

## ■ Performance Test Result

This document contains the actual time measured during the VaR margin calculation process using the new software.

This data is provided as reference for building an environment of your own.

Please note that it only serves as a guide, and you will have to make adjustments according to the environment and method of your use.

1. API Application (Information Added)
2. API Application (Multiple Requests)
3. CLI Application
4. GUI Application

Change History

#	Date	Version	Sheet	Description
1	Nov. 1, 2022	1.0		First Release
2	Jan. 31, 2023	1.01	Outline	Addition of new sheet names to the list Removal of an obsolete sentence
3			1. API App	Addition of measurement result using a different machine
4			3. CLI App 4. GUI App	Addition of sheets
5	Jan. 30, 2024	2.0	1. API App 2. API App (Multiple Requests) 3. CLI App 4. GUI App	Update "Measurement Result"
6	Dec. 16, 2024	3.0	1. API App 2. API App (Multiple Requests) 3. CLI App 4. GUI App	Update "Measurement Result"

1. API Application

Measurement Description

The time for processing API requests described in "2.5.1 Input File Reading" and "2.5.2 Calculation" in the API Application Specification was measured.

The measurement for input file reading shows the time required to execute 1 reading process of 3 files: BPF, VPF and APF. The number of instruments in the BPF was varied as seen in the Measurement Result table below.

The measurement for calculation process shows the time required to process 1 request with account and position settings seen in the Calculation table below.

Measurement Environment

The following AWS virtual machines were used.

A Amazon EC2 Instance: m5d.12xlarge CPU: 48Cores 2.5GHz Memory: 192GiB SSD OS: Red Hat Enterprise Linux Server release 7.7 (Maipo) Java: openjdk version "1.8.0\_332"

B Amazon EC2 Instance: m5ad.xlarge CPU: 4Cores 2.2GHz Memory: 16GiB SSD OS: Red Hat Enterprise Linux Server release 7.7 (Maipo) Java: openjdk version "1.8.0\_332"

The following parameter settings were used for measurement. (Parameters not affecting process time are left out.)

pool.size.max = pool.size.core

pool.size.queue = 0 (\* All calculation processes not allocated to threads will be moved to the queue.

pool.threshold = 1 (\* Calculation processes will be allocated to threads account-by-account and executed.)

server.tomcat.threads.max = 200

server.tomcat.threads.min-spare = 10

server.tomcat.accept-count = 100

Measurement Result

Input File Reading (Unit: ms)

#	Item	Setting	Machine A (Core:48)	Machine B (Core:4)
			pool.size.core=1	
1	BPF target instrument	1,000	902	1,312
2	BPF target instrument	7,000	6,359	9,611
3	BPF target instrument	15,000	12,780	21,039
4	BPF target instrument	30,000	24,789	42,452
5	BPF target instrument	50,000	41,176	—

Calculation

(Unit: ms)

#	Item	Setting	Machine A (Core:48)			
			pool.size.core=1	pool.size.core=5	pool.size.core=20	pool.size.core=50
			OutputType:SAM	OutputType:SAM	OutputType:SAM	OutputType:SAM
1	Number of accounts	5,000	4,385	1,315	766	992
	Average number of positions per account	2				
2	Number of accounts	10,000	8,732	2,483	1,406	1,972
	Average number of positions per account	2				
3	Number of accounts	25,000	21,440	6,209	3,396	4,450
	Average number of positions per account	2				
4	Number of accounts	50,000	42,807	12,831	7,273	9,221
	Average number of positions per account	2				
5	Number of accounts	10	344	128	155	168
	Average number of positions per account	100				
6	Number of accounts	50	246	116	51	130
	Average number of positions per account	10				
7	Number of accounts	500	850	276	193	209
	Average number of positions per account	3				
8	Number of accounts	1,000	1092	357	230	270
	Average number of positions per account	2				
9	Number of accounts	2,000	3,123	932	532	589
	Average number of positions per account	3				
10	Number of accounts	4,000	9,280	2,666	1,544	1,537
	Average number of positions per account	5				

(Unit: ms)

#	Item	Setting	Machine B (Core:4)	
			pool.size.core=1	pool.size.core=5
			OutputType:SAM	OutputType:SAM
1	Number of accounts	5,000	5,570	3,100
	Average number of positions per account	2		
2	Number of accounts	10	542	381
	Average number of positions per account	100		
3	Number of accounts	1,000	1,362	880
	Average number of positions per account	2		

2. API Application (Multiple Requests)

Measurement Description

The number of API requests in this volume "2.5.2 Calculation" defined in the "Setting" on the table of Measurement Result were processed simultaneously by the API application, and the average processing time of these requests was measured.

The calculation object (Output Type) was VaR Margin.

Only 1 account was contained in a request.

The number of positions contained in 1 account was 50.

Measurement Environment

The following 2 machines were used.

A: Amazon EC2 Instance: m5d.12xlarge CPU: 48Cores 2.5GHz Memory: 192GiB SSD OS: Red Hat Enterprise Linux Server release 7.7 (Maipo) Java: openjdk version "1.8.0\_332"

B: Amazon EC2 Instance: m5ad.xlarge CPU: 4Cores 2.2GHz Memory: 16GiB SSD OS: Red Hat Enterprise Linux Server release 7.7 (Maipo) Java: openjdk version "1.8.0\_332"

Parameter Settings

The following parameter settings were used for measurement. (Parameters not affecting process time are left out.)

pool.threshold = 2 (\* All requests processed in multithread processing.Only the influence of tomcat threads was measured.)

server.tomcat.threads.min-spare =server.tomcat.threads.max

Measurement Result

(Unit: TPS)

#	Item	Setting	Machine A (Core:48)			
			server.tomcat.threads.max=1	server.tomcat.threads.max=5	server.tomcat.threads.max=20	server.tomcat.threads.max=50
			OutputType:VaR Margin	OutputType:VaR Margin	OutputType:VaR Margin	OutputType:VaR Margin
1	Number of requests simultaneously sent	1	79	76	80	78
2		3	89	226	229	226
3		10	88	425	746	730
4		50	88	418	1316	1739
5		100	90	422	1304	1744
6		1,000	88	419	1319	1753

\*E.g., for server.tomcat.threads.max=5 and Setting=100 the TPS is 422. This gives a process time of 237 msec per request.

\*Remark the performance will not be significantly improved when server.tomcat.threads.max is more than the number of the machine core.

(Unit: TPS)

#	Item	Setting	Machin B (Core:4)	
			server.tomcat.threads.max=1	server.tomcat.threads.max=5
			OutputType:VaR Margin	OutputType:VaR Margin
1	Number of requests simultaneously sent	1	48	52
2		3	59	122
3		10	60	153
4		50	60	153
5		100	62	159



3. CLI Application

Measurement Description

The time required for calculation in accordance with the procedure described in "2.2.2 Execution of Calculation" in the CLI Application Specification was measured.

The time required for parameter File Reading: and the time required for processing requests with the account and position details seen in the Calculation table below are listed.

Measurement Environment

- The following AWS virtual machines were used.
- A Amazon EC2 Instance: m5d.12xlarge CPU: 48Cores 2.5GHz Memory: 192GiB SSD OS: Red Hat Enterprise Linux Server release 7.7 (Maipo) Java: openjdk version "1.8.0\_332"
  - B Amazon EC2 Instance: m5ad.xlarge CPU: 4Cores 2.2GHz Memory: 16GiB SSD OS: Red Hat Enterprise Linux Server release 7.7 (Maipo) Java: openjdk version "1.8.0\_332"

The following parameter settings were used for measurement. (Parameters not affecting process time are left out.)

- pool.size.max = pool.size.core (\* Time required for thread increase will not be measured.)
- pool.size.queue = 0 (\* Without request timeout)
- pool.threshold = 1 (\* All requests will be processed by multithreading.)

Measurement Result

Calculation

(Unit: ms)

#	Item	Setting	breakdown	Machine A (Core:48)			
				pool.size.core=1	pool.size.core=5	pool.size.core=20	pool.size.core=50
				OutputType:SAM	OutputType:SAM	OutputType:SAM	OutputType:SAM
1	BPF Target Instrument	7,000	Total	7,957	7,421	7,396	7,471
	Number of accounts	1,000	File Reading	5,732	5,734	5,728	5,688
	Average number of positions per account	2	Margin Calc	1,239	687	670	800
2	BPF Target Instrument	7,000	Total	9,561	8,493	8,392	8,545
	Number of accounts	2,000	File Reading	6,418	6,443	6,437	6,442
	Average number of positions per account	2	Margin Calc	2,130	1,063	949	1,082
3	BPF Target Instrument	7,000	Total	13,159	10,402	10,110	10,500
	Number of accounts	5,000	File Reading	7,476	7,449	7,461	7,500
	Average number of positions per account	2	Margin Calc	4,681	1,965	1,660	2,002
4	BPF Target Instrument	7,000	Total	17,099	11,953	11,195	11,644
	Number of accounts	10,000	File Reading	7,721	7,759	7,749	7,719
	Average number of positions per account	2	Margin Calc	8,388	3,197	2,444	2,926
5	BPF Target Instrument	30,000	Total	20,677	20,685	20,657	20,707
	Number of accounts	10	File Reading	19,163	19,211	19,102	19,133
	Average number of positions per account	100	Margin Calc	489	481	556	583
6	BPF Target Instrument	30,000	Total	20,413	20,304	20,407	20,289
	Number of accounts	50	File Reading	19,010	18,971	19,078	19,033
	Average number of positions per account	10	Margin Calc	390	333	340	266
7	BPF Target Instrument	30,000	Total	21,561	21,165	21,135	21,240
	Number of accounts	500	File Reading	19,637	19,645	19,630	19,601
	Average number of positions per account	3	Margin Calc	912	522	509	649
8	BPF Target Instrument	1,000	Total	3,054	2,748	2,725	2,893
	Number of accounts	500	File Reading	1,271	1,283	1,269	1,280
	Average number of positions per account	2	Margin Calc	788	445	472	581
9	BPF Target Instrument	1,000	Total	3,989	3,209	3,109	3,289
	Number of accounts	1,000	File Reading	1,322	1,318	1,320	1,332
	Average number of positions per account	3	Margin Calc	1,673	887	794	946
10	BPF Target Instrument	1,000	Total	6,713	4,251	3,955	4,031
	Number of accounts	2,000	File Reading	1,432	1,446	1,434	1,430
	Average number of positions per account	5	Margin Calc	4,275	1,806	1,517	1,610

\* Since File Reading: is performed by a single core, changing pool.size.core does not influence the processing time.

\* Remark the performance will not be significantly improved when server.tomcat.threads.max is more than the number of the machine core.

(Unit: ms)

#	Item	Setting	breakdown	Machine B (Core:4)	
				pool.size.core=1	pool.size.core=5
				OutputType:SAM	OutputType:SAM
1	BPF Target Instrument	7,000	Total	12,169	12,138
	Number of accounts	1,000	File Reading	7,970	8,433
	Average number of positions per account	2	Margin Calc	2,423	1,854
2	BPF Target Instrument	30,000	Total	28,548	28,234
	Number of accounts	10	File Reading	25,881	25,699
	Average number of positions per account	100	Margin Calc	839	701
3	BPF Target Instrument	1,000	Total	5,531	5,161
	Number of accounts	500	File Reading	2,240	2,224
	Average number of positions per account	2	Margin Calc	1,443	1,145

4. GUI Application

Measurement Description

The time required for calculation in accordance with the procedure described in "2.2.3 Execution of Calculation" in the GUI Application Specification was measured.

The time required for parameter file reading and the time required for processing requests with the account and position details seen in the Calculation table below are listed

Measurement Environment

The following physical machine was used.

C Physical terminal (Dell Latitude3520) CPU: Core (TM) i7-1165G7 Memory: 16GB SSD OS: Windows Client 10 (22H2) Java: 11.0.21 (Corretto)

The following parameter settings were used for measurement. (Parameters not affecting process time are left out.)

pool.size.max = pool.size.core (\* Time required for thread increase will not be measured.)

pool.size.queue = 0 (\* Without request timeout)

pool.threshold = 1 (\* All requests will be processed by multithreading.)

Measurement Result

Calculation

(Unit: ms)

#	Item	Setting	breakdown	Machine C (Core:4)		
				pool.size.core=1	pool.size.core=4	pool.size.core=8
				OutputType:SAM	OutputType:SAM	OutputType:SAM
1	BPF Target Instrument	7,000	Total	8,992	8,960	8,954
	Number of accounts	100	File Reading	8,057	8,100	8,083
	Average number of positions per account	5	Margin Calc	534	472	458
2	BPF Target Instrument	7,000	Total	9,830	9,435	9,447
	Number of accounts	200	File Reading	8,403	8,224	8,230
	Average number of positions per account	5	Margin Calc	838	595	626
3	BPF Target Instrument	30,000	Total	35,485	33,981	34,142
	Number of accounts	100	File Reading	32,014	31,478	31,562
	Average number of positions per account	50	Margin Calc	2,569	1,694	1,782
4	BPF Target Instrument	30,000	Total	44,213	39,691	41,097
	Number of accounts	200	File Reading	36,696	35,911	36,853
	Average number of positions per account	50	Margin Calc	6,249	2,633	3,052
5	BPF Target Instrument	1,000	Total	4,086	3,701	3,627
	Number of accounts	100	File Reading	2,094	2,068	1,925
	Average number of positions per account	20	Margin Calc	1,385	999	1,074
6	BPF Target Instrument	1,000	Total	5,138	4,032	4,136
	Number of accounts	200	File Reading	2,114	1,942	1,944
	Average number of positions per account	20	Margin Calc	2,116	1,316	1,354