model is used between the FX currency traders, and therefore might be possible that the used model does not provide the regular FX currency exchange for both: FX bought and sold foreign currencies, i.e. the final net settlement mechanism has to be PVP - **payment versus payment**.<sup>10</sup> Both parties in a PVP transaction are obliged to conduct payment in the selling currency before they make sure that they have received the purchased currency. However, the traditional settlement process in FX trading may be relatively slow, which means that the contractual parties may be exposed to risk in a longer period of time, often exceeding one day. For instance, it is assumed that 39% of the risk exposure in conducting FX currency transactions begins one to several days before the net settlement takes place, and that around 87% risk exposures last till the next business day.

Foreign exchange settlement risk is therefore primarily related to the payment obligation of the contractual party - the payment has been effected in the FX bought currency (*amount X of the deal*) without any guarantee that the second leg of the FX deal (*amount Y of the FX currency deal*) will be paid. If the FX deal is based on such a principle, it includes the payment risk of the principal amount (*principal risk*). In other words, it may happen that the payment in the sold FX currency is not settled, in which case the party loses the already effected amount of the FX deal forever, or it may happen that liquidity risk occurs because the other party does not pay

<sup>9</sup> BIS, "Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in April 2007", Basel, September 2007., str. 5

<sup>10</sup> **PvP** (*payment versus payment*) synchronised payment in the process of FX buy/sell transactions, CLS includes PvPj system

hongkonške dolare neće odmah dobiti američke dolare od banke B i na taj način može, sticajem raznih okolnosti, iskazati gubitak.

Zbog nastupanja ove vrste rizika u međunarodnim deviznim transakcijama preduzeto je više aktivnosti na globalnom planu koje su rezultirale donošenjem smernica o dobroj praksi kod poravnanja u deviznim transakcijama 1996. godine, formiranjem **CLS banke** za FX poravnanja, 8 osnovnih svetskih valuta, po sistemu stalnog poravnanja, koje izvršava CLS banka (razvijen je čitav sistem tzv. **CLS - Continuous Linked Settlements**, (slika 4.) koji je u vlasništvu CLS kompanije čiji su osnivači najveće banke u svetu (**70 banaka danas**), međutim problem još uvek nije do kraja rešen, jer banke koje su van **CLS (male i srednje snage)**, zbog visokih troškova poravnanja nisu u poziciji da FX transakcije izvršavaju kao CLS transakcije, tako da se napori na tom planu i dalje nastavljaju (12).

(Slika 4. strana 86)

Komitet za sisteme plaćanja i poravnanja (Committee on Payments and Settlement Systems - CPSS) Banke za međunarodna poravnanja (BIS) pokrenuo je set aktivnosti koje su se realizovale na tri nivoa:

1. aktivnosti individualnih banaka da kontrolišu svoju deviznu izloženost;
2. aktivnosti na nivou "bankarske industrije" da se obezbedi servis za izvršenje deviznih transakcija koji smanjuje rizik poravnanja i
3. aktivnosti centralnih banaka da se potpomognu prve dve aktivnosti (9).

Na drugom segmentu ostvaren je relativno veliki napredak kroz formiranje CLS Bank (**CLS**), 2002. godine, sa sedištem u Njujorku, ali sa glavnim poslovanjem u Londonu, koja pruža usluge plaćanja za plaćanje (**PVP**) putem kojih je gotovo potpuno elimisan "**rizik glavnice**", povezan sa deviznim transakcijama. Prema istraživanju iz 2006. godine **CLS**<sup>12</sup> je postala primarni mehanizam poravnanja u deviznoj trgovini pošto se preko nje realizuje 55% ove trgovine, dok se 32% trgovine realizuje putem

tradicionalnog korespodentskog bankarstva (pre pojave CLS to je bilo 85%), dok se putem bilateralnog izvršenja po neto principu realizuje 8%, a na druge preostale načine 5% (9).

CLS Bank nije banka u klasičnom smislu, pošto se bavi samo realizacijom poravnanja u određenim valutama i to: kanadski dolar (CAD), američki dolar (USD), južnoafrički rand (ZAR), danska kruna (DKK), evro (EUR), norveška kruna (NOK), švedska kruna (SKR), švajcarski franak (CHF), australijski dolar (AUD), honkongški dolar (HKD), japanski jen (JPY), korejski von (KRW), novozelandski dolar (NZD) i singapurski dolar (SGD) (poravnanja se realizuju još i u meksičkim pezovima i izraelskim šekalima).

Praktično CLS banka svojom ulogom poverenika (svojevrzne klirinške kuće) eliminiše rizik poravnanja (foreign exchange settlement risk) tako što ona isplaćuje kupljenu valutu X samo ako je plaćena valuta koja je Y kojom se kupuje valuta X (10). Ukoliko jedna strana u transakciji ne izvrši svoju obavezu CLS jednostavno vraća valutu koju je primila strani koja je izvršila plaćanje. Sam mehanizam funkcioniše tako što svaki član CLS ima kod nje viševalutni račun koji se odobrava i zadužuje za iznos kupljene/prodate valute u procesu realizacije transakcije. Transakcija se realizuje samo ako prođe kontrolu provere rizika CLS, uključujući i obavezu održavanja ukupnog pozitivnog salda na računu učesnika u transakciji. Na određeni dan članovi CLS će imati multilateralno bilo neto "kratku poziciju" (dugovanje) u svakoj valuti, bilo "dugu poziciju" (potraživanje) u svakoj valuti. Oni članovi koji imaju neto "kratku poziciju" vrše plaćanja u određenoj valuti prema CLS koja ova plaćanja koristi da bi izvršila plaćanja prema članovima koji imaju neto "dugu poziciju". Ako iz nekog razloga neki član ne ispuni obavezu plaćanja u određenoj valuti (pay-in failure) onda se "rizik glavnice" za drugu stranu izbegava tako što CLS može da toj strani vrati iznos (vrednost valute koju ona

<sup>12</sup> CLS (Continuous Linked Settlements) mehanizam kod Fx transakcija, znači istovremeno poravnanje za obe valute u procesu kupoprodaje (posrednik CLS bank), DvP (Delivery versus payment) princip u procesu kupoprodaje HOV (transakcija prodaje HOV sa istovremenim plaćanjem: transactions settled through a delivery - versus-payment system (DvP), providing simultaneous exchanges of securities for cash -> payment/delivery leg), PVP (payment versus payment) sinhronizovano plaćanje u procesu kupoprodaje (Fx transakcija, CLS uključuje sistem PVP)

on time, or pays in a wrong currency, leaving you without the FX you paid for, when you needed it.

Speaking of foreign exchange transactions, banking practice mentions Herstatt risk, named after the case of Bankhaus Herstatt, Koln Germany, which in June 1974 went bankrupt, generating a cascade of non-settled FX deals with a number of commercial banks, causing the unprecedented loss in the amount of 620 million US dollars in one business day due to the so-called *cross-currency settlement risk* (11).

On June 26, 1974 a large number of German banks have effected the payments in DM in favour of the Herstatt bank against the USD which had to be transferred to New York to the German banks' accounts as a second leg of the FX transaction deals. Herstatt bank<sup>11</sup> did not conduct the USD settlement payment based on the received DM amounts, due to the time zone difference, which further led to the German banks in the US not being able to pay their imminent irrevocable payment obligations in USD. The Herstatt bank case has shown that if the second leg of the FX deals is not conducted, all banks in the payment chain become members of the chain reaction of the non-settled deals, causing financial damage or losses, the so-called *chain reaction of cross-defaults*.

If we consider the problem irrespective of the presented Herstatt case and look at the systemic side of the FX settlement deal, the default or the FX - *cross-currency settlement risk* normally occurs when there are two different FX currency transaction payment flows, known as "legs" in FX business, which are effected in different time zones. If, for instance, there is no Clearing system for USD in Hong Kong, but the bank A in Hong Kong wishes to sell the HK dollars to the bank B in Hong Kong against USD, the payment in HK dollars could be instantly settled in the Hong Kong Clearing system. However, if it is a working day in Hong Kong, because of the time difference with the USD market, the USD dollar transfer could be settled only when the RTGS and Clearing system is in operation

in the USA, so that the payment in USD from bank B to bank A, as a second leg of the FX deal might be effected hours later. Because of the time differences and the non synchronized FX payment flows between two transfers, bank A, that has already paid HK dollars to bank B through the Hong Kong Clearing system, will not have available USD from bank B, and due to the various unexpected circumstances, bank A may experience an FX loss.

Due to the FX settlement risk in the international foreign exchange transactions, several actions are taken by the commercial banks at the global scale, resulting in a number of good practice guidelines for FX transactions settlement adopted in 1996, and in the foundation of the CLS bank for FX settlements. This bank operates with 8 major foreign currencies, using a constant settlements system, known as the CLS - **Continuous Linked Settlements**, (figure-4), owned by the CLS company, whose founders are the largest world banks (*today about 70 banks*). However, even though the system has new functionalities which resolve the problem of Herstatt risk, the entire problem of FX settlement risk is still open, because the banks non members of the CLS (*medium and small size banks*), due to the high cost of settlements are not in a position to use the CLS bank facilities, which is why the CLS project adjustment efforts are still continued (12).

(Figure 4. page 87)

Committee on Payments and Settlement Systems - CPSS within the Bank for International Settlements (BIS) has started a new set of activities grouped on the three levels:

1. Activities of individual commercial banks in managing their FX exposure;
2. Activities on a more general level, i.e. banking industry, aiming to provide FX transactions which reduce FX settlement risk;
3. Activities of Central Banks to support the first two (given above).

The second segment, which is already in place, has made some progress through the CLS bank (CLS), founded in 2002, located in

<sup>11</sup> Dr Predrag Kapor, "Komerčijalno i investiciono bankarstvo", Poslovni biro, Beograd 2008

uplaćuje (prodaje). S obzirom da CLS ima stalno otvorene kreditne linije kod velikih banaka u raznim valutama ona može da konvertuje valutu koju jedna strana prodaje (valuta X) u drugu valutu (valutu Y) koju ta strana želi da kupi, iako druga strana nije izvršila svoju obavezu uplate te valute (valute Y), tako da će iznos koji CLS vraća strani koja je izvršila svoju obavezu biti generalno u valuti koju je nameravala da kupi (valuta Y).

Prema istraživanju koje je izvršeno 2006. godine od deviznih transakcija koje su se dnevno realizovale u vrednosti od 3.821 milijarde američkih dolara (USD), preko CLS je realizovano 2.091 milijarda američkih dolara, dok je putem tradicionalnog korespodentskog bankarstva po bruto principu koje nije plaćanje za plaćanje (gross-non PVP) realizovano 1.224 milijarde američkih dolara ili 32%, a na bazi bilateralnog izvršenja po neto principu 302 milijarde američkih dolara ili 8% (10). CLS se najviše koristi kod deviznih transakcija u DKK (74%), NOK (70%), JPY (62%) EUR (58%) i USD (55%), a najmanje kod vona (30%) i CAD (38%) (10).

## Upravljanje rizikom SVP kao faktor stabilnosti finansijskog sistema

SVP su izloženi rizicima, nezavisno od uvođenja modernih tehnologija (**state of the art**, odn. sofisticiranih SW rešenja i platformi). Izloženost riziku (preciznije sredstava u plaćanjima) postoji, a radi smanjivanja stohastičkih uticaja na SVP primenjuju se istraživanja na modelima (simulacije, scenarija i druge vrste finansijskih eksperimentisanja) sa ciljem procena rizika i implikacija (posledica) koje mogu nastati.

Postoji visoka korelacija u odnosu na pojavu rizika (rizik u materijalnom smislu gubitak) u SVP i stabilnosti finansijskog sistema, odn. poremećaji (uslovno rečeno nestabilnost, nelikvidnost, blokade) i dr. procesi kratkih ili dužih prekida u funkcionisanju SVP izazivaju poremećaje i narušavaju stabilnost finansijskog sistema, primer: svetska finansijska kriza

implicira pojavu velikih gubitaka finansijskih i nefinansijskih institucija (čak i nivoa nacionalnih ekonomija: Island), koja generiše i uslovljava, da prestaju da važe mnogi modeli za procenu i upravljanje rizicima, da se planiraju nove metodologije i modeli, moguće **korekcije BII**, sa nagoveštajem **BIII**, značajno redefinišu regulatorni okviri i pripremaju izuzetno velika materijalna sredstva za poboljšanje i očuvanje likvidnosti na nacionalnim i globalnom nivou.

U smislu zaštite stabilnosti finansijskih sistema, finansijskih institucija, velikih i malih korporacija, standarda i zaposlenosti ljudi, započeti su, i već se implementiraju programi finansijske zaštite i pomoći kojima upravljaju same države (**vlade i parlamenti**), a posebnu ulogu, značajno promenjenu dobijaju **NCB - Nacionalne Centralne Banke**, koje vrše planiranje, distribuciju i usmeravanje novčanih sredstava poslovnim bankama, investicionim bankama, privrednim subjektima (koji su od nacionalnog i globalnog značaja: npr. u USA: JP Morgan, Citi Group, FORD, CHRYSLER, AIG, Goldman Sacs,...), u SAD program finansijske pomoći: **BAILOUT**<sup>13</sup> u iznosu od **700 milijardi \$**, a dalje u nizu programi finansijske podrške vlada: Nemačke, Japana, Francuske, Italije, Velike Britanije i dr. a i program za oporavak i stimulacije izvozno orijentisanih kompanija vlade Republike Srbije. U principu, suočavanje sa svetskom recesijom, velikom finansijskom krizom, pokazuje da su finansijski rizici prešli sa lokalnih i regionalnih nivoa na globalni nivo, ali da su vidljive i velike promene u pristupu konsolidaciji finansijskih stanja (intervencije država u zaštiti privatnih investicionih banaka iz sredstava državne kase, primeri iz SAD i drugih, do sada najmoćnijih nacionalnih i svetskih ekonomija. U programima NBS i dr. državnih organa predlažu se i donose mere radi konsolidacije banaka i privrede: rastu iznosi garantovanja za položenu deviznu štednju (sa 3.000,00 EUR na 50.000,00 EUR), rast kamata na sve oblike štednje, oslobađanje plaćanja poreza na kamatu ostvarenu kroz štednju i dr. stimulatívni modeli pomoći).

Cilj analize je da prikaže korelaciju i uticaj

<sup>13</sup> Bailout is an act of loaning or giving capital to a failing business in order to save it from bankruptcy, insolvency, or total liquidation and ruin.

New York, but conducting the main business in London, UK, providing the settlement services based on **PVP** model, free from the previously described “*principal risk*” related to the foreign exchange transactions. Based on a research conducted in 2006, CLS<sup>12</sup> became a primary mechanism for FX deal settlements in banking industry in FX trade, generating 55% of the total FX transaction deals, the rest of the volume being conducted through traditional correspondent banking - 32 % (*before CLS it used to be 85%*). The rest of the FX transaction settlements are arranged bilaterally based on the net principle - 8%, and FX deal settlements conducted in all other ways amount to 5% (9).

CLS bank is not a classic banking institution, since the key business of the bank are FX deal settlements for the member banks and other participants in the following foreign currencies: CAD, USD, ZAR, DKK, EUR, NOK, SKR, CHF, NZD and SGD (*apart from the listed foreign currencies, the subject of FX deal settlements are Mexican pesos and Israeli shekels*).

CLS bank operates as a cover bank (*in a way similar to a Clearing house*), and based on the settlement model it practically eliminates FX settlement risk (*foreign exchange settlement risk*) by paying the bought foreign currency X only if the sold foreign currency Y is settled (10). If one transaction party does not pay its settlement obligation, CLS bank simply repays the already paid foreign currency to the party which conducted the payment.

For each member bank of the CLS system a multicurrency account is opened and made available for the final postings for each of the submitted FX deals. FX transactions are effected only if they pass the CLS risk control, including the mandatory available assets on the CLS account which are used to cover the FX deal transactions. If we look at a specific business day, the CLS members will have either net debit position (*short position*) in the FX currencies, or net credit position (*long position*) in the FX currencies. All the members with a net debit position have to conduct payments

in a certain currency into the CLS foreign exchange accounts, which amounts CLS later uses to pay out all those members with a net credit position.

If for any reason some of the CLS members do not pay the obligation in a certain foreign currency (*pay-in failure*) then the only way for the second party of the FX deal to avoid “*principal risk*” is by letting CLS repay this amount to the party concerned. CLS constantly has available credit lines with the major world banks in different foreign currencies, and for each deal it settles CLS could provide foreign currency conversion and made sufficient funds available for effecting the foreign currency deal for the party, i.e. convert the sold foreign currency X into the foreign currency Y, this party wants to buy, even if the second party did not conduct its obligatory payment in the foreign currency Y. Thus, the amount CLS will repay to the party which conducted its part of the deal will, in general, be in the currency it intended to buy (i.e. currency Y).

Based on a research conducted in 2006, out of the total number of foreign currency transactions (*foreign exchange - FX deals*) settled daily in the total amount of 3,821 billion USD, there were 2,091 billion USD conducted through CLS, correspondent banking based on the gross principle, which is not PVP - payment versus payment (gross - non PVP) accounted for 1,224 billion USD, or 32%, and the bilateral net principle payment accounted for 302 billion USD or 8% (10). The biggest CLS turnover is recorded in FX transactions in the following currencies: DKK (74%), NOK (70%), JPY (62%), EUR (58%) and USD (55%), whereas the smallest occurs with VON 30%) and CAD (38%) (10).

### **RTGS risk management as a factor for financial system stability**

RTGS systems are exposed to risks, regardless of the last Information technology applied (*state of the art technology, i.e. sophisticated*

<sup>12</sup> **CLS** (*Continuous Linked Settlements* mechanism with FX transactions means concurrent settlement for both currencies in the buy/sell process (intermediary CLS bank). **DvP** (Delivery versus payment) principle in the process of buy/sell of securities - concurrent payment transactions settled through a delivery-versus-payment system (DvP), providing simultaneous exchanges of securities for cash -> payment/delivery leg), **PvP** (*payment versus payment*)

nacionalnog finansijskog sistema i sistema plaćanja (posebno SVP kao baze za kontrolu i realizaciju ključnih monetarnih i privrednih plaćanja), na stabilnost nacionalne ekonomije i zaštitu od unutrašnjih i spoljnih privrednih i finansijskih poremećaja.

U SVP ključne FI su direktni članovi sistema (po pravilu među njima su i najveće FI) koje imaju najveće promete (po vrednosti), ali i ukupan broj transakcija (obim) koji se realizuje (direktnih i indirektnih članova) kroz SVP, što znači da (pošto se u SVP realizuje 80% ukupnog prometa po vrednosti svih transakcija, koje ostvaruju direktni i indirektni članovi zajedno), uticaj SVP na stabilnost finansijskog sistema je značajan i važi pravilo: stabilan i bez poremećaja SVP = stabilan i bez poremećaja finansijski sistem, znači da zastoji, blokade i gubici koji mogu nastati u SVP (bez obzira na poreklo poremećaja) imaju isti negativan smer u finansijskom sistemu, tj. ako je gubitak nastao u SVP efekat gubitka se istovremeno prenosi u finansijski sistem. Što je veći gubitak (uzeto

uslovno, jer bankarski i finansijski nije data definicija šta se smatra gubitkom, koji može biti meren lokalno, regionalno i globalno) u SVP to je nestabilnost finansijskog sistema veća, što pokazuju intervencije u nacionalnim finansijskim sistemima i izvršeni programi finansijske konsolidacije.

Treba zaključiti da je SVP finansijska infrastruktura ukupne ekonomije, a na taj način i svi poremećaji u SVP (koji izazivaju gubitak, bez ozbira na situacije u kojima su nastali, način na koji su generisani, koje posledice mogu biti izazvane, itd.) znače i probleme u naplati javnih prihoda, probleme u regularnom poslovanju komercijalnih banaka i poslovnih organizacija, odn. imaju reperkusije na likvidnost ukupnog sistema plaćanja: SVP - Sistem velikih plaćanja (**RTGS** - Real Time Gross Settlement System), SMP sistem malih plaćanja (**LVPS** - Low Value Payment System) i sistem plaćanja u poslovanju HoV (**SSS** - Securities Settlement System) i naravno sve subjekte ukupnog privrednog sistema.

software solutions and platforms). Risk exposure (more precisely, risk exposure of payment funds) exists and in order to reduce stochastic impacts on RTGS, scenario research is applied to models (simulations, scenarios and other types of financial experimenting) with an aim to evaluate the risk and implications that may ensue.

There is a high correlation between risk occurrence (*risk implying material loss*) in an RTGS system and financial system stability, i.e. disturbances (*tentatively said instability, illiquidity, blockades*) and other short and long breaks and failures of the RTGS system, causing disruptions and endangering stability of financial systems, for example: the global financial crisis implies a large number of huge losses for financial and non-financial institutions (*even a national level bankruptcy - Iceland*). This proves that many of the current financial models and recommendations for risk assessment and management have failed, so that the new methodologies and models are being prepared, and even the Basel II framework will have to undergo some enhancements and corrections (*announcing BIII*). There is a significant redefining of regulatory and legal frameworks and huge financial assets are prepared to improve liquidity on both national and global level.

With a view to protecting stability of financial systems, financial institutions, major and small corporations, living standard and level of employment, some financial protection and assistance programs have been launched and are already being implemented by countries themselves (parliaments and governments), with a particular, significantly changed role, being played by the national - central banks, which are in charge of planning, distribution and allocation of funds to commercial banks, investment banks, corporate entities (of national and global interest, e.g. in the USA - JP Morgan, City Group, Ford, Chrysler, AIG, Goldman Sax, etc.). In the USA there is a financial assistance program BAILOUT<sup>13</sup> providing a total amount of over 700 billion USD, and elsewhere there are efforts made by the governments in order

to provide financial support, e.g. in Germany, Japan, France, Italy, UK and other countries, including the government program for recovery and financial aid for export oriented companies, launched by the government of the Republic of Serbia. In effect, facing the world economic crisis and recession indicates that financial risks are transferred from local and regional levels to the global level, but also that the great changes are taking place in respect of the approach to tackling economic problems (*state interventions in delivering financial aid using state budget for protection of private investment banks, e.g. the USA and other, until recently most powerful national and world economies. In the programs of the NBS and other government agencies there are measures and proposals for recovery and financial support to the banking system and economy: increase in guaranteeing foreign currency savings (from the 3,000 EUR to 50,000 EUR), interest rate increase for the short and long term saving deposits, tax allowances for interest earnings on saving deposits and some other support and aid programmes*).

The objective of this analysis was to document the correlation and impact of the financial and payment systems (*primarily RTGS system as the base for control and implementation of the key monetary and economy payment operations*), on the stability of national economy and protection from domestic and foreign financial and economic disturbances and risk transfers.

In the RTGS system the key financial institutions are members of the payment system (*the members are the major financial institutions*) whose asset volume and turnovers through RTGS are high (*taking into account the members of the RTGS and the indirect participants*), which actually means that 80% of the total turnover of payment volumes and the total number of transactions are posted by direct and indirect payment system participants. We may conclude that the influence of the RTGS system on financial system stability is significant and we believe that the following rule applies: stable RTGS without failures equals stable financial system without economic disturbances, which, in turn, implies that failures, gridlocks,

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<sup>13</sup> **Bailout** is an act of loaning or giving capital to a failing business in order to save it from bankruptcy, insolvency, or total liquidation and ruin.



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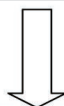
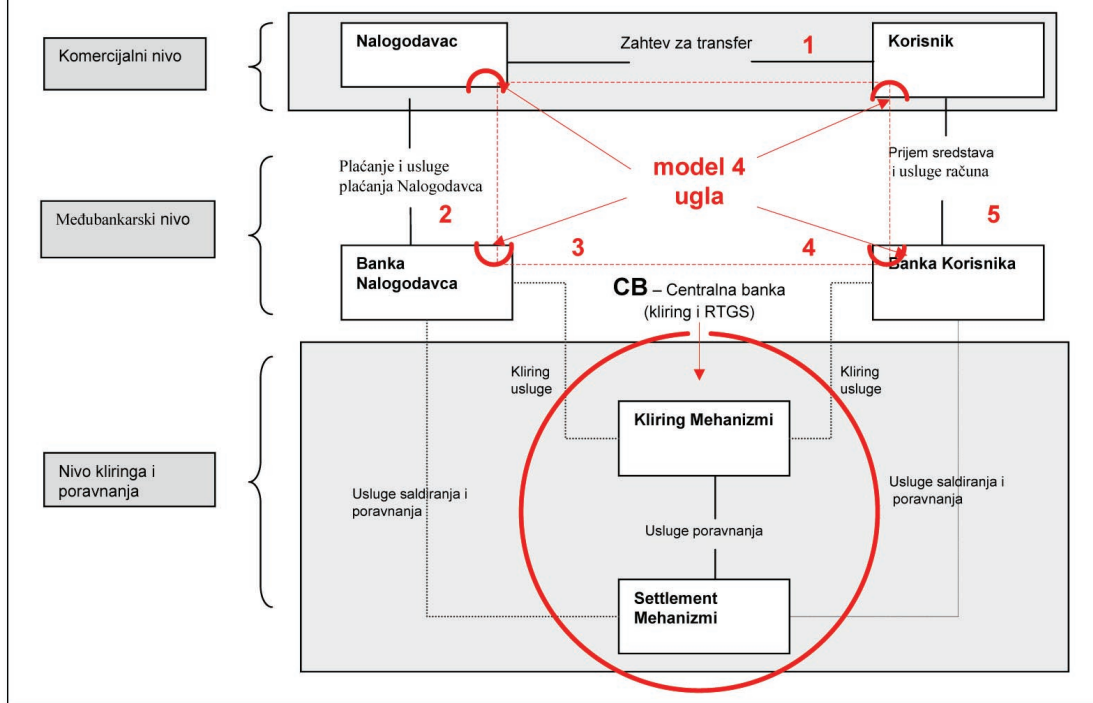
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deadlocks and losses which may appear in RTGS (*no matter what the source of these failures is*) have the same negative impact on the financial system, i.e. if the RTGS system fails, the failure is instantly transferred into the financial system. The higher the loss in the RTGS (*conditionally speaking, because there is no strict banking and financial definition what exactly may be considered a loss, which may be measured locally, regionally and globally*) the more severe the instability of the financial system, as evidenced by interventions in the national financial systems and the implemented programmes of financial recovery.

At the end, we may conclude that the RTGS is a financial infrastructure of the national economy, and accordingly, all failures in RTGS (*generating losses, regardless of the initial source, the way in which they are generated, their potential consequences, etc.*) incur problems in collecting public income and taxes, problems in regular operations of commercial banks and business organizations, i.e. they impact the entire RTGS system liquidity: **RTGS** - *Real Time Gross Settlement System*, but also both: **LVPS** - *Low Value Payment System* and **SSS** - *Securities Settlement System* and, naturally, all participants in the overall economic system.

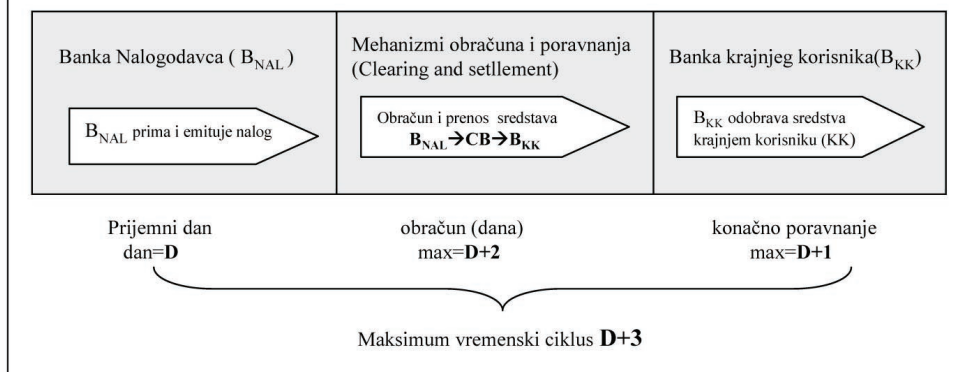
### Šematski prikaz procesa plaćanja (emitovanje naloga, prenos, obračun i poravnanje)

slika-1



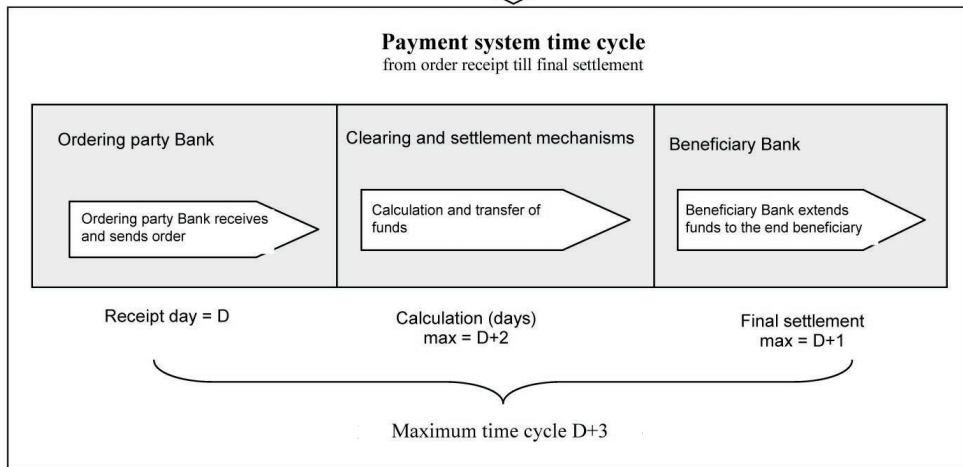
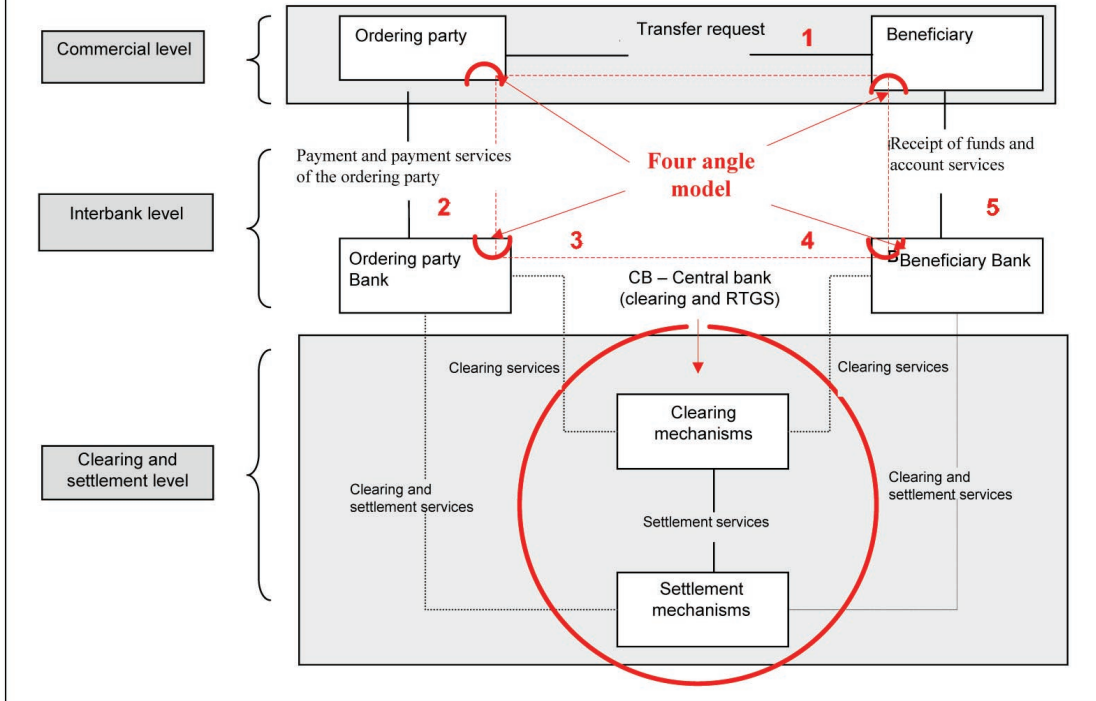
### vremenski ciklus u sistemu plaćanja

od prihvatanja naloga do konačnog poravnanja



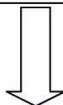
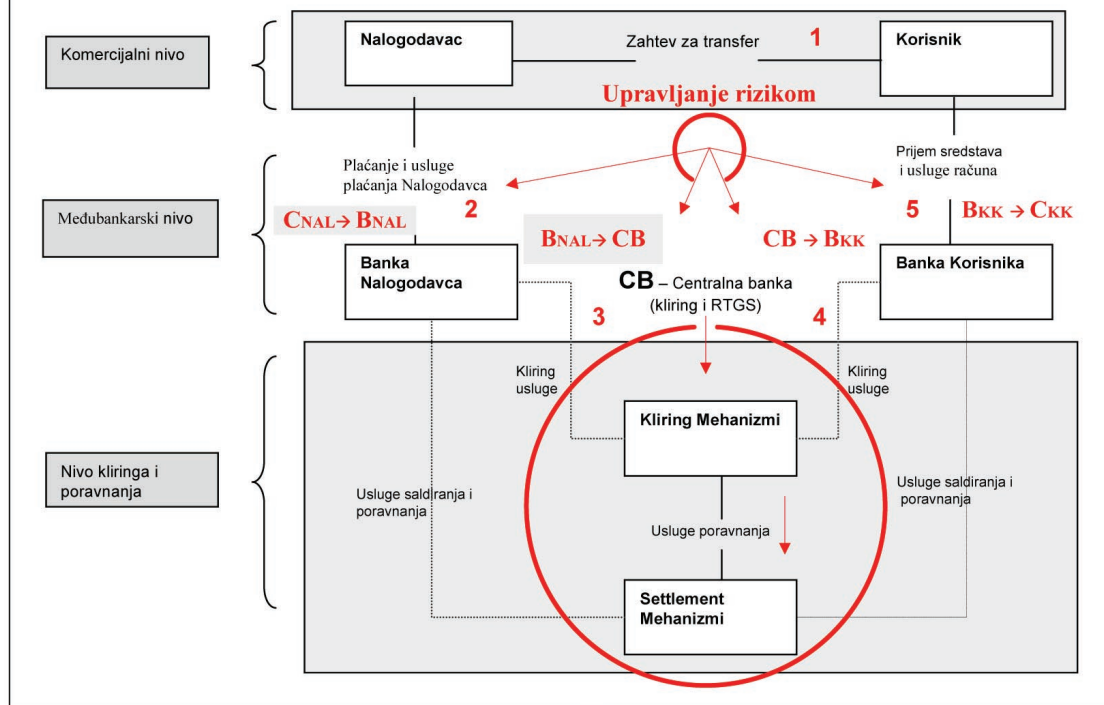
**PAYMENT PROCESS MODEL MANAGEMENT**  
 (sending and receiving process, money transfers, clearing and settlement)

figure-1



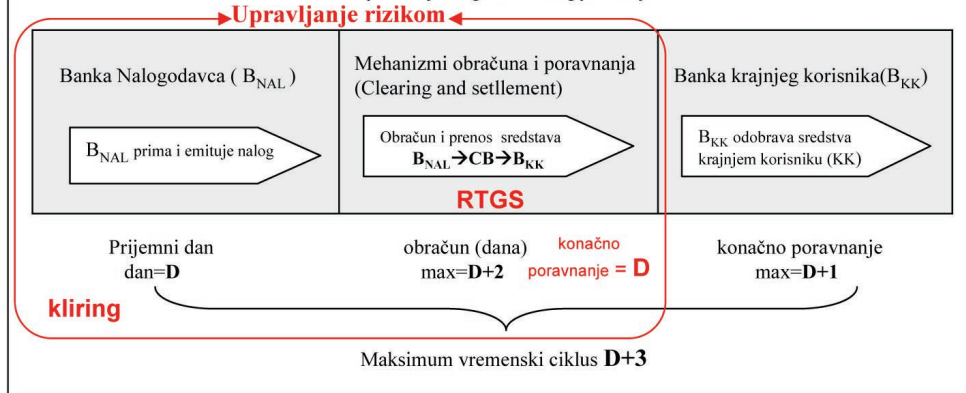
**Šematski prikaz procesa plaćanja**  
(emitovanje naloga, prenos, obračun i poravnanje)  
**Procesi upravljanja rizikom**

slika-2



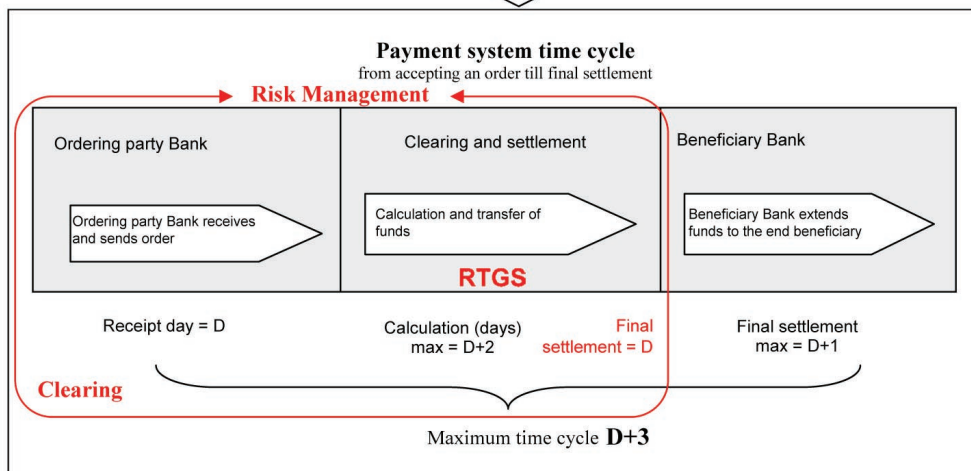
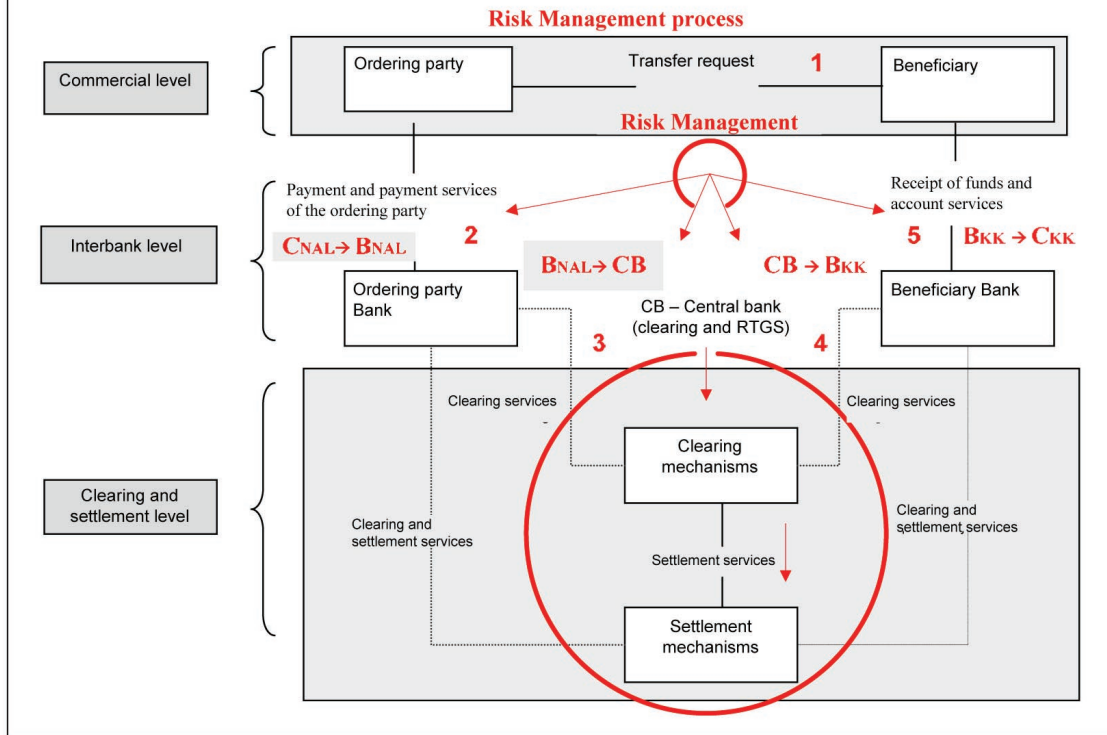
**vremenski ciklus u sistemu plaćanja**

od prihvatanja naloga do konačnog poravnanja



**PAYMENT PROCESS MODEL MANAGEMENT**  
 (sending and receiving process, money transfers, clearing and settlement)

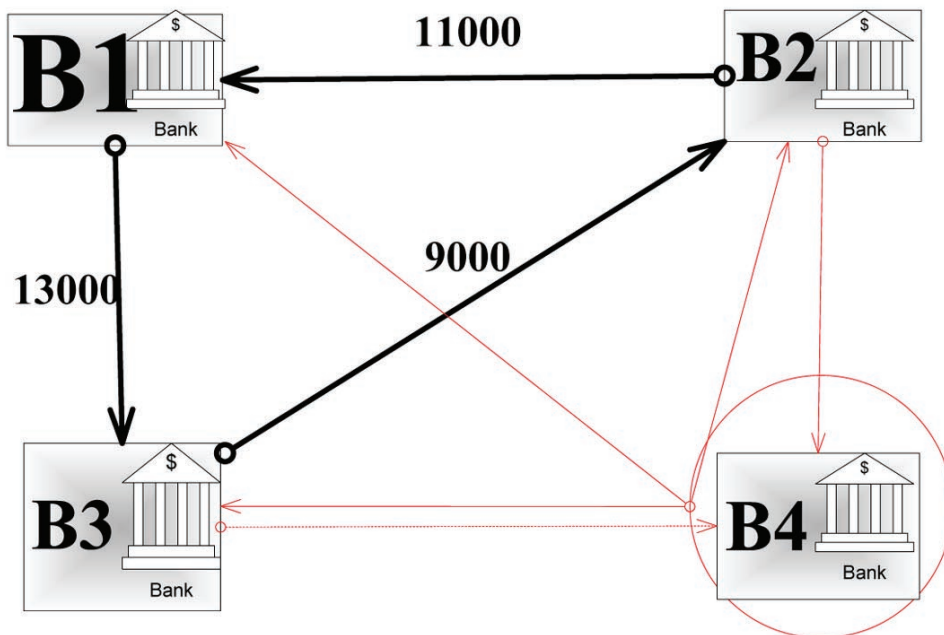
figure-2



# RTGS/KLIRING

## Mehanizam GRIDLOCK

slika-3



Problem pojave rizika gridlock-rešenje u KLIRING sistemu plaćanja

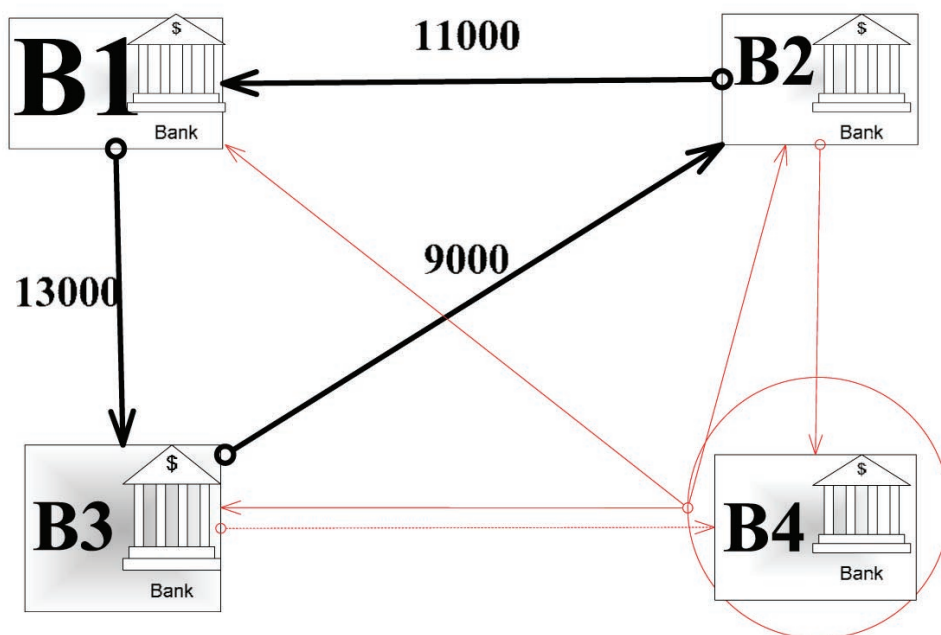
| banke P /<br>banke D     | B1               | B2               | B3               | B4   | zaduženja        |
|--------------------------|------------------|------------------|------------------|------|------------------|
| <b>B1</b>                | 0.00             | 0.00             | 13,000.00        |      | <b>13,000.00</b> |
| <b>B2</b>                | 11,000.00        | 0.00             | 0.00             |      | <b>11,000.00</b> |
| <b>B3</b>                | 0.00             | 9,000.00         | 0.00             |      | <b>9,000.00</b>  |
| <b>B4</b>                |                  |                  |                  |      |                  |
| <b>Σ potraživanja</b>    | <b>11,000.00</b> | <b>9,000.00</b>  | <b>13,000.00</b> |      | <b>33,000.00</b> |
| <b>Σ obaveza</b>         | <b>13,000.00</b> | <b>11,000.00</b> | <b>9,000.00</b>  |      | <b>33,000.00</b> |
| stanje posle<br>kliringa | <b>2,000.00</b>  | <b>2,000.00</b>  | 4,000.00         | 0.00 | 0.00             |
| saldo na<br>računu       | 7,990.00         | 10,230.00        | 5,260.00         | 0.00 |                  |
| novi saldo               | 5,990.00         | 8,230.00         | 9,260.00         | 0.00 |                  |

<A> u RTGS sistemu plaćanja B1 i B2 nisu likvidne, RTGS sistem eliminiše B1 i B2 iz sistema plaćanja, odn. sve banke u lancu plaćanja B1, B2 i B3

<B> Problem pojave rizika GRIDLOCK u multilateralnom kliringu, pod istim uslovima (promet, likvidnost i stanje) jednostavno više nepostoji

# RTGS / CLEARING GRIDLOCK MECHANISM

figure-3



**Problem of gridlock risk occurrence – solution within the clearing payment system**

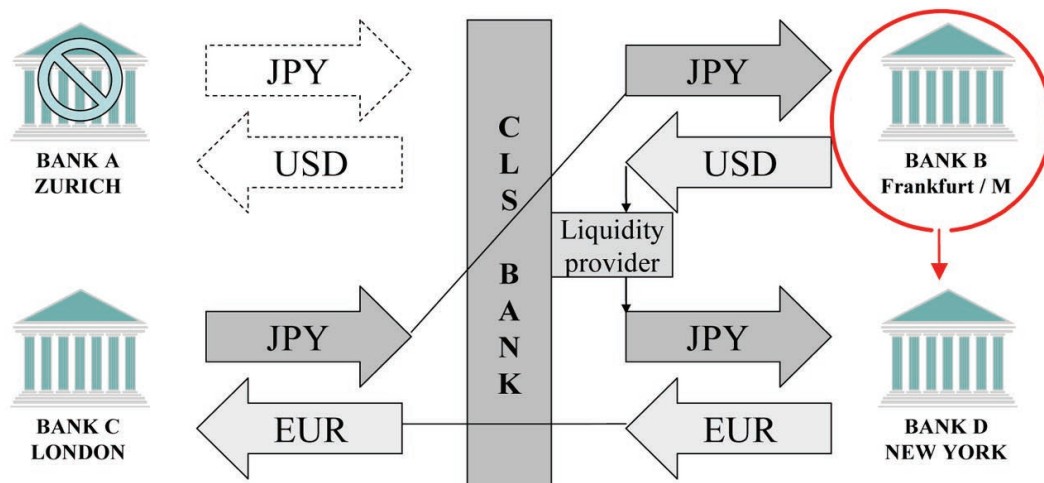
| Bank P / Bank D                | B1              | B2              | B3        | B4   | Debts            |
|--------------------------------|-----------------|-----------------|-----------|------|------------------|
| <b>B1</b>                      | 0.00            | 0.00            | 13,000.00 |      | <b>13,000.00</b> |
| <b>B2</b>                      | 11,000.00       | 0.00            | 0.00      |      | <b>11,000.00</b> |
| <b>B3</b>                      | 0.00            | 9,000.00        | 0.00      |      | <b>9,000.00</b>  |
| <b>B4</b>                      |                 |                 |           |      |                  |
| <b>Σ receivables</b>           | 11,000.00       | 9,000.00        | 13,000.00 |      | <b>33,000.00</b> |
| <b>Σ liabilities</b>           | 13,000.00       | 11,000.00       | 9,000.00  |      | <b>33,000.00</b> |
| <b>position after clearing</b> | <b>2,000.00</b> | <b>2,000.00</b> | 4,000.00  | 0.00 | 0.00             |
| <b>account balance</b>         | 7,990.00        | 10,230.00       | 5,260.00  | 0.00 |                  |
| <b>new balance</b>             | 5,990.00        | 8,230.00        | 9,260.00  | 0.00 |                  |

- <A> in RTGS system B1 and B2 are not liquid, RTGS system eliminates B1 and B2 from the payment system, i.e. all banks in the payment chain (B1, B2 and B3)
- <B> the problem of gridlock risk occurrence in the multilateral clearing, under the same conditions (turnover, liquidity and position) simply does not exist any more



## CLS INFRASTRUKTURA ZA FX PLAĆANJA

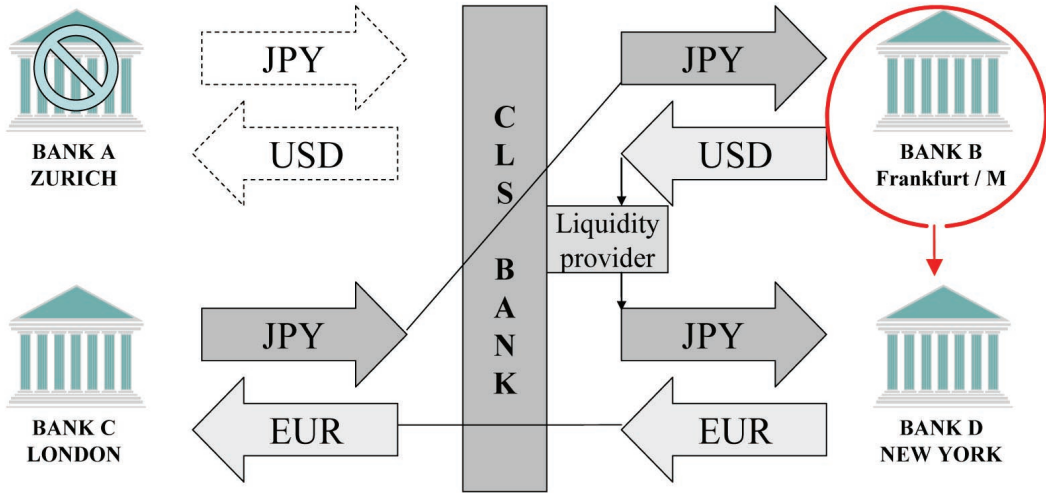
slika-4



**CLS BANKA KORISTI USD OD BANKE B DA IZVRŠI PLAĆANJE JPY BANCI D**  
**FX TRANSAKCIJA PREKO CLS BANKE USD:JPY**  
 B (USD) → CLS BANK → D (JPY)  
**FX TRANSAKCIJA OBEZBEDJENJE JPY CLS BANCI**  
 C (JPY) → CLS BANK → B (JPY)

## CLS INFRASTRUCTURE FOR FX PAYMENT

figure-4



CLS BANK USES USD FROM THE BANK B TO CONDUCT A PAYMENT IN JPY TO THE BANK D  
 FX TRANSACTION THROUGH THE CLS BANK USD:JPY  
 B (USD) → CLS BANK → D (JPY)  
 FX TRANSACTION PROVIDES JPY TO THE CLS BANK  
 C (JPY) → CLS BANK → B (JPY)