

CALCULATION METHODOLOGY

Calculation Methodology for the ABS Benchmarks



ABS Benchmarks Administration Co. Pte Ltd

absCo@abs.org.sg

4 January 2016

A. Introduction

ABS Benchmarks Administration Co Pte Ltd (ABS Co.) was setup in June 2013 specifically to own and administer the ABS Benchmarks in Singapore - the Singapore Interbank Offered Rate (SGD SIBOR), the Singapore Dollar Swap Offer Rate (SGD SOR), the Singapore Dollar Spot FX and the Thai Baht Spot FX. It is a fully owned subsidiary of the Association of Banks in Singapore (ABS).

ABS Co. has appointed Thomson Reuters, as the Calculation Agent to calculate and determine the Benchmarks on its behalf. The Calculation Agent may, with ABS Co.'s consent, disseminate the Benchmarks to any other third party information provider requesting the publication of the Benchmarks on its platform. All transactional data captured by the Calculating Agent will remain confidential, provided however, that transactional data may be made available to the Administrator, any relevant regulatory authority, or any other party appointed by the Administrator or the Monetary Authority of Singapore. Market participants shall only have access to the final Rates upon determination and publication, and not the transactional data used to construct the Rates.

This document details the calculation methodology for all the Benchmarks administered by ABS Co., and replaces the 2013 Trading Protocol.

B. Calculation Methodology: Singapore Interbank Offered Rate (SGD SIBOR)

Benchmark	Singapore Interbank Offered Rate (SGD SIBOR)
Description	The rate at which an individual Contributor Bank could borrow funds, were it to do so by asking for and then accepting the interbank offers in reasonable market size, just prior to 11:00 a.m. Singapore time.
SIBOR Contribution Process	<p>On each Business Day, Contributor Banks will contribute rates for the Singapore Interbank Offered Rate (SGD SIBOR) for deposits as follows:</p> <ol style="list-style-type: none"> 1. Contributor Banks will contribute the rate at which it could borrow funds, were it to do so by asking for and then accepting the interbank offers in reasonable market size, just prior to 11:00 a.m. Singapore time. 2. The rates shall be for deposits in Singapore Dollars, for such maturities and according to the agreed conventions. 3. Each Contributor Bank shall contribute their rates without reference to rates contributed by other Contributor Banks. 4. The rates shall be for deposits: <ol style="list-style-type: none"> a. in reasonable market size; b. that are simple and unsecured; and c. governed by the laws of Singapore, where the parties are subject to the jurisdiction of the courts of Singapore. 5. Maturity dates for the deposits shall be subject to the ISDA Modified Following Business Day Convention, which means that if the maturity date of a deposit falls on a day that is not a Business Day, the maturity date shall be the first following day that is a Business Day, unless that day falls in the next calendar month, in which case the maturity date will be the first preceding day that is a Business Day. 6. The rates shall be contributed up to five decimal places.
SGD SIBOR Contributor Banks	<p>Each bank in the panel of Contributor Banks is selected and determined by the Administrator.</p> <p>A minimum of 12 Contributor Banks shall submit rates for each maturity.</p>
Contribution Time	11:00 am to 11:10 am, Singapore time
Calculation Methodology	<ol style="list-style-type: none"> 1. On each Business Day, the Administrator shall calculate and determine the Rate using trimmed arithmetic mean of the contributed rates. 2. The contributed rates will be ranked in order, the top and bottom quartiles will be removed, with the remaining rates averaged arithmetically. 3. The arithmetic mean shall be published as the Rate.

Day/Time of Benchmark Publication	Each Singapore Business Day, from Monday to Friday 11.30 am, Singapore time
Day Count	Actual/365 (Fixed)
Maturities	<ul style="list-style-type: none"> • 1 month • 3 months • 6 months • 12 months
Publication Page	Thomson Reuters - ABSIRFIX01, Bloomberg - ABSI
No. of Decimal Points	5 decimal places, round to nearest
Corrections to Rate	<ol style="list-style-type: none"> 1. Any errors must be promptly reported to ABS Co by latest 3.00pm Singapore time that day, for an intraday re-fix to be considered. 2. If an intraday re-fix is under consideration, ABS Co will: <ol style="list-style-type: none"> a. make an announcement on the ABS Announcements page shortly after 3.00pm Singapore time, that a re-fix is under consideration, stating the affected tenor, and b. any re-fixed rates will be published by ABS Co no later than 4.00pm Singapore time that day. c. send out an email announcement to all SIBOR contributing banks on the re-fix. 3. The materiality threshold for an intraday re-fix is +/-3 bps of the published SIBOR. 4. When a re-fix is carried out, it will be a re-fixing of the SIBOR rate "as of 11.00am" to ensure that the re-fixed SIBOR would be the rate referenced under existing market standard documentation in the loan market.
Fallback (Insufficient Contributed Rates)	If, on any Business Day, the submissions from less than 12 Contributor Banks for any maturity are received, the Administrator shall issue a notice that SGD SIBOR for that maturity and that Business Day cannot be published due to insufficient number of submissions.

C. Calculation Methodology: Singapore Dollar Spot FX

Benchmark	Singapore Dollar Spot FX
Description	The US Dollar (USD)/Singapore Dollar (SGD) spot rate for the Valuation Date expressed as the amount of Singapore Dollars per one US Dollar.
Valuation Description	The Administrator shall calculate and determine the Rate based on the Volume Weighted Average Price ("VWAP") of Qualifying Transactions.
Valuation Date	Each Singapore Business Day, from Monday to Friday.
Day/Time of Benchmark Publication	11:30 am, Singapore time on each Valuation Date
Qualifying Transactions	Any Type of Trade which satisfies all of the following: <ul style="list-style-type: none"> (a) having a notional amount equal to or exceeding the Minimum Notional; (b) electronically routed and captured through an Approved Broker¹; (c) traded during the Qualifying Window; and (d) traded between interbank counterparties.
Type of Trades	USD/SGD spot foreign exchange transactions
Minimum Notional	USD 1,000,000
Qualifying Window	10:30 am to 11:00 am, Singapore time
No. of Decimal Points	4 decimal places, round to nearest
Publication Page	Thomson Reuters - ABSFIX01, Bloomberg - ABSI
Corrections to Rate	Any corrections to the published Rate must be published within 60 minutes following the Publication Time.
Fallback (Insufficient transactional data for VWAP calculation) <i>Note: The publication of the Rate for the preceding Business Day is a calculation methodology fallback procedure to address periods where transactional data may not be available and is not intended to invoke any contractual fallback in transactions between counterparties that reference the Rate as the Rate is still published.</i>	Fallback Trigger: A Fallback Trigger occurs if there is no Qualifying Transaction traded during the Qualifying Window. Fallback Procedure: If Fallback Trigger occurs, the Rate for the preceding Business Day will be published. Provided that if Fallback Trigger continues to occur for 2 consecutive Business Days, then no Rate shall be published on the 3 rd and each following Business Day that the Fallback Trigger continue to occur.

¹ An "Approved Broker" refers to any money broker in the list of approved money brokers in the Monetary Authority of Singapore ("MAS") Directory of Financial Institutions.

D. Calculation Methodology: Thai Baht Spot FX

Benchmark	Thai Baht Spot FX
Description	The US Dollar (USD)/Thai Baht (THB) spot rate for the Valuation Date expressed as the amount of Thai Baht per one US Dollar.
Valuation Description	The Administrator shall calculate and determine the Rate for each Valuation Date based on the Volume Weighted Average Price ("VWAP") of Qualifying Transactions.
Valuation Date	Each Singapore and Bangkok Business Day, from Monday to Friday.
Day/Time of Benchmark Publication	11:30 am, Singapore time on each Valuation Date
Qualifying Transactions	Any Type of Trade which satisfies all of the following conditions: <ul style="list-style-type: none"> (a) having a notional amount equal to or exceeding the Minimum Notional; (b) with at least one counterparty outside Thailand; (c) electronically routed and captured through an Approved Broker²; (d) traded during the Qualifying Window; and (e) traded between interbank counterparties.
Type of Trades	USD/THB spot foreign exchange transactions
Minimum Notional	USD 1,000,000
Qualifying Window	10:30 am to 11:00 am, Singapore time
No. of Decimal Points	3 decimal places, round to nearest
Publication Page	Thomson Reuters - ABSFIX01, Bloomberg - ABSI
Corrections to Rate	Any correction to the published Rate must be published within 60 minutes following the Publication Time.

² An "Approved Broker" refers to any money broker in the list of approved money brokers in the Monetary Authority of Singapore ("MAS") Directory of Financial Institutions.

Fallback (Insufficient transactional data for VWAP calculation)

Note: The publication of the Rate for the preceding Business Day is a calculation methodology fallback procedure to address periods where transactional data may not be available and is not intended to invoke any contractual fallback in transactions between counterparties that reference the Rate as the Rate is still published.

Fallback Trigger: A Fallback Trigger occurs if there is no Qualifying Transaction traded during the Qualifying Window.

Fallback Procedure: If Fallback Trigger occurs, the Rate for the preceding Business Day will be published. Provided that if Fallback Trigger continues to occur for 2 consecutive Business Days, then no Rate shall be published on the 3rd and each following Business Day that the Fallback Trigger continue to occur.

E. Calculation Methodology: Singapore Dollar Swap Offer Rate (SOR)

Benchmark	Singapore Dollar Swap Offer Rate (SOR)
Description	The synthetic rate for deposits in Singapore Dollars (SGD), which represents the effective cost of borrowing the Singapore Dollars synthetically by borrowing US Dollars (USD) for the same maturity, and swap out the US Dollars in return for the Singapore Dollars.
Calculation Methodology	<p>The Administrator shall calculate and determine the Rate, for each maturity matching each Tenor specified below (each a "calculation period"), on each Business Day as follows:</p> <p>SGD SOR =</p> <div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 10px auto;"> $\left\{ \left[\left(\frac{\text{Spot Rate} + \text{Forward Points}}{\text{Spot Rate}} \right) \times \left(1 + \frac{\text{USD Rate} \times \# \text{ days}}{360} \right) \right] - 1 \right\} \times \frac{365}{\# \text{ days}} \times 100$ </div> <p>Where:</p> <p>USD Rate means the rate for deposits in USD for a period of the calculation period which appears on Thomson Reuters Screen LIBOR01 (or successor page displaying USD LIBOR) as of 11:00 am, London time, on the same Business Day.</p> <p>#days means the actual number of days in the calculation period.</p> <p>Spot Rate means, in relation to all Qualifying Transactions, the volume weighted average rate calculated as follows:</p> $\sum(\text{SGD Principal}_i * \text{Spot Rate}_i) / \text{SGD Aggregate Principal}$ <p>SGD Principal_i means, in relation to a Qualifying Transaction, the notional amount of that Qualifying Transaction.</p> <p>SGD Aggregate Principal means the aggregate notional amounts of all Qualifying Transactions.</p> <p>Spot Rate_i means, in relation to a Qualifying Transaction, the spot rate (or currency exchange rate) for the near leg of that Qualifying Transaction.</p> <p>Forward Points means, in relation to all Qualifying Transactions, the volume weighted average rate calculated as follows:</p> $\sum(\text{SGD Principal}_i * \text{Forward Point}_i) / \text{SGD Aggregate Principal}$

	<p>“SGD Principal_i” means, in relation to a Qualifying Transaction, the notional amount of that Qualifying Transaction.</p> <p>“SGD Aggregate Principal” means the aggregate notional amounts of all Qualifying Transactions.</p> <p>“Forward Point_i” means, in relation to a Qualifying Transaction, the difference between the spot rate (or currency exchange rate) for the near leg and the forward rate (or currency exchange rate) for the far leg of that Qualifying Transaction.</p> <p><i>Please refer to the Example below for an illustration of the calculation of “Spot Rate” and “Forward Points”</i></p>
Qualifying Transactions	<p>Any Type of Trade which satisfies all of the following conditions:</p> <ul style="list-style-type: none"> (a) having a notional amount equal to or exceeding the Minimum Notional; (b) with at least one counterparty in Singapore; (c) electronically routed and captured through an Approved Broker³; (d) traded during the Qualifying Window; (e) with maturities matching the Tenors specified below; and (f) traded between interbank counterparties.
Type of Trades	SGD FX Swaps (with maturities matching the Tenors specified below)
Qualifying Window	SGD FX Swaps: 7:30 am to 4:30pm, Singapore time
Minimum Notional	USD 1,000,000
Tenors	Overnight, 1 month, 3 months and 6 months
Day/Time of Benchmark Publication	<ul style="list-style-type: none"> • SGD SOR for 1 month, 3 months and 6 months will be published on each day that is a Singapore and London Business Day, from Monday to Friday. • The Overnight SGD SOR will be published on each day that is a Singapore, London and New York Business Day, from Monday to Friday <p>Spot Rate: 4:45pm, Singapore time Forward Points: 4:45pm, Singapore time SGD SOR: 12:00 noon, London Time (7:00pm or 8:00pm, Singapore time)</p> <p>In addition to the Rate (SGD SOR), the Spot Rate and Forward Points, for each tenor will also be published.</p>

³ An “Approved Broker” refers to any money broker in the list of approved money brokers in the Monetary Authority of Singapore (“MAS”) Directory of Financial Institutions.

Publication Page	Thomson Reuters - ABSFIX01, Bloomberg - ABSI										
Corrections to Rate	Any correction to the Rate must be published within 90 minutes following the Publication Time.										
<p data-bbox="164 405 400 640">Fallback (Insufficient transactional data for VWAP calculation and/or USD Rate is not available)</p> <p data-bbox="164 719 424 1111"><i>Note: The publication of the Rate for the preceding Business Day is a calculation methodology fallback procedure to address periods where transactional data may not be available and is not intended to invoke any contractual fallback in transactions between counterparties that reference the Rate as the Rate is still published.</i></p>	<p data-bbox="456 405 1453 517">Fallback Trigger: In respect of any tenor, a Fallback Trigger occurs if (a) there is no Qualifying Transaction traded during the Qualifying Window; and/or (b) USD Rate is not available.</p> <p data-bbox="456 562 703 595">Fallback Procedure:</p> <ol data-bbox="496 607 1461 875" style="list-style-type: none"> 1. If the Fallback Trigger occurs in respect of any tenor, the Rate for that tenor for the preceding Business Day shall be published. 2. The Fallback Procedure in Paragraph 1 above can be invoked for a maximum of 2 consecutive Business Days. 3. If the Fallback Trigger continues to occur on the 3rd consecutive Business Day, the Administrator shall calculate a substitute rate for that tenor as follows: <p data-bbox="552 931 616 965">A - B</p> <p data-bbox="552 1010 639 1043">Where:</p> <p data-bbox="552 1088 1453 1290">“A” means a rate equal to SGD SIBOR (published on the 3rd consecutive Business Day of the Fallback Trigger) for an equivalent tenor, provided that “A” means SGD SIBOR of 1 month tenor for the purposes of calculating a substitute rate or Overnight SGD SOR due to the unavailability of Overnight SGD SIBOR.</p> <p data-bbox="552 1335 1453 1447">“B” means a rate equal to SGD SIBOR minus SGD SOR (both as previously published on the Business Day preceding the day the Fallback Trigger first occurred).</p> <table border="1" data-bbox="635 1491 1177 1704"> <thead> <tr> <th>Tenor</th> <th>SIBOR – SOR Spread</th> </tr> </thead> <tbody> <tr> <td>SOR ON*</td> <td>SIBOR 1M – SOR ON</td> </tr> <tr> <td>SOR 1M</td> <td>SIBOR 1M – SOR 1M</td> </tr> <tr> <td>SOR 3M</td> <td>SIBOR 3M – SOR 3M</td> </tr> <tr> <td>SOR 6M</td> <td>SIBOR 6M – SOR 6M</td> </tr> </tbody> </table> <p data-bbox="552 1749 1358 1783">* SIBOR 1M will be used to calculate the substitute rate for SOR ON.</p>	Tenor	SIBOR – SOR Spread	SOR ON*	SIBOR 1M – SOR ON	SOR 1M	SIBOR 1M – SOR 1M	SOR 3M	SIBOR 3M – SOR 3M	SOR 6M	SIBOR 6M – SOR 6M
Tenor	SIBOR – SOR Spread										
SOR ON*	SIBOR 1M – SOR ON										
SOR 1M	SIBOR 1M – SOR 1M										
SOR 3M	SIBOR 3M – SOR 3M										
SOR 6M	SIBOR 6M – SOR 6M										

Example: Calculation of 6-mth SGD SOR

										Method: VWAP of Spot Rate and VWAP of Forward Points	
	Spot	Forward	Spot	Forward Point	Forward	Principal (in USD)	SGD Principal	Term	Day Count	Weighted Spot (= Spot Rate i * SGD Principal i)	Weighted Forward Points (= Forward Point i * SGD Principal i)
727706	12/03/2013	12/09/2013	1.2460	-0.000400	1.245600	50,000,000	62,300,000	6 Months	184	77625800.00	-24920.00
727738	12/03/2013	12/09/2013	1.2461	-0.000350	1.245750	159,697,490	198,999,042	6 Months	184	247972706.01	-69649.66
727758	12/03/2013	12/09/2013	1.2461	-0.000340	1.245760	240,747,280	299,995,185	6 Months	184	373824000.10	-101998.36
727765	12/03/2013	12/09/2013	1.2465	-0.000370	1.246130	48,149,456	60,018,297	6 Months	184	74812806.95	-22206.77
727769	12/03/2013	12/09/2013	1.2460	-0.000310	1.245690	102,718,839	127,987,674	6 Months	184	159472641.48	-39676.18
727774	12/03/2013	12/09/2013	1.2458	-0.000300	1.245500	138,039,518	171,969,631	6 Months	184	214239766.67	-51590.89
727789	12/03/2013	12/09/2013	1.2460	-0.000300	1.245700	80,249,093	99,990,370	6 Months	184	124588001.16	-29997.11
727836	12/03/2013	12/09/2013	1.2467	-0.000320	1.246380	72,980,642	90,984,966	6 Months	184	113430957.09	-29115.19
727838	12/03/2013	12/09/2013	1.2464	-0.000400	1.246000	40,115,533	50,000,000	6 Months	184	62319999.99	-20000.00
						Total	1162245164.80	Total		1448286679.46	-389154.17
						"SGD Aggregate Principal"		Volume Weighted Average of Spot Rate i		"Spot Rate" in the formula (This figure to be published at 4:45pm SG Time)	1.2461
								Volume Weighted Average of Forward Point i		"Forward Points" in the formula (This figure to be published at 4:45pm SG Time)	-0.000335

Calculation of 6-month SGD SOR

'USD Rate' on 12th March = 0.4459 %
 '#days' = 184
 'Spot Rate' (blue cell) = 1.2461
 'Forward Points' (green cell) = -0.000335

$$\text{SGD SOR} = \left\{ \left[\left(\frac{\text{Spot Rate} + \text{Forward Points}}{\text{Spot Rate}} \right) \times \left(1 + \frac{\text{USD Rate} \times \# \text{ days}}{360} \right) \right] - 1 \right\} \times \frac{365}{\# \text{ days}} \times 100$$

$$= \left\{ \left[\left(\frac{1.2461 + (-0.000335)}{1.2461} \right) \times \left(1 + \frac{(0.4459\% \times 184)}{360} \right) \right] - 1 \right\} \times \frac{365}{184} \times 100$$

= 0.39867 ← To be published at 1200hrs London Time (7pm or 8pm SG Time)