

NBP

Narodowy Bank Polski

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SORBNET2 Stress-Testing and Oversight

17th Payment and Settlement System Simulation Seminar

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Disclaimer

The opinions expressed in this presentation are those of the Author and do not necessarily reflect the views of Narodowy Bank Polski.

Agenda

1. Oversight of FMIs in Poland – with emphasis on payment systems
 - Objectives, laws and architecture
 - „*Narodowy Bank Polski payment system oversight policy*” and NBP’s oversight activities
2. SORBNET2 – LVPS owned and operated by NBP
 - System design and risk management framework
 - Stress-testing assumptions
 - Stress-testing results
3. Conclusions

Oversight of FMIs in Poland – with emphasis on payment systems

Objectives, laws and architecture

President of NBP performs oversight of (1) **payment systems** and (2) **payment schemes** and cooperates with KNF in assessing of the functioning of (3) **securities clearing systems and securities settlement systems** and (4) **provision of the *acquiring* services**.

On that account, NBP's prime oversight objectives are ensuring:

- **efficient and safe functioning of the payment systems;**
- **compliance of the overseen services and systems functioning rules with the provisions of law.**

Fulfilling prime oversight objectives contributes to the adequate performance of NBP's significant tasks, as defined in the **Act on Narodowy Bank Polski**, i.e.:

- **organising payments;**
- **acting towards stability of the national financial system.**

Oversight of FMIs in Poland – with emphasis on payment systems

Objectives, laws and architecture

Financial system, understood as a set of complement and consistent elements (i.e. mutual connections of financial institutions, financial markets and FMIs), allows to provide, *inter alia*:

- **methods allowing to transfer funds** – allocation of economic value between entities characterised by their surplus to these in deficit;
- **efficient risk management frameworks and risk pooling** – where risk mitigation mechanisms catalyse risk diversification;
- **payment, clearing and settlement** – via dedicated infrastructure, i.e.: payment systems and clearing and settlement systems.

Oversight of FMIs in Poland – with emphasis on payment systems

„Narodowy Bank Polski payment system oversight policy” and NBP’s oversight activities

„*Narodowy Bank Polski Payment System Oversight Policy*” was approved in October 2015 and updated in June 2017.

For the needs of oversight, payment systems are categorised as follows:

- systemically important payment systems;
- prominently important retail payment systems;
- other payment systems.

A new system or one already in place is assigned to one of the aforementioned categories on the basis of an individual assessment of NBP, which takes into account the following criteria:

- financial impact;
- degree of market penetration;
- cross-border dimension;
- settlement for other FMIs.

Oversight of FMIs in Poland – with emphasis on payment systems

„Narodowy Bank Polski payment system oversight policy” and NBP’s oversight activities

Figure 1. NBP’s oversight activities.



Source: Own elaboration.

Oversight of FMIs in Poland – with emphasis on payment systems

„Narodowy Bank Polski payment system oversight policy” and NBP’s oversight activities

From the *quantitative perspective*, oversight is performed through monitoring of the functioning of systems, which includes, i.e.:

- collecting and analysis of statistical data and information;
- clarifying incidents, which occur in systems;
- on-going cooperation with entities maintaining systems.

An entity that operates a payment system shall provide to the President of NBP *quarterly information* on:

- number and value of payment orders;
- number and value of not settled payment orders at the end of the business day;
- number of operational days and operational availability;
- value of funds used within the clearing and settlement guarantee system.

Additionally, entities that operate a payment system shall inform the President of NBP on updates on the list of participants and incidents.

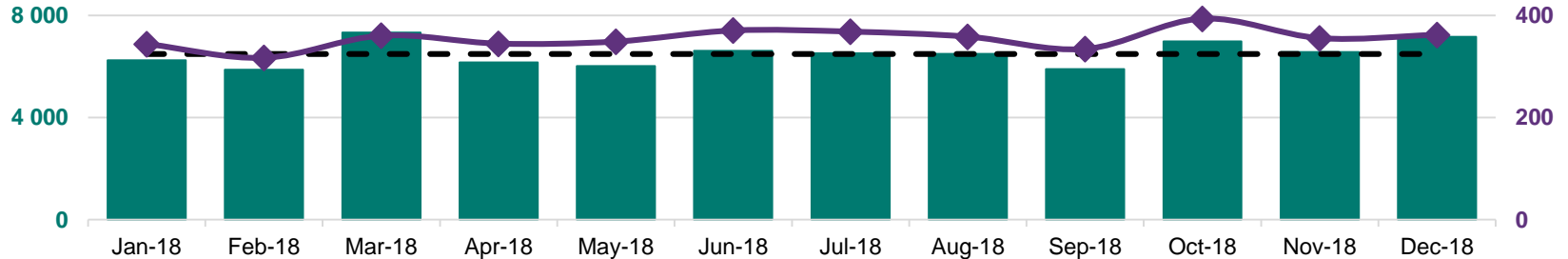
SORBNET2 – LVPS owned and operated by NBP

System design and risk management framework

SORBNET2:

- is a systemically important LVPS owned and operated by NBP that provides services in a RTGS design for payment transactions denominated in PLN;
- allows payment orders to be settled without *netting*, i.e. on a transaction-by-transaction basis in real-time with an immediate finality in central bank money.

Figure 2. Numbers [in thousands] and values [in bln PLN] of performed payment orders in 2018.



Source: Own elaboration based on NBP's data.

SORBNET2 – LVPS owned and operated by NBP

System design and risk management framework

Payment processing:	<i>transaction input and validation</i>	<i>payment routing</i>	<i>clearing and settlement</i>
Risk management:	<i>liquidity management</i>	<i>treasury reconciliation</i>	<i>liquidity monitoring</i>

SORBNET2 risk management is concentrated primarily on supporting direct participants in their liquidity management and liquidity monitoring.

In that manner, the system provides, *inter alia*, the following liquidity management tools:

- queuing mechanism for pending transfer orders;
- possibility to block funds in current accounts dedicated for settlement of ancillary systems;
- suspension of a participant;
- prioritising of transactions;
- collateralised intraday credit lines provided by NBP.

SORBNET2 – LVPS owned and operated by NBP

Stress-testing assumptions

At NBP, the Payment System Department performs stress-testing of SORBNET2 by means of BoF-PSS2, based on the oversight responsibilities and in accordance with „*Narodowy Bank Polski Payment System Oversight Policy*”.

Idea of the exercise?

- monitoring of the safe and efficient functioning of the system;
- evaluation of liquidity risk in the system model in extreme but plausible market conditions.

For the purpose of the simulations, SORBNET2 model's algorithms replicate:

- input, processing and prioritising of payment orders;
- *first in-first out* queuing mechanism for pending transfer orders;
- settlement and fund transferring procedures;
- intraday credit lines to a fixed limit.

SORBNET2 – LVPS owned and operated by NBP

Stress-testing assumptions

Benchmark Scenario – non-disrupted functioning of the system model from t to $t+5$.

Scenario 1 – participant generating highest *net* value of payment orders in t is unable to send payment orders until 09:00:00.

Scenario 2 – participant generating highest *net* value of payment orders in t is unable to send payment orders until 12:00:00.

Scenario 3 – participant generating highest *net* value of payment orders in t is unable to send payment orders for an entire business day.

Scenario 4 – reducing participants' intraday credit lines by 50%.

Scenario 5 – reducing participant's generating highest *net* value of payment orders in t intraday credit line by 100%.

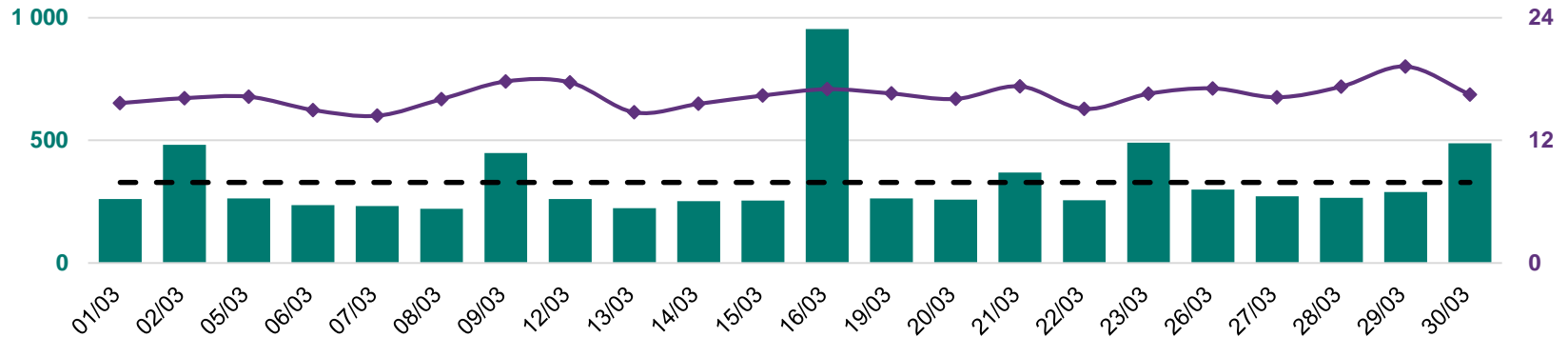
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Stress-testing assumptions

Input data?

- **time period selection** – (assumption of) the highest total value of performed payment orders. In 2018 it was March with 9,4% of total performed transfer orders in 2018.
- **(day) t** – 16/03/2018 with 13% of total performed payment orders in March 2018.

Figure 3. Numbers [in thousands] and values [in bln PLN] of performed payment orders in March 2018.



Source: Own elaboration based on NBP's data.

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Stress-testing assumptions

Input data? (cont'd)

Thus **firstly**, for the purpose of calculations and simulations a list of direct participants for the time period from 16/03/2018–23/03/2018 (i.e. from t to $t+5$) was used, with its corresponding data on:

- performed payment orders (00:01:00 frequency);
- intraday credit limits (daily frequency);
- initial balances, including current accounts and deposit accounts (daily frequency).

Secondly, for testing scenarios, a bank with the highest total *net* value of performed payment orders on 16/03/2018 was selected.

Figure 4. Percentage share in total net value of performed payment orders and operational links on 16/03/2018.

	Bank	% share	Links ($n_{max} = 48$)
1.	Bank A	5,1%	34
2.	Bank B	4,7%	42
3.	Bank C	3,8%	40
4.	Bank D	3,7%	41
5.	Bank E	3,3%	38

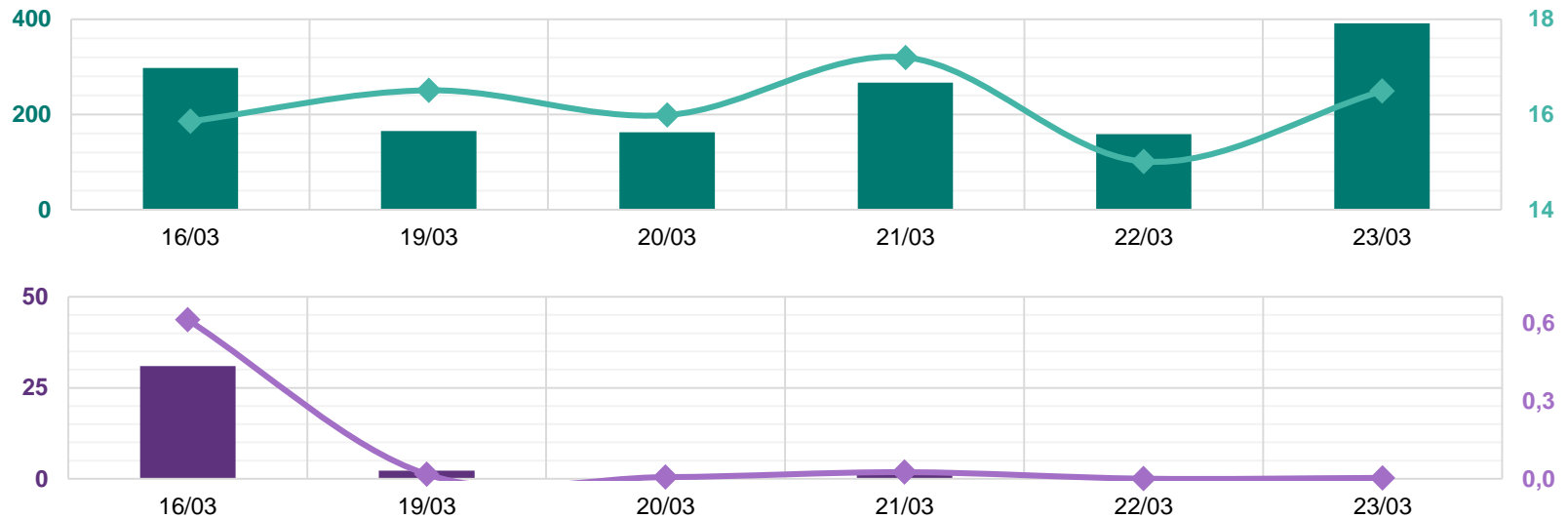
Source: Own elaboration based on NBP's data.

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Stress-testing results

Scenario 1 (participant generating highest *net* value of payment orders in *t* is unable to send payment orders until 09:00:00) vs. **Benchmark Scenario**.

Figure 5. Simulation results for **Scenario 1** regarding numbers and values of **settled/not settled** payment orders in SORBNET2 model from 16/03/2018 to 23/03/2018.



Source: Own elaboration based on NBP's data.

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Stress-testing results

Scenario 1 (participant generating highest *net* value of payment orders in *t* is unable to send payment orders until 09:00:00) vs. *Benchmark Scenario*.

Results at the system level:

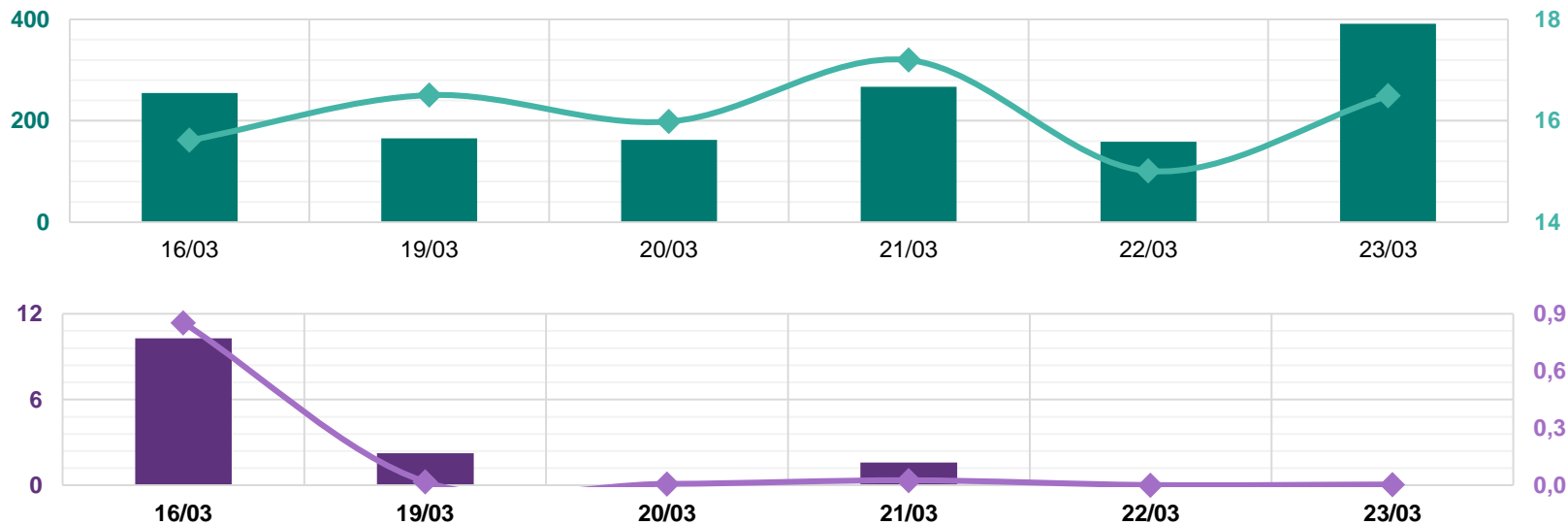
- 0,4% lower total number of settled payment orders;
- 3,6% lower total value of settled payment orders;
- total number of not settled payment orders constituted 0,7% of total number of performed payment orders;
- total value of not settled payment orders constituted 2,4% of total value of performed payment orders;
- 169,4% higher total number of not settled payment orders;
- 278,8% higher total value of not settled payment orders.

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Stress-testing results

Scenario 2 (participant generating highest *net* value of payment orders in *t* is unable to send payment orders until 12:00:00) vs. **Benchmark Scenario**.

Figure 6. Simulation results for **Scenario 2** regarding numbers and values of **settled/not settled** payment orders in SORBNET2 model from 16/03/2018 to 23/03/2018.



Source: Own elaboration based on NBP's data.

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Stress-testing results

Scenario 2 (participant generating highest *net* value of payment orders in *t* is unable to send payment orders until 12:00:00) vs. *Benchmark Scenario*.

Results at the system level:

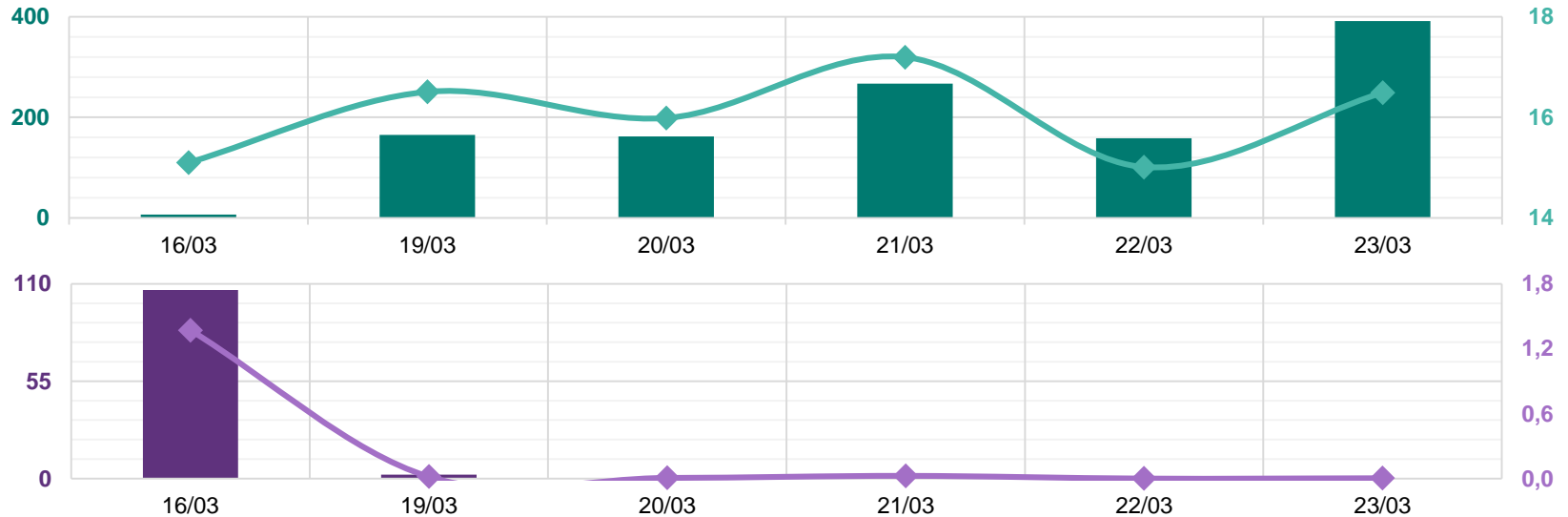
- 0,7% lower total number of settled payment orders;
- 6,5% lower total value of settled payment orders;
- total number of not settled payment orders constituted 0,9% of total number of performed payment orders;
- total value of not settled payment orders constituted 1% of total value of performed payment orders;
- 266,5% higher total number of not settled payment orders;
- 54,7% higher total value of not settled payment orders.

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Stress-testing results

Scenario 3 (participant generating highest net value of payment orders in t is unable to send payment orders for an entire business day) vs. **Benchmark Scenario**.

Figure 7. Simulation results for **Scenario 3** regarding numbers and values of **settled/not settled** payment orders in SORBNET2 model from 16/03/2018 to 23/03/2018.



Source: Own elaboration based on NBP's data.

SORBNET2 – LVPS owned and operated by NBP

Stress-testing results

Scenario 3 (participant generating highest net value of payment orders in t is unable to send payment orders for an entire business day) vs. *Benchmark Scenario*.

Results at the system level:

- 1,2% lower total number of settled of payment orders;
- 23,1% lower total value of settled of payment orders;
- total number of not settled payment orders constituted 1,5% of total number of performed payment orders;
- total value of not settled payment orders constituted 9,6% of total value of performed payment orders;
- 475,4% higher number of not settled payment orders;
- 1100,8% higher total value of not settled payment orders.

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Stress-testing results

Scenario 4 (reducing participants' intraday credit lines by 50%) vs. *Benchmark Scenario*.

Results at the system level = *Benchmark Scenario*

Scenario 5 (reducing participant's generating highest *net* value of payment orders in *t* intraday credit line by 100%) vs. *Benchmark Scenario*.

Results at the system level = *Benchmark Scenario*

Conclusions

Stress-testing scenarios of **SORBNET2 model** included assumptions on:

- inability to send payment orders by a participant generating highest *net* value of payment orders in *t* (*Scenarios 1, 2 and 3*);
 - significant reduction of participants' intraday credit lines (*Scenarios 4 and 5*).
1. Results of simulations under *Scenarios 1 and 2* suggest that assumed circumstances might influence safe and efficient functioning of the system at large, however in case of the analysed SORBNET2 model their potential materialisation aftermath (i.e. not performed settlements of transfer orders) remained low in importance in relation to total performed payment orders.
 2. Observed increased numbers and values of not settled payment orders in the morning hours under *Scenarios 1 and 2* suggest that some participants might anticipate liquidity of other linked participants (*liquidity recycling*). However in the analysed SORBNET2 model the scale of such a behaviour remained low in relation to total performed payment orders in the morning hours.
 3. Results of simulations under *Scenario 3* might influence safe and efficient functioning of the system.
 4. Results of simulations under *Scenarios 4 and 5* indicate that there were no negative consequences of reducing participants' intraday credit lines.

Thus, it shall be stated that **SORBNET2 model remains resistant to liquidity risk** in assumed extreme but plausible market conditions.



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We protect the value of money