Algo Due Diligence Template

GENERAL
This general section outlines the core features of the algorithm. Providers may consolidate answers 1–5 into a table or grid if they wish to cover multiple algorithms with the same template.

Q1	Algo Provider (also referred to as "you" or "your" below as required):
A1	Bank of America, N.A.and certain affiliates (BofA). (See CLS Bank Public register link: https://www.globalfxc.org/global_index.htm)
Q2	Algo name(s):
A2	BofA's eFX Global Algo Strategy Guide provides information on available algos and may be accessed using the following link: *BofA eFX Algo Strategy Guide*
Q3	Liquidity type (internal, external, hybrid):
A3	BofA uses a hybrid liquidity model where customers may select external as well as BofA internal liquidity for algo execution. BofA's algos include default settings for liquidity source selection and other parameters that may differ across algos. BofA pre-selects external liquidity sources for its algorithms based upon such factors as it determines relevant, including but not limited to, the algo's objectives, relative source liquidity and fill rates. BofA algos route orders depending on the trading objective of the algo. For certain algos, where customer elects to include BofA's internal matching engine (IME) and one or more external trading venues as liquidity sources, customer orders may be placed in the IME irrespective of whether the same pricing is available on an external liquidity source; and (ii) where customer selects an external trading venue for algorithm customer order execution, (a) such external trading venue may include BofA liquidity; and (b) any residual amount may be placed in BofA's IME for execution.
Q4	Products covered (spot, NDF):
A4	Spot FX

Q5	Description[1] of algo(s):
A5	BofA's eFX Global Algo Strategy Guide provides information on available algos and may be accessed using the following link: *BofA eFX Algo Strategy Guide*
Q6	Please describe any parameters or controls the user may adjust:
A6	BofA offers a number of algos, which are designed to meet different execution objectives, and may differ in urgency of execution, willingness to cross the bid-offer spread and use of limit orders. Each algo has default parameters that may be accepted or overridden by the customer. Customers should familiarize themselves with the intended purpose of each algo and the respective parameter controls to ensure that algorithm selection and use is appropriate to their execution objectives.
Q7	Please specify if the product is built internally or externally:
A7	All BofA algos have been developed and are supported internally at BofA.

CONFLICTS OF INTEREST

Some conflicts of interest may be expected but it is important to know what they are and what steps have been taken to manage them. This way the Algo User can make an informed decision.

Q8	If principal liquidity interacts with the Algo User's order, how does this happen and what steps are taken to ensure the fill is a fair one from the order's point of view?
A8	Any customer order fill via an algorithmic trading strategy that interacts with BofA principal liquidity is tagged as "IPE" (Internal Pricing Engine), as the execution venue tag. Please see answers to 16, 18, 21, and 22 for more information on BofA System Order Router (SOR) functionality, how liquidity pools are curated, internalization and the segregation between principal and customer algo execution. BofA's IPE is subject to the same internal governance procedures as other external venues for consistency across liquidity sources accessed by BofA algos.
Q9	If another part of your business needs to hedge or trade in the same direction as the Algo User's order, how are fills allocated between the two?
A9	

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[1] You may find it helpful to refer to the 'algo archetypes' delineated in section 2.1 of FX execution algorithms and market functioning

	Algo orders are treated individually and filled on a price-time priority basis regardless of the source of the order (internal or external)
Q10	Are there any particular commercial interests in trading venues or other relevant service providers that interact with the algorithm provided by you? If so, how are such conflicts addressed?
A10	BofA is one of fifteen banks with an ownership stake in FXSpotstream (FSS), which operates an FX trading venue. BofA's investment in FSS does not influence BofA algo order routing decisions.
Q11	Please elaborate on your role as regards market risk, counterparty risk, and settlement risk.
A11	BofA operates within robust risk management framework, which includes market risk, order size, counterparty credit risk and settlement limits. Electronic order acceptance and execution is subject to fat finger limits and automated customer credit limit checks, as well as controls that limit potential market impact, such as urgency of execution or order throughput. Orders that exceed approved limits for a customer result in order rejects back to the customer EMS / OMS. BofA systematically monitors order status and execution performance before, during and post execution. In addition, BofA algos are subject to a rigorous algo governance process, which covers the development, implementation and control framework for all execution algos. This includes periodic review and algo change procedures for new and existing algorithms. Settlement risk is controlled by maximum daylight delivery (MDD) limits, netting and settlement through payment vs. payment FMUs, such as CLS Bank, where possible.
Q12	Is there anything else of which you feel the Algo User should be aware?
A12	Please see BofA's FX Trading Disclosures document available through the following link: *BofA FX Trading Disclosures*

ALLOCATION POLICY

There are many different approaches to allocations. It is important to understand what happens in circumstances where multiple clients wish to trade or, indeed, when one order would be used to fill the order of another client.	
Q13	If you have more than one client order wishing to trade in the same pair and on the same side, how are fills allocated amongst these orders?
A13	BofA algos generate discrete child orders, which are placed on execution venues, which may be both external and the BofA IME. Orders are filled based on a price- time priority basis. Parent order scheduling, slicing, and displayed

	quantity can affect and determine respective fill rates across two or more orders in the same pair and direction.
Q14	If two client orders are eligible for execution netting, how does this process work?
A14	Please see the answer to 21 below.

ROUTING POLICY	
Routing policy is an important topic. There are several components such as how execution venues are evaluated, curated, and prioritised. Also covered is the question of what fair-value mid the algo uses to make routing decisions and how information leakage is avoided when placing lit orders. Finally, internalisation is defined: some providers have a strict definition such as 'two algo orders netting' whereas others will include midbooks and trades where they have shown a skew through mid externally to incentivise another counterparty to fill them.	
Q15	How are hedging execution venues evaluated, including both observable (spread, impact) and implicit costs (information leakage)?
A15	Hedging execution venue performance is regularly evaluated based on spread, market impact and information leakage. The costs of misses and fill times are also considered. Expected thresholds are defined for hedging costs and any breach of these is investigated.
Q16	How do you prioritise between different execution venues (both external and internal sources) when routing orders?
A16	Liquidity is sourced via a common execution framework within the BofA SOR. For urgent execution, an optimizer is used to select performing venues (both sweep-able and full amount). This is based on current order book elements, historic fill ratios, mark outs and the likelihood of fill. For posting or tracking via passive venue selection, the venue weight is benchmarked based on spread capture performance and trading activity, including fill probability and market share. This is updated periodically based on regular execution quality reviews to improve execution outcomes. For more on internalization, please see answer 21 below.
Q17	If multiple clients enter orders in the same pair, will you aggregate these orders before placing orders externally or treat each client order individually and place multiple similar orders, which may compete with one another for fills?
A17	Algo orders are not aggregated and are treated as individual orders for execution.
Q18	What – if any – ongoing work do you do in order to curate execution venues, where curation is possible? Approximately how often is this conducted?
A18	BofA actively reviews venues and strategy performance to ensure the efficacy of the BofA SOR. Key data and metrics used for analysis are aggregated at the

	venue, strategy and instrument level and include fill ratio, order duration, mark outs, round trip latency, parent level performance and post trade reversion.
Q19	Do you have any logic to avoid orders on venues where the order book is visible to all participants (lit execution venues) causing information leakage? If so, please describe it.
A19	There is no explicit logic to avoid orders on venues based on order book visibility, but information leakage becomes apparent through the ongoing venue analysis and management process, which is used to inform our BofA SOR.
Q20	Does the mid/fair-value used by the algorithm differ from the one used by your own market making system for pricing and risk management? If yes, please specify.
A20	Customer algo strategies use the same pricing strategies as our market-making algos.
Q21	Please define your understanding of 'internalisation' and, using an example, describe how this works in practice, demonstrating if/how your Algo Clients benefit from this process. If you wish to do so you may provide an indication of how much volume is internalised on average.
A21	There are three types of internalisation offered: • The first is the process of offsetting algo risk with liquidity from BofA franchise customers via BofA's Internal Matching Engine (IME), where algo interest is shown to customers and resulting customer trades are passed directly to the active algorithm; • The second form of internsalisation is through the matching of overlapping trading schedules within the spread via the IME, for example two opposing TWAP strategies; and • The third form of internalisation is execution against the BofA Internal Pricing Engine (IPE) risk price.

SEGREGATION POLICY

Segregation policy is all about keeping order information private and reducing the risk of signalling.

Q22	Please describe if and how the algo orders are segregated within your institution.
A22	Instinct FX, BofA's platform for electronic FX trading, user access is controlled through assigned Permission, Role and Screen Authorizations, which are standardized by user type across FX Sales, eFX Sales and Trading. Instinct FX user access follows a "need-to-know" principle, as follows: **FX Sales**

	FX Sales is organized into Functional Sales Groups (e.g., Institutional, LCT, Corporate and eFX). When an algo order is entered to Instinct FX by a sales person on behalf of a customer, the order, as well as trades executed therefrom, are visible to the submitting salesperson and other sales people in the same Functional Sales Group. **eFX Sales** eFX Sales, which is responsible for assisting customers with electronic trading, has system-level access to the electronic order book and can view all electronic orders (with the exception of fixing orders), including algos, as well as trades executed therefrom. This includes algo orders entered directly to Instinct FX by a customer. Electronic orders entered directly to Instinct FX by customers are only visible to ETS Trading, which manages electronic trading of FX, and eFX Sales. **Trading** ETS Trading is responsible for electronic resting and algo order execution and has system-level access to the electronic order book. ETS Trading is able to view algo child order fills during algo order execution and the single trade booked to the customer upon completion of algo order execution. All other trading desks have restricted electronic order book access and may only access electronic orders submitted by traders within their own trading group (e.g., FX Spot, FX Forwards, FX Options, etc.). Apart from ETS Trading, no other trading desks have access to child order fills during algo order execution or executed customer algo trades in Instinct FX.
Q23	Can sales and trading personnel who provide intraday 'market colour' view algo orders at any stage? If so, what steps have been taken to minimise the risk of information leakage?
A23	Sales and trading access restrictions to customer algo orders is detailed in 22. BofA policies regarding market colour permit only anonymized information and are consistent with the FX Global Code.
Q24	Can discretionary traders who may enter or exit risk for your institution view algo orders at any stage? If so, what steps have been taken to minimise the risk of information leakage?
A24	ETS Trading is the only trading desk that has access to customer algo orders.
Q25	Can an electronic market making system view algo orders at any stage? If so, what steps have been taken to minimise the risk of information leakage or misuse of information?
A25	Electronic market making algorithms do not have access to customer algo order information.
Q26	Are algo order flows included in any market positioning tools or analyses that other clients may use?

A26	Customer algo order flows are not included in flow or positioning analysis.

SAFETY FEATURES

Safety features might include fat-finger limits, kill switches or protections that automatically suspend the order when it trades too fast or in certain market conditions.

Q27	Please describe any in-built safety features you have that may cause an order to be suspended or rejected.
A27	Order controls include limit price collars, price drift and spread checks to mitigate the effect of negative external events. BofA also uses automated kill switches, which may be activated in the event of market volatility or PnL events. Examples of hard limit checks carried out for orders may include, but are not limited to: • Maximum amount per order • Aggressive and passive price tolerance checks • Credit limit • Enabled currency pairs • Maximum orders per time period
Q28	Please explain what you have done, and will continue to do, to ensure the integrity of the electronic trading system you provide for clients to use (including the system's reliability, security, capacity and contingency measures).
A28	BofA's Algo Governance Routine oversees electronic trading at BofA and applies control standards to ensure trading system integrity. In addition, eFX Technology and FX Support groups monitor system activity and performance metrics to ensure such are operating within capacity and latency tolerances. ETS Trading and support/technology partners are available globally, 24 hours / 5.5 days a week, to ensure optimal performance.

TCA

TCA is an increasingly important part of the service. Where the TCA is not third party it is important to understand internal metrics. For example, if you have 'beaten risk transfer price' by 3bp how is that risk transfer price calculated?

Q29	Do you support any TCA or analytics? If so, please specify which providers.
A29	BofA offers Real Time Transaction Cost Analysis (RT TCA) via the Mercury web-based platform, along with a Post Trade Transaction Cost Analysis (TCA) via email or SFTP. Additionally, we are integrated and have agreements with most major TCA vendors/third-parties (i.e., BestX, TradeFeedr, etc.) to support mutual customer use of those services.
Q30	If you provide proprietary analytics, please describe how relevant metrics are calculated (mid-price, risk-transfer benchmarks, etc.).
A30	

	Upon request, BofA can send customers aggregate TCA reports, with bespoke commentary.
Q31	If you provide proprietary analytics, is there a difference in data provided to different users? If so, please elaborate.
A31	Upon request, BofA will tailor a customer's TCA to their required format. Other than this, BofA's TCA products are standardized for all algo customers. Please see the answer to 29 above for additional information.

SWAPS

Algo Users may have a need to roll an algo execution entirely/partially to one or more forward value date/s. If roll forwards are executed with the Algo Provider, it is crucial to understand if the respective swap prices are competitive and whether potentially sensitive order information is exposed. For example, does the swaps trader know which side of the quote the algo execution is on or do they receive a two-sided RFQ? Also, does the swap trader know they are quoting a captive spot fill or does it appear the same as RFQs that are priced in competition with other banks?

Q32	What information is provided to the STIRT desk when there is a request for swap pricing from an algo order?
A32	If within auto-pricing limits, the swap would be automatically priced by Instinct FX. If it exceeds the auto-pricing limit, the RFQ would go to the STIRT desk for manual pricing.