

SWISS REFERENCE RATES RULES

CONTENTS

1.	Structure	1
1.1	Introduction	1
1.2	Basic framework	1
1.3	Composition	1
2.	Calculation of the Average Rate	2
2.1	Trades	2
2.2	Quotes	2
2.2.1	Quote filter	2
2.2.2	Quote rules	2
2.2.3	Quote volume	2
2.2.4	Restrictions	3
2.3	Formula	3
2.4	Sample calculation: reference price R_q	4
2.5	Calculation interval and publication times	5
3.	Calculation of the Current Rate	6
3.1	Trades and quotes	6
3.2	Formula	6
3.3	Sample calculation	6
3.4	Calculation interval and publication times	7
4.	Calculation of the Average and Current Index	8
4.1	Formula	8
4.2	Sample calculation	8
4.3	Calculation interval and publication times	8
5.	Trademark protection, use and licensing	9
5.1	Protection	9
5.2	Licensing	9
5.2.1	Free usage	9
5.2.2	Usage subject to licence	9
6.	Contact	10
7.	Static data	11
7.1	Average and Current Rate	11
7.2	Average and Current Index	11

The information contained in this document is given without warranty, implies no obligation of any kind on the part of SIX Group Ltd or the companies associated with SIX Group Ltd (referred to below as SIX Group Ltd) and may be altered by SIX Group Ltd at any time without further notice. To the extent permitted by law, SIX Group Ltd accepts no liability whatsoever for any errors contained in this document. SIX Group Ltd is under no obligation whatsoever to draw attention to such errors. Technical documentation must be used only in conjunction with the correct software version and may be used and copied only in accordance with the terms of the licence. All software described in the technical documentation is supplied on the basis of a licence agreement and may be used or copied only in accordance with the terms of the said licence agreement.

1. STRUCTURE

1.1 Introduction

Repo transactions are an important instrument in day-to-day liquidity management. To serve the financial markets, Swiss Exchange calculates and publishes CHF reference rates and indices for the various durations (overnight to 12 months). Specifications for reference rates have been drawn up in conjunction with the Swiss National Bank (SNB).

1.2 Basic framework

The reference rates and indices are based on transaction data from Eurex Zurich Ltd's CHF repo interbank market. Repo transactions are an important tool in the banks' day-to-day liquidity management. The repo transaction has advanced to become a major money market instrument around the world. The SNB also uses the repo market to implement its monetary policy.

Only standardised, CHF-denominated GC contracts¹ against fixed-income securities eligible for SNB repo transactions are used to calculate the reference rates and indices.

1.3 Composition

Swiss Reference Rates comprise 24 reference rates and two indices that cover a range of durations from overnight to 12 months. A further eight reference rates are calculated for IMM contracts².

		Swiss Reference Rates			
		Average Rates	Current Rates	Average Indices	Current Indices
Terms to maturity	Overnight OH	SARON	SCRON	SAION	SCION
	Tom/next TH	SARTN	SCR TN		
	Spot/next SH	SAR5N	SCR5N		
	1 Week 1W	SAR1W	SCR1W		
	2 Weeks 2W	SAR2W	SCR2W		
	3 Weeks 3W	SAR3W	SCR3W		
	1 Month 1M	SAR1M	SCR1M		
	2 Months 2M	SAR2M	SCR2M		
	3 Months 3M	SAR3M	SCR3M		
	6 Months 6M	SAR6M	SCR6M		
	9 Months 9M	SAR9M	SCR9M		
	12 Months 12M	SAR12M	SCR12M		
	IMM March Contract	SARMAR	SCRMAR		
	IMM June Contract	SARJUN	SCRJUN		
	IMM September Contract	SARSEP	SCRSEP		
	IMM December Contract	SARDEC	SCRDEC		

¹ GC contract: GC stands for General Collateral. In a repo transaction, the money that is loaned out is secured against securities of a defined quality that are drawn from a GC basket.

² IMM contracts: Exactly four contracts exist at any time: for March, June, September and December respectively. They all mature on the third Wednesday of the corresponding month. A contract always has a remaining term to maturity of less than one year. This term shortens with each trading day and converges with zero.

2. CALCULATION OF THE AVERAGE RATE

The Average Rate (rounded to six decimal places) is calculated on the basis of trades concluded (T_p), or on a reference price (R_q) that is itself based on quotes. The Average Rate is recalculated every time a trade is concluded or a new quote issued, providing they meet the following specifications.

2.1

Trades

The price of a trade and its volume (V_T) are fed directly in to the index calculation, providing the price is within the trade filter of 50 basis points (bp): $P_{n-1} - 50 \text{ bp} \leq T_p \leq P_{n-1} + 50 \text{ bp}$. Prices that correspond exactly to the marginal value are factored in to the calculation. There is no limit to trade volume. The Average Rate is not corrected if a trade is reversed.

2.2

Quotes

2.2.1

Quote filter

The reference price (R_q) is calculated on the basis of the quotes available in the order book, providing they lie within the quote filter³. The starting point for the quote filter is the median price (mid price, m), which lies halfway between the bid and ask sides. It corresponds to the volume-weighted average of the best buy and sell quotes. Measured at the mid price and rounded to five decimal places, the quote spread (q_n) amounts to three basis points: $m + 3 \text{ bp} \geq \text{quote} \geq m - 3 \text{ bp}$. The calculation factors in both quotes that correspond exactly to the marginal value and those which are available to only a selection of participants.

2.2.2

Quote rules

Any number of quotes may be used to calculate the reference price (R_q), providing the quotes concerned lie within the quote spread (q_n) and order book depth 10, i.e. a maximum of ten best buy and sell quotes are factored in to the calculation. Where quotes differ, one quote only from each bank will be included for each side of the order. Furthermore, it may be that the number of prices included from the ask side is greater than that from the bid side, and vice versa. If no quotes are available within the quote spread (q_n), the mid price (m) is used as the new reference price (R_q).

2.2.3

Quote volume

The volume of quotes is restricted to CHF 100 million. If there are several identical quotes on each side of the order, but their volumes differ, then the volumes of these quotes are aggregated

³ The use of a quote filter prevents quotes that diverge sharply from the current interest level distorting the Average Rate.

for the purposes of calculating the mid price (m). The aggregated volume is capped at CHF 100 million.


The volumes of identical quotes that lie within the quote spread (q_n) are cumulated and capped at CHF 100 million. The volumes given for the quotes that are to be factored in are also included in the calculation of average volume (no fractions), but the aggregated volume per quote is once again limited to CHF 100 million. This average volume is then fed into the recalculation of the Average Rate.

2.2.4
Restrictions

In the cases described below, the Average Rate is not recalculated and the last reference price remains valid:

- The order book contains quotes for only one side of the transaction (buy or sell), or contains no quotes at all.
- New quotes are entered in the order book, but they do not change the reference price (R_q) compared with its previous value, neither do they impact on the total volume for the reference price (R_q).
- Changes in volume relating to quotes that are already in the order book do not trigger a recalculation.
- The spread between the best buy and sell quotes exceeds 20 basis points.

2.3
Formula

	Formula	Legend
Average Rate (AR_n)	$AR_n = \frac{AR_{(n-1)} \cdot \sum_{j=1}^{n-1} v_j + p_n \cdot v_n}{\sum_{j=1}^n v_j}$	$\sum_{j=1}^{n-1} v_j$ = past volume for reference prices and trades used in calculating the reference rate
Trade filter	$P_{n-1} - 50 \text{ bp} \leq T_p \leq P_{n-1} + 50 \text{ bp}$	
Price (P_n)		P_n = relevant price for the calculation, based on a trade (T_p) or a reference price (R_q)
Volume (V_n)	if $P_n = T_p \rightarrow V_n = V_T$ if $P_n = R_q \rightarrow V_n = V_q$	T_p = price of a trade V_T = volume of a trade (unlimited)

Calculation of the Reference Price (R_q):

	Formula	Legend
Mid price (m):	$m = \frac{b \cdot v_b + s \cdot v_s}{v_b + v_s}$	b = best buy s = best sell v_b = volume b (max. 100 m.) v_s = volume s (max. 100 m.)
	<i>If $s=0$ and/or $b=0$ → no update</i>	
Quote spread (q_n)	$(m + 3 bp \geq q_n \geq m - 3 bp)$	q_n = buy and sell price within the spread
Reference price (R_q)	$R_q = \frac{\sum_{j=1}^n q_j \cdot v_j}{\sum_{j=1}^n v_j}$	q_j = quotes in q_n v_j = volume of quote j j = 1, 2, 3, ... max. volume per quote = CHF 100 m. max. aggregated volume for identical quotes = CHF 100 m.
Volume of R_q (V_q)	$V_q = \frac{\sum_{j=1}^n v_j}{n}$	V_q = average volume max. volume per quote = CHF 100 m. max. aggregated volume for identical quotes = CHF 100 m.
If $q_n = \{ \}$	$R_q = m$ and $V_q = (v_b + v_s) / 2$	v_b = volume b (max. 100 m.) v_s = volume s (max. 100 m.)

2.4

Sample calculation:
reference price R_q

Market participants may enter the price of a trade, and quotes, at up to six decimal places. Prices that correspond exactly to the marginal value are factored in to the calculation. In the example given below, a new quote triggers recalculation.

Size	Repo Rate	Repo Rate	Size
100c	0.760000		
100c	0.742000		
100c	0.735000		
50c	0.730000		
		0.705000	100c
		0.702000	100c
		0.690000	100c

Mid price = $\frac{0.73 \cdot 50 + 0.705 \cdot 100}{50 + 100} = 0.71333$

Quote spread = $0.68333 - 0.74333$
 → All quotes within the quote spread are considered to calculate the reference price.

Reference price $R_q = \frac{\Sigma (\text{Quote} \cdot \text{volume})}{\text{Aggregated volume}} = \frac{393.9}{550} = 0.7161818$

100	*	0.742	=	74.2
100	*	0.735	=	73.5
50	*	0.730	=	36.5
100	*	0.705	=	70.5
100	*	0.702	=	70.2
100	*	0.690	=	69.0
550				393.9

In order to compute the average rate, the average volume (V_q) has to be calculated first.

$V_q = \frac{550}{6} = 91.666667$

All quotes that lie within the quote spread (q_n) are used to calculate the reference price (R_q). They are weighted according to their volume, added together and finally divided by the total volume (the sum of all volumes for the quotes to be factored in to the calculation). The average volume must be taken into account in calculating the Average Rate.

2.5

Calculation interval and publication times

The Average Rate is calculated for the first time when the first constellation arises in the order book. It is published for the first time at 08.30 and for the last time at the end of the trading day. The Average Rates for different durations may have different cut-off times. The cut-off time determines the end of the trading day, and the rates for different durations may have different cut-off times. Since the cut-off time is not necessarily the same as the publication time for the Average Rate, the publication of the last Average Rate figure may fall outside the defined publication interval of ten minutes.

The market value of the Average Rate is published every day at 12.00, 16.00 and at the end of the trading day (no earlier than 18.00). These figures are referred to as fixed rates⁴.

Average Rates are calculated in real time but are published every ten minutes.

Reference rates and indices are calculated and published on all official trading days on the Swiss franc repo market.

All data is distributed by SIX Exfeed Ltd, a subsidiary of SIX Group Ltd.

⁴ Given the different trading hours, it may be that individual durations or interest rates have only two fixed rates (12.00 and the cut-off time) rather than the usual three average fixed rates (12.00, 16.00 and the cut-off time), or that the 16.00 fixed rate corresponds to that at the cut-off time.

3. CALCULATION OF THE CURRENT RATE

The Current Rate shows the progress of trading during the day and reflects the current market price. The Current Rate gives an indication of the direction in which the market is moving. It may thus also serve as an indicator of short-term shifts.

3.1

Trades and quotes

Rather than in real time, the Current Rate (rounded to six decimal places) is calculated and published every three minutes. It gives the last trade observed during the publication interval. In the absence of a trade during this period, the mid price is calculated and published as the Current Rate. Trades take precedence over the mid price, however. If no new trades have been concluded within the three-minute period, or no new quotes have been entered in the order book, the previous Current Rate is published again. This also applies if no trade has taken place and the spread between the best buy and sell quotes exceeds 20 basis points.

3.2

Formula

	Formula	Legend
Current Rate (CR _t)	If T exists in the interval prior to publication: $CR_t = T$ Otherwise: $CR_t = M$	T = Trade M = Mid price
Mid price (M):	$M = \frac{b + s}{2}$	b = best buy s = best sell
	If $s=0$ and/or $b=0$ → last available mid price	

3.3

Sample calculation

Time at which the Current Rate is published:
V1=08.30, V2=08.33, V3=08.36, V4=08.39

The intervals are:
up to 8:29:59 → V1
8:30:00-8:32:59 → V1
8:33:00-8:35:59 → V3
8:36:00-8:38:59 → V4

Timing	8.29	8.31	8.32	8.37
Best sell	0.59		0.60	0.65
Best buy	0.61		0.62	0.75
Trade		0.63		
M or T	M	T	M	M

Publication:

V1 (08.30):

→ No trade so far

→ $CR_{V1} = (0.59 + 0.61) / 2 = 0.60$

V2 (08.33):

→ Trade at 8:31 within the interval

→ $CR_{V2} = 0.63$

V3 (08.36):

→ No changes to quotes or trades

→ $CR_{V3} = CR_{V2} = 0.63$

V4 (08.39):

→ No trade within the interval

→ $CR_{V4} = (0.65 + 0.75) / 2 = 0.70$

3.4

Calculation interval and publication times

The Current Rate is published for the first time at 08.30 and for the last time at the end of the trading day. The Current Rates for different durations may have different cut-off times. The cut-off time determines the end of the trading day, and the rates for different durations may have different cut-off times. Since the cut-off time is not necessarily the same as the publication time for the Current Rate, the publication of the last Current Rate figure may fall outside the defined publication interval of three minutes.

The Current Rate is calculated immediately prior to publication in each case. This takes place every three minutes.

Reference rates and indices are calculated and published on all official trading days on the Swiss franc repo market.

All data is distributed by SIX Exfeed Ltd, a subsidiary of SIX Group Ltd.

4. CALCULATION OF THE AVERAGE AND CURRENT INDEX

For the "overnight" duration, SIX Swiss Exchange calculates and publishes two indices, on the basis of the Average and Current Rates respectively. These give the performance generated by daily overnight transactions.

4.1 Formula

	Formula	Legend
Index I_t	$I_t = I_T \left[1 + \left(\frac{SRR_T}{360} \right) D \right]$	<p>I = index</p> <p>t = closing price on the current trading day</p> <p>T = closing price on the last trading day prior to t</p> <p>SRR = Swiss Reference Rate (as a percentage) for the corresponding duration and price type</p> <p>D = number of calendar days between t and T</p> <p>Interest convention = current/360</p> <p>Publication at time t with date stamp t (no time stamp)</p>

4.2 Sample calculation

Index at time T : 100
 Swiss Reference Rate (overnight) at time T : 0.15
 Number of calendar days between t and T : 1

Index at time t :

$$I_t = 100 \left[1 + \left(\frac{0.15/100}{360} \right) 1 \right] = 100.000417$$

4.3 Calculation interval and publication times

The Current and Average indices are calculated and published once a day at the end of the trading day.

Reference rates and indices are calculated and published on all official trading days on the Swiss franc repo market.

All data is distributed by SIX Exfeed Ltd, a subsidiary of SIX Group Ltd.

5. TRADEMARK PROTECTION, USE AND LICENSING

5.1
Protection The names of the [Swiss Reference Rates](#) are internationally registered trademarks of SIX Swiss Exchange.

5.2
Licensing

5.2.1
Free usage The names of the [Swiss Reference Rates](#) may be freely used for the purpose of honest reporting of the relevant index. Insofar as it is technically possible, the symbols ® and ™ should be used, possibly with a footnote stating that these names are registered trademarks of SIX Swiss Exchange, Zurich.

5.2.2
Usage subject to licence Any additional use of the [Swiss Reference Rates](#) or any commercial use of the index figures (e.g., issue of index-linked financial instruments or capital insurance with or without mention of the trademark in the name or description) is only permissible with a valid licensing agreement. Any requests should be sent to the following address together with documentation of the planned products:

SIX Swiss Exchange Ltd
Index Department
Selnaustrasse 30
P.O. Box
CH-8021 Zurich

E-mail: indices@six-group.com

Offering prospectuses must include the following disclaimers, which is accessible via the [SIX Swiss Exchange Website](#).

6. CONTACT

Information concerning SIX Swiss Exchange indices (index adjustments, announcements etc.) is available at the following Internet address: http://www.six-swiss-exchange.com/indices/overview_en.html

SIX Swiss Exchange Ltd
Index Department
Selnaustrasse 30
P.O. Box
CH-8021 Zurich

E-mail: indices@six-group.com
Helpdesk: T +41(0)58 854 22 80

E-mail information service

Information on corporate events related to SIX Swiss Exchange equity indices is included in the weekly Investor Service Equity. You can subscribe to this e-mail service, which is free of charge, at the following link:

http://www.six-swiss-exchange.com/.../subscription_en.html

Telephone helpdesk

Our helpdesk is open on trading days from 8.30 a.m. to 12.00 noon and from 1.30 p.m. to 6.00 pm. Tel. helpdesk +41(0)58 854 22 80.

7. STATIC DATA

7.1

Average and Current Rate

Name	Kurzname	Symbol	ISIN
SAR Swiss Average Rate ON	SAR ON	SARON	CH0049613687
SAR Swiss Average Rate TN	SAR TN	SARTN	CH0049613703
SAR Swiss Average Rate SN	SAR SN	SARSN	CH0049613711
SAR Swiss Average Rate 1W	SAR 1W	SAR1W	CH0049613737
SAR Swiss Average Rate 2W	SAR 2W	SAR2W	CH0049613745
SAR Swiss Average Rate 3W	SAR 3W	SAR3W	CH0049613752
SAR Swiss Average Rate 1M	SAR 1M	SAR1M	CH0049613760
SAR Swiss Average Rate 2M	SAR 2M	SAR2M	CH0049613778
SAR Swiss Average Rate 3M	SAR 3M	SAR3M	CH0049613786
SAR Swiss Average Rate 6M	SAR 6M	SAR6M	CH0049613802
SAR Swiss Average Rate 9M	SAR 9M	SAR9M	CH0049613810
SAR Swiss Average Rate 12M	SAR 12M	SAR12M	CH0049613828
SAR Swiss Average Rate MAR	SAR MAR	SARMAR	CH0049613836
SAR Swiss Average Rate JUN	SAR JUN	SARJUN	CH0049613851
SAR Swiss Average Rate SEP	SAR SEP	SARSEP	CH0049613869
SAR Swiss Average Rate DEC	SAR DEC	SARDEC	CH0049613885
SCR Swiss Current Rate ON	SCR ON	SCRON	CH0049613901
SCR Swiss Current Rate TN	SCR TN	SCR TN	CH0049613919
SCR Swiss Current Rate SN	SCR SN	SCR SN	CH0049613927
SCR Swiss Current Rate 1W	SCR 1W	SCR1W	CH0049613935
SCR Swiss Current Rate 2W	SCR 2W	SCR2W	CH0049613950
SCR Swiss Current Rate 3W	SCR 3W	SCR3W	CH0049613968
SCR Swiss Current Rate 1M	SCR 1M	SCR1M	CH0049613976
SCR Swiss Current Rate 2M	SCR 2M	SCR2M	CH0049613984
SCR Swiss Current Rate 3M	SCR 3M	SCR3M	CH0049613992
SCR Swiss Current Rate 6M	SCR 6M	SCR6M	CH0049614008
SCR Swiss Current Rate 9M	SCR 9M	SCR9M	CH0049614016
SCR Swiss Current Rate 12M	SCR 12M	SCR12M	CH0049614024
SCR Swiss Current Rate MAR	SCR MAR	SCR MAR	CH0049614032
SCR Swiss Current Rate JUN	SCR JUN	SCR JUN	CH0049614040
SCR Swiss Current Rate SEP	SCR SEP	SCR SEP	CH0049614057
SCR Swiss Current Rate DEC	SCR DEC	SCR DEC	CH0049614065

7.2

Average and Current Index

Name	Kurzname	Symbol	ISIN
Swiss Average Index ON	SAI ON	SAION	CH0100517157
Swiss Current Index ON	SCI ON	SCION	CH0100484986

A current list of all indices calculated by SIX Swiss Exchange is accessible at the SIX Swiss Exchange Website: www.six-swiss-exchange.com/.../calculated_indices.xls.