



**RISK MANAGEMENT FRAMEWORK  
TO BE APPLIED TO THE EQUITY  
MARKET  
FOLLOWING BISTECH®  
TRANSITION AND CCP (CENTRAL  
COUNTERPARTY) SERVICE**

Central Counterparty Department  
March, 2015

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## I. INTRODUCTION

Upon the implementation and the launch of BISTECH system at Borsa Istanbul Equity Market, risk and collateral management shall be carried out by Takasbank. This system, which will be conducted over two different processes as intraday and end-of-day, will introduce some fundamental changes to the principles applied to the market. Among these major changes are the transition to a new risk-based margin calculation method, assets accepted as collateral, change in the collateral valuation methods as well as collateral adequacy controls, and last but not least, establishing a guarantee fund.

At intraday periods set by Takasbank (Post-trade Risk Management) and at the time when the order is matched and executed as transaction; instantaneous (At-trade Risk Management) and end-of-day (End-of-Day Risk Management) risk and collateral checks will be carried out.

Risk management process to be applied in the Equity Market will be gradually launched. The first phase of the project to be completed in September 2015 will start up with intraday periodic risk checks, and the second phase to be launched in the last quarter of 2016 will start up with instantaneous risk checks.

On the other hand, end-of-day risk management covers risk checks and collateral evaluations with the prices occur in the market at the end of each business day.

This document excludes limit allocations and determination of membership types based on capitals of the market members and their internal credit ratings in providing the Central Counter Party (CCP) services in Equity Market.

## II. RISK AND COLLATERAL MANAGEMENT

At Borsa Istanbul Equity Market, risk calculations shall be made via Delta Hedge Method which uses a SPAN-like methodology. Uniform risk calculation rules will be used for currently traded stocks, pre-emption right coupons, stock market mutual funds, warrants and certificates. Examples given for stocks in the following sections will also be applicable to other securities listed in this paragraph.

After BISTECH system is launched, trading positions for capital market instruments in the Equity Market will be monitored in different position accounts on the basis of differentiation between portfolios and customers. Multi-position accounts will be used for customer positions.

In case these position accounts include capital market instruments for which CCP service is not provided, collateral to be deposited for those assets will be traced in a single margin account without any customer or portfolio differentiation. On the other hand, collateral adequacy for financial instruments for which CCP service is provided will be separately traced in customer accounts and portfolio positions. Consequently, there will be three margin accounts of one member in the Equity Market and the member shall maintain required collateral in those margin accounts to cover the risks associated with the relevant positions. Illustrative account structure to be used in risk and collateral management is given in Figure 1.

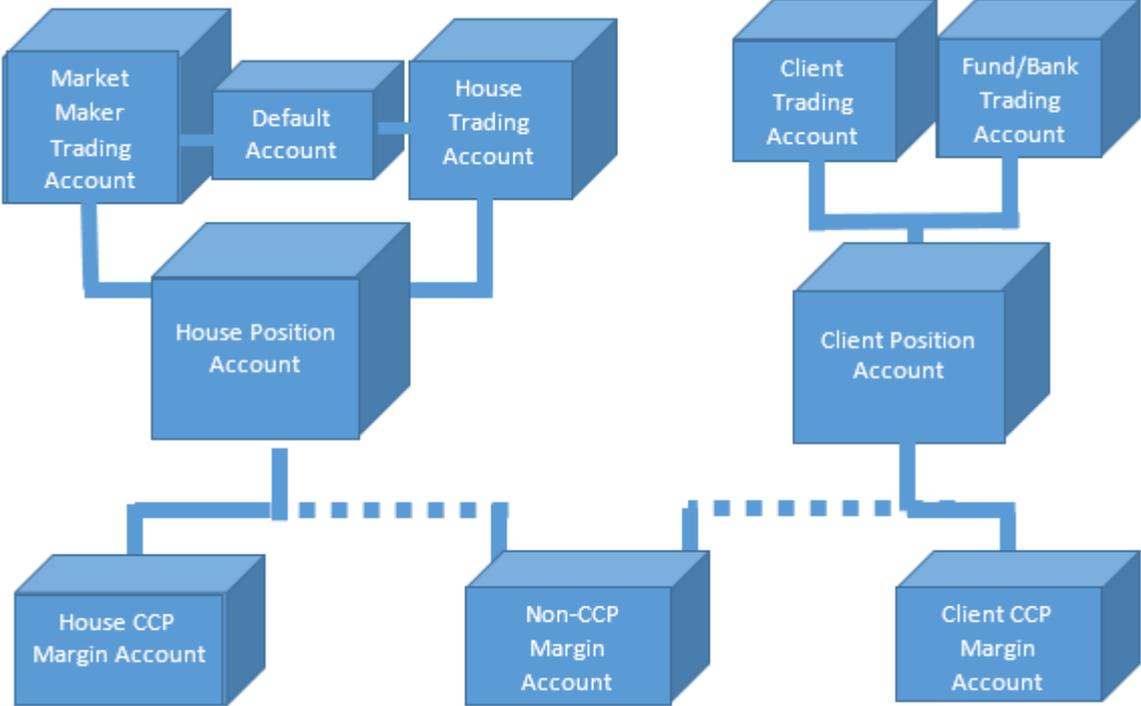


Figure 1- Account structure to be used in risk and collateral management

## A. Intraday Risk Management Procedures

Intraday Risk Management System to be applied by Takasbank at the Equity Market comprises two components. The first one is Post-trade Risk Management System which covers periodic risk and collateral calculations to be launched along with the first phase (September 2015), and the second one is At-trade Risk Management System which will instantaneously monitor the collateral adequacy, which, according to the plans, is to be launched in September 2016. Figure 2 illustrates the mechanism by which intra-day risk management functions are conducted.



Figure 2- The mechanism by which intra-day risk management functions are conducted

### 1. Post-trade Risk Management (Periodic)

Post-trade risk management system is based on monitoring the risk-collateral levels at specified intervals during the day. In these calculation times, prices and positions which have been used to calculate initial margin will be uploaded to the risk management system and collateral valuation shall be made for all accounts which have a position in the system. Results of these calculations can be viewed at member terminals.

For accounts with inadequate collateral during the day, intra-day margin call may be done. Unless collateral is deposited to such accounts for which margin call has been made within the specified periods, suspension of accounts/ members and/ or application of default procedures will be at stake for the relevant Member.

### 2. At-trade Risk Management (Instantaneous)

According to project schedule, instantaneous risk controls will be launched in the last quarter in 2016.

During at-trade risk management process, collateral/margin adequacy will be sought as soon as the order is matched and executed as trade in the equity market. In cash equity market, no margin control on the basis of order will be carried out. Via member screens it will be possible to display available collateral.

**B. End-of-Day Risk Management**

Using current risk parameters and prices that occur at the end of each business day, risk calculation and collateral valuation will take place for all accounts. As result of these calculations, margin call will be made for those accounts whose valued collateral amount is lower than margin requirement. Members will be asked to deposit deficit to the relevant accounts until specified time in next business day, and order transmissions over these accounts may be blocked. Accounts failing to comply with margin call obligations may be suspended and/ or default procedures may be applied for the relevant member. Figure 3 illustrates the end-of-day risk management mechanism.

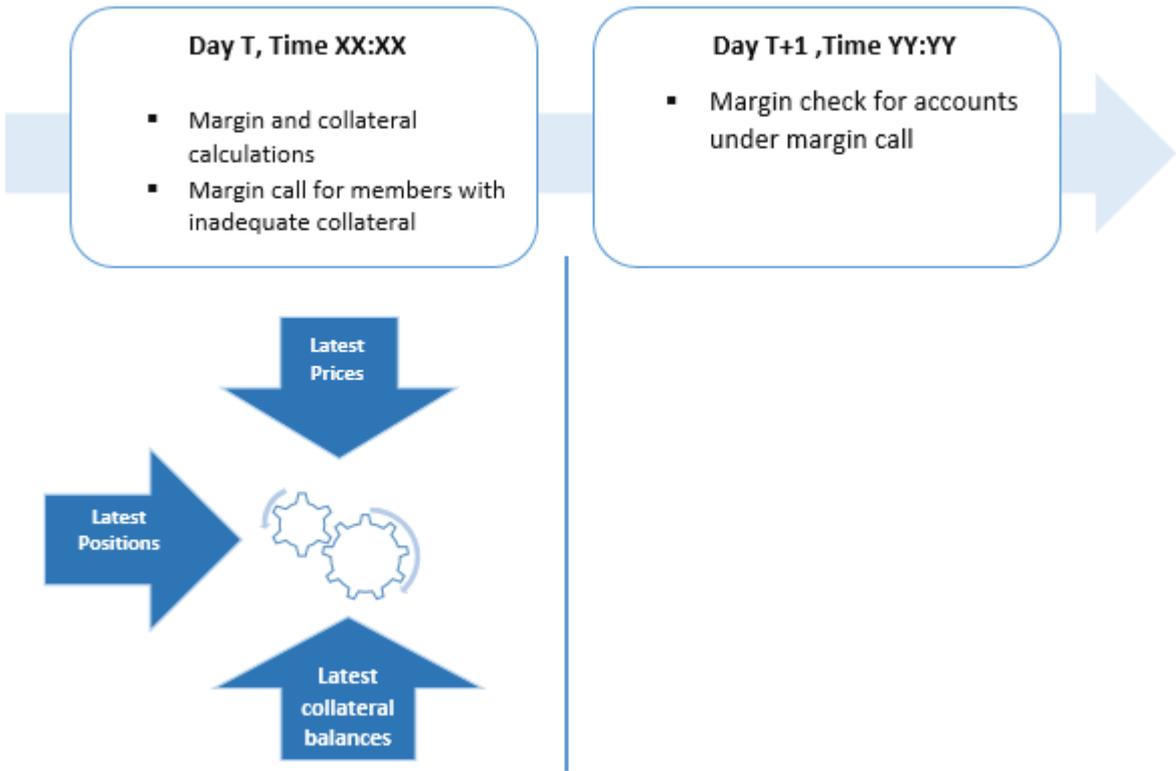


Figure 3- End-of-day risk management mechanism

## II. INNOVATIONS THAT BISTECH RISK MANAGEMENT WILL INTRODUCE

Potential changes in existing risk and collateral management system upon the launch of BISTECH system is illustrated in Figure 4 and they will be described in detail in the following sections.



*Figure 4- Changes introduced by BISTECH Risk Management*

### A. Margin Calculation Method

In the Equity Market, margin requirements will be calculated based on positions carried by the members. In this market, the concept “position” means asset/ cash credit/ debt obligations. A position occurs when the order is matched on day T and terminates upon the completion of settlement on day T+2.

The margin calculation method to be applied to the Equity Market at Borsa Istanbul consists of two components: initial margin and variation margin. Total margin requirement for each account with a position is the sum of these two values.

Initial margin is demanded against potential future exposures that may arise in case of any potential future default. In the Equity Market, initial margin to be asked for each account with a position will be calculated by using SPAN-like Delta Hedge method.

Variation margin, on the other hand, means the difference between the value of positions calculated by using settlement (trading) prices and the market value of these positions. From this point of view, variation margin will be asked for current (realized) exposures.



*Figure 5- Total margin requirement under BISTECH System*

### *1. Combined Commodity*

One of the milestones in margin calculation method in the Equity Market is the concept of “combined commodity” that is used in SPAN-like Delta Hedge method. The shares which assumed to display similar price movements will be addressed in the same combined commodity groups; and in light of this fact, positions with regards to the shares in the same combined commodity group will be netted.<sup>1</sup> Takasbank will decide which share will take place in which combined commodity group.

#### **Netting Example:**

Let’s assume that stock A with a price of 10TL and stock B with a price of 20 TL are included in the same combined commodity group and the netting parameter has not been identified in this combined commodity group. Let’s further assume that a member has bought 1.000 stocks of A and sold 200 stocks of B.

During the margining, risk amount arising from the long positions in the same combined commodity group will be taken into account as “+”, and risk amounts associated with short positions will be taken into account as “-”.

<sup>1</sup> In Delta hedge method, there is a parameter that controls netting ratio of the assets included in the same combined commodity group. Details about this parameter will be described in the following section.

Figure 6 displays the examples for combined commodity groups that may be used in the Equity Market.



Figure 6- Illustrated combined commodities

## 2. Calculation of Margin Requirement via Delta Hedge Model

Total margin requirement will be calculated using delta hedge model by following the steps listed below.

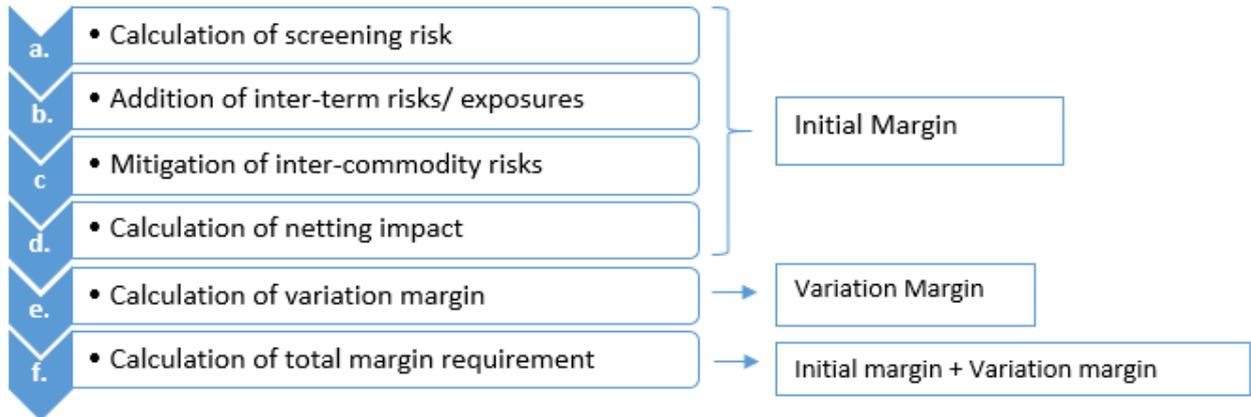


Figure 7- Steps in calculation of total margin requirement via Delta hedge model

### a. Calculation of Scanning Risk

Scanning risk is calculated by multiplying each share's price by the number of positions and by the price scan range (PSR) parameter set for the relevant positions. The PSR for a share shows the price variation range of that share in the specified period.

#### **Example:**

Where the PSR parameter for share A with the current price of 10 TL is defined as 10% on day T means that the price of that share may vary between 9 TL and 11 TL at the margin calculation time on day T+1.

***The price used to calculate scanning risk is the latest trading price in the market.***

Scanning risk will be calculated by using the following formula:

$$\text{Scanning Risk} = \text{Number of positions} * \text{Price} * \text{Price Scan Range}$$

The price fluctuation of a share for one day may be different from price fluctuation of that share for two days. In other words, PSR value may differ based on the number of days to settlement. Delta hedge model takes this difference into account by using time-dependent PSR values. In this model, it is possible to differentiate

the PSR values of positions whose settlement will be completed two days after, from the PSR values of positions whose settlement will be completed today or tomorrow.

For example, while 15% margin is applied for the positions of share A whose settlement will be completed on day T+2, it is quite possible that 10% margin may be charged into the positions of the same share whose settlement will be completed today or tomorrow.

**Example:**

Let's assume that share A with 10TL current price and share B with 20TL current price are in the same combined commodity group. Member X has bought 200 shares of A and sold 1,000 shares of B from the client account on day T and Takasbank has defined PSR parameter of 15% for these shares. Scanning risk for this account will be the aggregate of scanning risks calculated for shares A and B.

In the example, "+" sign is used for the "buy" positions, and "-" sign is used for the "sell" positions.

Trading Day	Name of the Share	Buy/ Sell	Number of Positions	Settlement Day
03.01.2015 (T+0)	A	Buy	200	05.01.2015 (T+2)
03.01.2015 (T+0)	B	Sell	1000	05.01.2015 (T+2)

Today: 03.01.2015 (T+0)

Scanning risk for share A =  $200 \text{ units} \times 10 \text{ TL} \times 15\% = +300 \text{ TL}$

Scanning risk for share B =  $-1.000 \text{ units} \times 20 \text{ TL} \times 15\% = -3.000 \text{ TL}$

Result of the Scanning risk =  $300 - 3.000 = -2.700 \text{ TL}$

For this account, the margin requirement calculated at the scanning risk step will be 2,700TL.\*

\* Assuming that there is no variation margin.

**b. Addition of Inter-month Spread Charges**

There is no concept of "term" or "maturity" in delta hedge method just like SPAN. For this reason, opposite direction positions with different settlement maturities can be netted in the calculations. In order to make up this gap, under delta hedge method, *Inter-month Spread Charge* is calculated to margin the basis risk that arises from different settlement maturity dates of the shares in the same combined commodity group. The calculated *Inter-month Spread Charge amount* is added to the total margin requirement amount.

Inter-month Spread Charge is calculated by using the following formula:

*Inter – month Spread Charge*

$$= \min (\text{Total Buy Units}, \text{Total Sell Units}) \times \text{Inter month Spread Charge Parameter}$$

**Example:**

Let's assume that in an account, there are 8,000 shares of A with 10 TL current price per share in long position where the settlement will be completed today (T+0). Likewise, there are 5,000 shares of A in short settlement position in the same account with a (T+2) term.

Trading Day	Name of the Share	Buy/ Sell	Number of Positions	Settlement Day
05.01.2015 (T-2)	A	Buy	8,000	07.01.2015 (T+0)
07.01.2015 (T+0)	A	Sell	5,000	09.01.2015 (T+2)

Today: 07.01.2015 (T+0)

On day T, the PSR value of the share A for day T has been determined as 10%, and its PSR value for day T+2 has been set to 15%. Let's assume that for the combined commodity group including share A, the Inter-month Spread Charge parameter has been identified as 1 TL per share.

Scanning risk for the long positions with term T+0:

$$= +8.000 \text{ units} \times 10 \text{ TL} \times 10\% = 8.000 \text{ TL}$$

Scanning risk for the short positions with term T+2:

$$= -5.000 \text{ units} \times 10 \text{ TL} \times 15\% = -7.500 \text{ TL}$$

Calculation of number of shares covered by the Inter-month Spread Charge:

$$= \min (8.000, 5.000) = 5.000 \text{ units}$$

Calculation of Inter-month Spread Charge:  $5.000 \text{ units} \times 1 \text{ TL} = 5.000 \text{ TL}$

Total margin requirement:  $8.000 \text{ TL} - 7.500 \text{ TL} + 5.000 \text{ TL} = 5.500 \text{ TL}$

### C. Mitigation of Inter-commodity Spread Credits

Under the margining method in the Equity Market, circumstances where correlations between the price movements of combined commodities may mitigate the member's total margin requirement are taken into account. After combined commodities are self-netted, where there are opposite directional trades/positions

between these commodities, the correlation effect is calculated and is deducted from the total margin requirement.<sup>2</sup>

Steps to calculate inter-commodity spread credit is given below with an example illustrating two combined commodities.

*Number of shares subject to correlation effect (KEKPA)*

$$= \min (\text{Group 1 Total Units}, \text{Group 2 Total Units})$$

*Risk Mitigating Effect for Group 1 (1 → 2)*

$$= \text{Scanning Risk for Group 1} \times \frac{\text{KEKPA}}{\text{Total Number of Positions of Group 1}}$$

*Risk Mitigating Effect for Group 2 (2 → 1)*

$$= \text{Scanning Risk for Group 2} \times \frac{\text{KEKPA}}{\text{Total Number of Positions of Group 2}}$$

*Total correlation effect*

$$= \text{Risk Mitigating Effect for Group 1} + \text{Risk Mitigating Effect for Group 2}$$

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<sup>2</sup> In circumstances where there are combined commodities with statistically and economically significant inverse correlation (“-“ Correlation) at the equity market, net settlement positions in the same direction between combined commodity groups will create risk mitigating effect.

### Example:

Let's assume that there are two combined commodity groups at the Equity Market. In an account, there have been 10,000 A shares with a current price of 10 TL in long position and their settlement will be completed today (T+0). Likewise, in the same account, there have been 4,000 short settlement position of B shares with a current price of 20 TL and the settlement day of (T+2) in the other combined commodity group .

Trading Day	Name of the Share	Buy/ Sell	Number of Positions	Settlement Day	Combined Commodity Group
05.01.2015 (T-2)	A	Buy	10,000	07.01.2015 (T+0)	Group 1
07.01.2015 (T+0)	B	Sell	4,000	09.01.2015 (T+2)	Group 2

Today: 07.01.2015 (T+0)

Let's further assume that the PSR value of share A on day T has been defined as 10% and the PSR value of share B on day T+2 has been set to 15%. Also, the correlation for the combined commodities in the Equity Market has assumed to be 60%. Risk amount associated with this account will be calculated by following the steps below.

Scanning risk for the long positions with the term T+0:

$$= +10.000 \text{ units} \times 10 \text{ TL} \times 10\% = 10.000 \text{ TL}$$

Scanning risk for the short positions with the term T+2:

$$= +4.000 \text{ units} \times 20 \text{ TL} \times 15\% = 12.000 \text{ TL}$$

**Since share A and B are in different combined commodity groups, the direction of the trades will not be taken into account. No netting will be applied for these shares.**

$$\text{Scanning risk excluding correlation effect} = 10.000 \text{ TL} + 12.000 \text{ TL} = 22.000 \text{ TL}$$

**As these shares are included in different combined commodity groups and they are in opposite direction positions, the correlation effect is calculated and deducted from the total margin requirement.**

Correlation effect is calculated in three steps and is distributed based on the number of shares.

1. Calculation of the number of units subject to correlation effect:

$$\min(10.000 \text{ units}, 4.000 \text{ units}) = 4.000 \text{ units}$$

2. Calculation of the correlation effect:

$$\text{For Group 1 } (4.000 \text{ units} / 10.000 \text{ units} \times 10.000 \text{ TL} \times 60\%) = 2.400 \text{ TL}$$

$$\text{For Group 2 } (4.000 \text{ units} / 4.000 \text{ units} \times 12.000 \text{ TL} \times 60\%) = 7.200 \text{ TL}$$

3. Total correlation effect:  $2.400 \text{ TL} + 7.200 \text{ TL} = 9.600 \text{ TL}$

$$\begin{aligned} \text{Total margin requirement} &= \text{Total scanning risk} - \text{Total correlation effect} \\ &= 22.000 - 9.600 = 12.400 \text{ TL} \end{aligned}$$

#### d. Calculation of the netting effect

In the new risk calculation model to be used in the Equity Market, it is possible to limit the netting effect of the shares in the same combined commodity group. This limitation is calculated as: after taking the difference between margining of all positions in one account without netting effect (gross) and with netting effect (net), netting parameter is applied to this difference and the resulting amount is added to the total margin requirement. This effect is calculated by using the netting parameter set by Takasbank between 0 and 1.

$$\text{Netting Effect} = [\text{Scanning Risk (gross)} - \text{Scanning Risk (net)}] * (1 - \text{Netting Parameter})$$

#### Example:

Let's assume that share A with 10 TL current price and share B with 20 TL current price are included in the same combined commodity group. And a member has bought 1.000 shares of A and sold 200 shares of B on day T. Assuming that Takasbank has set the PSR value for the positions of this combined commodity group with 2-days to settlement date as 15%; and the netting parameter for this group as 80%.

In the example, "+" sign has been used for the "buy" positions, and "-" sign has been used for the "sell" positions.

Trading Day	Name of the Share	Buy/ Sell	Number of Positions	Settlement Day
05.01.2015 (T+0)	A	Buy	1.000	07.01.2015 (T+2)
05.01.2015 (T+0)	B	Sell	200	07.01.2015 (T+2)

Today: 05.01.2015 (T+0)

**Scanning risk is the aggregate of the scanning risks calculated for A and B shares. Since these shares are in the same combined commodity group, no correlation effect will be calculated.**

Scanning risk for A share:  $+1.000 \text{ units} \times 10 \text{ TL} \times 15\% = +1.500\text{TL}$

Scanning risk for B share:  $-200 \text{ units} \times 20 \text{ TL} \times 15\% = -600\text{TL}$

Scanning risk (net):  $1.500\text{TL} - 600\text{TL} = 900\text{TL}$

Scanning risk (gross):  $1.500\text{TL} + 600\text{TL} = 2.100\text{TL}$

**Gross margin amount is calculated by summing the Scanning risks regardless of the directions of the positions.**

Netting effect:  $(2.100\text{TL} - 900\text{TL}) \times (1 - 80\%) = 240\text{TL}$

Total margin requirement:  $900\text{TL} + 240\text{TL} = 1.140\text{TL}$

#### e. Calculation of Variation Margin

In Delta Hedge method, risk is calculated by using current (market) price of the share. Variation margin is equal to the difference between market value and settlement amount of the positions.

$$\text{Variation Margin} = \text{Number of positions} \times (\text{current price} - \text{settlement price})$$

Variation margin may increase or decrease the total margin requirement.

#### **Example:**

Let's assume that there are 1000 A shares with the trade price of 9 TL and with the current price of 10TL. Also, PSR value for this share has been set to 15%.

Scanning risk for the A share:  $1,000 \text{ units} \times 10 \text{ TL} \times 15\% = +1,500\text{TL}$

Variation margin for the A share:  $(10\text{TL} - 9\text{TL}) \times 1,000 \text{ units} = 1,000\text{TL}$

As the Group A share was purchased at 9TL (its current price is 10TL), there is a profit. For this reason, in the example, the variation margin will decrease the total margin requirement.

Total margin requirement  $1.500\text{TL} - 1.000\text{TL} = 500 \text{ TL}$

#### f. Calculation of Total Margin Requirement

Total margin requirement is equal to the sum of initial margin and variation margin calculated via Delta Hedge method.

*Initial margin*

$$= \text{Scanning risk} + \text{Inter month Spread Charge} - \text{Inter commodity Spread Credit} + \text{Netting Effect}$$

$$\text{Margin Requirement} = \text{Initial Margin} + \text{Variation Margin}$$

## B. Assets Accepted as Collateral and Collateral Valuation Method

In the Equity Market, Takasbank will provide collateral management services. Takasbank, in its regulations and procedures, will set out collateral deposit-withdrawal times, rules applied to the valuation of assets accepted as collateral and to the composition and concentration limits.

After CCP service is launched in the Equity Market in Borsa Istanbul, a limitation shall be set for the collateral compositions. Moreover, Letter of Guarantees shall not be accepted as collateral after the end of the transition period to be defined.

Deposited collaterals will be valued by Takasbank and this valuation process comprises two phases: The first one is the valuation of the collaterals by using the current prices and haircuts. The purpose of the haircut application is to prevent the case that positions will remain without collateral due to sudden declines in the values of assets accepted as collateral.

Collateral value of an asset accepted by Takasbank will be calculated by multiplying the current market price of the said asset by  $(1 - \textit{haircut})$  to be determined by Takasbank. Collateral valuation factors will be determined on the basis of asset types (shares, government bill and securities, foreign currencies etc).

### **Example:**

The day on which USD/TL rate is 2,5 TL, the 10.000 USD deposited by the member will be firstly reduced by the collateral valuation factor determined by Takasbank for US dollar. Let's assume that the valuation factor is 0,95:

$$10.000 \text{ USD} \times 0,95 = 9.500 \text{ USD}$$

Afterwards, the calculated amount in USD will be converted to Turkish Lira with the current exchange rate:

$$9.500 \text{ USD} \times 2,5 = 23.750 \text{ TL}$$

The other step in the valuation of collateral is to determine the total collateral available for use. In the Equity Market, the composition of each asset type accepted as collateral in total collateral may be subject to a limitation. Any collateral exceeding the limit will not be taken into account. Moreover, a new obligation will be introduced where minimum cash collateral should be maintained up to a specific ratio of the total collateral amount.

Total margin requirement will be compared to the total available collateral and any collateral surplus/ deficit will be the difference of these amounts.

*Total collateral surplus/deficit*

*= Total collateral available for use – Total margin requirement*

### C. Calculation of the Guarantee Fund

Takasbank shall establish a guarantee fund to be used for the part of the losses exceeding the collaterals of the relevant members, in case of the default of one or more of the members in the Equity market for which the CCP service is provided. The size of the Guarantee Fund and the capital to be allocated by Takasbank shall be determined by taking the market conditions into consideration, and shall not be less than the greater one of the resource need that shall arise in case of the default of the member holding the biggest open position and the resource need that shall arise in case of the joint default of the members, holding the open position of the second and third biggest size. Rules applicable to the collateral valuation to be used for the margin requirement will also be valid for the guarantee fund contributions of the members. The collateral composition of the guarantee fund may be different from the collateral composition received for the margin requirements. Moreover, total resources to be used for the default management should not be less than the resource needed to cover the defaults of the two members with the biggest open position.

The size of the guarantee fund shall be calculated by Takasbank at the beginning of each month, and the contributions to be paid to the guarantee fund by the members shall be calculated by the distribution of the total guarantee fund size in proportion to the risks arising from the operations of the relevant member. Members have to fulfil their guarantee fund obligations within the specified time period. The amount of the guarantee fund to be deposited by each member cannot be less than the fixed contribution amount set for this market. Principles related to the guarantee fund shall be announced by Takasbank in the relevant procedures.

IV. CENTRAL COUNTER PARTY SERVICES AT THE EQUITY MARKET IN BORSA ISTANBUL

Takasbank will provide Central Counterparty (CCP) service in the Equity Market in Borsa Istanbul, and the risk and collateral management, in this regard, will be carried out by Takasbank.

CCP service is the service that Takasbank commits to complete clearing and settlement operations for the markets this service is provided through collaterals received for transactions, guarantee fund contributions and the capital allocated to covered risks and committed from its own resources.

Transition to the new system in the Equity Market and the launch of the CCP services will be gradually introduced.

Upon the launch of BISTECH risk management and the settlement system, periodic daily risk management system will be put into implementation in the equity market. However, for the duration until the launch of CCP services, the margining will continue to be made on the basis of quarterly averages just like the way in the current system. During that term, members can monitor their daily margin requirements which will be calculated via Delta Hedge Model on their screens for information purposes. It is expected that members will have an idea about the margin and collateral levels during the transition period.

Within 3 to 6 months following the transition to the new system, it is planned to provide CCP services in the market. Along with the CCP services, formal risk management procedures will be introduced.

It is planned that in September 2016, instantaneous risk management will be launched in the market upon the implementation of the second phase in BISTECH. Figure 8 shows the calendar for establishing the risk and collateral management and the CCP services planned to be provided on step-by-step basis.

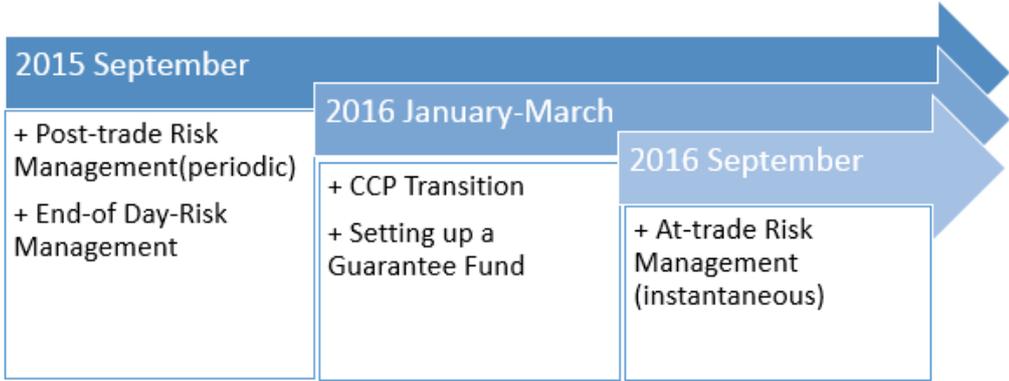


Figure 8- BISTECH transition calendar planned at the Equity Market

## V. MEMBER SCREENS

All risk calculations and collateral valuations to be done by Takasbank can be viewed by the members on their own screens. Members can enter trades by using the simulation menus and calculate the margin requirement amounts for these transactions.

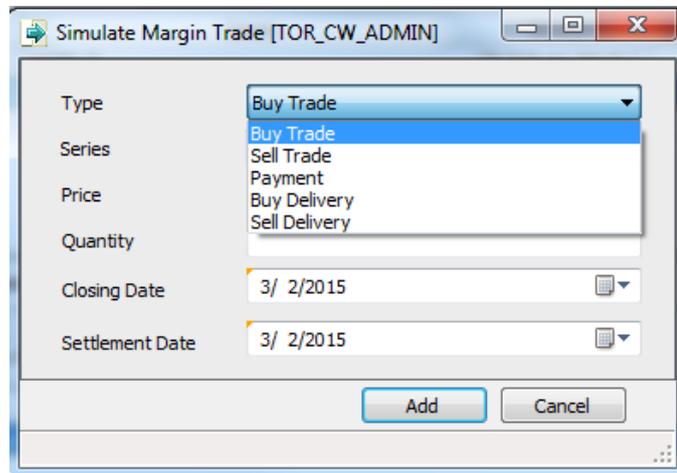


Figure 9- Screen to create a trade at BISTECH system

By using the simulation menu, members can create hypothetical portfolios. Moreover, it will be possible to monitor the margin requirement that should be deposited in case new position is taken in addition to the current portfolio.

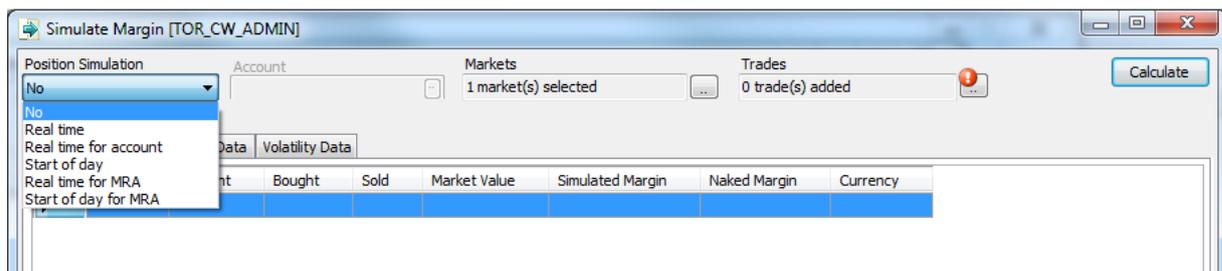


Figure 10- Portfolio selection for which margin calculation is to be made at BISTECH system

Series	Account	Bought	Sold	Market Value	Simulated Margin	Naked Margin	Currency
ACSEL.E	BI TOR MJ-TM-M-C	10	0	966	860	860	
<b>Required margin for ACSEL based on the price</b>						<b>860</b>	<b>860 TRY</b>
<b>Total for CurrencyTRY</b>						<b>860</b>	<b>TRY</b>

Figure 11- Result screen for margin simulation at BISTECH system

Along with the transition to the new system, Takasbank will also start to publish SPAN-compatible files for the equity market. Our members who currently use SPAN may calculate their margin requirements by using the published files.

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