

# TECHNICAL WORKSHOP



BRAZILIAN  
EXCHANGE  
AND OTC

**New Aggregate Metric RMKTN  
RMKTN limits monitoring**



# New Aggregate Metric (RMKTN)



# LINE 5.0

## INTRODUCTION



Following B3's last improvement in LiNe Clearing system:

- Currently, the LiNe Clearing system has the following aggregate metrics in near-time evaluation:
  - RMKT – Risk Measure
  - SDP – Potential Debt Balance
  - SPVD – Potential Short Sale Balance
  - SFD – Day Trade Financial Balance
- In order to continuously improve and adapt our risk control to the dynamics of listed and OTC markers, we will be enabling a new risk metric similar to the current risk measure, but that will only consider in its calculation executed: **RMKTN**.
- The goal of this new metric is to enable the monitoring of the risk effectively undertaken by investors and, as a result, assist the decision-making process for risk management;
- The new metric is already available in certification environment and is expected to be implemented in **parallel production** in November 2024 and in **production** in 12/09/2024.

# LINE 5.0



## RMKTN METRICS

### New aggregated market risk measure of executed trades | RMKTN

**Goal:** The new measure aims to limit the increment of risk generated by the set of trades in the opening portfolio and by the trades executed throughout the day compared with the risk of the opening portfolio.

In its calculation, the metric makes use of:

- ✓ Unit risk per instrument in each stress scenario.
- ✓ Balance trades (buy/sell) of the opening portfolio.
- ✓ Balance of buy trades executed throughout the day.
- ✓ Balance of sell trades executed throughout the day.

In its calculation, the following market segments are considered:

- ✓ All contracts in the derivatives segment.
- ✓ OTC derivatives contracts (swaps, forwards and flexible options) are also considered as trades in the opening portfolio and are **only** considered for opening risk purposes.

# LINE 5.0



## RMKTN METRICS

New aggregated market risk measure of executed trades | RMKTN

### Characteristics:

- Near-time evaluation;
- The assignment of limits by PNPs/PLs is mandatory by document and optional for accounts. If not performed, the investor's order will be cancelled;
- Furthermore, participants may choose whether they want the metric to be calculated from the perspective of the document or the account;
- When exceeded, the protected mode is triggered and all open orders in the book for all markets are cancelled;
- When activated the protected mode, only IRMKT and SPI metrics are evaluated, allowing only risk and position reductions.

### Net between buy and sell trades:

- **Definitive** account: there is compensation
- **Transitory** account: there is **no** compensation

Also, there is no compensation between buy and sell trades for different assets.

## RMKTN METRICS

### New aggregated market risk measure of executed trades | RMKTN

Calculation details for **definitive** accounts:

$$RMKTN_{DfAcct} = -\min \left\{ \min \left[ \min_{\forall c} \left( CO_{(1,c)} + \sum_{\forall i} (C_i - V_i) \times RU_{(i,c)} \right) + \sum_{i_{CPM}} RMKTN_{i_{CPM}} ; 0 \right] ; -\min[ \min_{\forall c} CO_{(1,c)} ; 0 ] ; 0 \right\}$$

Calculation details for **transitory** accounts:

$$RMKTN_{TrAcct} = -\min \left\{ \min \left[ \min_{\forall c} \left( CO_{(1,c)} + \sum_{\forall i} \left[ \begin{array}{l} \min(C_i \times RU_{(i,c)}; 0) \\ \min(-V_i \times RU_{(i,c)}; 0) \end{array} \right] \right) + \sum_{i_{CPM}} RMKTN_{i_{CPM}} ; 0 \right] ; -\min[ \min_{\forall c} CO_{(1,c)} ; 0 ] ; 0 \right\}$$

#### Where:

- $RMKTN_{DfAcct}$  is the RMKTN measure for the definitive accounts;
- $RMKTN_{TrAcct}$  is the RMKTN measure for the transitory accounts;
- $RMKTN_{i_{CPM}}$  is the RMKTN for Copom option  $i_{CPM}$  for the document or account;
- C: is each existing scenario;
- $i$ : is each instrument traded;

- $CO_{(1,c)}$  : is the one-dimensional matrix [1 x c] of the opening portfolio risks;
- $RU_{(i,c)}$ : is the two-dimensional matrix [i x c] of the unit risk constants for each instrument (row) under each scenario (column);
- $C_i$ : is the balance (in number of contracts) of buy trades executed for the account in instrument  $i$ ; and
- $V_i$ : is the balance (in number of contracts) of sell trades executed for the account in instrument  $i$ .

## RMKTN METRICS

### New aggregated market risk measure of executed trades | RMKTN

Calculation details for **documents**:

$$RMKTN_{Doc} = - \min \left\{ \begin{array}{l} \min_{\forall c} \left( \sum_{\forall CtD} CO_{(1,c)} + \sum_{\forall i} \left[ \begin{array}{l} \sum_{\forall CtD} (C_i - V_i) \times RU_{(i,c)} \\ + \\ \min(C_i \times RU_{(i,c)}; 0) \\ \min(-V_i \times RU_{(i,c)}; 0) \end{array} \right] \right) \\ + \sum_{i_{CPM}} RMKTN_{i_{CPM}}; 0 \\ - \min_{\forall c} \left[ \min_{\forall c} \left( \sum_{\forall CtD} CO_{(1,c)} \right) + \sum_{i_{CPM_0}} RMKTN_{i_{CPM_0}}; 0 \right]; 0 \end{array} \right\}$$

Where:

- $RMKTN_{Doc}$  is the RMKTN measure for the document;
- $RMKTN_{TrAcct}$  is the RMKTN measure for the transitory accounts;
- $RMKTN_{i_{CPM}}$  is the RMKTN for Copom option  $i_{CPM}$  for the document or account;
- C: is each existing scenario;
- $i$ : is each instrument traded;
- $CO_{(1,c)}$  : is the one-dimensional matrix [1 x c] of the opening portfolio risks;
- $RU_{(i,c)}$ : is the two-dimensional matrix [i x c] of the unit risk constants for each instrument (row) under each scenario (column);
- $C_i$ : is the balance (in number of contracts) of buy trades executed for the account in instrument  $i$ ; and
- $V_i$ : is the balance (in number of contracts) of sell trades executed for the account in instrument  $i$ .



A blue-tinted photograph of a classical building with columns and arches, serving as the background for the left half of the slide.

# Monitoring of assigned limits





# LINE 5.0

## Monitoring of assigned limits



### Changes

Market risk of trades:

The new metric emerge as a new functionality for realized risk control undertaken by investor;

The limit assigned to the metric must respect the measure of stressed economic capacity of the chain of responsibility.

Monitoring of the limits assigned in LiNe Clearing and LiNe BTB:

- ✓ The new metric will be included in the current limits monitoring model for aggregated metrics, which currently already covers the following metrics:

- Risk Measure (RMKT);
  - Risk Measure of trades (RMKTN)
  - SFD;
  - SDP;
  - SPVD;
  - SPDA; e
  - SPTA.
- } LiNe Clearing Aggregate Metrics
- } LiNe BTB Aggregate Metrics

# LINE 5.0

## Monitoring of assigned limits



### Changes

- ✓ Starting from production date, the RMKTN metric will be considered in the monitoring of limits and in the computation of residual risk violations.

The settlement risk will be given by:

$$RL_{P,Func,doc} = \max \left( LRMKT_{P,Func,doc}; 0,25 \times LSDP_{P,Func,doc}; LSFDP_{P,Func,doc}; 0,18 \times LSPDA_{P,Func,doc}; 0,25 \times LSPTA_{P,Func,doc}; 0,25 \times LSPVD_{P,Func,doc}; \mathbf{LRMKTN}_{P,Func,doc} \right)$$

where:

$RL_{P,Func,doc}$ : is the settlement risk of an investor (doc) under the responsibility of PNP/PL (P) acting under the function (Carrying or PNP);

$LMA_{P,Func,doc}$ : is the limit assigned to an investor (doc) under the responsibility of PNP/PL (P) acting under the function (Func - Carrying or PNP) for the aggregate risk metric (MA), where MA could be RMKT, **RMKTN**, SDP, SFD, SPDA, SPTA ou SPVD.

The execution risk will be given by:

$$RE_{P,doc} = \max_{ct} \left( 0,35 \times \max(LRMKT_{P,doc,ct}; \mathbf{LRMKTN}_{P,doc,ct}; 0,25 \times LSDP_{P,doc,ct}; 0,25 \times LSPVD_{P,doc,ct}); LSFDP_{P,doc,ct} \right)$$

where:

$RE_{P,doc}$ : is the execution risk of an investor (doc) under the responsibility of PNP (P);

$LMA_{P,doc,ct}$ : is the limit assigned to an account (ct) of an investor (doc) under the responsibility of PNP (P) for the aggregate risk metric (MA), where MA could be RMKT, **RMKTN**, SDP, SPVD ou SFD.

# LINE 5.0

## Monitoring of assigned limits



### Changes

- The RMKTN limit will be separated in two cases:

- Default – RMKT limit smaller than the CEE:** the RMKTN limit must be equal or less than the CEE:

$$LRMKTN \leq CEE$$

- Exception – RMKT limit bigger than the CEE:** invertors that has the need of the RMKT limit bigger than the CEE can assign a bigger limit, only if:

- Has TMOX cap defined by B3;
- CEE equal or bigger than the  $FinLimit_{offer}$ ;
- RMKTN limit given by:

$$LRMKTN \leq CEE - \min(0,5 \times FinLimit_{offer}; 150MM)$$

- Being:

$FinLimit_{offer}$ : Financial limit of an offer. Currently this parameter is R\$ 300MM for all invertors that has mandatory TMOC/TMOV cap. In case of necessity of the investor, B3 can adjust the parameter to make the  $FinLimit_{offer}$  be less than R\$ 300MM, what will lead to TMOC/TMOV also smaller.

Participants who wish to opt for option 2 must contact B3 with the request. This implementation depends on prior analysis by B3 to assess the implementation of conditions 1 to 3. B3 may, at its discretion, in specific cases, require additional information or restrictions as a result of this assessment.



# Example



# LINE 5.0

## Example



### Example

- Scenario of a definitive account with two instruments
  - Assumptions:
    - Permissions and limits for the authorized currency and index futures markets;
    - Investor 123456 has only one definitive account ((ACC10));
    - RMKT and RMKTN limits set to BRL 3,000,000.00;
    - Opening portfolio balance (C0) = 1.000 long DOLG25 and 200 short DI1F26 contracts;
    - Balance of trades (S) = 100 long DOLG25 contracts.

Investor makes a trade of 100 short DI1F26 contracts

- Scenario:

Instrument	C0	B	S	S = B - S
DOLG25	1000	100	0	100
DI1F26	-200	0	100	-100

- Considering only 5 scenarios calculated by CORE:

CORE Scenarios					
Instrument	Scen1	Scen2	Scen3	Scen4	Scen5
DOLG25	500	25.000	-100	-800	-28.000
DI1F26	300	15.000	600	-700	-19.000

# LINE 5.0

## Example



### Example

Investor makes a trade of 100 short DI1F26 contracts

- Considering only 5 scenarios calculated by CORE:

CORE Scenarios					
Instrument	Scen1	Scen2	Scen3	Scen4	Scen5
DOLG25	500	25.000	-100	-800	-28.000
DI1F26	300	15.000	600	-700	-19.000

- Calculation of the opening portfolio risk:

R(C0) = (Opening portfolio balance)*(Scenario value)					
Instrumentos	Cen1	Cen2	Cen3	Cen4	Cen5
DOLG25	500,000	25,000,000	-100,000	-800,000	-28,000,000
DI1F26	-60,000	-3,000,000	-120,000	140,000	3,800,000
<b>R(C0)</b>	<b>440,000</b>	<b>22,000,000</b>	<b>-220,000</b>	<b>-660,000</b>	<b>-24,200,000</b>

- Calculation of the trades risk:

R(S) = (Balance of trades)*(Scenario value)					
Instruments	Scen1	Scen2	Scen3	Scen4	Scen5
DOLG25	50,000	2,500,000	-10,000	-80,000	-2,800,000
DI1F26	-30,000	-1,500,000	-60,000	70,000	1,900,000
<b>R(S)</b>	<b>20,000</b>	<b>1,000,000</b>	<b>-70,000</b>	<b>-10,000</b>	<b>-900,000</b>



# LINE 5.0

## Example



### Example

Investor makes a trade of 100 short DI1F26 contracts

- Calculation of the opening portfolio risk:

R(C0) = (Opening portfolio balance)*(Scenario value)					
Instrumentos	Cen1	Cen2	Cen3	Cen4	Cen5
DOLG25	500,000	25,000,000	-100,000	-800,000	-28,000,000
DI1F26	-60,000	-3,000,000	-120,000	140,000	3,800,000
<b>R(C0)</b>	<b>440,000</b>	<b>22,000,000</b>	<b>-220,000</b>	<b>-660,000</b>	<b>-24,200,000</b>

- Calculation of the trades risk:

R(S) =(Balance of trades)*(Scenario value)					
Instrumentos	Scen1	Scen2	Scen3	Scen4	Scen5
DOLG25	50,000	2,500,000	-10,000	-80,000	-2,800,000
DI1F26	-30,000	-1,500,000	-60,000	70,000	1,900,000
<b>R(S)</b>	<b>20,000</b>	<b>1,000,000</b>	<b>-70,000</b>	<b>-10,000</b>	<b>-900,000</b>

$$RMKTN_{DfAcct} = 900.000,00$$



**Thank you!**

# Annex





# LINE 5.0

## Example



### Example – Calculation

Investor makes a trade of 100 short DI1F26 contracts

- Calculation of the opening portfolio risk:

R(C0) = (Opening portfolio balance)*(Scenario value)					
Instrumentos	Cen1	Cen2	Cen3	Cen4	Cen5
DOLG25	500,000	25,000,000	-100,000	-800,000	-28,000,000
DI1F26	-60,000	-3,000,000	-120,000	140,000	3,800,000
<b>R(C0)</b>	<b>440,000</b>	<b>22,000,000</b>	<b>-220,000</b>	<b>-660,000</b>	<b>-24,200,000</b>

- Calculation of the trades risk:

R(S) =(Balance of trades)*(Scenario value)					
Instrumentos	Scen1	Scen2	Scen3	Scen4	Scen5
DOLG25	50,000	2,500,000	-10,000	-80,000	-2,800,000
DI1F26	-30,000	-1,500,000	-60,000	70,000	1,900,000
<b>R(S)</b>	<b>20,000</b>	<b>1,000,000</b>	<b>-70,000</b>	<b>-10,000</b>	<b>-900,000</b>

$$RMKTN_{DfAcct} = - \min \left\{ \begin{array}{l} \min \left[ \begin{array}{l} \min ([440.000; 22.000.000; -220.000; -660.000; -24.200.000]) \\ \forall c \left( + [140.000; 4.000.000; -60.000; -160.000; -4.040.000] \right) \\ + 0; 0 \end{array} \right] \\ - \min [\min_{\forall c} ([440.000; 22.000.000; -220.000; -660.000; -24.200.000]) + 0; 0] ; 0 \end{array} \right\}$$

# LINE 5.0

## Example



### Example – Calculation

Investor makes a trade of 100 short DI1F26 contracts

$$RMKTN_{DfAcct} = - \min \left\{ \begin{array}{l} \min \left[ \begin{array}{l} \min ([440.000; 22.000.000; -220.000; -660.000; -24.200.000]) \\ \forall c \left( + [140.000; 4.000.000; -60.000; -160.000; -4.040.000] \right) \\ + 0; 0 \end{array} \right] \\ - \min [\min_{\forall c} ([440.000; 22.000.000; -220.000; -660.000; -24.260.000]) + 0; 0] ; 0 \end{array} \right\}$$

$$RMKTN_{DfAcct} = - \min \left\{ \begin{array}{l} \min \left[ \begin{array}{l} \min_{\forall c} ([460.000; 23.000.000; -290.000; -670.000; -25.100.000]) \\ + 0; 0 \end{array} \right] \\ - \min [-16.160.000; 0] ; 0 \end{array} \right\}$$

$$RMKTN_{DfAcct} = - \min \{ \min [-25.100.000; 0] - \min [-24.200.000; 0] ; 0 \}$$

$$RMKTN_{DfAcct} = - \min \{ -25.100.000 + 24.200.000; 0 \}$$

$$RMKTN_{DfAcct} = - \min \{ -4.040.000; 0 \}$$

$$RMKTN_{DfAcct} = \mathbf{900.000}$$