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1 Purpose of the document

The following comments are intended to explain the calculation of the clearing fees charged by SIX x-clear.

The total amount charged to an SIX x-clear member (= Individual Clearing Member (ICM) or General Clearing Member (GCM)) corresponds to the sum of the following fees:

- Membership fee (MS)
- Clearing line fee (CL)
- Clearing transaction fee (CT)
- Risk management fee (RM)

Non Clearing Members (NCMs) are not charged any fees directly by SIX x-clear.

To make the explanation of the SIX x-clear fee calculation more comprehensible, we assume the following 3-day sample trading flow of a notional member:

ISIN A			
	Long (-)	Short (+)	Net (+/-)
Day 1	-100,000,000	50,000,000	-50,000,000
Day 2	-20,000,000	40,000,000	20,000,000
Day 3	-70,000,000	130,000,000	60,000,000
Net open position on day 3 in CHF:			30,000,000
ISIN B			
	Long (-)	Short (+)	Net (+/-)
Day 1	-180,000,000	190,000,000	10,000,000
Day 2	-170,000,000	200,000,000	30,000,000
Day 3	-160,000,000	90,000,000	-70,000,000
Net open position on day 3 in CHF:			-30,000,000
ISIN C			
	Long (-)	Short (+)	Net (+/-)
Day 1	-100,000,000	70,000,000	-30,000,000
Day 2	-100,000,000	170,000,000	70,000,000
Day 3	0	0	0
Net open position on day 3 in CHF:			40,000,000

Table 1

For example, on day 2 the sum of all buy orders for ISIN B amounts to CHF 170,000,000 while the sum of all sell orders for the same ISIN adds up to CHF 200,000,000.

2 Membership fee (MS)

The membership fee of an SIX x-clear member (Individual Clearing Member or General Clearing Member) is CHF 10,000 per year irrespective of the number or the CHF amount of trades cleared through SIX x-clear.

The contribution for Non-Clearing Members (NCMs) equals CHF 2,400 per year and is charged to the respective General Clearing Member (GCM).

3 Clearing line fee (CL)

The clearing line fee is based on the number of different ISINs cleared per day. It is calculated as follows:

$$CL = CHF0.25 \cdot \sum_{i=1}^b n_i \quad (1)$$

where

b = number of business days

n_i = number of clearing lines on day i (= number of different ISINs cleared on day i)¹

With the trade flow described in table 1 we get:

b = 3

$n_1 = 3, n_2 = 3, n_3 = 2$

n_3 is 2 rather than 3 because the ISIN C is not traded by the respective member on day 3.

Hence, the clearing line fee according to the above sample trade flow amounts to:

$$CL = CHF0.25 \cdot \sum_{i=1}^3 n_i = CHF0.25 \cdot (3 + 3 + 2) = CHF2.00$$

When calculating the clearing line fee for GCMs, it is to be noted that the clearing lines of a GCM are consolidated with those of its NCMs. If for instance a GCM, who has got

¹ Note that the number of clearing lines does not say anything about the number of underlying trades, except for the fact that there must at least be one trade on the respective ISIN if there is a clearing line on the same ISIN.

two NCMs, trades in ISINs A, B and C whereas NCM 1 trades in ISINs C and D and NCM 2 trades exclusively in ISIN D on day i , only four clearing lines are charged to the GCM on day i , and not six (see table 2).

Member	ISIN A	ISIN B	ISIN C	ISIN D
GCM	X	X	X	
NCM 1			X	X
NCM 2				X
Number of clearing lines charged to the GCM	1	1	1	1

Table 2

4 Clearing transaction fee (CT)

The clearing transaction fee is based on the number of gross transactions cumulated across all cleared ISINs. It is given by:

$$CT = CHF0.05 \cdot \sum_{i=1}^b m_i \quad (2)$$

where

b = number of business days

m_i = number of gross transactions on day i

Assume now that the amounts in table 1 are derived from the subsequent underlying transactions listed below. Do not be confused by the various figures in tables 3 – 5. To calculate the clearing transaction fee, solely the number of orders on each business day must be considered.

Trades on day 1

	ISIN	Quantity long	Quantity short	Trade price	Settlement amount
Order 1	A	1,000,000		100.00	-100,000,000
Order 2	B	900,000		200.00	-180,000,000
Order 3	B		925,000	205.41	190,000,000
Order 4	A		500,000	100.00	50,000,000
Order 5	C	250,000		200.00	-50,000,000
Order 6	C	250,000		200.00	-50,000,000
Order 7	C		342,750	204.23	70,000,000

Table 3

Trades on day 2

	ISIN	Quantity long	Quantity short	Trade price	Settlement amount
Order 1	C	500,000		200.00	-100,000,000
Order 2	A	210,500		95.01	-20,000,000
Order 3	B	500,000		200.00	-100,000,000
Order 4	A		400,000	100.00	40,000,000
Order 5	B	350,000		200.00	-70,000,000
Order 6	C		1,000,000	170.00	170,000,000
Order 7	B		735,200	204.03	150,000,000
Order 8	B		250,000	200.00	50,000,000

Table 4

Trades on day 3

	ISIN	Quantity long	Quantity short	Trade price	Settlement amount
Order 1	A		1,200,000	108.33	130,000,000
Order 2	A	700,000		100.00	-70,000,000
Order 3	B	750,000		213.33	-160,000,000
Order 4	B		418,000	215.31	90,000,000

Table 5

Tables 3 – 5 show that the respective member concluded seven trades on day 1 ($m_1 = 7$), eight trades on day 2 ($m_2 = 8$) and four trades on day 3 ($m_3 = 4$). Thus, with

$$b = 3$$

we get:

$$CT = CHF0.05 \cdot \sum_{i=1}^3 m_i = CHF0.05 \cdot (7 + 8 + 4) = CHF0.95$$

When calculating the clearing transaction fee of a GCM, the gross transactions of its NCMs are added and charged to the GCM. As the transaction fee is calculated on a gross basis, offsetting is not possible.

5 Risk management fee (RM)

The risk management fee is dependent on both the exposure of the respective client and its creditworthiness. The exposure is measured by the weighted average net open position per ISIN k , which in turn is measured by the respective net position at beginning of day processing (BOD), at intraday processing (at 2:30 pm CET) and at end of day processing (EOD). These net open positions are equally weighted:

$$X_{i,k} = \frac{1}{3} (X_{iBOD,k} + X_{iID,k} + X_{iEOD,k}) \quad (3.1)$$

where:

$X_{i,k}$ = weighted average net open position in ISIN k in CHF on day i

$X_{iBOD,k}$ = net open position in ISIN k in CHF at beginning of day i

$X_{iID,k}$ = net open position in ISIN k in CHF at intraday processing of day i

$X_{iEOD,k}$ = net open position in ISIN k in CHF at end of day i

The net open position in a particular ISIN k at any time is equivalent to the exposure on an ISIN by considering all the open transactions accrued during the last 3 days². As there is a time period of 3 days between trading day i and settlement day (ISD/i+3), the actual relevant exposure on any business day i is the sum of all net exposures (netting per ISIN/day) of the trading days i, i-1 and i-2. On the settlement day of trading day i-3 (= i) the net exposure of trading day i-3 drops out. Instead, the net exposure of trading day i accrues.

When determining the weighted average net position in ISIN k of a GCM, it is to be noted that open net positions of the GCM are offset against those of its NCMs (see table 6).

	ISIN A	ISIN B	ISIN C
GCM	- CHF 40,000	CHF 15,000	CHF 100,000
NCM 1	CHF 50,000	CHF 10,000	- CHF 20,000
NCM 2	CHF 10,000	CHF 25,000	CHF 10,000
Net position GCM	CHF 20,000	CHF 50,000	CHF 90,000

Table 6

Calculation of the risk management fee is performed on ISIN level for every day i by multiplying the weighted average net open position in every ISIN k by a risk rate r_j , which depends on the rating of the respective member (j). If the fee thus calculated is smaller than a specific minimum amount (which is currently CHF 1.00), the minimum amount (= CHF 1.00) is applied:

$$RM_{i,k} = \max(|X_{i,k}| \cdot r_j, CHF1.00) \quad (3.2)$$

where:

² The net open position also includes unsettled corporate action claims and late settlements, the trades of which were concluded on trading dates < i-2.

$RM_{i,k}$ = risk management fee for the open ISIN k on day i

$X_{i,k}$ = weighted average net open position in ISIN k in CHF on day i

r_j = rate in %, based on the respective member's rating

The risk management fee increases either with a deterioration of the member's rating or with a rise of the same member's average open positions. A list with the risk rates r_j currently applied is shown on the website www.six-x-clear.com/ccp/index/pub-prod/fees/fees-basicservices.htm.

To make the calculation of the risk management fee more comprehensible, we have redisplayed the sample trade flow in table 1. In this table we can see, for instance, that at end of day 3 the net open position in ISIN A is CHF 30,000,000 while the net open position in ISIN B is minus CHF 30,000,000 at the same time.

ISIN A			
	Long (-)	Short (+)	Net (+/-)
Day 1	-100,000,000	50,000,000	-50,000,000
Day 2	-20,000,000	40,000,000	20,000,000
Day 3	-70,000,000	130,000,000	60,000,000
Net open position on day 3 in CHF:			30,000,000
ISIN B			
	Long (-)	Short (+)	Net (+/-)
Day 1	-180,000,000	190,000,000	10,000,000
Day 2	-170,000,000	200,000,000	30,000,000
Day 3	-160,000,000	90,000,000	-70,000,000
Net open position on day 3 in CHF:			-30,000,000
ISIN C			
	Long (-)	Short (+)	Net (+/-)
Day 1	-100,000,000	70,000,000	-30,000,000
Day 2	-100,000,000	170,000,000	70,000,000
Day 3	0	0	0
Net open position on day 3 in CHF:			40,000,000

Table 1

For reasons of simplicity we assume that the respective member trades in a steady manner involving only small deviations of its net open positions compared to the average net open position. Thus, for the purpose of our example the weighted average of the net open position in ISIN k on day i ($X_{i,k}$) is approximated by the net open position at end of day i.

Assume further that the respective member has a credit rating of A+, which implies a risk rate r_j of 0.00035% as specified in the published list. Therewith, the risk management fee for the open ISIN A on day 3 according to (3.2) is calculated as:

$$RM_{3,A} = \max(|X_{3,A}| \cdot r_j, CHF1.00) = \max(CHF30'000'000 \cdot 0.00035\%, CHF1.00) = CHF105.00$$

The total risk management fee for the respective member j for any day i is the sum of the risk management fees for all ISINs that are open on day i:

$$RM_i = \sum_{k=1}^u \max(|X_{i,k}| \cdot r_j, CHF1.00) \quad (3.3)$$

where:

RM_i = total risk management fee on day i

$X_{i,k}$ = weighted average net open position in ISIN k in CHF on day i

r_j = rate in %, based on the respective member's rating

u = number of ISINs traded by the respective member during the last 3 days

In our example, the total risk management fee for member j on day 3 is therefore:

$$\begin{aligned} RM_3 &= \sum_{k=1}^u \max(|X_{3,k}| \cdot r_j, CHF1.00) = \sum_{k=1}^3 \max(|X_{3,k}| \cdot 0.00035\%, CHF1.00) \\ &= \max(CHF30'000'000 \cdot 0.00035\%, CHF1.00) + \max(|-CHF30'000'000| \cdot 0.00035\%, CHF1.00) + \\ &\quad \max(CHF40'000'000 \cdot 0.00035\%, CHF1.00) \\ &= CHF105.00 + CHF105.00 + CHF140.00 = CHF350.00 \end{aligned}$$

To receive the risk management fee charge for any time period (e.g. for one month), the fee charges (3.3) for all trading days i within the respective time period must be summed up:

$$RM = \sum_{i=1}^b \sum_{k=1}^u \max(|X_{i,k}| \cdot r_j, CHF1.00) \quad (3)$$

where:

RM = total risk management fee

$X_{i,k}$ = weighted average net open position in ISIN k in CHF on day i

r_j = rate in %, based on the respective member's rating

u = number of ISINs that are open on day i

b = number of trading days

We now want to calculate a member's total risk management fee charge for one month given the following simplifying assumptions:

- The respective month has 22 trading days ($b = 22$)
- On average, the respective member has 50 trading ISINs per day ($u = 50$)
- The respective member has a credit rating of A+ ($r_j = 0.00035\%$)
- On average, the respective member has in any ISIN k a weighted average net open position of CHF 2,000,000 for any day i ($X_{i,k} = CHF\ 2'000'000 \forall i, k$)

Hence, we get:

$$RM = 22 \cdot 50 \cdot \max(CHF\ 2'000'000 \cdot 0.00035\%, CHF\ 1.00) = 22 \cdot 50 \cdot CHF\ 7.00 = CHF\ 7'700.-$$

6 Total clearing fee charge of an SIX x-clear member (TF)

The total clearing fee charge (TF) of an SIX x-clear member is calculated as the sum of the membership fee (MS), the clearing line fee (CL), the clearing transaction fee (CT) and the risk management fee (RM):

$$TF = MS + CL + CT + RM \quad (4)$$

By substituting CL, CT and RM by the respective terms given in (1), (2) and (3) we get:

$$TF = MS + CHF\ 0.25 \cdot \sum_{i=1}^b n_i + CHF\ 0.05 \cdot \sum_{i=1}^b m_i + \sum_{i=1}^b \sum_{k=1}^u \max(|X_{i,k}| \cdot r_j, CHF\ 1.00) \quad (4.1)$$

which can be simplified to:

$$TF = MS + \sum_{i=1}^b \left(n_i \cdot CHF\ 0.25 + m_i \cdot CHF\ 0.05 + \sum_{k=1}^u \max(|X_{i,k}| \cdot r_j, CHF\ 1.00) \right) \quad (4.2)$$

where:

MS = membership fee

b = number of business days

n_i = number of clearing lines on day i

m_i = number of gross transactions on day i

u = number of ISINs that are open on day i

$X_{i,k}$ = weighted average net open position in ISIN k in CHF on day i

r_j = rate in %, based on the respective member's rating

Price example for an ICM:

We now want to calculate an ICM's approximate total clearing fee charge for one month given the following simplifying assumptions:

- The respective month has 22 trading days ($b = 22$)
- On average, the respective member has 50 trading ISINs ($n_i = u = 50, \forall i$) and approx. 1,000 gross transactions ($m_i = 1,000, \forall i$) per day i
- On average, the respective member has in any ISIN k a weighted average net open position of CHF 2,000,000 for any day i ($X_{i,k} = CHF\ 2'000'000, \forall i, k$)
- The respective member has a credit rating of A+ ($r_j = 0.00035\%$)

The membership fee (MS) is CHF 10,000 per year, i.e. CHF 833.35 per month.

Hence, the total clearing fee charge for the corresponding month amounts to:

$$\begin{aligned}
 TF &= CHF833.35 + 22 \cdot (50 \cdot CHF0.25 + 1'000 \cdot CHF0.05 + 50 \cdot \max(CHF2'000'000 \cdot 0.00035\%, CHF1.00)) \\
 &= CHF833.35 + 22 \cdot (CHF12.50 + CHF50.00 + 50 \cdot \max(CHF7.00, CHF1.00)) \\
 &= CHF833.35 + 22 \cdot (CHF62.50 + 50 \cdot CHF7.00) \\
 &= CHF833.35 + 22 \cdot CHF412.50 = CHF9'908.35
 \end{aligned}$$

Price example for a GCM with two NCMs:

Below is a calculation of the approximate total clearing fee charge of a GCM with two NCMs (NCM 1 and NCM 2).

Simplifying assumptions:

- The respective month has 22 trading days ($b = 22$)
- On average, the individual participants have approximately the following number of gross transactions per day:
 - GCM: 900 gross transactions
 - NCM 1: 250 gross transactions
 - NCM 2: 350 gross transactions

The average gross transactions thus amount per day to $900 + 250 + 350 = 1,500$ (i.e. $m_i = 1,500, \forall i$).

- On average, the individual participants trade approximately in the following number of clearing ISINs per day:
 - GCM: 40 clearing lines
 - NCM 1: 15 clearing lines
 - NCM 2: 20 clearing lines

As the clearing lines of GCMs are consolidated with those of its NCMs, the total of the clearing lines charged to the GCM is generally smaller than the sum of the clearing lines of the individual participants. In our example, we assume that the total of all offset clearing lines amount in average to 50 clearing lines per day (i.e. $n_i = u = 50 \leq 40 + 15 + 20, \forall i$).

- On average the individual participants have in a specific ISIN k per day the following weighted average net position (in absolute terms):
 - GCM: CHF 1,500,000
 - NCM 1: CHF 450,000
 - NCM 2: CHF 750,000

Based on the fact that the net positions of the three participants are netted at ISIN level, the total of the weighted average net position (in absolute terms) per ISIN is in general smaller than their total. In our example, we assume an average value of CHF 2,000,000 on any day i (i.e.

$$X_{i,k} = CHF\,2'000'000 \leq CHF\,1'500'000 + CHF\,450'000 + CHF\,750'000, \forall i, k$$

- The GCM's credit rating is A+ ($r_j = 0.00035\%$)

The membership fee (MS) of a GCM is CHF 10,000 per year. That of a NCM is CHF 2,400 per year. The membership fee charged to above GCM is therefore CHF 10,000 + 2 x CHF 2,400 = CHF 14,800 per year, i.e. CHF 1,233.35 per month.

The total clearing fee for the respective month thus amounts to:

$$\begin{aligned} TF &= CHF\,1'233.35 + 22 \cdot (50 \cdot CHF\,0.25 + 1'500 \cdot CHF\,0.05 + 50 \cdot \max(CHF\,2'000'000 \cdot 0.00035\%, CHF\,1.00)) \\ &= CHF\,1'233.35 + 22 \cdot (CHF\,12.50 + CHF\,75.00 + 50 \cdot \max(CHF\,7.00, CHF\,1.00)) \\ &= CHF\,1'233.35 + 22 \cdot (CHF\,87.50 + 50 \cdot CHF\,7.00) \\ &= CHF\,1'233.35 + 22 \cdot CHF\,437.50 = CHF\,10'858.35 \end{aligned}$$