FX ALGO NEWS

Virtu offers TCA for FX algos

Virtu Financial, Inc. has announced the continued expansion of its global TCA offering with the launch of a new analytics product dedicated to FX algorithmic execution. As consumers of its own products, Virtu incorporates first-hand learning into its analytics tools that are designed to assist clients in analysing their trading decisions. Drawing on Virtu's scale, execution and analytics expertise, the new addition to Virtu's FX TCA offering merges data from three distinct sources:

- FX benchmark data sourced from Virtu's market making business
- Virtu's global, broker-neutral market impact model: FX Agency

Cost Estimator (ACE)
- Direct connections to bank algo providers on behalf of clients that subscribe to the offering

"Virtu is the leading equity TCA provider to the buy-side, serving 75% of the world's largest asset managers and this extensive experience – combined with the expertise from Virtu's multi-asset market making operations – uniquely positions us to support our clients' analysis of algorithmic execution across asset classes. FX algo execution is increasingly relevant for a large portion of our clients. Our new FX TCA functionality is designed to enable

both comparative metrics between providers and strategies, as well as to help clients determine which execution strategies to use given their risk appetite and market conditions," according to Kevin O'Connor, head of Virtu's broker-neutral Analytics and Workflow Technology division.

Kevin O'Connor

Credit Suisse unveils range of FX NDF algos

Credit Suisse has expanded its Advanced Execution Services (AES) FX offering to include NDF algos across a range of currency pairs in the APAC and LATAM markets. According to the bank the launch covers the full AES FX suite, enabling clients to benefit from a range of NDF execution algorithms, real-time TCA through its award-winning EDGE FX TCA portal and expert pre-trade execution advice. The move follows strong client

Evangelos Maniatopoulos

demand and a successful pilot phase, says Evangelos Maniatopoulos, Global Head of AES FX Product & Trading at Credit Suisse. "Access to quality liquidity and execution transparency have always been core to AES FX and have remained central to the development of our NDF product," he adds. "Our algos combine a broad set of external liquidity venues along with Credit Suisse's NDF streaming prices. This will provide the buy-side with a diversified pool to help them navigate the liquidity challenges of the NDF market." Maniatopoulos explains that it is this diverse liquidity access which not only helps position the AES FX offering in anticipation of market developments, but has also already offered unique insights into NDF algo selection and the broader market microstructure. "Our high execution standards and liquidity access empower our clients with the tools necessary to identify and capture opportunities in this market," he says.

J.P.Morgan

HSBC launches NDF algo suite

HSBC has begun offering flexible algorithmic trading on a range of emerging market NDF currency pairs. The new service, called the NDFlex Algorithmic Suite, launched in July and covers the key NDF pairs of US Dollar versus IDR, INR, KRW, PHP and TWD. The NDFlex Suite offers flexible value dates so clients can execute across broken value dates in an automated fashion having selected the date at the point of order entry, as well as flexible liquidity options so clients have the ability to choose between using HSBC's internal liquidity or external liquidity via EBS, or both.

Vivek Sarohia, Global Head of Alternative Execution Services at HSBC says that the final, and perhaps most important feature, is that the NDF offering is available with HSBC's full suite of algorithmic strategies. "Clients have the ability not to only trade TWAPs but, depending on their individual execution needs, they can trade NDFlex both passively via, for example, our Liquidity Seeking strategy, but also more aggressively should they choose via our Implementation Shortfall strategy," he says.

Vivek Sarohia

Societe Generale adds FX algos to SG-Markets

Societe Generale has made a number of enhancements to its FX algo suite in recent months, including making its FX algos available through its single-dealer platform, SG-Markets. In addition, it has recently begun offering clients the ability to switch their algo strategy while the algo is mid-flight, allowing clients the flexibility to optimise their execution style. Loïc Bourgeois Ducournau, e-FX Liquidity Sales at Societe Generale, explains that this enables experienced algo users to optimise their execution according to the market conditions on the day and during the execution.

"This means that if a client has a large order, for example, they might want to start with a very passive executions strategy, such as our stealth algo Nightjar," says Bourgeois Ducournau. "But then if they are happy with 95 percent of the execution, the client could choose to switch to an aggressive algo, such as Falcon, to finish the execution very quickly for the remainder of the order. Or on the other hand, if a client starts with our TWAP or a Falcon algos but is not happy with the execution, they can always switch to something much more passive."

Barclays launches NDF algos on BARX

Barclays has announced the launch of new non-deliverable forwards (NDF) algorithms on the BARX electronic trading platform. The NDF algorithms are the latest addition to the BARX Gator™ algorithm suite for FX trading. BARX Gator™ is Barclays electronic order execution channel which combines liquidity available on external venues with BARX principal liquidity. The channel now supports 1-month NDFs for multiple algorithms in seven Asian currency pairs; USDCNY, USDIDR, USDINR, USDKRW, USDMYR, USDPHP, USDTWD.This new global offering is a direct result of strong client demand, particularly in Asia, to trade NDFs in the same way as deliverable currencies. The electronification of the NDF inter-bank market has created an ideal environment to launch NDF algorithms and improve liquidity. Naseer Al-Khudairi, Global Head of Markets Electronic Trading and Digital Strategy at Barclays said: "The launch of our NDF algorithms puts Barclays at the forefront of a significant evolution in FX algos and we're pleased to offer this innovative product to our clients. This is an exciting addition to the BARX platform as we continue to make significant investments to our electronic offering to provide clients with the solutions they need."

Naseer Al-Khudairi

UBS revamps UBS Float algo

UBS has made a number of significant enhancements to its hugely successful algo, UBS Float, both in how it works and the logic behind it. Christian Gressel, Head of FX Algo Trading, UBS explains how this will further help clients achieve the best outcomes using FX algo execution.

The UBS Float algo has always been a very successful strategy, but clients notably increased their usage of this passive FX algo throughout the volatile trading period in February, March and April. According to Gressel, this confirmation that even in these more turbulent market periods when spreads widen out, that the UBS Float algo works very well.

As a result, Gressel and his team dug a little further into the performance of the algo in those conditions and have since implemented a number of enhancements, with an improved logic around what levels they post and at what venue. "During that volatile period, we saw that the Float algo works very well and it's given clients really good outcomes.

After a period of testing, we've also decided to further build on this success and, instead of only posting one child order at a time, in this revamp we've improved the posting logic of the algo in a way which enables us to post up to four child orders at the same time," Gressel says.

CHARACTERISTICS HAVE CHANGED
In addition, the characteristics have changed depending on which venue is used. Firstly, the tightest price is posted on ECNs using last look. Gressel explains: "However, in this case it is not the LP's that are using last look to cancel on the client, but it is the user of that algo who can now cancel the child order and trade at a better level if there is an adverse selection against them."

Secondly, UBS Float is now able to post a little bit bigger in terms of the size, but deeper in the stack on the primary venue. "The reason why we do it on the primary venue is because obviously there is the liquidity and the reason why we do it deeper in the stack is that we want to create passive fills where clients start earning the bid offer spread. So if there is big market volatility, then you'll get the benefit of trading at those better levels," Gressel adds.

Then the third and final change is the ability to post against an internal matching engine, which enables the UBS Float algo to post passively against the UBS 'franchise flow'. UBS electronic principle trading has seen very strong recent success, notes Gressel.

This internal matching engine now allows the UBS Float algo to post at mid into that engine so when algo users want to hedge themselves in the markets, they will ping into that matching engine to see whether there is something in there that they can trade against, instead of going out to the markets. According to Gressel, this allows them to post bigger sizes into that venue.

"The benefit for clients in trading mid against the e-FX flow is that there is no footprint. Because it doesn't leave UBS, it has a very low impact," says Gressel. A further interesting aspect is how UBS Float can also open up the possibility of trading passively against the e-FX flow, which with UBS ORCA Direct is a much more aggressive order type. "With UBS Float, we've really tackled the other side of the spectrum. So if clients want to get passive fills, we've improved how we're posting at all these different venues in a different style which opens up the ability to trade passively against the e-FX flow," he concludes.

Aoraki Advisors

Consultants in algo trading, algo controls and execution cost analysis

Offering independent advisory on using algorithms and ways to optimise electronic FX workflows

For more information contact info@aorakiadvisors.com

CACIB unveils enhancements to FX algo suite

As the FX algo market takes stock of the lessons learnt so far during the Covid-19 crisis, Tom Appleton and Nicholas Prezioso, Co-Heads of FX Algo Execution at Crédit Agricole CIB (CACIB) share how the bank is further enhancing its FX algo offering to meet the evolving needs of clients.

Tom Appleton

Nicholas Prezioso

Can you share any new developments to your FX algo suite and TCA toolsets?

We have two major pieces of work in development. The internal tools we use to monitor liquidity have been so useful for clients that we are opening them up for access via a web page for RealTime TCA and market insights. These have helped clients make decisions on the parameters before and during an execution and this has resulted in some great executions even in very challenging markets. When trading large orders it's important to have a feel if the order is impacting the market. If the price starts moving is it because of the algo, or is it something else? These tools help to understand what's going on under the hood of the market.

The other exciting development is our partnership with XTX Markets, where we will offer their Execution Algorithm as part of our algo suite. This partnership allows our clients to execute orders using the XTX algo, which is an Implementation Shortfall Algo (opportunistic and seeks to minimise slippage vs arrival price). Orders are placed and executed with CACIB, while order fills are driven by XTX Markets and their unique liquidity. Clients can select the XTX algo as though it is one of the CACIB algo products in our suite. Orders are passed on a transparent basis to XTX who fill the order. All fills are passed back in their entirety to the clients and the client fills are all booked with CACIB. The clients still face CACIB as counterparts to the trade, ensuring the workflow for clients is as seamless and straightforward as usual. Clients will be able to access the algo through all of our existing distribution channels including Bloomberg, FXall and 360T, amongst others.

What lessons can be learnt from this crisis that might help in future development of FX execution algos?

Sometimes when an order is running you really want to know if it's the algo that's causing a change. A recommender system based on the current conditions, and if the conditions change then the recommendation changes, would be really useful.

How do you see the FX algo and TCA space growing over the coming year? What will be the key areas of focus, for you and for the industry in general?

We see the FX algo space continuing to pick up. The flexibility that algos offer was shown quite clearly during the pandemic. It allowed clients to easily source liquidity, while working remotely. It gives clients flexibility that is hard to beat. Specifically at CACIB, we continue to improve our overall algo suite, adding new sources of liquidity, a new algo and automated forwards in 2020. Clients have the ability to control urgency, change algos and select specific liquidity pools, all with one touch. This type of flexibility is now needed more than ever. Real-time TCA and market colour has also been a high priority item for us. We have built a web based tool that will allow clients to look at estimated volumes, spreads and see the performance of orders in real-time compared with an indicative risk transfer price. Each pair is also scored on the basis of five metrics that will allow clients to make more informed decisions before entering or an order. Pretrade TCA is another area of focus in the industry and we hope to tackle this in our next phase of TCA development.
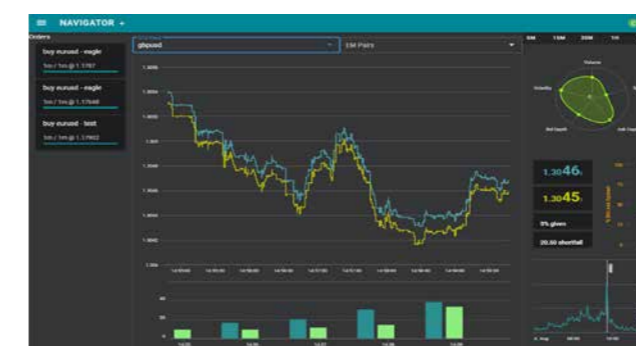
Real-time TCA Tool

TradeTech FX event highlights FX algo use in Covid crisis

The TradeTech FX Virtual event ran 21-22 July, bringing together heads of FX and their teams in a bid to benchmark their response and solutions to the Covid-19 crisis. The online programme included a live interview with Christian Gressel, Head of FX Algo Trading, UBS and Brendan McMurtray, CFA, Vice President, FX Electronic Trading Analyst, T. Rowe Price to discuss how to implement advanced algorithms to achieve best execution during increasing volumes and times of high volatility.

Gressel began with an overview of the main challenges facing FX algo providers during the crisis, with the biggest challenge coming from the external influences that they witnessed over February, March and also into April to some degree. While leading investment banks such as UBS had detailed business continuity plans, Gressel noted that these plans had not needed to be fully tested for more than a day here or there

and certainly not to the extent we've seen, particularly in March, where market volatility added to the additional strain. "If you think of our business, we have a group of sales traders globally who monitor the FX algo flow and the client business. Now, if you are now trying to relocate those people to backup sites and to working from home situations, you can see how capacity very, very quickly becomes a little bit of an issue or a strain and working environments change dramatically," he says.

In addition, Gressel noted the loss of quick interactions and the physical contact gained from being in the office environment. Yet overall, taking into consideration how volatile the market was and how much volume was actually traded during that time, Gressel says that the business weathered that period very, very well and he was amazed at how few problems they encountered.

McMurtray agreed with Gressel and echoed his own experiences of the sudden loss of an office environment where there's so much cross pollination and collaboration, which he adds can really impact the way that things get done at T. Rowe as even with WebEx, Zoom calls or chats via Symphony, that contact is still a spectre of its former self. Even so, he agrees that on the whole, they were pleasantly surprised as far as business continuity was concerned. An audience poll taken during the conference day also found that 100% had experienced a seamless transition to working from home during the crisis.

Christian Gressel

CALLS FOR BETTER FUNCTIONALITY

However, one major concern McMurtray found was the lack of flexibility available from their providers. "This was an issue that we had previously, but was certainly exacerbated in the higher volatility environment, specifically having the ability to partially fill an FX algo, mark the portion traded as complete and carve out the balance. We had a number of situations where trades either ran away from us or, you know, market news came out and we decided that we needed to change tactics. But our current provider couldn't support this, which was definitely a detriment that we saw that was kind of highlighted in this environment," he explained.

McMurtray looked forward to the provider releasing the functionality which will allow users to trade an algo part way through, effectively mark the portion that they have traded as complete and then carve out the balance and trade it via a

Brendan McMurtray

different mechanism, either via voice, RFQ etc. As of the writing of this article, this has been made available. Aside from that, McMurtray added that the extreme widening of spreads and market volatility did drive T. Rowe Price to reduce its RFQ trading in favour of other execution types. "When we couple this with a significantly higher internal volumes that we saw, as well as an elevated demand for execution flexibility from our traders, FX algos did become an increasingly important execution tool for us," he says. "During the crisis our algo usage definitely did increase on an absolute basis."

In terms of strategies, McMurtray says they continue to favour opportunistic strategies, although there has been some additional uptick in the usage of internal only or non-displayed strategies throughout the crisis, at the expense of more purely passive or pegging based strategies. He explains: "We did find that these pegging strategies tended to

underperform in times of volatility and trending markets, especially given their asymmetric payoff. When these trades were moving against us, they would have filled slowly as no one would come in from the other side across the spread. And then on the flip side, when they moved in our favour, they would fill too quickly and not benefit from the market movement."

LESSONS LEARNT

Gressel says that UBS had also seen a general increase in algo usage and the use of more opportunistic and urgent strategies by clients. In turn, he says that one of the main takeaways from the crisis is the need to consider much more flexibility around the parameters that are going into the FX algos. "Before this crisis, although we have seen volatility, we haven't seen those intraday and very short term changes - not just for a single event, but actually being in place for a couple of days and literally changing

the environment that we're in for a few days or a week. So that was something that we definitely have looked into and that we learned that we needed to adapt much quicker to," he adds. On the algo front, McMurtray adds that he believes this crisis will drive further integration of real-time market conditions within the algo ecosystem. "So whether it's on the execution side itself or on the analytics and execution decision making side, being able to adapt to changing market conditions will be crucial to minimising some of the tail events that both Christian and I referenced. Algos have been, and continue to be, an excellent tool for the buyside to be able to capture spread and achieve cost savings versus risk transfer," he concludes.

FORTHCOMING EVENT

On 22nd and 23rd September 2020 the Tradetech FX organisers are holding an invite-only Virtual Forum for FX leaders to benchmark their COVID-19 recovery strategy.

TradetechFX continues to bring many leading buyside firms together

TradeTech FX Virtual Boardroom Agenda

The event is split into two boardrooms; select either the TTFX EU or the TTFX USA boardroom agenda

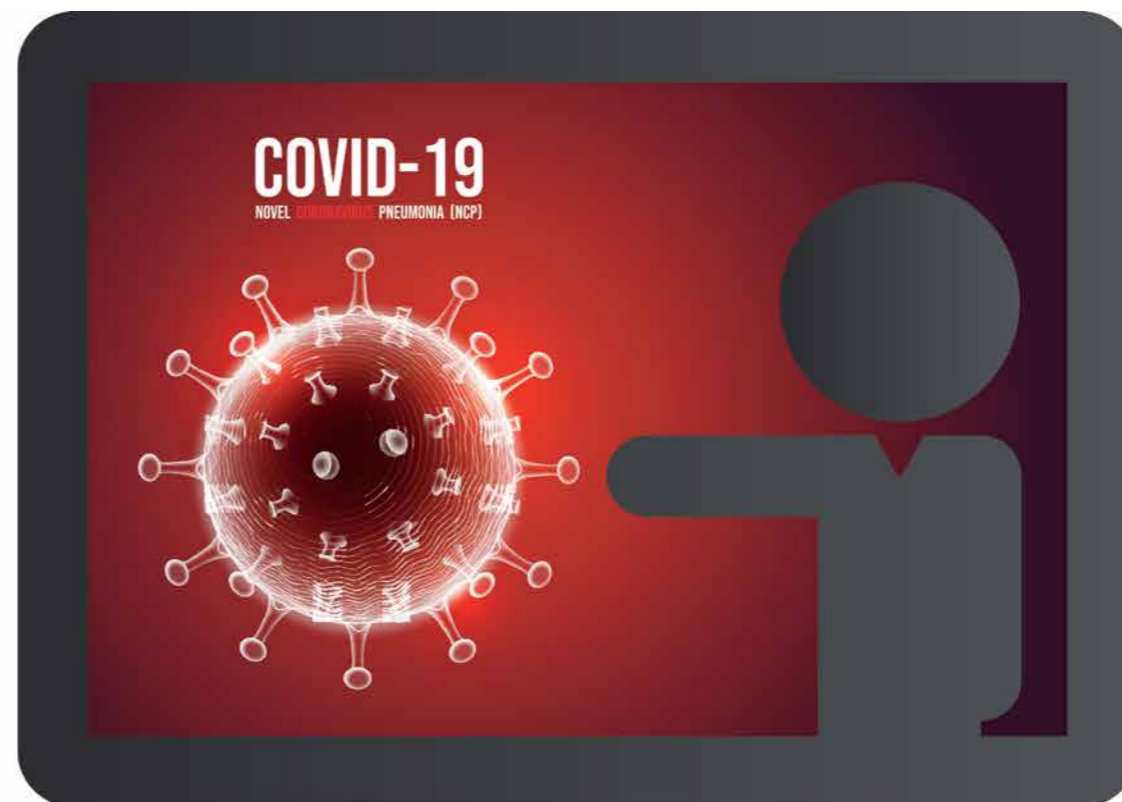| TTFX EU VIRTUAL BOARDROOM DAY ONE | TTFX USA VIRTUAL BOARDROOM DAY ONE | TTFX EU VIRTUAL BOARDROOM DAY TWO | TTFX USA VIRTUAL BOARDROOM DAY TWO |

More information can be found at:
https://www.wbresearch.com/events-trade-tech-fx-virtual-boardroom-eu-september-2020/?utm_source=ttfxeuwbr&utm_medium=referral

Shining a light on Covid-19:
What has the buyside really learnt about FX algo use during the crisis?

As the data analytics, reports and whitepapers begin to drill down into the detail of FX algo performance during the height of the Covid-19 volatile market period, the true extent of increased buyside usage is now fully coming to light. Yet while the buyside may have finally experienced how well FX algos can perform in volatile market conditions, did clients and their algo providers learn any additional lessons which can now be used to consolidate and build on this new understanding of FX algo use going forward? Nicola Tavendale investigates.

Nicola Tavendale

According to analysis published by Refinitiv's FXall, recent usage trends confirm algos have become an everyday tool for the buyside - and not just in times of low volatility. Algo trading volumes in March increased by 380% year-over-year on FXall, with the bulk of the increase attributable to asset management clients, while the continued heavy workload faced created by tough market conditions means the buyside is increasingly turning to smart tools to enhance their trade execution.

A JP Morgan report provides further evidence for this increase, with more than 60% of trades for ticket sizes of more than $10 million having been executed in March using an FX
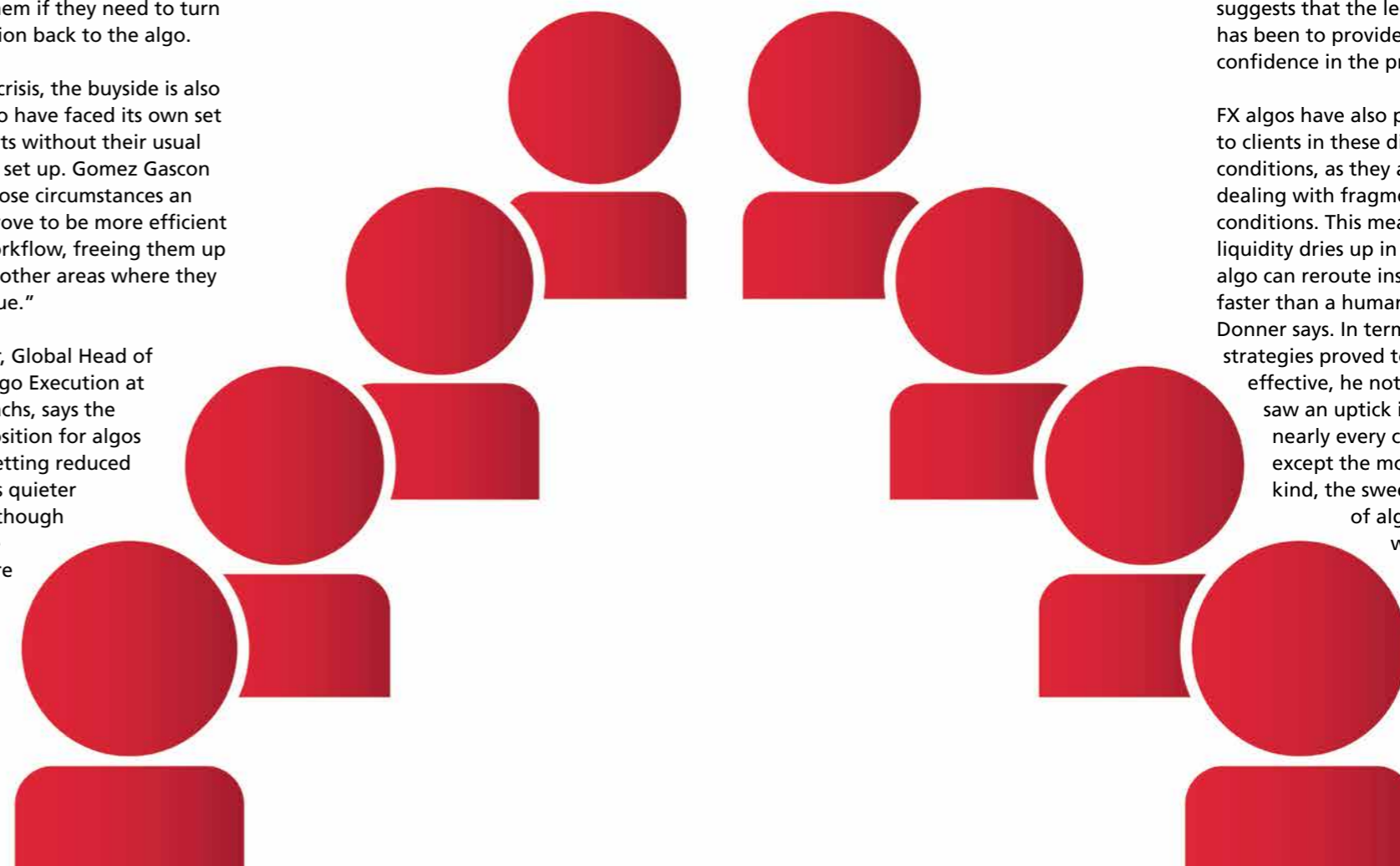
algorithm, with a notable rise in use form hedge funds and real money accounts. In comparison to other periods of volatility, the weight of FX algo versus the use of traditional risk transfer was surprising, as during previous events or times of volatility clients had been unsure whether to use algos or not in those market conditions, says Carlos Gomez Gascon, Executive Director, Head of FX Algorithmic Execution at JP Morgan.
"Our analysis with the clients and traders during this period of high volatility demonstrates that we continue to outperform the risk transfer price," Gomez Gascon adds. "Another interesting finding is that because there's more automation and the traders are doing more, what they need are just the highlights. As a result, we've been experimenting with new workflows and have also developed a new alert called VPIN (volume synchronized probability of informed trading) which is based on the findings of an academic paper which found that a VPIN alert could have predicted the SNB flash crash hours before it happened."

The aim of the alert is to warn JP Morgan's algo users if there is some probability that a market event is likely to happen or that there may be extra volatility, Gomez Gascon

explains. This helps reduce the need for clients to constantly monitor the algo in flight and can instead rely on there being an alarm in place which will warn them if they need to turn their attention back to the algo.

During the crisis, the buyside is also very likely to have faced its own set of constraints without their usual operational set up. Gomez Gascon adds: "In those circumstances an algo may prove to be more efficient for their workflow, freeing them up to focus on other areas where they can add value."

Ralf Donner, Global Head of Client FX Algo Execution at Goldman Sachs, says the value proposition for algos was even getting reduced in last year's quieter markets. Although clients were getting more

comfortable using algos in that low volatility period, he says that on the other hand the competition from risk transfer was extremely tight to the extent that it was difficult to justify using algos in some cases.

RESILIENT AND RELIABLE
"What the crisis did was it brought that volatility back and interestingly, instead of migrating away from algos, we saw a huge uptick," Donner adds. "Of course, the conditions were measurably worse than pre-crisis and yet it was still competitive, because other alternatives to algo execution were also significantly more expensive. For many clients, the fact that these algos did perform comparatively even under more difficult market conditions has really helped to boost confidence in their use."
Yet now that the alternatives to execution have started to get cheaper, Donner notes that they are still seeing higher algo volumes than they had last year, which he says suggests that the legacy of the crisis has been to provide clients with confidence in the product.

FX algos have also proven beneficial to clients in these difficult trading conditions, as they are used to dealing with fragmented liquidity conditions. This means that even if liquidity dries up in one place, the algo can reroute instantly much faster than a human trader could, Donner says. In terms of which strategies proved to be the most effective, he notes that his team saw an uptick in volume for nearly every category of algo except the most aggressive kind, the sweep-to-fill type of algo. "Then there were two algos which really stood out, the first being our flagship dynamic hybrid algo. This was largely due to a fortuitous

> **"We also expect to see further migration towards some of the newer products that clients saw were particularly helpful, such as the basket algos."**

Ralf Donner

investment that we had made in the previous 12 months in adaptive dynamics, or self-learning logic in other words, for the algos," Donner says. That enhancement meant that there were fewer hardcoded, calibrated parameters, which gave more ability to the algo to update on the fly, which greatly enhanced its performance. The second strong performance was in Goldman Sachs' basket algo type products, which are better for trading highly correlated markets. "They had a number of successes. It's a small but loyal following that we've got for the for the basket algo and we certainly saw larger ticket sizes on basket algos and a strikingly good performance there," Donner adds.

FX algos appear to have proven to be as resilient in volatile markets as providers have long assured clients they would be, but significantly have shown that the checks and balances are also extremely robust. It is vitally important to have the ability to slow down or interrupt execution depending on the market conditions, explains Vittorio Nuti, Global Head FX Algos at Deutsche Bank. "I believe our balance overall was the correct one and we didn't have any major issues," he says. "Now clients trust the product more than ever before after they've seen how well the FX algos perform in both periods of low volatility and high volatility, which helps a huge amount in building confidence."

Vittorio Nuti

> **"Now clients trust the product more than ever before after they've seen how well the FX algos perform in both periods of low volatility and high volatility,"**

LOOKING FOR LIQUIDITY
According to Nuti, the feedback from clients on the effectiveness of the analytics offered by Deutsche Bank, such as the Market Colour app, has also been extremely positive in terms of the ability it provides clients to see and understand what is actually happening in the market and how the execution is going in real time. Yet while he says that passive strategies do tend to give clients the better results, as they take more market risk, as the volatility has subsided, clients are also still comfortable with the more aggressive strategies to clear risk. "Those are the elements which are important to clients," he adds. "Yet a lot of clients during the periods of high volatility had varied experiences in terms of the liquidity provisions that each algo provider has, with some finding it very difficult when using other providers when the liquidity disappeared quite quickly." That wasn't the case at Deutsche Bank, where Nuti says the team worked hard to manage the liquidity and to make it a fair provision for all parties involved, which means ensuring there is liquidity when things get busy as well.

Nuti explains: "We offer multilateral liquidity, like the ECNs, and then we have bilateral liquidity which that includes both internal and external flows. It is only the top quality LPs that provide liquidity to our algo business and we work closely with them to make sure that they provide high quality liquidity but also that our algorithms are going to be trading appropriately on those feeds as well. It is very much a two way street. That sort of partnership really helps when you have moments of stress because it is viewed as a more longer term relationship rather than just a variety of ECNs or anonymous feeds, where pricing could just disappear all of a sudden, which happened to some of our competitors."

In addition, the overall levels of technical support available faced a particular challenge during the height of the crisis, with both buyside clients and the teams of FX algo providers having to adapt quickly to working from home. The primary focus has to be sustaining that high level of service provision to clients, says Loïc Bourgeois Ducournau, e-FX Liquidity Sales at Societe Generale. "We had to ensure consistency even though of course we were also very, very busy," he adds. "The challenge was to pitch new clients who perhaps did not want to risk using any new tools or algos when they were working from home, but those clients who were already comfortable using algos before Covid were very happy with how they performed and the support provided, even while they were working from home."

CONTINUED USE
The increased volatility also meant that volumes exploded during the volatile Covid period and according to Bourgeois Ducournau, the levels of algo adoption are continuing to increase even now. "That is in keeping with the market trend, with

some clients preferring to pay fixed fees and have full transparency instead of to making that trading information visible to the Street," he adds. "It's really, really efficient. It also provides clients with the ability to have much more access to liquidity and not only bank liquidity. Clients are looking to passive algos in order to spread their execution."

However, Bourgeois Ducournau adds that during the volatile period, they noticed that some clients preferred to do risk transfer price and to get out of the risk very quickly, instead of risking a very sharp and strong market move. Then on the other hand, they also saw other clients who were very happy with the algo execution and tended to prefer aggressive execution using the Falcon algo, which executes very quickly to get out of the risk as quick as possible. "It works very well in liquid pairs and we had some of our more experienced clients using it, with strong performance results," he says.

Although the markets are not in that highly volatile period anymore, the new trading environment we're now in is set to continue in the

"The use of algos is going to continue to increase, because there is going to continue to be a focus on cost reduction and scalability,"

Carlos Gomez Gascon

foreseeable future. Gomez Gascon says that regardless of this new Covid world, the point of using algos is for scalability of execution and is going to be increasingly recognised. "Buyside clients can start focusing on the real value which algos can bring," he adds. "Algos are a useful toolkit for them to focus on adding the most value on the strategy. While they work from home, algos mean that they don't need to be doing several things at the same time, they can just let the algos run and then set up the alerts that they think are interesting or in case they need to intervene and so can focus more on strategy. The whole process is seamless."

TURNING TO SOPHISTICATED STRATEGIES

FX algos also offer an important benefit at a time where the cost of doing business is under the spotlight as the automation piece also offers considerable savings. According to Gomez Gascon, it's not just about the quality of the algo but about all the things that surround it that actually allow the buyside to save money. "That's why the use of algos is going to continue to increase, because there is going to continue to be a focus on cost reduction and scalability," he adds. Even during the highly volatile period, there were also no unexpected risks uncovered and as Central Banks now start to evaluate the market response to those conditions, there are on the whole no unpleasant surprises to report. Donner explains that while the markets were volatile, they were typically well behaved and did not really run the risk of major outages or something going very badly wrong.

Even so, having algo performance tools to monitor algo performance live proved essential, Donner says. Especially when market conditions are unusual, he says that clients were able to rely on having a live analytics tool to monitor where the liquidity was. So if the primary and secondary markets have evaporated, then the performance of the algo is going to go down to internalisation opportunities and any mid book

Loïc Bourgeois Ducournau

"Those clients who were already comfortable using algos before Covid were very happy with how they performed and the support provided, even while they were working from home."

matching that's possible, Donner notes. Analytical tools that were less useful in this period were anything with a long look back window, perhaps calibrated to other market conditions or historical datasets of executions, those were less likely to be relevant.

It is also unlikely that providers will continue to hear that buyside clients only use FX algos in 'no vol' environments, Donner adds. "Many clients have come to the conclusion that there was a good performance also in the higher vol period and we expect they will be emboldened to continue using the product because they've seen that it works under quite difficult circumstances," he says. "We also expect to see further migration towards some of the newer products that clients saw were particularly helpful, such as the basket algos. The buyside has now come to the conclusion not just to use FX algos, but hopefully that they will start using some of the more sophisticated algos that are smarter about executing things together."

CREDIT SUISSE

The future is in the air.
AES® FX NDFs

Others might be preparing for the electronic marketplace of today. We are preparing for the future.

AES® FX now offers a full-service algorithmic execution solution for Non-Deliverable Forwards (NDFs), across APAC and LATAM currency pairs. Access our diverse liquidity pool via the AES® FX comprehensive FX algo suite.

Ask us about our NDF offering.
credit-suisse.com/aesfx

Exploring the importance of liquidity in FX algo trading performance

FXAlgoNews talks with Zeke Vince, Global Head of eFX Sales at Bank of America Merrill Lynch

Zeke Vince
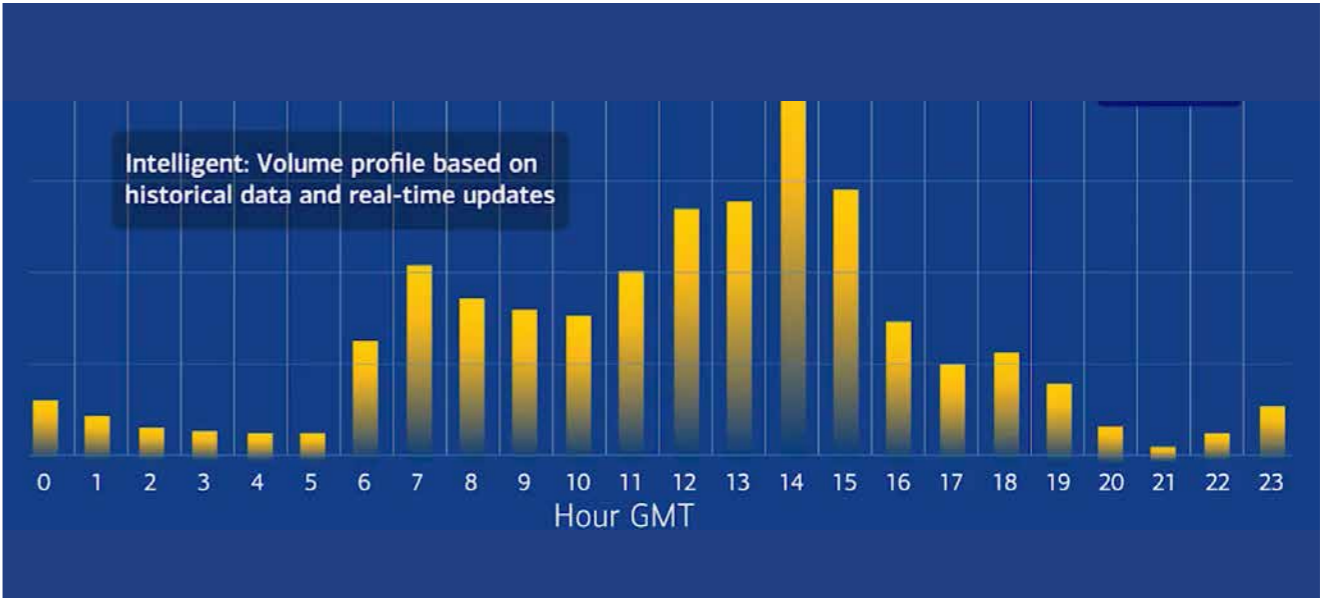
Decipher considers factors like market impact and historical volume data using them to intelligently take liquidity

BofA's adaptive algo Decipher is of particular interest to clients seeking the value of trading with passive franchise liquidity

Algorithmic trading is an important step for FX but how dependent is the performance of these toolsets on the liquidity they interact with?

Liquidity is frequently a key factor in algo performance. Depending on the algo strategy, liquidity may supersede execution logic, as the most important determinant of execution performance, as who you're matching with may significantly impact the outcome of the order. Clean liquidity with depth is something very few firms are able to offer.

Why is it important that buy-side firms have a greater understanding about the underlying liquidity that's involved in algo FX trading and what steps can leading practitioners take to bring more transparency to the process?

It's important to understand the underlying liquidity, as it may differ significantly depending on the provider you face. Buy-side firms need to know whether their order information is transmitted to the market, whether intentionally or not. Information leakage leads to market impact and that is what our clients want to avoid.

Leading providers need to provide clients with transparency into the composition of their liquidity pools. At BofA, we provide full details of the channel, order and client types an algo faces. We believe it's essential that clients understand the liquidity their orders are interacting with.

In what ways can more effective liquidity management help to enhance the abilities of FX algos?

Proactive liquidity management often leads to better fills, which often results in better price / execution.

However, sole focus on the tightest price in the liquidity pool misses the point. Clients benefit from a wider view of liquidity. Quantifying factors, such as fill probability and market impact, help determine the overall attractiveness of liquidity. BofA uses this approach seek better outcomes for our clients.

How much of a challenge is it for banks and clients to effectively manage and benchmark the various liquidity pools?

It is a constant challenge to manage and benchmark various liquidity pools. It takes a substantial investment in personnel and technology to create a purely data-driven approach, however, we view this as a BofA strength.

How can algo FX providers ensure the quality of the liquidity they provide to clients and how much of a challenge is keeping liquidity pools clean?

It is an ongoing process, as both market conditions and trading behaviors change over time. In order to successfully do this, it is critical to use an adaptive data-driven approach.

Optimal liquidity may differ depending on the client.

This makes sharing the same philosophical approach of liquidity management with clients important. We believe minimizing information leakage is a top priority and BofA can be incredibly selective, due to the size of our franchise.

How is quantitative research helping providers to make more effective use of liquidity for algo FX trading?

Quantitative research is central to everything we do. Our decisions are data driven. The depth of our client base and our market reach provide us with scale. We leverage this scale to provide highly attractive liquidity to our algo FX trading clients.

What are the typical pros and cons of internal versus external liquidity for FX algo trading?

If you are working with a trusted counterparty, internal liquidity provides anonymity and certainty around who you're facing. As a result the requirement to trade on secondary markets is reduced and thus results in lower market impact overall.

In what ways can leading FX providers leverage their liquidity as a key differentiator in this space?

FX providers can showcase their franchise on pass-through internal fills. BofA runs a pass-through liquidity model which allows algo execution to benefit from our client flow, including all "clicking" channels. These fills are passive and not market impactful. Clients know that large non-directional flows only come from a few providers. BofA, with its large payment business and global client franchise, is one of them.

What can we expect to see with next generation FX algos that will make them smarter in accessing hidden liquidity?

There has been tremendous innovation in this space. We are starting to see a proliferation of venues with a slightly different flavor of hidden liquidity. Although it's positive for the market place, it makes the role of Smart Order Routers more complicated.

Order Routers will have to be more dynamic to maximize liquidity capture across both hidden and lit venues. Constant recalibration, using real-time data and signals, will govern where and why clients post larger order sizes. We expect to see a new generation of liquidity seeking algos that are richer in terms of the signals they consume.

Passive versus Aggressive: Exploring the underlying decision making behind FX algo strategies

Nicholas Pratt asks how buy-side firms are using FX algos to execute their passive versus aggressive trading strategies

Nicholas Pratt

For the most part of this millennium, buy-side firms have been looking to take more control of their trading processes, from direct market access to the use of execution algorithms, firstly in equities but now also for their FX trades.

Buy-side traders have also developed more sophisticated trading strategies and techniques due to greater awareness of market impact, opportunity costs and their respective impact on best execution. This has become especially important during the market volatility we saw as a result of the Covid 19 pandemic. So not only are buy-side traders using algos more, they are using algos to do more than simply slice and dice their trades.

Consequently algo developers have looked to improve their offerings to match buy-side clients' demands. One area of development has been around the use of algos to perform either passive or aggressive execution strategies. But how well do algos deal with this distinction? Does everyone share the same definition of passive versus aggressive, especially between buy and sell-side participants? And is the decision to trade passively versus aggressively one that should be made by algos at all, or should it be left to traders themselves?

RISK VERSUS REWARD

"Passive versus aggressive execution is a question of risk versus reward," says Alexander Barzykin, FX eRisk quantitative analyst for HSBC. "In the context of placing a single child limit order, the reward of a passive placement is spread capture and the risk is volatility which may come into play. Similarly for parent orders, passive execution aims to explore cost saving opportunities while facing higher risk of deviating from the target benchmark. Aggressive execution style aims to minimise this risk while somewhat sacrificing transaction cost savings," says Barzykin.

Different execution algorithms use different performance

Alexander Barzykin

"Passive versus aggressive execution is a question of risk versus reward,"

benchmarks, such as arrival price or time weighted average price, and manage risk differently, adds Barzykin. "For example, HSBC's Liquidity Seeking algorithm is inherently passive while the execution style controls the depth of order placement. HSBC's Implementation Shortfall algorithm, on the other hand, can actively manage risk by crossing the spread while the execution style controls the level of volatility at which the algo will aggress."
There are various factors that determine traders' level of execution risk appetite and which then influences their strategy selection, says Farzana Nanji, EMEA head of eFX sales at HSBC. The factors include market volatility, spreads, market trends and the size of the order.

"If the client's main objective is to minimise footprint and they have discretion over execution duration, then a passive strategy would be a more likely choice," says Nanji. "For a client who benchmarks execution against arrival price, an implementation shortfall strategy would be a strategic choice. For algo execution, the client takes on the execution risk, which is also a factor when selecting the strategy - the more passive the strategy, the higher the execution risk," says Nanji.

Given the effect of market conditions on execution strategy, the unprecedented rise in market volatility and widening of spreads that we saw in March as a result of the impact of Covid 19, did see a greater reliance on the use of algos, says Barzykin. "Wider spreads and diminished liquidity created particular challenges for larger transactions. Taking all of these factors into consideration, clients turned to algos to help navigate their way through an increasingly fragmented FX market, opting for smarter execution," he says.

"A use case that emerged during this period was for clients to start out with a passive strategy, testing liquidity and observing any impact, with the ambition of capturing

Farzana Nanji

"The liquidity curation process becomes a vital component of the algo performance, especially given the fragmented and delocalised nature of liquidity within the FX markets,"

spread. However, if volatility significantly increased, then they could resort to a strategy that cleared the risk more aggressively," says Barzykin and he refers to HSBC's Liquidity Plus product which provides the ability to switch between strategies either manually or on the basis of a defined market level.

"During this period of time, both volatility and spreads increased," he says. "What is interesting to note is that, at least for some instruments, long-term volatility increase was relatively less pronounced than that of short-term, or high-frequency volatility. So besides lack of liquidity for larger order sizes, this effect could also explain significant increase in algo execution."
The new generation of algos involves a more curated form of liquidity, which monitors a number of factors within each of the execution venues for a more optimal execution, says HSBC's Nanji. For example, it monitors fill rates by looking at the percentage of orders that have been ▶

filled, based on the total number submitted. It also monitors round trip times and market impact.

"The liquidity curation process becomes a vital component of the algo performance, especially given the fragmented and delocalised nature of liquidity within the FX markets," says Nanji. "HSBC algorithms dynamically evaluate the market microstructure in real time and make optimal decisions around passive and/or aggressive allocation of orders at different venues, to provide an overall better execution experience for the clients."

DIVERSE EXECUTION:
What remains to be seen is whether buy-side traders believe that an algo is the best means by which to make the decision on how passive or aggressive a trade should be. The global asset manager Allianz Global Investors uses a diverse set of execution strategies that cover both passive and aggressive trading, says Andreas Anschperger, director,

Andreas Anschperger

"Algo execution will always be a trade-off and a judgement between a key set of parameters – execution urgency, market volatility, risk appetite, client/portfolio restrictions and timing which is down to a trader's skill,"

European head of foreign exchange trading. He does not believe in the binary descriptions of passive versus aggressive execution and instead sees execution strategy as a human judgement on several factors.

"Algo execution will always be a trade-off and a judgement between a key set of parameters – execution urgency, market volatility, risk appetite, client/portfolio restrictions and timing which is down to a trader's skill," says Anschperger. There are factors that influence how traders make those judgements and trade-offs, says Anschperger. These include pre and post-trade analytics and the related transaction cost analysis and respecting various liquidity pools in various currency pairs.

Market conditions also play their part in the trader's decision making and preference for passive versus aggressive execution. "When envisaging a higher market spread during a time of high market liquidity, a more passive strategy might be advisable, including the opportunity for matching market interest," says Anschperger.

When it comes to a new generation of algos being engineered to fine-tune passive vs aggressive execution strategies, Anschperger says that it is the widely discussed search for intelligent algos making dynamically use of above mentioned interest and market conditions with the dominant factors such as pools of liquidity, internalisation and dynamic adaptation to changing market volatility.

TRADE URGENCY:
Passive order execution is where a participant adds liquidity to the market while trying to fill an order, with the objective to only trade when someone has an offsetting interest, says Ronald Lagarde, expert trader FX, APG Asset Management. In contrast, aggressive order execution is where a participant takes liquidity from the market, buying and selling at market prices and looking for immediate execution.

Ronald Lagarde

"Covid was a reminder that you can't rely on the algos to do all the work for you. Trader decision-making became much more important and to trade based on what you see in front of you in terms of cost and volatility,"

But when it comes to FX algos, there is a miscomprehension that passive versus aggressive relates to how fast or slow an algo works, says Lagarde.

While a passive algo can execute more slowly, it doesn't always have to do so. "Some algo providers understand this but not all. Our main goal is to lower market impact, while minimising opportunity risk. In our experience this can generally be done best when you spread your execution over a period of time, with the use of passive algos," says Lagarde.

The main influence on the decision to use passive versus aggressive is the urgency of the trade, says Lagarde. "That urgency derives from the order I get from my portfolio managers and the objective of the fund. Next to this there are the market conditions like costs and volatility. If there was high urgency, we would not use passive algos because that creates opportunity cost.
But if you have low urgency, we would use passive strategies unless

we have strong reasons not too. We have been using passive strategies first through leaving bids and offers with banks, but also directly on ECNs, although this was manual and cumbersome. It really took off when FX algos became available," he says.

"The size of the order is also a factor. If you have a large order and you trade with high urgency, you will incur high market impact and it will be self-defeating. It is really about market impact versus opportunity risk. Our main objective is market impact so low urgency trading and passive algos are our priority," says Lagarde.

Over the last five months, since the outbreak of the Covid 19 pandemic, market factors have become a much greater influence, says Lagarde. "We have seen super high event risk. Prior to Covid 19, we were in a low event risk environment that really benefitted from the use of passive algos. In the first weeks, there was a sharp rise in volatility. Then for a short while, there was a decrease in liquidity."

This is where a human trader can really excel, says Lagarde. "Spreads widened a lot and it became very expensive for risk-based trading but passive trading also becomes expensive if there are sudden, directional and extreme changes in markets. So what we saw in that period was a big increase in the use of different strategies, with different urgencies, as the market changed.

It was a reminder that you can't rely on the algos to do all the work for you and to rely on the short-term experience and data that feeds those algos. Trader decision-making became much more important and to trade based on what you see in front of you in terms of cost and volatility," he states.

After that initial four week period of volatility, conditions have started to normalise, says Lagarde. However, he hopes that the importance of human discretion will be remembered when it comes to the development of the next generation of FX execution algorithms.

"Some algo developers are looking to include the decision between passive versus aggressive execution into their algos. But that is not really what we require. They should focus more on the smart order routing behind the execution strategy and creating more efficient algos, be they passive, aggressive or neutral," says Lagarde. "The choice between passive versus aggressive remains the choice of the trader because it is based on information that is not included when I send out an algo order."

Bank of Japan Review - August 2020

An overview of algorithmic trading in FX markets and its impacts on market liquidity
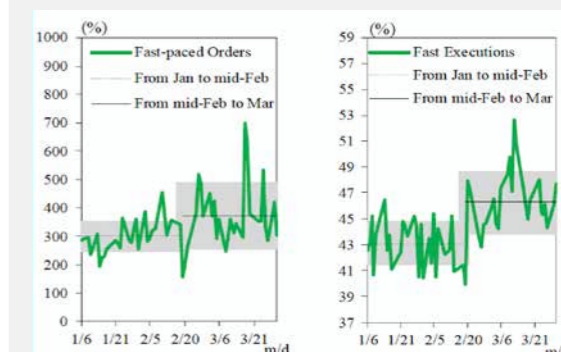
Financial Markets Department
FUKUMA Noritaka, KADOGAWA Yoichi

In this paper, the authors outline FX markets' algorithmic trading and conduct quantitative analysis on its recent developments and impacts on market liquidity in the USD/JPY spot market.

https://www.boj.or.jp/en/research/wps_rev/rev_2020/data/rev20e05.pdf

Leveraging interactive execution technology in the FX algo trading process

With Asif Razaq, Global Head of FX Automated Client Execution at BNP Paribas

Asif Razaq

BNP Paribas' award-winning FX spot and NDF algorithm service CORTEX employs next generation interactive execution technology. Broadly speaking what is interactive execution?

In opaque FX markets, clients have historically lacked access to data and struggled to gain visibility on the inner workings of their algo execution, let alone interact and take control. The issue with algorithms today is that they are broadly seen as black box technology, so once the user submits their order they have very little insight into the methodology behind the algorithm.

BNP Paribas have addressed this issue by launching Insight Live, with interactive algos, that put the client in the driving seat and

gives them an algo eye view of the market in real time. What makes our algorithms interactive is that they go far beyond a simple click-and-trade functionality but instead provide clients with live feedback, track execution performance against benchmarks, and understand the environment using real time market data. With the introduction of ALiX, the industry's first digital trading assistant, earlier this year, clients can now directly interact with their algorithm during execution.

BNP Paribas pioneered the concept of interactive algorithms. How challenging was it to get the technology working perfectly and why is the FX market a good fit for it?

We're driven and influenced by advances in tech, which in turn create exciting opportunities to redefine what's possible. As our clients become more and more sophisticated in the way they use algo execution it has become important to build solutions that optimise execution even further.

To do this we've taken a leaf from Silicon Valley's book, building on the concept of automated assistants such as Siri and Alexa and brought the latest technology to financial trading. Thanks to the nature of the bank's interactive algorithmic methodology, the fourth-generation algorithms are already able to continuously adapt and recalibrate their strategy to better function.

Together with ALiX and Insight Live, we have now given clients greater transparency and control

in uncertain markets, while significantly reducing execution costs.

The latest adaptive algos clearly have much greater built-in intelligence than previous generations of these toolsets so what are they doing that makes them so smart?

No longer does a trader need simply to enter their order, press go, then blindly wait until completion and hope the strategy performed as expected. 4th generation, interactive algos put control of the execution firmly in the hands of the trader by seamlessly combining tried-and-tested adaptive strategies with a wealth of real-time market data and powerful analytics. Information such as the volume currently trading across venues, depth of the overall market, whether the market is currently bid or offered, and what liquidity regime the algo is currently operating in can all be combined with real-time performance of the algo to optimise their execution even further.

Is interactive execution suitable for all types of clients and strategies or are the applications and benefits much more specific?

The great thing about interactive algorithms is that we have engineered the platform specifically to service all classes of clients, from the novice to the most sophisticated. Depending on the needs of the client, the platform has been built so that they can see as little or as much detail as necessary and ALiX will always be there providing key updates on their execution.
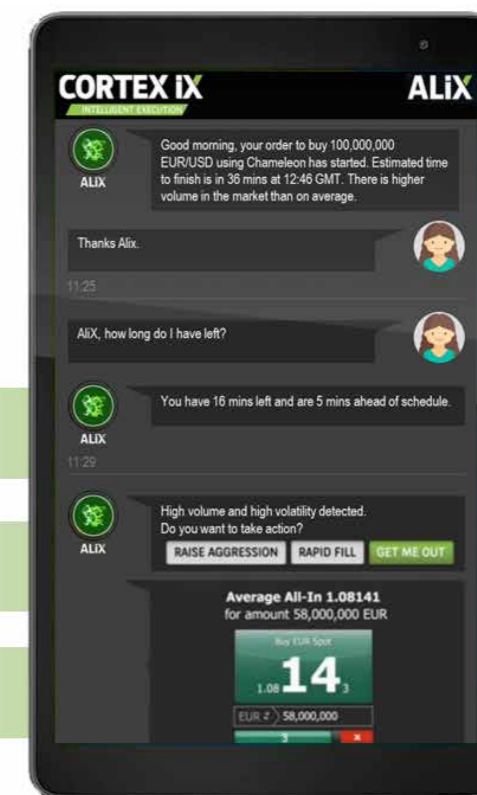

ALiX is the industry's first digital trading assistant

Is there a premium to be paid for using technically advanced algo trading technology like this or are the costs balanced out in other ways?

Our focus has always been and will remain making high quality products that provide our clients with the tools they need to manoeuvre the market. Of course advanced technology comes with its costs, however rather than charge a premium to the client, we continue to invest and build on our products; by providing a more value add effective service clients will reward us by using our product more. We haven't increased the cost of the product since its launch but rather invested in making the product more sophisticated, perform better, which is why our clients turn to us.

The Covid-19 crisis has seen increased levels of volatility. How have your interactive algos performed during recent market turbulence?

During the pandemic, our interactive algorithms have proven to be very effective at navigating the difficult and rapidly changing FX liquidity landscape. Their ability to respond to changing market

conditions independently, and provide mid-flight information and control of execution, has meant that they have been able to navigate the market without too much change in performance due to their intelligent spread capture logic. This means that they are able to monitor the liquidity landscape and execute optimally. When spreads are wide and markets are thin they can place passively and benefit from spread capture without significant market impact.

How does BNP Paribas cater for clients who employ these toolsets but still want more involvement in the algo execution process?

The very nature of interactive algorithms means that they enable the trader to be more involved in the execution. While simplicity is key to CORTEX iX, more sophisticated users are able to benefit from a more bespoke service through Flex iX, a customised algorithm which lets clients get under the hood of CORTEX iX to create their own versions of the pre-existing algos, engineering personalised versions of Chameleon, Viper or Iguana. With this level of flexibility, advanced

clients are given the opportunity to build on the strategy itself and decide on key composing elements of the execution so that every time they reach for a given algo, they are getting a specific, customised service.

The FX algo trading space is starting to become noisy. How important will next generation technologies like interactive execution and a willingness to invest in them become in helping to differentiate providers in the future?

A big part of what makes FX interactive execution so exciting is that we are always pushing the limits of the technology and what is possible. Advances in the tech and the increasing sophistication of our clients means we need to keep innovating and adapting our strategies to meet changing needs.

To do this, we place the focus on investing in new technologies to make our solutions more intelligent and automate workflows where possible. There's always a new frontier in algos for FX, and we plan on staying right at the forefront of that.

FX algo trading at GlaxoSmithKline:
Fabio Piga tells us how it's helping to add value for stakeholders.

GlaxoSmithKline (GSK) is one of the world's most innovative, best performing and trusted healthcare companies. It has three global businesses that research, develop and manufacture innovative pharmaceutical medicines, vaccines and consumer healthcare products. FXAlgoNews spoke with Fabio Piga, MSTA, Group Treasury Front Office Manager – FX & Interest Rate Risk Management at the firm about algorithmic FX trading and the key benefits it delivers for GSK.
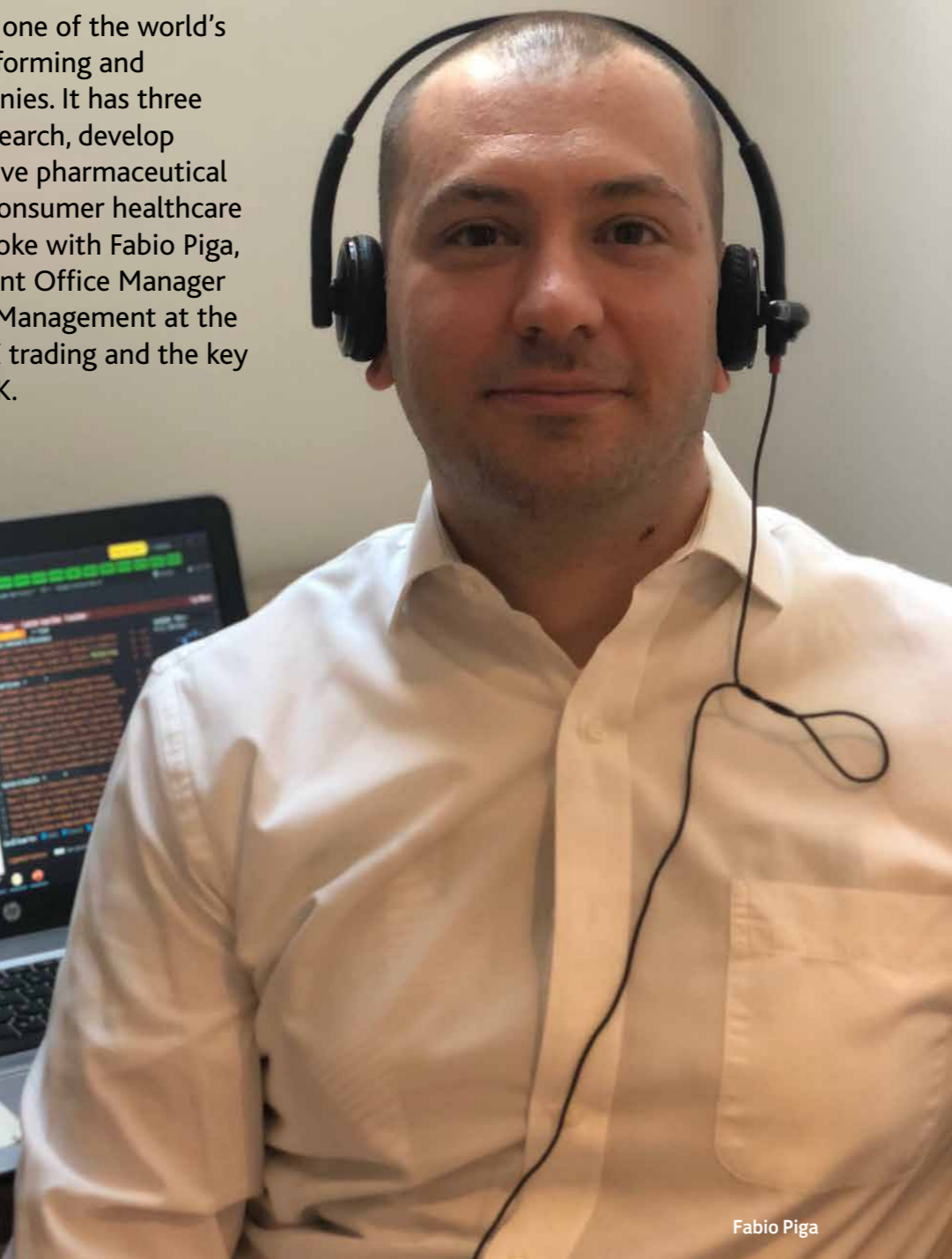
Fabio Piga

Fabio, please tell us a little about your day to day responsibilities at GSK and what your job involves.

I joined GSK 2 years ago as treasury front office manager and I am responsible for all risk management execution activities relating to cash management, foreign exchange and interest rate risk, and ensuring the delivery of a high-quality front office function to the business. I work closely with various areas of the business to support payables, receivables and inventory management and enhancement of the Treasury Management System (TMS) and execution processes.

How does your FX dealing unit fit into GSK's overall treasury operations?

The FX dealing team is at the core of Treasury operations; we are the SMEs for FX and manage the organisation's liquidity and financial risks, banking relationships and working capital as well as providing support to management and business units. We are also involved in the FX and interest rate risk management activities associated with M&A.

How would you describe the key objectives and guiding principles of your trading desk?

Our key objective is to make sure that FX risk is identified and managed in a timely and efficient way, in line with GSK's FX policies. We cover the full FX exposures as soon as they arise, and we make sure there are no open risks for GSK. We will start soon hedging more forecast flows and introducing new execution strategies and hedging programmes by pairs.

Some firms feel it's important to use a stable and mature platform rather than the latest technology. How much importance does GSK place on increasing automation and continuously working to improve its own trading infrastructure?

GSK treasury is making significant changes to its use of technology. It is in the process of replacing its TMS and FX execution platform at the same time. We are moving to system that allows more automation and gives the team more time to analyse the market and focus on greater cost reduction. I am personally very keen on increasing automation and reducing manual interaction with the orders being executed, so that the traders can spend more time on tasks that add value i.e. reducing execution costs, TCA.

Did GSK suddenly decide to adopt algorithmic FX trading or was it a more gradual process?

I would say it was a quite fast process. I introduced algo trading in my first 4 months here. I spent those initial months analysing GSK currency portfolio, execution style and processes in order to gather a better understanding of how the company operates.
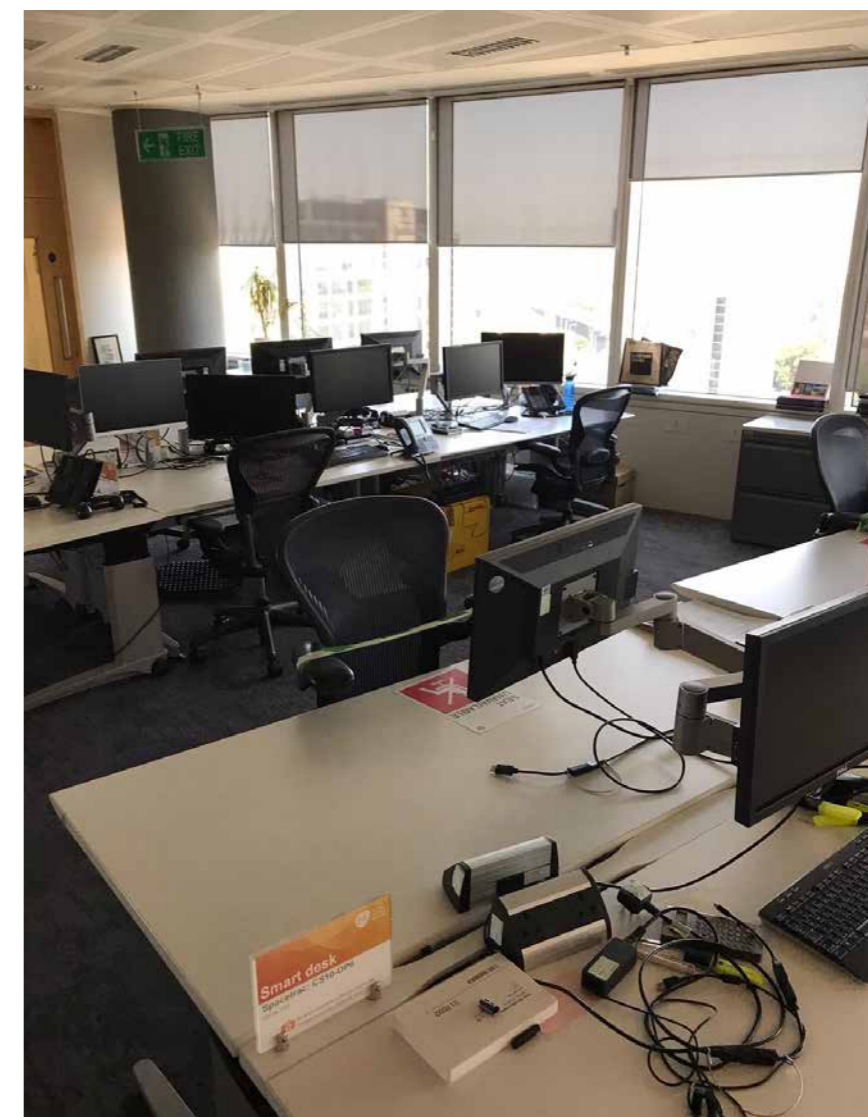
Making changes in a big organisation is always a challenge so it's really important to involve the right people in the conversation at the right time. I had to make sure a switch to algo trading would not be disruptive for the team, the system or the existing processes.

In the end, it was a success and senior management has been very supportive and happy with the change.

What are your main goals when undertaking algorithmic FX trading and what types of FX orders are usually a good fit for it?

The main goal of GSK algo execution is to reduce execution

GSK like many large firms has dealing teams currently working from home ▶

GSK's corporate headquarters in Brentford, London

portfolio which is mainly made of very liquid pairs (85% G10) . Of course, the type of FX algorithm a trader decides to use depends on benchmark, order size, currency pair, liquidity, and urgency of the FX order. We want to be dynamic and able to adapt execution if market condition changes. An example has been the COVID situation; on some days we realised that passive algos were not performing as expected due to the poor liquidity and high volatility hence we chose a more aggressive type of execution, in order to get the order done and close out the risk.

How willing are you to let algos do their job without micromanaging many aspects of the execution process?

I think that as a trader you are ultimately responsible for your trade performance and shouldn't rely 100% on your algo to do the right thing. This is true especially when market conditions are not normal; this is where I believe the trader can still add some value vs the algo.

Using real time TCA can be a good starting point to understand how your algo is performing and when it's not available, I like interacting with the algo teams over chat to have a better understanding of market conditions and make sure the strategy I'm using will deliver the results I'm expecting.

The main goal of GSK algo execution is to reduce execution costs by capturing spread and achieving cost savings versus risk transfer whilst minimising market impact

What do you see as the key benefits that algorithmic FX trading delivers for GSK?

The main benefit of introducing algorithmic FX trading has been the reduction of execution costs vs mid, which are significant. Not only do we not pay the premium of the risk transfer price, we also save against the mid-price.
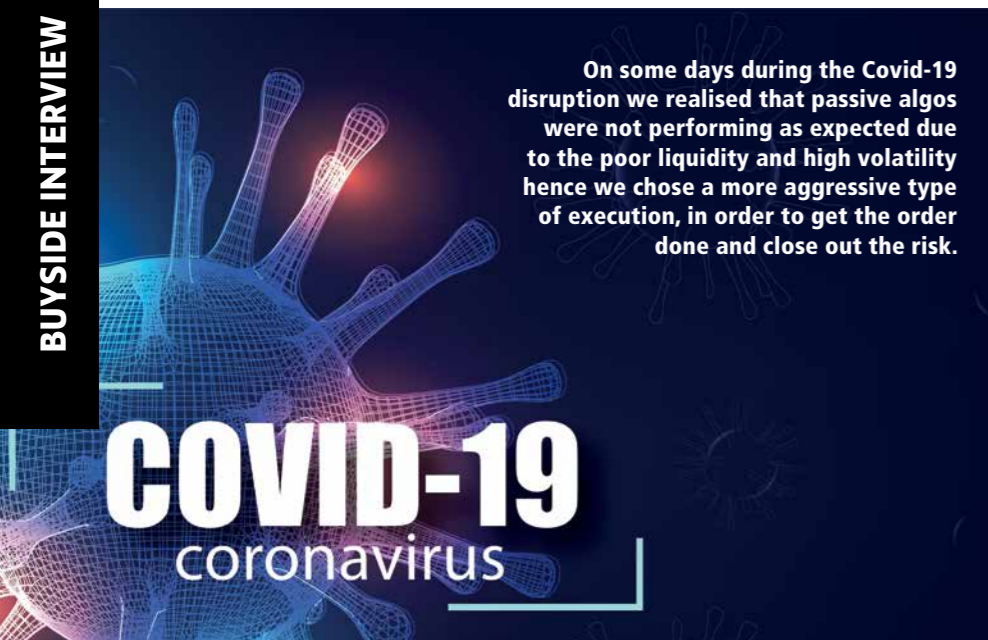
Algo trading makes even more sense now because banks no longer warehouse risk for very long. Other benefits have been the access to a wider liquidity pool, full control over execution, transparency of execution with detailed TCA, reduction of time spent on a deal and the ability to analyse large amounts of data in order to conduct price discovery and identify optimal liquidity.

Have your algos performed as expected during the recent Covid-19 crisis and have they proved resilient under sometimes quite volatile conditions?

The most significant change that we've seen as a result of the current market conditions is the fact that passive strategy execution has been underperforming. With greater market volatility, wider spreads, less liquidity beyond top of the book, executing via a pure passive strategy has proved challenging.

We noticed a big difference on spreads in the primary vs secondary market and that even passive orders become 'impactful' as they feed back into moves in these markets. As a result, we adjusted our execution moving toward a TWAP style algo, which allowed us to get risk covered even if crossing spread whilst still taking passive fills opportunities. Furthermore, to reduce market impact we routed our ▶

costs by capturing spread and achieving cost savings versus risk transfer whilst minimising market impact. When we hedge, we don't express a view on the currency, and we don't normally have a specific target price to beat. Some of the other benefits of introducing algos included the efficiency versus traditional voice execution, and transparent TCA.

In terms of the "types of FX orders are usually a good fit", I believe the FX portfolio drives the strategy and not vice versa. We adapted/ designed the strategy around our FX exposures and company needs. More than 80% of what we trade is G10, hence very liquid pairs that can be traded using a passive strategy.

Post-trade TCA has great value of course but how important is the ability for you to see how an algorithm is performing in real-time and how can that be achieved?

I believe that real-time TCA is essential, particularly for orders with a longer time horizon, which are most likely to be impacted by changing market conditions.

Real time market data such as TOB spreads, liquidity, execution venues, economic data releases can be used for a better decision-making process and to adjust the strategy under changing market conditions. Few algo providers have invested heavily in real time TCA and we started using them more and more, especially those that prioritized ease-of-access via Bloomberg. What is important is making sure you know your algo before interacting with it; most third generation adaptive algos are actually designed to read markets in real time, understand the changes and then formulate dynamic strategy accordingly. The question is do you think you can do better than a machine?

In what ways can improved TCA help you to make more effective use of FX algos?

TCA is key for us to understand algo performance and our performance

too.We use a combination of pre trade, real time and post trade TCA to make trading decisions and this has proved to be beneficial and improved our execution costs.

Initially we used the post trade TCA only, but then started adding pre trade analysis to get a better view of liquidity, volumes before trading and adjust to changes whilst the order is executing with real time tools.

I found that post trade TCAs biggest problem is the lack of a centralised FX market benchmark and pre trade TCA looking at a historical market does not work well in "unusual scenarios".

What types of FX algorithms are your trading team currently employing and what factors generally influence this?

We tend to be extremely passive with our algorithmic orders, opting for less impact and more spread savings. This decision was made after analysing our currency

What is important is making sure you know your algo before interacting with it

On some days during the Covid-19 disruption we realised that passive algos were not performing as expected due to the poor liquidity and high volatility hence we chose a more aggressive type of execution, in order to get the order done and close out the risk.

trades to firm liquidity venues and primary markets only.

In what ways has your TCA been influenced by market conditions during this event and have you been able to pick up any important lessons for your future algo trading activities from it?

On the TCA side, we increased usage of pre trade TCA tools to get a better view of volatility, spreads and select the most optimal execution type: Algo vs RT vs Streaming. When executing via algo we leveraged in-flight TCA to direct flows to specific venues or reduce/increase the execution speed, so we are interacting more with the algo than we did before.

In these market conditions, passive algos have not performed as they did in the past so we have learnt how to adapt and be flexible. For example, if the market is moving against you and you passive algo is not getting fills, we have been willing to pay the spread to close our risk sooner.

What steps do you think banks and algo providers can take to increase the appeal of algorithmic execution especially for large corporates?

I think banks need to reduce the complexity of their algo offering for corporates and improve

understanding of internal processes and strategies. Corporates are very fragmented when it comes to FX execution, some have a very strict policy, which is difficult to change, others see FX dealing as an admin task and don't focus/invest in it, whilst others instead are very sophisticated and behave like real money clients.

In such environments, banks need to approach clients differently: guiding, training and supporting those who are behind the curve and working closely with the more sophisticated ones to make sure they are always informed and included in changes.

We are now frequently talking about how AI and Machine Learning are being leveraged in algorithmic FX trading and associated analytics. How are you approaching the use of next generation technology like this to improve your own FX trading outcomes?

We are not considering it at the moment, but I agree that with the implementation of AI for FX Trading, computers will undoubtedly make accurate and precise decisions saving us time and energy.

In my opinion it will be very challenging to figure out what kind of data and data combinations would be the most appropriate

when building an FX trading model and AI will still face the challenges of filtering out the unpredictability of the markets. For AI to reach the required level of efficiency in FX, it needs the cooperation of experts and experienced FX traders.

Many large asset managers are already adopting algorithmic FX trading but most corporates haven't yet fully committed to it. Do you expect that to change?

Yes definitely. Corporates want to minimize FX costs in the same way as other buy-side clients and are unwilling to pay a widespread via RFQ.

Some recent studies showed that corporates are looking to execute more FX spot volume algorithmically and are increasingly using bank-provided algos, attracted by their potential benefits like cost savings through minimizing spreads paid, reduce market impact (especially for larger trades), access to liquidity across a wide range of liquidity pools.

Corporate FX desks can also benefit from desk operational efficiencies that result from automating the execution.

In what ways are you likely to expand your use of FX algos in the future

I would like to be able to increase the percentage of spot executed via algos. We're currently being stopped by system limitations, many of which will be fixed with the launch of our new TMS. The new system will allow us to net and aggregate our exposure minimizing spread crossing.

In addition, I would like the team to increase their confidence in interacting with the algo and be more dynamic in adjusting algo selection vs market conditions. I believe that the automation and time we are saving on execution thanks to algos should be spent on TCA analysis and data analysis to improve the quality of our execution and add value for GSK stakeholders.

Considerations for FX algo execution in changing markets

By Dr Cameron Mouat, CEO of Aoraki Advisors

Dr Cameron Mouat

Although FX markets are always changing, many market characteristics such as spread, volatility or liquidity often fall into predictable ranges. An algo that can recognise and adapt as these market characteristics change is more likely to give clients better outcomes than one that doesn't. We will consider some talking points around algos in changing markets; and will also consider questions a buyside trader might ask about algo behaviour to assess algo providers.

An algo will be most effective if it can adapt to as many market regimes as possible and make informed execution decisions that are appropriate for each situation

A LESSON LEARNT FROM 2008
In late 2008 and early 2009, deleveraging and risk-off sentiment lead to significant intraday movements in currencies. Algo execution was still a nascent product in FX, and although there were sophisticated heuristic algos, it is reasonable to say that algos today generally should have better models to recognise and adapt to variable market conditions.

I remember a US macro fund using an algo for the first time to trade an Aussie cross. Liquidity was heavily imbalanced with multiple sellers of Aussie and few buyers. To reduce impact, this algo trade was restricted to 10% of the main market volume. This slowed down the execution and as the market moved a big figure, what could have been a 20-point slippage, turned into 50. Using an algo to reduce market impact was the wrong approach in these market conditions. A more prudent approach when liquidity on the opposing side of the market is scarce, is to use the execution certainty given by a risk transfer price.

The lesson from this trade, and a number of events since, is that although markets predominantly behave in a reasonably stable manner with predictable liquidity and volatility, when market conditions change, algo users need to understand how the algo will adapt, what slippage estimates change, and alter execution style accordingly. Today, algos and pre-trade analytics are more sophisticated, and just as importantly the way we talk about and use algos has advanced. Picking the correct algo and using it in the right way will significantly improve outcomes.

MARKET REGIMES AND ADAPTING TO CHANGING CONDITIONS
A market regime can be characterised by quantitative variables such as direction, spreads, liquidity and volatility. If any of these characteristics substantially change there will be a shift from one regime to another. Two methods for identifying regimes are via market structure or historical events. Identifying structural regimes is usually straight-forward as they are relatively common and due to factors such as the intraday distribution of liquidity. However, identifying regimes through historical events is also important so an algo can be programmed to adapt to market conditions that may only be seen rarely. Examples of this are different regimes that followed sterling devaluing after the Brexit referendum result.

An algo will be most effective if it can adapt to as many market regimes as possible and make informed execution decisions that are appropriate for each situation. Some algos may not explicitly trade according to defined regimes but will still use quantitative models

Picking the correct algo and using it in the right way will significantly improve outcomes

to analyse real-time and historical market data. It is important to note that if these models are only looking at recent history, then they may not capture more historical event behaviours. Because such events could reoccur, it is worthwhile understanding how far back quantitative analysis goes.

Let's consider changes in algo logic for a TWAP execution. In a low volatility regime, the decision to trade passively is stronger as there is lower risk that the market will move substantially away and capturing spread is beneficial. It follows that for a TWAP algo to trade more passively it will need to have greater flexibility around the TWAP schedule. However, if volatility increases, the risks from trading passively are increased and the algo should keep closer to the TWAP schedule.

Now consider a TWAP execution when the market has a significant liquidity imbalance and the market is trending. Clearly if the trend is towards us (i.e. market is going lower and we are buying) we would want to trade slower and fall behind the TWAP schedule. This will take advantage of trading more of the order in a lower market and thus outperform the TWAP benchmark. On the other hand, if the market is moving away, we should trade quicker, cross the spread more often, and try and be ahead of the schedule to take advantage of

better prices now than what we expect later.

Other algo types have characteristics and behaviours for different market regimes to outperform versus benchmarks. An algo with an arrival price benchmark, for example, might determine that the current market regime is likely to result in a higher cost execution than usually expected. In response to this the algo behaviour could have more market impact and cross wider spreads. Of course, every algo provider is going to have different methodology to measure regimes and adapt their algos. An effective way that algo providers test algo behaviour across regimes is to carry out event specific trading simulations. Buyside traders interested in algo behaviour across different regimes, should review these simulation results.

CONCLUSION
Traders can gain execution savings during normal market conditions, only to give them up when markets start to behave differently and algos underperform. To partly mitigate this, having an execution plan for different market conditions or market regimes is a worthwhile exercise. Traders should therefore seek to understand how algo providers analyse changing markets, how they adapt their algos and what they recommend in different scenarios.

Traders may also consider asking the following questions of their algo providers:

- **What quantitative metrics do you use in determining market regimes?**
  The metrics used to characterise market conditions will vary substantially across algo providers.
- **How do you identify infrequent historical regimes or events?**
  Identifying past events is important for ensuring an algo is programmed to react effectively.
- **How does the algo adapt to different regimes or changes in market characteristics?**
  Changing market conditions should lead to different algo behaviour.
- **How does the algo behave when the market gaps?**
  Significant market gaps can often stop algos from executing due to hard limits.
- **How does the algo trade differently in trending or volatile markets?**
  More advanced algos will have adaptable behaviour for different market conditions.
- **How do you ensure algos behave as expected in different regimes?**
  Simulation testing is an example of preparing for regime changes.
- **What notifications or alerts do you have in place when market conditions unexpectedly change?**
  Ideally, there would be an automated or manual notification of a significant change to market conditions when trading an order.
- **Do you have specific recommendations for algos in different market conditions?**
  Algo providers might have specific market conditions where they believe their algos have an advantage.
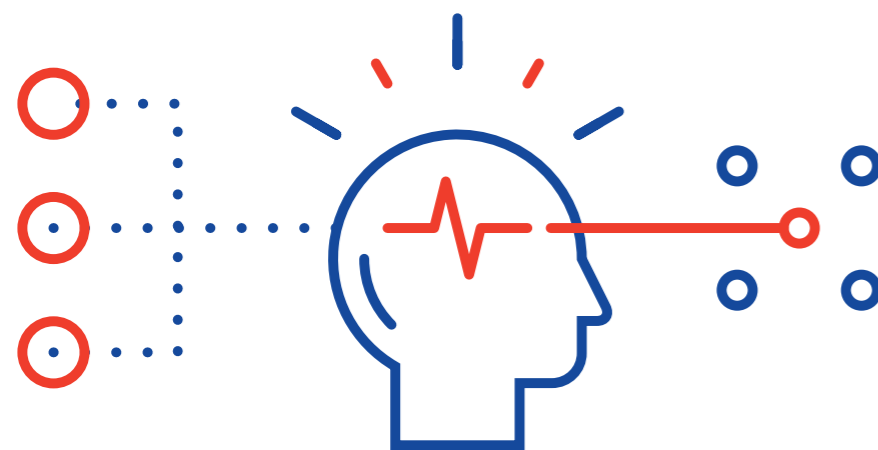
Exploiting the power of Artificial Intelligence for FX algo trading

by Alexei Jiltsov, Co-Founder of Tradefeedr

Alexei Jiltsov

Terminology around Machine Learning (ML) and especially Artificial Intelligence (AI) is typically quite loose which leads to confusions. Therefore, it is important to provide some definitions for the purpose of this article to frame the AI/ML examples provided. As the name suggests AI is understood as human-like intelligence observed from machines. While the term was coined by John McCarthy, the organizer of the now famous Dartmouth Summer Research Project, it is Marvyn Minsky's definition which is frequently used for AI -- the science of making machines do things that would require intelligence if done by men.

Machine learning (ML) on the other hand is defined as a study of algorithms which learn from the data. Therefore, trained Machine learning models can be easily be utilised as AI. It is often implied that AI is more general than ML. An example of AI which is not ML is an expert system with hard coded human knowledge – the results look intelligent. Also by that definition every ML system which does something "which would require intelligence if done by men" is AI.

A more colloquial way to describe AI is a software which can learn and solve problems "by itself" and learns as we go along. Like on a trading floor, the trainee is becoming a trader after he/she "learns the environment" and then is expected to make decisions him/herself. By that definition linear regression is not an AI as it is not self-updating. So, when people say AI they normally picture something which does make some decisions, adapts to the changes in the environment and does not get confused by regime shifts. The pressure to apply AI business problems is largely due to competition to make use of increasing volumes of data. The challenge is to select the right AI, which can help to separate signal from noise by processing this ever increasing data flow.

Direct application of AI and ML to finance/trading/asset management is complex as explained by de Prado (2018). Simply borrowing what works from say image recognition and applying it to financial time series will not work for a number of reasons. Low signal to noise ratio is one. A successful trader is correct (up or down on a trade) around 50 percent of the time – this percentage would be considered low for most other activities and would be considered random in statistics. Also there is a lot of overlap in financial observations. De Prado compares financial ML to standard ML where all observations have been mixed together in unknown proportions (blood tubes example on page 60 in de Prado, 2018).

Also, when it comes to finance the definition of "required intelligence if done by men" is different. A proportion of successful traders within any intelligent population is much smaller than the proportion of people who are able to recognize their friends and relatives (or tell cats and dogs apart) on a set of images. Kahneman (2013) provides an excellent review of how human "heuristics" (the same ones which allow us to recognize images successfully) fail to deliver successful results when it comes to more analytical decision making (where trading and financial management belongs to).

On the flip side a lot of concerns in Kahneman (2013) can be addressed by careful application of consistent Bayesian updating. Therefore, AI data processing and even humble ▶

statistics can be more successful than "human intelligence". This has been known for long time in a systematic trading literature.

Despite all the challenges increased flow of data implies AI is as welcome in finance as in any other subject. Humans simply cannot cope with market speed and simple rule based models, while fast, tend to break down. Ability to process a lot of data and extract information from data as it would be done by an intelligent person but in a much more scalable way is extremely valuable in trading as it is in any other field. Therefore, the main criteria for our examples of AI below is their ability to replace the human work. We consider a perspective of trade execution which is a short term decision making.

CREATING TRADING CONTEXT: MARKET REGIMES

The first task of execution trader to identify a "market regime". It is a mental model to map what is going on with the most likely price action today. A trader normally aggregates different volatility and risk aversion indicators. A judgement has therefore to be made on which ones are relevant.

Alternative to human decision making is to apply machine learning procedure to identify market regime. The procedure can cluster
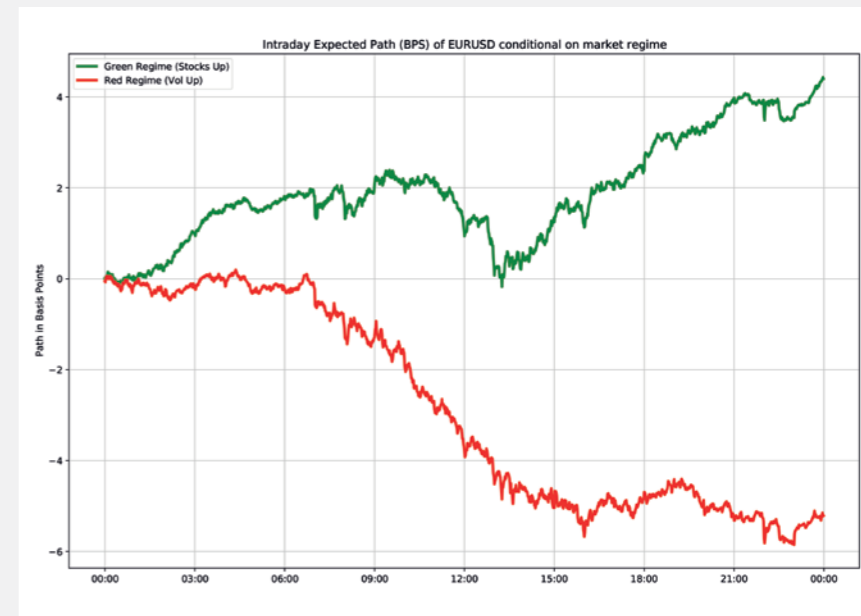

Figure 2: Expected EURUSD Intraday dynamics in different market regimes

different return realizations over time intp homogenous groups called "regimes". For example, a market regime can be risk-off with equity markets down, volatility up and USD up or down depending on the prevailing macro theme. Machine learning models such as Hidden Markov Model (HMM) can be applied to identify market regimes. HMM were introduced for speech recognition (an inherently AI problem) and date all the way back to 1980s (see Rabiner, 1989). Figure 1 follows the exposition in Jiltsov (2020a) and presents the evolution of different asset classes in different market regimes.

The regimes are identified by HMM estimation based on observable market variables such as equity return, volatility, credit spreads and liquidity indicators. HMM with fixed number of states maps naturally onto our human mental model. On the one hand it presents a small number of regimes so classification is easy (the human brain cannot manage large number of states, Miller law - see Miller 1956). At the same time the model is "fuzzy" in the sense it produces the probability estimate for each state rather than exact forecast so this confidence (probability) information can be utilized for eventual trading model.

This market regime classification can feed into trading desk decision making this an application of AI. For example Figure 2 presents expected intraday dynamics of EURUSD in different market regimes. This dynamics suggests different trading behaviour depending on what regime we are in, where in the day the execution is taking place, and how long do we expect the execution to take place. For example, a trader selling EURUSD in a green regime after 1pm may prefer to go slow as the expected trend is upward, while a trader selling EURUSD in a red regime should expect to do that faster. But even this can be an oversimplification as liquidity may ▶
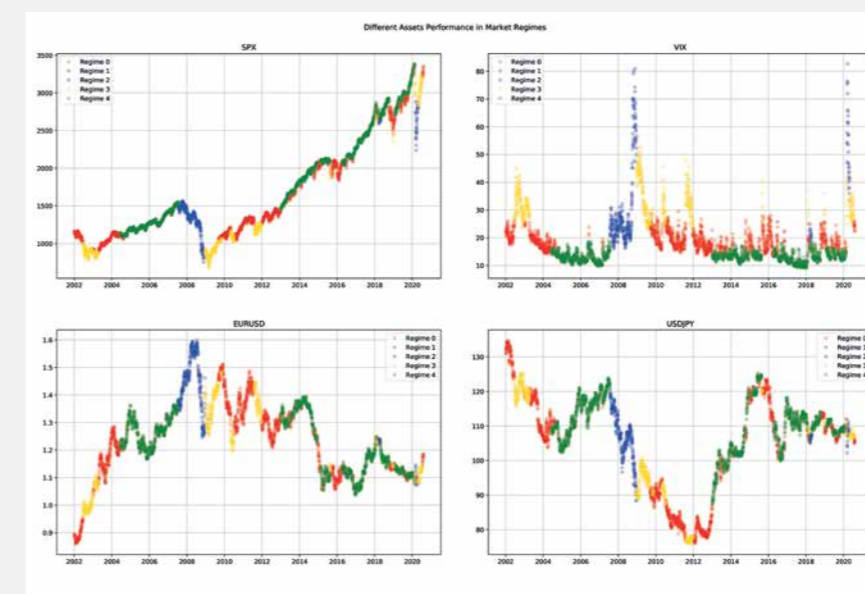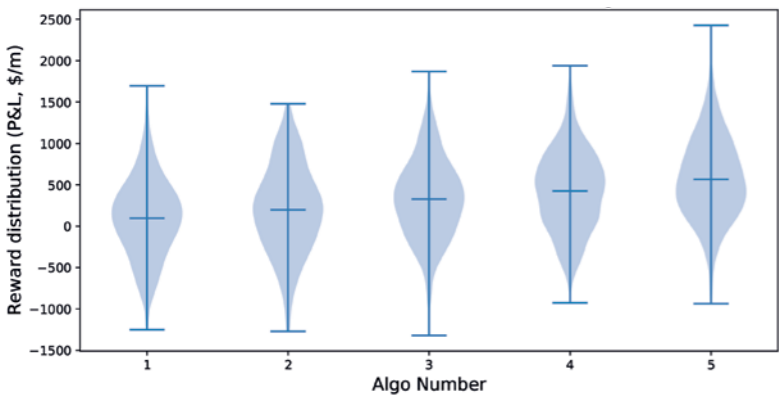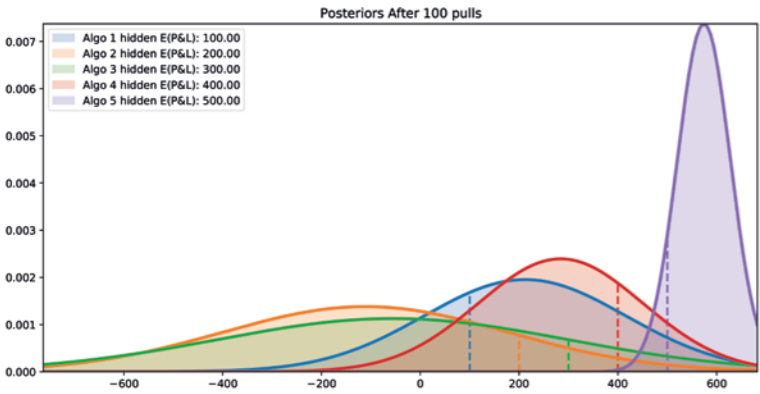

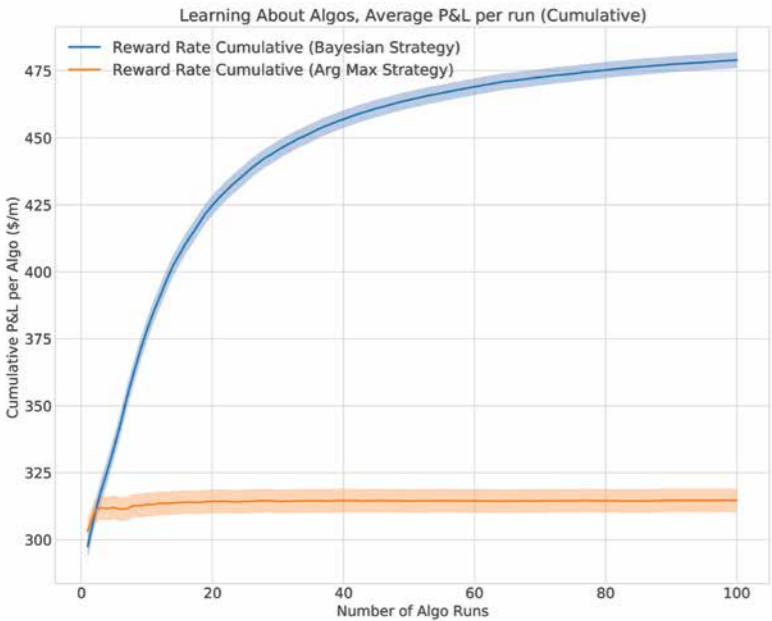Figure 1: Market Regimes Identify via Hidden Market Model

Figure 3. Algo Selection – Problem and Solution

PANEL A: Assumed Algo Performance (Invisible to AI decision maker)

PANEL B: Learning Process

PANEL C: Trading Selection Results. Average Reward Rate ($/M)

be worse in a red regime (also part of the regime) so the market impact of going faster in a red regime may be prohibitively expensive. This the "last mile" decision making.

This "last mile" automation may be based on some AI as well or it can be a simple rule-based model. The second option might be less flexible in terms of modelling but will definitely be more explainable with the heavy lifting by machine learning identifying market dynamics. The first option is described in the next section.

REINFORCEMENT LEARNING AND ALGO SELECTION

FX Algo selection is very similar to the classical multi-arm bandit problem which is a special case of reinforcement learning (a multi-arm bandit is reinforcement learning with no state). In fact the motivation of the multi-arm bandit was a gambler playing with a row of slot machines. We just return back to the basics: a trader playing with a set of algos.

A basic illustration of how reinforcement learning could be applied to algo selection is presented Jiltsov (2020b). The study calibrates typical volatility and performance of FX algo runs and runs a simulation study. The summary of the study and its conclusions are shown in Figure 3. The top panel shows the selection of algos, the middle shows Bayesian Bandits leaning process and the bottom panel show the cumulative reward accumulated by different bandit strategies. Unlike theoretical studies focusing on long run performance this study is focused on cumulative performance up to 100 algo runs assuming that it is the maximum amount of algo runs which can be done in a reasonably stationary environment (before algo characteristics change).

However the above study assumes that algo performance is the same in all market conditions. Ideally we would like to have a framework to learn about algo performance in a relevant trading context. Trading
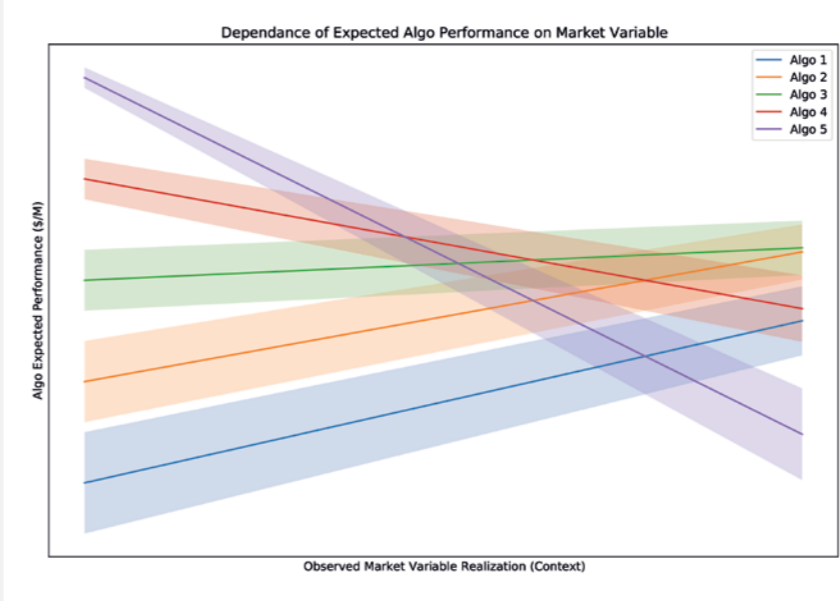

Figure 4: Contextual Bandit Example – Context Mapping - Learning Algo Performance in Different Regimes

context could range from the basic variable such as time of the day, to market conditions and even regime variable identified in the previous section. This problem maps very well on the contextual bandit problem (see for example Lu, Pal, Pal, 2018 for theoretical results). In this framework it is assumed that before pulling an arm of a multi-arm bandit (selecting an algo in our case) the user gets to see some "context" (can be market colour in trading language).

The algorithm then builds a model which maps the distribution of algo expected return to observed context. Figure 4 presents a simple illustration for our 5 Algos considered above. On the x-axis we see the market variable realization – this is context. Assume for the sake of argument that this is a measure of market momentum. If the market momentum is slow (left hand side) we know (learnt over time) that Algo 5 has the best performance in those conditions. If the market momentum is strong, Algo 5 performance deteriorates while other Algos become more appealing. Note that uncertainty (band) around algo performance is inversely proportional to algo performance. The learning algorithm is selecting algos with higher expected reward more often

thus learning proportionally more about their performance.

It should be noted that the mapping between observed context and the state is essentially an unknown function. This mapping can either be done by Bayesian regression as in the example in Figure 4 or can be done via a neural network in which case it is called Deep Contextual Bandit (see Collier and Urdiales, 2018).

CONCLUSION

One thing that financial industry is naturally good at is collecting data. While 10 years ago the availability of big datasets of labelled photos was a challenge (thus together with computing power hindering the progress of deep learning for image recognition) financial data was in a better shape. So it is extremely attractive to just apply state of the art machine learning algorithms to financial problems. However, it is not always simple. De Prado (2018) provides a good example of how simple transfer-application of machine learning to finance fails.

However, some financial problems can be mapped very well on well-researched AI applications. This article argues for two such scenarios. The first is a so called market regime application. A large

number of market variables can be mapped onto lower dimension (regime). Market behaviour within an identified regime is reasonably homogenous. The second is a reinforcement learning application for selecting the best FX algo to execute a given transaction. The two problems can be linked. Market regime identification can serve as a context for the algo selection problem transforming it into contextual bandits problem.

So far we have focused on an algo user perspective. An algo provider (electronic trader) has access to much richer datasets (order book events) and has more room for experimentation (high frequency order placement). However, the combination of techniques is very similar– Deep Neural Network to learn the q-state and reinforcement learning to formalize reward optimization for each action (see Bacoyannis et al, 2018 for detail).

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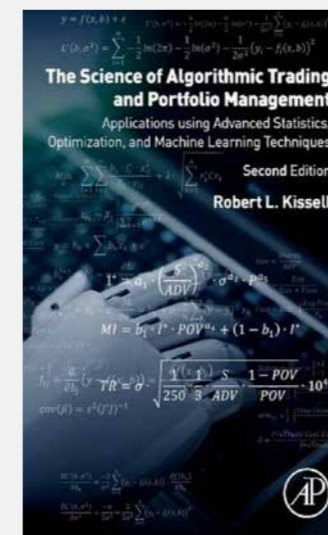
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