Risk and Collateral Management Service
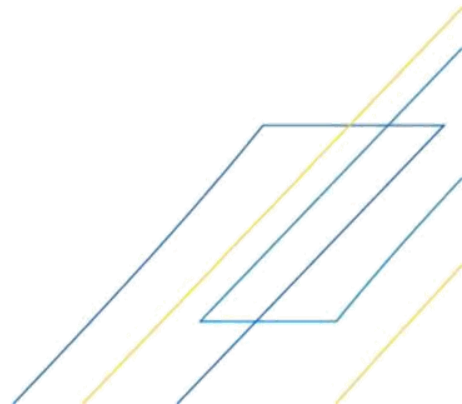
Risk and Collateral Management Service provided by Takasbank in Borsa Istanbul Futures and Options Market
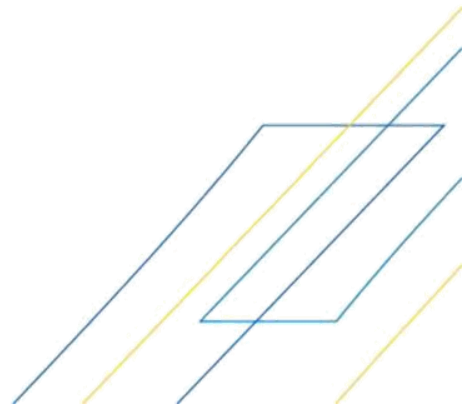
TAKAS İSTANBUL

Takasbank Risk Management and Margining System

> The risk and collateral management in Borsa Istanbul Futures and Options Market to which central counterparty service is provided shall be performed by Takasbank.

> For the portfolio-based risk measurement, the advanced Delta Hedge system is used.

  – Delta Hedge is an overall system allowing scenario analyses and analysis of extraordinary situations to be conducted, in which parametric definitions and sensitivity analyses can be performed.

  – Maximum risk is computed among the scenarios generated based on various price and volatility levels and the collateral is calculated so as to cover a daily settlement process.

Risk Analysis Method

› The risk analysis is conducted by grouping together the financial instruments with the same underlying asset (combined commodity) (For example, Equity Futures Contracts and Equity Options Contracts are analyzed by combining them in the same group).

› Each product is referred to as a «Combined Commodity».

› The analysis determines the risk of a portfolio with the following two steps by using the parameters set by Takasbank:

- **1st Step**: The risk of each **combined commodity** is analyzed in a separate manner.

- **2nd Step**: Based on correlation analysis, it is checked whether or not there is any risk mitigating position **between combined commodities**.

› Further to the foregoing steps for the risk identification of the portfolio:

- **3rd Step**: The risk value is calculated.
- **4th Step**: The initial margin is calculated.
- **5th Step:** The required margin is calculated.

Combined Commodity Risk Analysis:
(Scan Risk + Intra-Commodity Spread Charge)

› **Scan Risk**

> › The maximum risk to which the portfolio may be exposed over a given time frame is calculated by simulating scenarios with various price levels and volatility, and Takasbank requires such risk value from the relevant portfolio as collateral.
>
> - *Price Scan Range: It refers to the range of potential price changes to be used in the profit/loss analysis. For example: the value of XU030 would increase tomorrow by maximum 795 TL.*
> - *Volatility Scan Range: It refers to the range of implied volatility change likely to occur in the underlying asset for options. For example: XU030's volatility would increase by maximum 23% → Hypothetical Implied Volatility = (1+implied volatility)*0.23.*
>
> › **Risk Arrays:** They represent the hypothetical profit/loss arrays to be generated by a contract under a pre-determined set of market conditions from a given point in time to a specific point in time in the future.
>
> - The original risk application consists of 16 scenarios, but the number of scenarios may also be determined differently. In these scenarios, the moves of underlying price and of volatility up and down are simulated.
>
> › The maximum likely loss in the risk arrays would become the **Scan Risk** for the portfolio.

Risk Arrays

Scenario	Price Change as % of Price Scan Range; Volatility Move (VSR)	Scenario	Price Change as % of Price Scan Range; Volatility Move (VSR)
1	Price Unchanged; Volatility Up	2	Price Unchanged; Volatility Down
3	Price 1/3 Up; Volatility Up	4	Price 1/3 Up; Volatility Down
5	Price 1/3 Down; Volatility Up	6	Price 1/3 Down; Volatility Down
7	Price 2/3 Up; Volatility Up	8	Price 2/3 Up; Volatility Down
9	Price 2/3 Down; Volatility Up	10	Price 2/3 Down; Volatility Down
11	Price 3/3 Up; Volatility Up	12	Price 3/3 Up; Volatility Down
13	Price 3/3 Down; Volatility Up	14	Price 3/3 Down; Volatility Down
15	Extreme Move Scenario: Price 3x Up, Volatility Unchanged, Coverage Ratio 32%	16	Extreme Move Scenario: Price 3x Down, Volatility Unchanged, Coverage Ratio 32%

Scan Risk Example

> Scan Risk Calculation:
> – 1 Long XU030 June Futures Contract (Price is 98.225)
> – 1 Short XU030 June 98 Strike Price Call Option Contract (Implied Volatility is 21%)

> XU030 Price Scan Range (PSR) is 795 TL.

> XU030 Volatility Scan Range (VSR) is 23%.

Scenario	Price Move as % of XU030 Price Scan Range (PSR)		Implied Volatility Move up to XU030 Volatility Scan Range (VSR)	1 Long XU030 June Futures Profit /Loss	1 Short XU030 June 98 Call Option Profit /Loss	Portfolio Profit/Loss
1	UNCHANGED		UP	0	46.66	46.66
2	UNCHANGED		DOWN	0	-61.71	-61.71
3	UP	33%	UP	-265	205.63	-59.37
4	UP	33%	DOWN	-265	108.55	-156.45
5	DOWN	33%	UP	265	-74.36	190.64
6	DOWN	33%	DOWN	265	-172.37	92.63
7	UP	67%	UP	-530	398.44	-131.56
8	UP	67%	DOWN	-530	326.44	-203.56
9	DOWN	67%	UP	530	-157.95	372.05
10	DOWN	67%	DOWN	530	-228.8	301.20
11	UP	100%	UP	-795	618.05	-176.95
12	UP	100%	DOWN	-795	572.65	-222.35
13	DOWN	100%	UP	795	-209.4	585.60
14	DOWN	100%	DOWN	795	-250.18	544.82
15	UP	300%	UNCHANGED	-763.2	689.51	-73.69
16	DOWN	300%	UNCHANGED	763.2	-82.26	**680.94**
					Largest Potential Loss = Scan Risk	**680.94**

Spread Types

› **_Intra-Commodity Spread Charge_:** It is calculated for the basis risk between the different expiry dates of the financial instruments with the same underlying asset.

› **_Inter-Commodity Spread Credit_:** By taking account of the risk mitigating impacts of the contracts with off-setting positions in different combined commodities based on their underlying correlations, the margin requirement is reduced accordingly.

› Intra Commodity Spread Charge may be differentiated between the given months.

› After the intra commodity spread charge, the inter commodity spread credit is calculated.

Intra Commodity Spread Charge
Composite Delta

❯ In calculating the scan risk, it is particularly assumed that the futures contract prices of an underlying at different expiry dates would change by the same rate. Hence, a long position in any month is offset with a short position in another month. Since the intra commodity price moves may differ, the portfolios are vulnerable to intra commodity price risk.

- In calculating the intra commodity spread charge of a combined commodity, the options contracts are converted to equivalent futures contracts by using the delta values of the contracts in the combined commodity and the intra-commodity spread charge between the futures contracts and the options contracts is calculated.

❯ Delta is the amount of change that each unit change in the price of underlying asset would create in the contract price.

- The delta values of 7 scenarios in which volatility moves up are weighted by the probabilities set by Takasbank and the contract-based composite delta is calculated.
- Composite Delta gets a value between 0 and 1 for the call options and a value between -1 and 0 for the put options. For the futures contracts, the Composite Delta is 1.

Scenario	Underlying Price Change as % of Price Scan Range		Probability
1	UNCHANGED		0.270
3	UP	33%	0.217
5	DOWN	33%	0.217
7	UP	67%	0.110
9	DOWN	67%	0.110
11	UP	100%	0.037
13	DOWN	100%	0.037

Net Delta:

Composite Delta x Delta Haircut x Number of Positions

Intra Commodity Spread Charge Example

⟩ Intra commodity spread charge for June vs August 2014 is 795 TL.

⟩ The profits generated from June XU030 contract offset the losses on August XU030 contract, and the Scan Risk becomes 0 TL.

⟩ Therefore, the Intra Commodity Spread Charge of 795 TL becomes the risk value of the portfolio.

Scenario	Price Move as % of XU030 Price Scan Range (PSR)		Implied Volatility Move up to XU030 Volatility Scan Range (VSR)	1 Long XU030 June Futures Profit/Loss	1 Short XU030 August Futures Profit/Loss	Portfolio Profit/Loss
1	UNCHANGED		UP	0	0	0
2	UNCHANGED		DOWN	0	0	0
3	UP	%33	UP	-265	265	0
4	UP	%33	DOWN	-265	265	0
5	DOWN	%33	UP	265	-265	0
6	DOWN	%33	DOWN	265	-265	0
7	UP	%67	UP	-530	530	0
8	UP	%67	DOWN	-530	530	0
9	DOWN	%67	UP	530	-530	0
10	DOWN	%67	DOWN	530	-530	0
11	UP	%100	UP	-795	795	0
12	UP	%100	DOWN	-795	795	0
13	DOWN	%100	UP	795	-795	0
14	DOWN	%100	DOWN	795	-795	0
15	UP	%300	UNCHANGED	-763.2	763.2	0
16	DOWN	%300	UNCHANGED	763.2	-763.2	0
					Scan Risk	0

Inter Commodity Spread Credit Example

> After calculating the risk of each combined commodity for a portfolio, the correlations between the price moves of combined commodity reduces the risk of the portfolio, and less margin is required.

> Let's assume a portfolio with 1 Long XU030 Futures Contract and 10 Short SAHOL Equity Futures Contracts; and let's say that the defined spread credit is 1 XU030 vs 10 SAHOL and inter-commodity correlation is 50%:

Combined Commodity	Position	Scan Risk	Inter-Commodity Spread Credit	SPAN Margin Requirement
XU030	+ 1	795 TL		
SAHOL	- 10	(95x10) =950 TL		
Total		1745 TL	X %50 = 872.5 TL	872.5 TL

Short Option Minimum (SOM)

› Given the fact that the deep out-of-the-money short options are not heavily affected from the price and volatility moves, zero or minimal scan risk is calculated. However, these options may move closer, in extreme conditions, to at-the-money (ATM) or in-the-money (ITM) position status and, thereby, may lead to the large losses. To account for this potential large losses, a short option minimum can be set on the basis of each combined commodity. If the scan risk of the portfolio is lower than such value, then the Short Option Minimum amount is to be requested as collateral.

Example:

› - Let's assume a portfolio with 1 short XU030 68 Strike Price June 2014 Put Option (underlying asset price is 97.451 TL), where 1 XU030 short option minimum is 160 TL.
  - Scan Risk = 44.36 TL< 160 TL → Portfolio Risk =160 TL

Scenario	Price Move as % of XU030 Price Scan Range (PSR)		Implied Volatility Move up to XU030 Volatility Scan Range (VSR)	Portfolio Profit/Loss
1	UNCHANGED		UP	4.06
2	UNCHANGED		DOWN	-0.97
3	UP	33%	UP	2.13
4	UP	33%	DOWN	-0.99
5	DOWN	33%	UP	7.11
6	DOWN	33%	DOWN	-0.92
7	UP	67%	UP	0.91
8	UP	67%	DOWN	-1.00
9	DOWN	67%	UP	11.85
10	DOWN	67%	DOWN	-0.78
11	UP	100%	UP	0.16
12	UP	100%	DOWN	-1.00
13	DOWN	100%	UP	19.08
14	DOWN	100%	DOWN	-0.40
15	UP	300%	UNCHANGED	-0.32
16	DOWN	300%	UNCHANGED	44.36
			Scan Risk	44.36

Summary of Risk Analysis

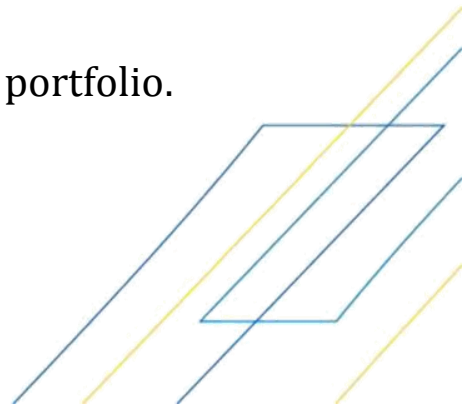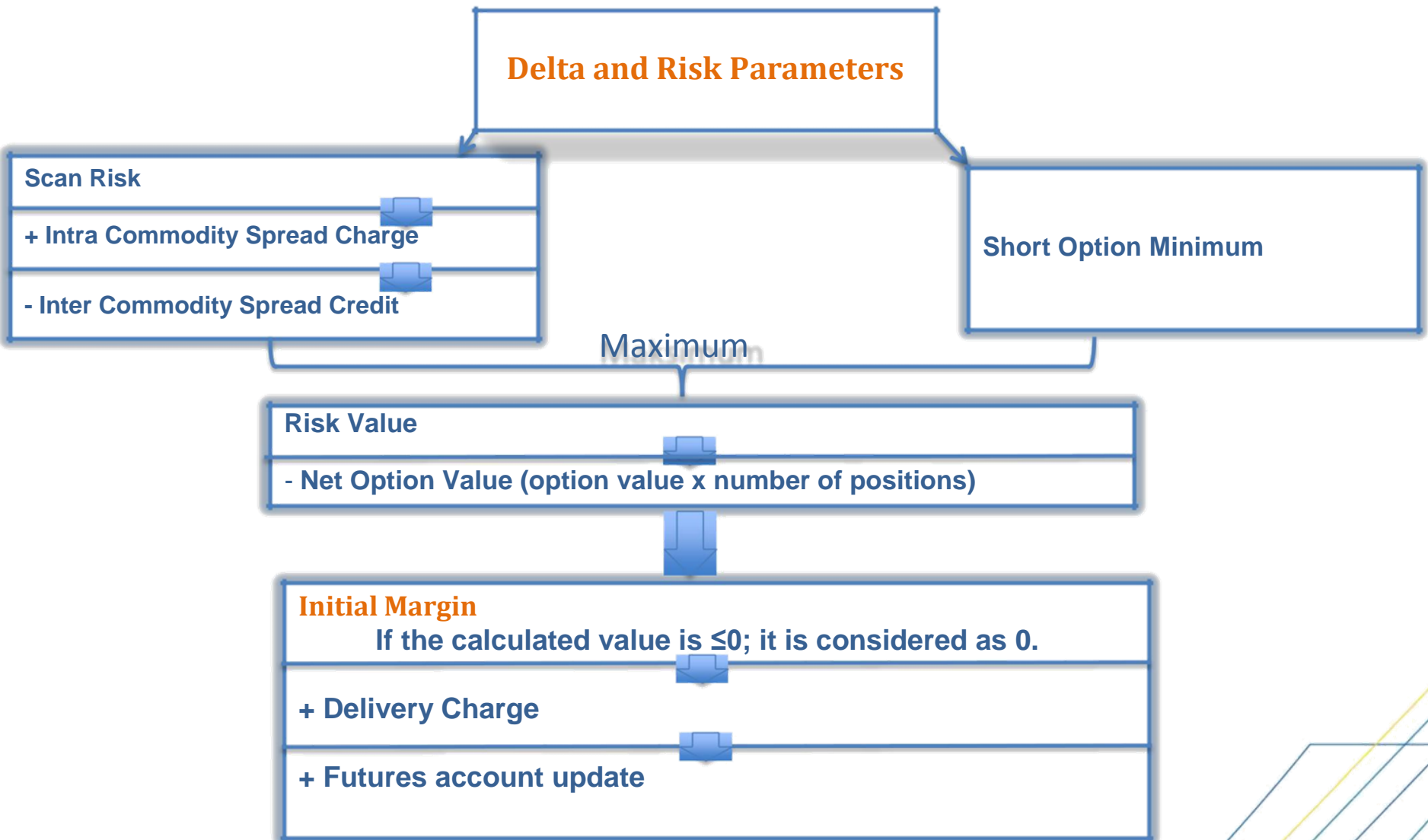|	
Scan Risk	It directly measures the market risk.
Intra Commodity Spread Charge	It calculates the basis risk between the different expirations of the same product.
Inter Commodity Spread Credit	It measures the risk mitigating impact of the assets with a correlation between each other.
Delivery Charge	It measures the risk in the delivery period.
Short Option Minimum Margin	It calculates the largest risk likely to be arisen from the short option positions.
Combined Commodity Risk Value	It is the greater of: • Scan Risk + Intra Commodity Spread Charge + Delivery Charge – Inter Commodity Spread Credit • Short Option Minimum
Total Risk Value of Portfolio	The sum of the risk values calculated for all combined commodities.

Net Option Value

➤ Profit/loss component (*mark-to-market*) of the options is reflected in the «Net Option Value» component.

➤ Total portfolio margin requirement is the sum of the "Total Risk Value" and the "Net Option Value".

➤ The Net Option Value of a portfolio is equal to the long option value minus the short option value.

  – Long Option Value (LOV): The total value of all long options in the portfolio.
    • Long Option Value reduces the «Total Margin Requirement».

  – Short Option Value (SOV): The total value of all short options in the portfolio.
    • Short Option Value increases the «Total Margin Requirement».

Takasbank Margin Calculation Summary

Delta and Risk Parameters

Scan Risk

+ Intra Commodity Spread Charge

- Inter Commodity Spread Credit

Short Option Minimum

Maximum

Risk Value

- Net Option Value (option value x number of positions)

Initial Margin
        If the calculated value is ≤0; it is considered as 0.

+ Delivery Charge

+ Futures account update

Risk Value Calculation Summary

Risk Value = Max. [(Scan Risk + Intra Commodity Spread Charge – Inter Commodity Spread Credit), (Short Option Minimum)]

Initial Margin = Risk Value – Net Option Value

- Net Option Value = Total Value of Long Option Positions – Total Value of Short Option Positions

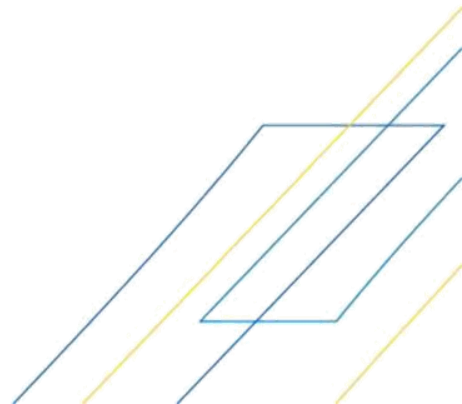**Required Margin =** Initial Margin + Delivery Charge

- Delivery Charge = Number of Contracts Subject to Delivery Charge x Underlying Asset Price Scan Range

Maintenance Level:

- All outstanding passive orders of the account whose margin has exceeded the maintenance level in the intraday risk calculations and become inadequate are cancelled automatically in the Exchange trading system and any position-enhancing order transmission is restrained.
- In the market, no maintenance level application is performed at the end-of-day.
- The ratio for the intraday maintenance level is set by Takasbank by taking account of the market conditions and announced via a general letter.
- The criteria for the intraday margin call have been stipulated in the relevant Procedure.

Futures and Options Market Risk Parameter File

> The clearing and settlement members can access to the contract details, parameters and collateral information by using the "**Futures and Options Market Risk Parameter File**" being published on Takasbank web site at the end of each day and at the beginning of each hour during the day.

Thank You

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