CCP Back Testing Applications and the Results

Takasbank Practice 2019-4

Central Counterparty Department

Gizlilik Seviyesi: Halka Açık (Tasnif Dışı)

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Introduction

- In risk management, back-testing which is usually employed to assess the measurement models' accuracy and performance, is used by CCPs to test the parameters in the collateral calculation models and haircuts applied to eligible collateral assets.
- It is compulsory for CCPs to back-test risk management models as per the CPMI-IOSCO principles and EU EMIR regulations. Similarly, in our country the Takasbank's obligation to check the authenticity and reliability of the risk models employed in CCP services through back-testing was introduced through the Central Counterparty Regulation, Article 45 .

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Initial Margin Back-testing

- In the CCP-enabled markets the models employed in the calculation of initial margin and adequacy of confidence levels are analysed via back-tests executed on a daily basis by the Central Counterparty Division.
- In back-testing , it is controlled whether the initial margin required for the positions are large enough the to meet the change in the value of the position during the holding period in light of the confidence level and holding period assumptions that are utilized in initial margin calculation. The observations where the initial margin does not cover the change in value is referred as breach. In the back-testing period, the number of breaches are anticipated to be less than the number implied by the confidence level.
- The back-testing results of the models employed in initial margin calculation and if there is any, suggested measures are presented to Takasbank Board of Directors at least 4 times a year in March, June, September and December by internal audit divisions. The back-testing results shall be submitted to the CCP Risk Advisory Committee in June and December.

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Account Based Back-testing

- In Derivatives Market (VIOP) the back-tests are conducted on a daily basis on all accounts with open positions. At the end of each day, it is checked whether the initial margin amount required for the relevant account is large enough to meet the change in value of the position in the account during holding period. For this purpose the positions in the account are valued at market prices in the following days (during the holding period) and the change in the value of positions is calculated. If this value is larger than the initial margin, it is acknowledged that there is a breach in the account. The change in values of the positions in the Derivatives Market (VIOP) is based on the change in the profit/loss arising from futures contracts and short option positions' values.
- The conditions whereby the maximum change exceeds the initial margin is acknowledged as "breach". Back-testing is performed for all the positions taken in the market on a daily basis and the excess numbers' ratio to the total number of observations is anticipated to remain at the confidence level utilized in the initial margin calculation.

Product Based Back-testing

- As gross collateral basis is applied in Securities Lending Market (ÖPP) in back-testing an approach based on borrowed/ lent security is followed. For this purpose borrowing/ lending transactions are used on security basis. For a single day, the varied number of securities, which are subject of borrowing transactions, is the observation number for that day. The price changes in the borrowed/ lent securities during the holding period is acknowledged as breach if they exceed the initial margin requested for the related borrowing transaction. In Securities Lending Market, since initial margin and valuation process utilize weighted average price, in back-testing weighted average prices are used for borrowed/lent securities as well.
- Also, in Derivatives Market (VIOP) and Equity Market(PP) back-testing are performed. In this regard, it is tested through daily calculations whether the initial margin values requested for the contracts compensate for the price movements that they shall be exposed to in the course of the holding period.
- In the Debt Securities Market, back-testing is performed to determine whether the unit margin amounts required for the securities traded at the end of each day are sufficient to cover the daily weighted average clearing price change.

Money Market Back-testing

- In the Money Market, one and three month maturity transactions are made. In this context, a different approach to Securities Lending Market (ÖPP) and Derivatives Market (VIOP) has been adopted in backtest analyzes. According to this, the interest rate implied by the level of initial margin on the contract basis is calculated daily and then it is observed whether there is an interest rate change exceeding the amount of change calculated in the market.

SWAP Market Back-testing

- The SWAP Market back-test applies to foreign currency underlying assets traded in the SWAP Market.
- The back-test was conducted by taking into account the 2-day holding period of the exchange rate fluctuations in the USD and EUR data set for the test period.

Haircut Back-testing

- Haircuts are back-tested on a monthly basis. Back-testing may be performed via indices, maturity and indicators that represent the collateral assets.
- In the event that breach is observed for more than two business days in average for the past one year period during the back-testing and this asset group’s haircuts have not been previously calibrated via multiplication factors, the haircuts is calibrated by reduction subject to the framework of the multiplication factors table. If the need to recalibrate arises for a previously calibrated asset group , the haircuts are recalculated.

Haircut Back-testing

Haircut (%) = 1 – (% Reduction multiple x Multiplication factor)

Number of Breach	Multiplication Factor
2 and less	1.00
3	1.20
4	1.35
5	1.5

In the event that breach is observed for more than 5 business days in the last year's valuation multiples , the utilized data set , confidence level and the model are reviewed.

Back-testing Results

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Initial Margin Back-testing Results

Product Based Back-Test Results (Derivatives Market 2019-4)

Total Number of Observations	117,849
Number of Breach	250
Breach (%)	0,21
The Limit Subject to the Confidence Level (%) (1-99.5%)	0,5
Acceptable Number of Breach	589

In the back-test for the period concerned the open contracts in the derivatives market (VIOP) are taken into consideration. In the daily calculation, breach has not been observed on contract basis.

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Initial Margin Back-testing Results

Product based Back-testing Results (SLM 2019-4):

Total Number of Observations	18,895
Number of Breach	88
Breach (%)	0,47
The Limit Subject to the Confidence Level (%) (1-99.5%)	0,5
Acceptable Number of Breach	94

In the daily calculation, breach has not been observed on contract basis.

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Initial Margin Back-testing Results

Product Based Back-Test Results (Equity Market 2019-4)

Total Number of Observations	191,464
Number of Breach	1331
Breach (%)	0,70
The Limit Subject to the Confidence Level (%) (1-99.5%)	0,5
Acceptable Number of Breach	957

In the daily calculation, breach has been observed on contract basis for equity market.

Initial Margin Back-testing Results

Product Based Back-Test Results (Debt Securities Market 2019-4)

Total Number of Observations	2480
Number of Breach	12
Breach (%)	0,48
The Limit Subject to the Confidence Level (%) (1-99.5%)	0,50
Acceptable Number of Breach	12

In the daily calculation, breach has been observed on contract basis for Debt Securities Market.

Initial Margin Back-testing Results

Money Market Back-testing Results (2019-4):

Total Number of Observations	520
Number of Breach	0
Breach (%)	0
The Limit Subject to the Confidence Level (%) (1-99.5%)	0,5
Acceptable Number of Breach	3

The back test results for Money Market are given above. The interest rate change implied by the initial margin of 5% in the market is 61% for 1 month contract and 20% for 3 months contract. The test results show that there is no change in the market interest rate exceeding the declared rates.

Initial Margin Back-testing Results

SWAP Market Back-testing Results (2019-4):

	USD	EUR	TL
Total Number of Observations	260	260	520
Number of Breach	3	1	2
Breach (%)	1	0,4	0,4
The Limit Subject to the Confidence Level (%) (1-99.5%)	1	1	1
Acceptable Number of Breach	3	3	5

In the back-test, the exceeding rate in the SWAP Market in the relevant period does not indicate that the confidence level used (99.5%).

The total number of excesses in the period subject to the analysis is 7 for USD and 4 for EUR.

Haircut Back-testing Results

Haircut Back-Test		Haircut	No of Breach
FX	USD	94%	2
	EUR	95%	2
	POUND	93%	1
DIBS (*)	Based on the 1 yrs benchmark interest rate.	97%	0
	Based on the 5 yrs benchmark interest rate.	93%	0
	Based on the 10 yrs benchmark interest rate.	92%	0
EUROBOND (USD)	Based on the 5 yrs benchmark interest rate.	93%	0
	Based on the 10 yrs benchmark interest rate.	93%	0
	Based on the 30 yrs benchmark interest rate.	89%	0
EUROBOND (EUR)	Based on the 5 yrs benchmark interest rate.	93%	0
	Based on the 10 yrs benchmark interest rate.	91%	0
	Based on the 30 yrs benchmark interest rate.	89%	0
STOCK	BIST 30 Index	86%	0
	BIST 100 Index	82%	0
	The number of stocks in BIST 30 where breach was observed		
	4	86%	5
	The number of stocks in BIST 30/BIST100 where breach was observed		
	34	82%	109
GOLD		91%	0
MUTUAL FUND	***The number of Equity Umbrella Fund where breach was observed***		
	1	89%	2
	The number of Debt Instruments Umbrella Fund where breach was observed		
	1	89%	2

(*) Government domestic borrowing security

Haircut Back-testing Results

The fact that the number of breach observed across asset groups such as FX, equity government domestic borrowing security (DIBS) and gold does not exceed two times for the past year indicates that there is no need for calibration.

In equities, three conditions are sought simultaneously, that number of breach shall not exceed 2 in BIST 30 Index, the number of breach for the stocks in BIST 30 shall not exceed 60 and the number of breach for the stocks in BIST 100-30 shall not exceed 140.

In mutual funds , the fact that there are 68 equity umbrella funds, but the number of breach does not exceed 136 and that the number of breach does not exceed 78 for the 156 debt instrumnets umbrella funds indicates that there is no need for calibrating the valuation multiples for mutual funds.

Thank you

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