

CCP Market Risk Management General Application Principles

The general principles concerning the application of Central Counterparty (CCP) Regulations by Takasbank's business units is regulated under 3 different Regulations supplementing each other:

- Regulation on Takasbank Central Counterparty Risk Management Implementation Principles
- Regulation on Takasbank Central Counterparty Collateral Management Implementation Principles
- Regulation on Takasbank Central Counterparty Default Management Implementation Principles

In the Regulation on Takasbank Central Counterparty Risk Management Implementation Principles, where it is aimed to regulate the application principles regarding the operations - which are not regulated in another legislation- Takasbank service and internal system units run to manage risks assumed as CCP, provisions related to matters below are laid down;

- General Principles
- Central Counterparty Risk Management Organization,
- Credit and Concentration Risks Management,
- Market Risk Management,
- Liquidity Risk Management,
- General Business Risk Management,
- Operational Risk Management
- The Capital that shall be Allocated and Committed for CCP Risks
- Review of the Models, Back testing and Stress tests,
- Transparency in CCP services and public disclosure of the data

Procedures might be issued to guide the business, transaction and rules followed in the application of the principles laid down in the Regulation.

The regulations legislated in the Regulation, where public disclosure is thought to be favorable, are summarized below;

Risk Management Principles

In the markets operated as CCP to ensure that members fulfill their obligations to Takasbank in a timely and entirely manner, risks must be measured and monitored in an efficient way. In this regard it is required that;

- a) The initial margin level is calculated at regular intervals incorporating the recent financial turbulence and monitored taking into account market conditions and revised when required,
- b) The size of the guarantee fund is established based on confidence levels describing seldom experienced but intense financial turbulence,

- c) The sufficiency of the transaction collateral is monitored incorporating the intraday price movements and position changes,
- d) Transaction collateral, guarantee fund contribution, the adequacy of the Takasbank capital allocated and committed to CCP risks are monitored at regular intervals through stress tests
- e) Continuously monitoring the member's financial competency and restriction of their transactions through limits set taking into account their financial strength.

The Risk management activities in the CCP service enabled markets, unless stated otherwise is operated by the Central Counterparty. With the exception of incidentally resorting to external consultancy or validation services, CCP risk management activities are not outsourced.

International standards are taken into consideration in CCP risk management activities and services. In application, unless otherwise legislated in the regulation, CPMI-IOSCO's benchmark principles regarding central counterparties are referred to.

CCP Risk Advisory Committee

It has been decided to establish CCP Takasbank Risk Advisory Committee, designated and authorized to advise the Board of Directors on matters related to the management of the risk. CCP Risk Advisory Committee, chaired by one of the independent members of the Board of Directors, is composed of CCP member representatives, CCP member's legal person clients' representatives and independent members of Takasbank Board of Directors. Takasbank employees, market operators' representatives or external experts may participate in the CCP Risk Advisory Committee but without any voting right. The rulings of the Risk Advisory Committee are regarded as recommendation. None of the representative groups are allowed to have majority in the committee. In the Risk Advisory Committee, the modification of risk models utilized in the CCP risk management, default procedures, membership criteria, clearing of new kind of capital market instruments or matters which affect CCP's risk management such as insurance or use of external resources are discussed. Although the Risk Committees' recommendations are not binding for the Board of Directors, the rationale for non-compliance has to be explained. Central Counterparty Risk Divisions assumes the role of secretary in the CCP Risk Advisory Committee. Takasbank, does not remunerate CCP Risk Advisory Committee members for this task. The principles and procedures concerning CCP Risk Advisory Committee's operations and constructions shall be regulated in a separate regulations, approved by Takasbank Board of Directors and published on Takasbank's website.

Admittance into CCP Membership

Members that shall be admitted into the CCP are required to possess sufficient moral, financial and operational competency. In CCP service enabled markets, if required, for every capital markets instrument that is cleared, membership categories and admission criteria is set and published in the relevant market directives and procedures. Such criteria have to be transparent, objective and of the nature ensuring possession of financial resources and operation competency to fulfill obligations to Takasbank. Size of shareholders' equity, Credit Rating and Assessment Systems General Principles Regulation and subject to the framework of relevant procedure internal and/ or independent credit rating grades are used to measure and monitor CCP members' financial competency and to determine membership type. The general principles of model and methods utilized to measure credit worthiness during member admission and assigning membership type, are published on Takasbank's website.

To ensure that CCP members possess adequate operational competency, a written commitment is obtained from the board of directors of the applicant institutions, that they shall establish and sustain adequate IT, risk management, internal control and audit systems. Pre-admission Takasbank Internal Audit unit conducts on-site audit of IT, risk management, internal control and audit systems.

Management of Credit and Concentration Risks

The credit risk that Takasbank is exposed to due to CCP service is monitored by comparing the deposited collateral with the required collateral level. (Risk) In the event that the current collateral falls below the required level of collateral, until the margin call is met, the member may be restricted from opening additional position.

To monitor concentration risk, the ratio of the collateral level that each member is required to hold to the total level of collateral required in the relevant market, has been limited and such limit is monitored on a daily basis. However in any market, if the ratio of risks outside the largest 3 members to the total risk does not exceed a certain amount (the market does not have adequate depth), the limit is not applied. Likewise, for members who expend below a certain amount of the limit allocated for the relevant market, limit is not applied either.

In the event of breach of concentration limit by any member, upon Central Risk and Collateral Management Director's suggestion, General Manager's approval and if required Board of Directors' ruling, the member may be restricted from opening additional position, additional transaction collateral may be demanded from the member, the member's transaction limits may be lowered until the end of the set period.

Member risk limits

In the CCP service enabled markets, to restrict the risks that members are posing for Takasbank, upon the General Manager's suggestion, by the Board of Directors or within the framework of transferred authority by the Board of Directors, Credit Committee or General Manager, members are allocated limits taking into account the counter party's shareholders' equity and/ or credit rating and assessment results. Risk limits may be determined on the basis of nominal open position amount or another indicator (e.g. VAR) measuring member risk such as initial margin.

The maximum risk limits that shall be allocated to each member in line with credit rating and assessment results are calculated by the Financial Analysis and Risk Monitoring Team in accordance with the Credit Rating and Assessment General Principles Regulation and the relevant procedure.

Member risk limits, may be determined separately for each CCP service enabled market or a common limit may be allocated for various markets. The allocated risk limits are announced to the respective members.

Segregation of Positions

In the CCP service enabled market, members' proprietary portfolios and client positions are held in separate accounts.

To segregate member and client positions 2 types of accounts may be held with Takasbank:

- Individual position accounts; the accounts where members hold positions belonging to a single client or their proprietary portfolios
- Joint position accounts; the accounts where the positions belonging to members' multiple clients may be held or where client or portfolio positions or sub-accounts are jointly held due to being associated with the same collateral account and other reasons. In any case, portfolio and client positions must be segregated.

Individual or joint position accounts, are associated with the individual or joint collateral accounts whose principles are laid down in the Regulation on Takasbank Central Counterparty Collateral Management Implementation Principles. The association may be set by linking positions and collateral accounts, or alternatively position and collateral accounts may be opened based on their ability to serve expected functionality. If required, joint-clearing accounts may be used for security or cash settlement of individual and/or joint position accounts and segregated accounts.

Portfolio based collateralization

In the cases where portfolio based collateral is applied, to be able to define correlation among different product groups, the correlation calculations for the respective product groups have to be based on at least 5 –year data set and the calculated correlation value has to be economically and econometrically viable.

The following rule is applied to calculate required collateral through the correlation impact assessment.

$$\begin{aligned} &\text{The maximum correlation reduction possible on required margin} \\ &= \%80 * (\text{required margin, calculated as gross} - \text{required margin, calculated as net}) \end{aligned}$$

Initial margin calculation methods and parameters

Initial margin may be determined as amount or ratio.

In the calculation of initial margin, the potential risks that will arise in the period, from the generation of the position until liquidation of such position due to its default is considered. The holding period used for initial margin calculation is minimum 2-business day. For OTC derivatives such period cannot be less than 5 business days.

For each market, in determining the confidence level that will be employed in the initial margin calculation; the uncertainty with respect to the complexity and pricing of the assets traded in the market, volatility, modified and Macaulay durations, liquidity, non-linear price characteristics, risk characteristics such as specific reverse inversion risk, the extent to which the other risk controls in the market restrict credit risks, the difficulty in closing position or the concentration level of market trades on various member, are taken into consideration. The confidence level or confidence level range that shall be employed for each market, is regulated in the relevant directives and procedures.

It is essential not to frequently change the initial margin due to price movements in the market. To ensure the long-term usability of the initial margin rate or amount, one of several of the methods listed below may be applied:

- In the cases where the initial margin is set as risk parameter amount, to remain within the boundaries set in the market directives and procedures, determining the maximum and minimum confidence levels
- Determining the minimum starting level parameters with estimates based on no less than past 10 years data set,
- Assigning 25% weighting to the outlier prices used in the calculations,
- Increasing the collateral amount or rate by multiplying with a multiple below 1.5

The recent financial turbulence is involved in the calculations to ensure the reduction of the cyclicity of the data set employed and prudent calculation of initial margins. If exists, the market data which shall be used in the initial margin calculations has to cover at the minimum the last 1 year. If there is no available or insufficient level of data on the asset, or in the case of lack of healthy data due to reasons such as shallow market, the data belonging to asset in kind is used.

The parameters may be determined in a relatively more prudent manner than those calculated on historical values, by taking into consideration current and future market conditions.

The parameters used to calculate initial margin and/or initial margin level, may be scaled with reference to the member's credit worthiness, collateral concentration requirement and limit use. The criteria with respect to scaling are laid down in the market directives and procedures.

The parameters, which constitute the basis for initial margin, are recalculated at least 4 times in a year in March, June, September and December by using the market data and the efficiency of current parameters is tested. The data that will be used in the calculations must include the last business day of the month preceding the calculation date to ensure that they are up to date.

The parameters, which constitute the basis for initial margin, are constantly monitored in light of the market conditions and when required, revised.

In the markets, if for at least one of the variables below the respective intraday change in price limit mentioned below is breached, without waiting for revision, initial margin parameters are recalculated as per this Regulation and if required, are revised.

- In BIST 30 or/and BIST 100 index 10%,
- In the benchmark Treasury domestic borrowing security (DIBS) 300 bps,
- In the FX basket consisting of 1 USD and 1 EUR, 5%,
- In 10 Year Euro bond interest rate 200 bps,
- In gold's TRY per gram price 10%

The modifications, which are considered appropriate, are submitted to the General Manager for approval. The parameter modifications approved by the General Manager is announced to the members by Takasbank market and operation units and published on the Internet.

Guarantee Fund

Takasbank, in the markets where it offers CCP service, establishes guarantee fund/ funds with members' contribution, to expend in the default event of its clients, towards the losses that might arise in excess of the collateral. (To cover the portion over the collateral)

The CCP members' guarantee fund/funds' contributions comprise of deposited and additional guarantee fund contributions, which shall be deposited upon, demand. Where the guarantee funds are used in accordance with the provisions of CCP Regulation, the maximum additional contribution number / and or amount per year is determined in light of the relevant market conditions and published in the relevant market directives and procedures. The additional guarantee fund contribution that may be demanded at one time cannot exceed the guarantee fund contribution amount, which should have been deposited on the relevant default date.

The size of the guarantee fund/ funds is determined by taking into consideration the market conditions, not exceeding the larger of the resource requirement which shall arise under extraordinary circumstances, in the default event of the member with the highest risk, or second and third members, with highest risk, at the same time. The resource requirement consists of, under extraordinary market conditions, the portion of the risk exposed to or difference in the members' portfolios market value that cannot be paid off with the transaction collateral.

To define extraordinary market conditions the following may be utilized;

- Statistical scenarios generated with at least 5 –year historical data and minimum 99.5% confidence level,
- Specific historical scenarios experienced in the past,
- Hypothetical scenarios generated under quantified and qualified predictions with respect to the possible volatility and correlation in the market

The extraordinary market conditions assumptions utilized to attain guarantee fund's size is set for each market and announced in the relevant market directive and procedures. Such assumption is reviewed at least once a year in January.

At least 1 year backdated, member based, daily open position data is used to calculate guarantee fund size. In the absence of sufficient data, or if lack of an event strong enough to lead to structural change in the market in the past year, data sets shorter than 1 year may be used. If historical data is not available at all, guarantee fund size is calculated by using theoretically obtained or if exists, data pertaining to similar markets.

Guarantee fund size calculations are carried out quarterly, in March, June, September and December. To ensure up-to-datedness of the data employed in the calculations, the data set has to at the least, include the last business day of the month preceding the date of the calculation.

As of the date that the guarantee fund size is calculated, if its is detected that the resources related to stress test is or will be permanently inadequate, upon the suggestion of the Central Risk and Collateral Management Group Director and General Manager's approval, a multiple that shall not exceed 1.5, shall be used to determine the size of the fund.

One of the methods below is utilized to distribute the fund among members:

- The distribution of the calculated guarantee fund on the basis of carried risks,
- To determine the contribution of each member by multiplying the risk multiple determined with reference to guarantee fund size, by the risks that the members are carrying.

The risk carried by members may be determined on the basis of the value computed by using the daily average collateral value they are required to maintain in the guarantee fund calculation period, or its maximum.

The methods that will be utilized to determine the guarantee fund contributions are regulated in the market directive and procedures.

If in use, the proposals to modify guarantee fund risk multiple, are submitted for General Manager's approval. The regulatory changes relating to the risk multiple approved by the General Manager, are announced by Takasbank's market and operation unit members and published on the website.

Guarantee Fund Size $\geq \max(\text{The resource requirement in the default event of the member with the highest risk, the resource requirement in the joint default event of the 2nd and 3d members with the highest risk})$

Market Risk Management

While setting the collateral valuation multiples to effectively manage the market risk that shall be exposed to due to CCP operations- at the outset market risk- the risks that shall be exposed to during cashing in the collateral have to be taken into consideration, variance margin has to be calculated on a daily basis and settlement prices have to be determined in a healthy manner.

Collateral-risk balance is monitored close to real time basis through valuation of positions and collateral with intra day and end of day prices. Variance margin is calculated on a daily basis.

The end of day settlement prices of tradable option contracts are revised if it is judged that due to reason such as poor liquidity and supply/demand imbalance and so on the prices are not set in a healthy manner. Implied volatility limits are used for price revision. The adequacy of the set limit values are reviewed quarterly in March, June, September and December.

Management of Liquidity Risk

In the CCP enabled market the potential liquidity requirement that may be needed against risk, is monitored on a daily basis. In measuring the liquidity risk collateral is divided into 3 groups; cash, cash-like and other assets. Cash and cash-alike collateral is regarded as highly liquid. TRY, convertible FX and gold make up cash assets. Domestic and foreign borrowing securities that have been issued by the Treasury Directorate that may be used to provide liquidity from Republic of Turkey Central Bank and stocks include in the BIST 100 index and mutual fund participation certificates are regarded as cash-alike assets.

It is essential the ratio of the sum of the collateral belonging to the two members with the highest risk, the assets in the guarantee fund pertaining to the relevant market and the highly liquid assets committed from Takasbank's own capital to the respective members' risk amount cannot be below a certain limit.

Due to market specific conditions, the Board of Directors may set the liquidity limit below this limit. The liquidity limits set under this limit are reviewed at least once a year in January and if required suggestion to modify, is submitted to the Board of Directors.

If it is assessed that liquid assets and Bank's other borrowing alternatives shall not compensate for liquidity requirement, upon the Central Risk and Collateral Management Director's proposal and General Manager' approval, if required, one or several of the measures below are applied upon Board of Directors' ruling:

- Modification of the liquid asset
- Increasing initial margin or rates,
- Increasing the size of the guarantee fund.

Management of Operational Risk

The determination and monitoring of CCP member's operational competencies, control of procedures and standards pertaining to IT systems and business sustainability and communication are carried out by Takasbank Internal Audit Team through member audits.

The Capital that shall be Allocated and Committed for CCP Risks

The calculation of the Takasbank's capital allocated and committed to CCP default management is calculated as demonstrated below within the framework of CCP Regulation and BRSA's capital adequacy regulations (banking regulation)

| | |
|----------|---|
| A | <input type="checkbox"/> Minimum capital requirement for credit, market and operational risks under banking regulation (Calculated based on Basel II, Pillar One) |
| B | <input type="checkbox"/> Internal capital allocation for business risks and restructuring costs (Calculated based on Basel II, Pillar Two) B = 75% of the previous year's operational expenses related to CCP services (in line with (EU) No 152/2013 Articles 2 & 5 and CPMI –IOSCO Principle 15) |
| C | <input type="checkbox"/> Dedicated capital of Takasbank for CCP services (<i>Skin-in-the-game for covered risks</i> , in line with (EU) No 153/2013 Article 35) C = (A+B) * %25 |
| D | <input type="checkbox"/> Commitment made from the remaining capital of Takasbank D=Regulatory Capital – A – B – C – Other Internal Capital Allocations under Basel II, Pillar Two |

Diagram- The capital "allocated" (C) and "committed" (D) to CCP default management by Takasbank.

The amount of capital that shall be allocated and committed from Takasbank's capital and distribution of this among the markets where CPC is provided/or planned to be provided is submitted to the Board of Directors for approval every year in March to be in effect from April of the current year until March next year. Such amounts are announced on the website and additionally Capital Markets Board is provided with the information.

Back testing, Stress Tests, Reverse Stress Tests and Sensitivity Analysis

In the CCP enabled markets the adequacy of the models utilized to calculate the initial margin and the confidence level, is analyzed on a daily basis via back testing that will be carried out by the CCP Department. In these tests, it is checked whether the possible changes in the value of the positions in the accounts are met with the demanded initial margin for the relevant account or contracts. The changes in value, which exceed the demanded initial margin for the account or the contract, are regarded as excess.

With the stress tests it is tested whether;

- The CCP total default management resources,
- Guarantee funds,
- The liquid funds among the CCP default management resources,

Are adequate. In stress tests, extraordinary market conditions are described by statistical, historical, and/or fictive scenarios.

In the stress tests that check the sufficiency of the CCP default management resources, it is analyzed whether the CCP default management financial resources (transaction collateral, guarantee fund and Takasbank's allocated and committed capital) are large enough to protect the Bank against potential loss which may incur upon the joint default of the two members with the highest risk.

Financial Resources \geq The potential loss which shall arise in the joint default event of 2 member with the highest risk

In the stress tests that check the adequacy of guarantee funds, the initial margin after the joint default of the first, second and third members with the highest risk is compared with the uncovered risk. The guarantee fund should be sizeable enough to meet the largest of the amounts compared.

In the stress test liquid resources adequacy is also tested.

The monthly stress test conducted by the CCP Department, are submitted to the board of directors at least four times during the year.

*Transaction Collateral + Guarantee Fund \geq
max(The potential loss that will arise in the default event of the member with the highest risk,
The potential loss that will arise in the default event of 2nd and 3d members with the highest risk)*

The potential loss that will arise in the default event of member with highest risk,

The loss that will arise in the default event of 2nd and 3^d members with the highest risk

The reverse stress tests are conducted to,

- Determine how many of the CCP members' default may be met by the entire default management resources under the extraordinary market conditions defined in the stress test and/or
- Analyze (determination of the stress level at which the resources will suffice) the market conditions, which shall equal entire default recourses to the resource requirement, which may arise from the default of 2 members with largest risk.

Reverse stress test are conducted on a quarterly basis.

Sensitivity analysis is conducted to observe the impact of a change in the risk measurement parameters used in CCP service enabled markets, to the initial margin level pertaining to the capital markets instruments traded in these markets, through stress test, on a monthly basis.

Transparency and explanation

To ensure transparency of the CCP services provided by Takasbank, with respect to management regulations; matters concerning organizational and corporate management audited financials of the last term, with respect to business rules; regulations, directives and procedures, information about the Bank's CCP clearing services, risk management, membership and default management principles, assets accepted as collateral and collateral valuation multiples, monitoring and segregation of collateral and the nature of collateral accounts, transaction collateral and guarantee fund parameters, summary result regarding stress test and back testing, current CCP members, the amount of settlement transaction per day, market average of required collateral, clearing commission an fee and technical requirement with respect to system communication protocols, are disclosed to the members and public. In the data publicly closed, care and attention is taken to protect commercial secrets. In the announcement regarding stress test result, member names are not mentioned.