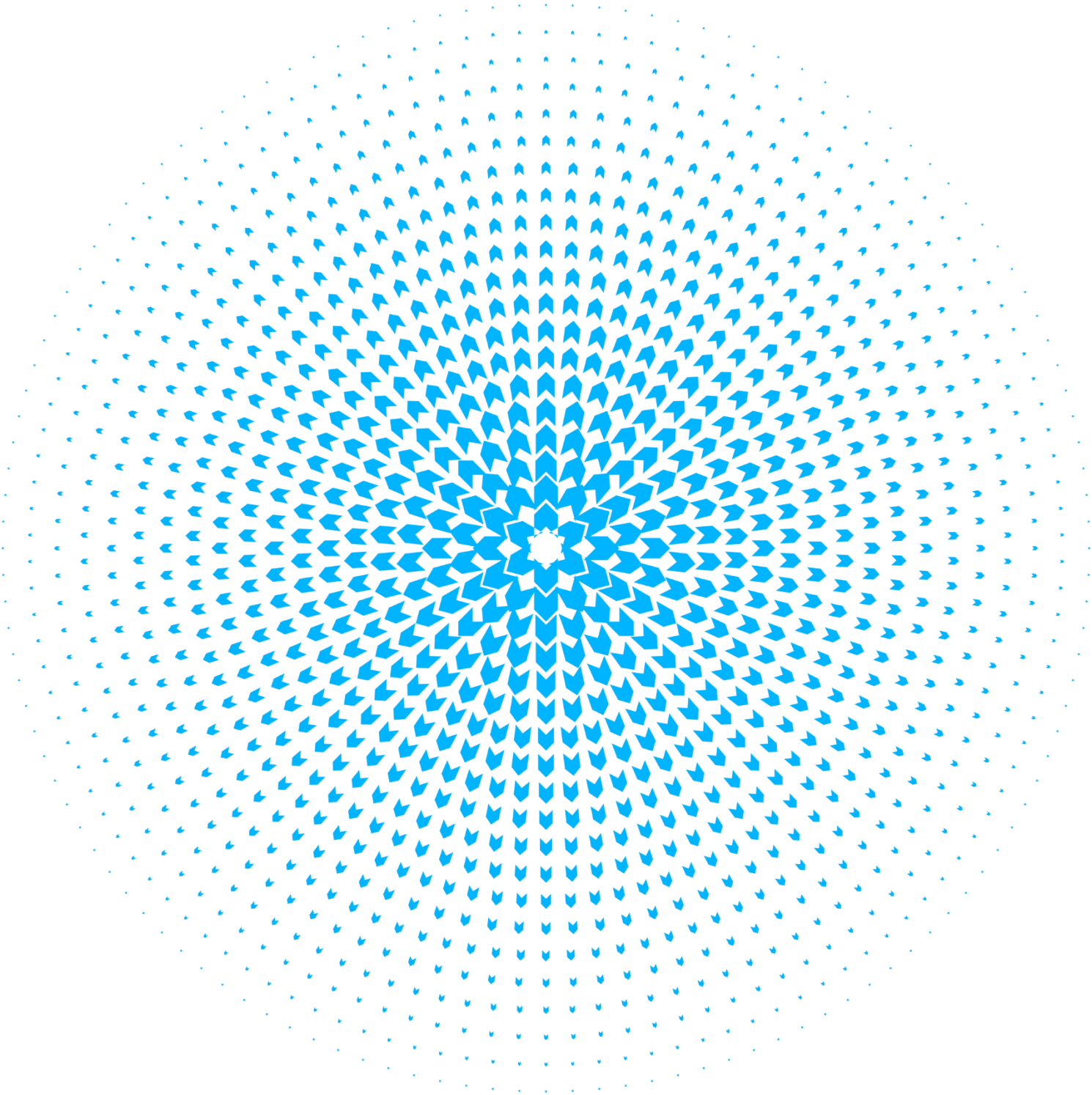
مقاصة
Muqassa
من مجموعة تداول السعودية
From Saudi Tadawul Group

Exchange Traded Derivatives Margining Guide

Prepared by:

Risk Management Division



Contents

Glossary	
Term	**Meaning**
Combined Commodity	A grouping of products, such as futures and options, that belong to the same underlying asset or a group of assets and considered for netting.
Scanning Risk	The maximum potential loss calculated by evaluating a portfolio against a set of sixteen price and volatility change scenarios.
Price Scan Range	The estimated maximum upward/downward price movement for an underlying instrument and also known as initial margin rate.
Volatility Scan Range	The maximum expected change in the implied volatility for an underlying instrument used to determine the risk array values.
Risk Array	A set of sixteen loss/gain values representing the potential change in a contract's value across various price and volatility movements.
Composite Delta	The risk-weighted measure of a portfolio's sensitivity to price changes in the underlying instrument.
Net Delta	The arithmetic sum of all long and short deltas within a combined commodity.
Delta Scaling Factor	A multiplier applied to the delta of an instrument to adjust its risk profile relative to another contract within the same group.
Delta Spread	The required number of long (short) positions in an instrument to offset another short (long) position in a different instrument while calculating the spread margins.
In-The-Money Option Contracts (ITM)	A Call Option whose Underlying Asset Price is higher to the Strike Price, and in case of a Put Option, if the Strike Price is higher to the Underlying Asset Price at end of day.
At-The-Money Option Contracts (ATM)	A Call Option or a Put Option whose Underlying Asset price is equal to the Strike Price at end of day.
Out-of-The-Money Option Contracts (OTM)	A Call Option whose Underlying Asset Price is lower than the Strike Price, and in case of a Put Option, if the Strike Price is lower than the Underlying Asset Price at end of day.
Short Option Minimum Margin	A mandatory floor amount of margin required for each short option position to ensure a minimum level of coverage against extreme market gaps.

Physical Delivery	The terms in Option Contracts which requires the Underlying Asset to be delivered upon the specified delivery date.
Stress Testing	Estimation of credit exposures that would result from the realization of extreme price changes

1. Introduction

1.1. Overview

This guide provides an overview of the margin methodology adopted by Securities Clearing Center Company (Muqassa) for Exchange-Traded Derivatives (ETD). It explains how initial margin, variation margin, and total margins requirement are calculated, with portfolio risk assessments determined by the Delta Hedge margining model.

1.2. Objective

This document is intended as a generic guide for the industry to understand the concept of margining and is solely for information purpose only.

For any enquiries, please contact the Muqassa Risk Management at *RM@muqassa.sa*.

2. Margins

Securities Clearing Center Company (Muqassa), the clearing house serves as the central counterparty (CCP) to every cleared transaction, becoming a seller to the buying clearing member and a buyer to the selling clearing member. In doing so, Muqassa supports the fulfilment of obligations under each contract thereby limiting credit and systemic risks in the market. The clearing house employs a range of risk management tools in managing its exposure to the credit risk of its clearing members. These include the collection of margins on open positions and the revaluation of contracts on at least a daily basis.

Type of margins:

Margins are intended to reduce the risk of exposure on the market and to cater for potential future exposures. Muqassa collects mainly two types of margins:

2.1. Variation Margin (VM)

Variation Margin is calculated to protect the market against the losses arising from revaluation of open contracts at current prices, usually performed multiple times intraday and at end of day, so that the exposure is limited and does not get accumulated.

Muqassa uses various calculation methods to calculate the variation margin depending on the position's status and type, all detailed in Muqassa Derivatives Clearing Procedures (available on the website).

2.2. Initial Margin (IM)

Initial margin is calculated for all open positions to protect the market against potential liquidation losses based on plausible market fluctuation scenarios. This amount is intended to cover the expected exposure fluctuation over a defined liquidation period which is derived from a set of risk-based parameters. Its objective is to uphold integrity and ensure continuous operation of the market.

Muqassa uses Nasdaq's Delta Hedge portfolio margining system, which is compatible with the widely used Standard Portfolio Analysis of Risk® (SPAN®).

3. Delta Hedge Methodology

Delta Hedge is a portfolio risk-based margining system and uses the scenario approach to determine the initial margin requirement. Open positions across multiple derivatives products are assessed as one portfolio and overall risk exposure is calculated to arrive at the initial margin requirement. A set of risk scenarios are applied to estimate the liquidation value of a portfolio in adverse market conditions. In general, the following events are considered:

- Possible underlying price change
- Possible underlying volatility change
- Impact of decrease in time to expiration

Initial margin therefore represents the most unfavorable liquidation value and this data is recorded in risk arrays, which are specific to each contract and updated on a daily basis.

4. Combined Commodity

The fundamental concept of Delta Hedge is to simulate potential market moves and calculate the profit or loss on individual contracts. All products such as futures and options relating to the same underlying are grouped in one combined commodity for evaluation. For example, futures on MSCI Tadawul 30 Index (MT30) and options on MT30 will be grouped together. In doing so, simulated gains of one contract can be used to offset the simulated losses from another contract. If there is more than one combined commodity in the portfolio, the risk of each combined commodity will firstly be analyzed in isolation from others, before introducing risk-reducing offsets between different combined commodities.

5. Risk Array and Scanning Risk

The risk array is a set of 16 scenarios defined for a particular contract specifying how a hypothetical single long position will lose or gain value if corresponding risk scenario occurs. By convention, losses for long positions are expressed as positive numbers, and gains as negative numbers. Each risk scenario is defined in the following terms:

- The (underlying) price shift: upward (+) and downward (-) with corresponding scan range fraction (0, 1/3, 2/3, 1, or 3);
- The (underlying) volatility shift: upward (+) and downward (-) with corresponding scan range;
- The weight, also called the covered fraction

For futures, the price shift mentioned above refers to price of the instrument itself and volatility shift is only relevant for options. Price shift for options is often applied to the underlying instrument.

The scale of the price shift and volatility shift, as well as the associated weight are defined for each of the 16 scenario points. Two scan ranges, the **Price Scan Range** (**PSR**) and the **Volatility Scan Range** (**VSR**) are the deciding variables to arrive at risk array values. These two key variables, among other margining parameters are determined by the Muqassa risk management team in accordance with international best practices.

Each risk array value is calculated as the current value of the contract less the estimated future value, taking into account the (underlying) price and volatility shift associated with the risk scenarios then multiplied by the weight. Typically, the change in value for futures is determined by the price shift, time to expiration, associated interest rates and/or dividends. For options estimated future value a volatility shift is also applied.

The 16 risk scenarios adopted by Muqassa:

Risk Scenario / Scan Point	*Price Shift in Multiple of Scan Range*	*Volatility Shift in Multiple of Scan Range (applicable only for options)*	*Weight / Covered Fraction*
1	UNCHANGED	UP	100%
2	UNCHANGED	DOWN	100%
3	UP 33%	UP	100%
4	UP 33%	DOWN	100%
5	DOWN 33%	UP	100%
6	DOWN 33%	DOWN	100%
7	UP 67%	UP	100%
8	UP 67%	DOWN	100%

9	DOWN 67%	UP	100%
10	DOWN 67%	DOWN	100%
11	UP 100%	UP	100%
12	UP 100%	DOWN	100%
13	DOWN 100%	UP	100%
14	DOWN 100%	DOWN	100%
15	UP 300%	UP	33%
16	DOWN 300%	DOWN	33%

Scenarios 15 and 16 are designed to cover losses arising from deep out-of-the-money options as a result of unexpected extreme price movement. Risk array values are represented in the currency in which the contract is denominated and, as mentioned earlier, a positive value represents losses.

The following table is an example of risk array for **futures on Saudi Index**, assuming the price scan range is ﷼ 12,000 = (**1200** "Index Price" * **100** "Contract Size" * **10%** "Index Margin")

Risk Scenario / Scan Point	*Risk Array Value (in SAR)*
1	0
2	0
3	-4000
4	-4000
5	4000
6	4000
7	-8000
8	-8000
9	8000
10	8000
11	-12000
12	-12000
13	12000
14	12000
15	11880
16	-11880

With the risk array values, scanning risk can be determined as the first step of calculating the initial margin requirement of a portfolio. Scanning risk is calculated independently for every combined commodity if there are more than one in the portfolio. The steps to calculate scanning risk at combined commodity level are shown below:

1. Multiply each of the 16 risk array values, for which the portfolio holds position, by the position quantity. For long positions, multiply by a positive position size and vice versa. This yields the positional risk array;
2. Sum the total across all scenarios for the combined commodity, ignoring any differences between expirations, series or strike prices. This will result in 16 aggregated amounts for this combined commodity;
3. The largest positive value of the 16 amounts represents the largest loss, this will be the scanning risk for this combined commodity. Scanning risk will be set to zero if all 16 values are negative.

The scenario that results in scanning risk is known as the active scenario. A scanning risk calculation example is shown in the following table for this portfolio:

- 1 long position in Saudi Index futures contract with expiration in May 20xx;
- 2 short positions in Saudi Index futures contract with expiration in June 20xx;
- Assuming price scan range is ﷼ 12,000 = (**1200** * **100** * **10%**) as defined before.

Risk Scenario / Scan Point	*May 20xx (+1)*	*Jun 20xx (-2)*	*Simulated Gain / Loss*
1	0	0	0
2	0	0	0
3	4,000	-8,000	-4,000
4	4,000	-8,000	-4,000
5	-4,000	8,000	4,000
6	-4,000	8,000	4,000
7	8,000	-16,000	-8,000
8	8,000	-16,000	-8,000
9	-8,000	16,000	8,000
10	-8,000	16,000	8,000
11	12,000	-24,000	-12,000
12	12,000	-24,000	-12,000
13	-12,000	24,000	12,000
14	-12,000	24,000	12,000
15	11,880	-23,760	-11,880
16	-11,880	23,760	11,880

Therefore, the scanning risk for the combined commodity in the portfolio is ﷼ 12,000 with active scenario 13.

6. Delta Calculation for Options

The Delta Hedge calculation involves determining the net delta for each contract within a combined commodity. Option contracts are adjusted with delta values within the same combined commodity. Delta represents the rate of change of the price of the option with respect to a unit change in the price of its underlying asset. For options, the composite delta is used to reflect the scenario effects on delta value of each contract. It ranges between 0 and 1 for Call Options and between -1 and 0 for Put Options as per contract held as an open position.

Composite Delta per each option contract, applicable for the following day, is determined by considering the 7 of 16 risk array scenario prices, which include upward (+) volatility shifts, for related options. A weighted sum of each delta value derived from these scenario prices (weighted by their own standard probabilities determined by the CCP) will be the Composite Delta of a single option contract to be considered in the net delta calculation.

While calculating Net Delta for a contract, composite delta of the contract will be scaled by the Delta Scaling Factor, which considers the different price sizes of underlying assets, before multiplying it with the number of positions. Finally, the difference between the long and short composite deltas will be the Net Delta for the specific Option Contract.

With this composite delta adjustment, options can be included into the Inter-Month Spread Charge and Inter Commodity Spread Credit applications using their delta equivalent values.

7. Inter-Month Spread Charge

As Delta Hedge scans across contracts within the combined commodity, it assumes perfect correlation in price movements between different expirations. However, in reality price movements across contract months do not always move in the same direction and by the exact identical magnitude.

In order to account for the inter-month spread risk, whereby gains in one contract month may not exactly offset losses in another contract month, Delta Hedge imposes the inter-month spread charge.

Delta Hedge begins with determining the long or short net delta for every contract month within the combined commodity, and typically for futures the delta is always 1 per contract held as an open position.

Following that, Delta Hedge defines tiers which essentially groups a set of contract months by different expirations and assigns priority for which spreads will be formed. Inter-month spread is then determined between the long and short delta by the priority defined, after which the associated charge rate is imposed. The following example demonstrates how an inter-month spread is determined:

Tier	*Contract Month Sequence*

1	1
2	2 - 4

Priority	*Spread Pairing*	*Inter-Month Spread Charge*
1	Tier 1 : Tier 2	2,500
2	Tier 2 : Tier 2	2,250

Using the same portfolio from earlier scanning risk example:

- Tier 1: Saudi Index May 20xx contract has net delta of +1 (long);
- Tier 2: Saudi Index June 20xx contract has net delta of -2 (short);
- One inter month pair can be formed under priority 1;
- Inter-month spread charge of ﷼ 2,500 will be imposed for this portfolio.

The model also calculates an inter spread between eligible underlyings (for e.g.: Index Futures and SSFs) to account for correlation risk within a portfolio. By identifying shared underlyings and aggregating contracts into Combined Commodity Groups, the model applies specific offsets to opposite positions. This ensures that the final margin requirement accurately reflects the mathematical relationship and risk-reducing potential between underlyings. The following example demonstrates how an inter spread is applied:

Assuming the same portfolio has an additional 10 long position on a Single Stock Futures (SSF):

- MT30 June 20xx contract has net delta of -1 (short), remaining after netting with Inter-Month Spread Charge;
- SSF/SSO June 20xx contract has net delta of +10 (long);
- Predetermined Price Scan Range rate of MT30 contract is 8.73%;
- Predetermined Price Scan Range rate of SSF/SSO contract is 15%;
- Predetermined Inter Spread (correlation offset) rate between the Index and an underlying stock is 50%.
- The Delta Spread ratio of 1:30 reflects the approximate relationship between the index contract multiplier and the individual stock contract multiplier values.

Combined Commodity	*Positions*	*Price*	*Scanning Risk*	*Delta Spread* between Index & SSF*	*Inter Commodity Spread Credit (%50)*
MT30	-1	1,500	((100 * 1,500* 1) * 8.73%) = 13,095	1	(13,095*(10/30) * 0.5) = 2,183
SSF/SSO	+10	50	((100 * 50 * 10) * 15%) = 7,500	(1,500/50) = 30	(7,500*(10/30) * 0.5) = 1,250

8. Short Option Minimum Margin

The Delta Hedge margin model generates 16 risk scenarios by shocking volatility and price to determine margins for options. For long option value "representing the money paid" Delta Hedge establishes a credit in the initial margin calculation. Conversely, for short option value "representing the money collected" it establishes a debit. This approach ensures that credit is provided against risk margin, corresponding to the funds paid out. Notably, the long option value always exceeds the calculated risk margin, as losses from a long option cannot exceed the initial investment. Conversely, for short options, a debit is created to ensure that the collected premium remains in the account until the position is closed or expires. This mechanism also necessitates the posting of additional margin beyond the collected premium.

Additionally, for short deep out-of-the-money options, Muqassa may apply a Short Option Minimum (SOM) to the position. This is because deep out-of-the-money short options may show zero or minimal Scan Risk given the price and volatility moves in the 16 market scenarios, yet still present risk in the event that these options move closer to at-the-money or in-the-money, thereby generating potentially large losses. Hence Muqassa may apply the SOM to each product to account for this potential exposure. If the Scan Risk is lower than the Short Option Minimum, the SOM is charged.

9. Total Initial Margin Requirement

The initial margin requirement for a combined commodity at the portfolio level is the sum of the scanning risk and inter-month spread charge. Using again the same portfolio:

Initial Margin Requirement = Scanning Risk + Inter-month spread charge – Inter commodity spread credit

$$\text{Initial Margin} = (﷼\ 12{,}000 + ﷼\ 2{,}500 - ﷼\ 1.250) = ﷼\ 13{,}250$$

In case the portfolio includes Option contracts, then while determining the basic risk of each option contract, short option minimum requirement will be taken into consideration. If the basic risk of the combined commodity of the option is less than the short option minimum requirement, the short option minimum requirement will be considered instead of the basic margin of the combined commodity.

In case of Physical Delivery, physical delivery margin may also be charged to the portfolios (within the basic margin calculation).

In the event there is more than one combined commodity in a portfolio, the model repeats the steps for each combined commodity and sums the initial margin requirement (adjusted to the spreads) to get the total portfolio initial margin requirement

10. Additional Margin

Based on Muqassa's regular monitoring of clearing members' exposure, including the results from daily stress testing, additional margins may be imposed in accordance with the relevant regulations and requirements, as outlined in the relevant policies and procedures. This is to ensure the financial stability of the clearing members and to mitigate any potential risks that may arise from their exposure.

Note:

All risk parameters related to the calculations can be found in:

- *Muqassa website – Risk Management – Margin Rates – Derivatives Market*
- *Muqassa website – News & Announcements*

Additionally, you can find Muqassa Derivatives Margin Calculator in the website, which estimates the margin calculations.

مقاصة
Muqassa

من مجموعة تداول السعودية
From Saudi Tadawul Group

Thank you