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**Structural change in the foreign exchange market:  
implications for the SNB**  
Money Market Event

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Ladies and gentlemen

It gives me great pleasure to welcome you all – both online and in person – to this year’s Swiss National Bank Money Market Event in Geneva.

The past two decades have been marked by dramatic changes in the economic landscape. These changes include a series of crises such as the global financial crisis, the European sovereign debt crisis and, most recently, the coronavirus pandemic. Structural change is occurring at multiple levels, and the pace of this change is picking up significantly due to the ongoing digital revolution. Financial markets are particularly affected by these developments.

In recent years, new technologies, new players and new tools have substantially altered not only the outward appearance of these markets but also their inner workings, their underlying dynamics. Market participants and central banks must therefore confront the following questions: Where can innovations be exploited, what opportunities will they create, and how should any risks be managed? Where is ‘mere’ technological progress in play, and where do the ongoing changes have more far-reaching, fundamental consequences?

Today, we wish to focus on the structural change – indeed the transformation – taking place on the foreign exchange (FX) market. The developments and challenges are particularly evident in the FX market, where trading activity has accelerated markedly in recent years. The FX market is now a so-called ‘fast-paced electronic market’ – high-frequency, electronic and complex.

These developments are particularly relevant for the SNB, as the exchange value of the Swiss franc, and hence the FX market, are of great importance to us. Even though the exchange rate is not a target of monetary policy, it is relevant because it significantly influences monetary conditions and thus our ability to fulfil our mandate to ensure price stability while taking due account of economic developments. In a small open economy such as Switzerland, changes in the exchange rate materially affect domestic prices and economic activity and must therefore be taken into account when designing monetary policy. If the SNB adjusts its policy rate or intervenes in the FX market, this in turn has an impact on the exchange rate. The dynamics of the Swiss franc are complicated by the fact that its exchange value tends to appreciate in uncertain times due to the currency’s status as an international safe haven.

In addition to the important role the Swiss franc plays in influencing monetary conditions in Switzerland, the FX market also matters because it affects the implementation of our monetary and investment policies. As a central bank, the SNB is interested in ensuring that the FX market functions smoothly at all times, enabling an efficient price discovery process which supports the transmission of monetary policy. Furthermore, as a direct participant in the FX market, we have a responsibility to act as efficiently and effectively as possible. For instance, in the context of monetary policy implementation, we seek to achieve maximum impact when deploying our instruments. By contrast, when it comes to our investment policy and managing our currency reserves (these make up the bulk of our balance sheet, which is worth over CHF 1,000 billion), we seek to minimise our impact.

My colleague Thomas Moser and I will outline today the changes we are observing in the FX market, the challenges associated with them, and what this means for the SNB.

The key message of our presentation is as follows: Rapid structural change, driven by the ongoing digital revolution, is affecting all financial markets today, and it could accelerate further in the years ahead. As a central bank, we must have a solid grasp of the developments and changes taking place in the markets – at both a macroeconomic and a market microstructure level – and be able to identify their fundamental implications at an early stage. When core variables, including the structure and functioning of the market, price discovery processes and market dynamics, change, central banks must be able to spot such changes and react to them where necessary.

Using the example of the FX market, we will demonstrate that, in addition to new data, new technologies and new skills, central banks will require a completely new data and analysis infrastructure if their market monitoring and analysis are to remain state-of-the-art in the face of the profound transformation taking place. It will likely not surprise you to learn that central banks have been exploring this issue for some time and are joining forces in this area.

The remainder of our presentation is divided into three sections. First, we will examine the nature of the structural change that has been underway in the FX market for some years. Second, we will discuss various operational and policy-related challenges that result from this structural change. And third, we will outline how the SNB is responding to these challenges as a market participant and market observer and what role the FX Global Code plays in this context.

## **Digital innovation is bringing about structural change in the FX market**

With daily trading volume averaging USD 6.6 trillion, the FX market is the world's largest financial market. Notably, the FX market is not centralised – it has a decentralised, fragmented structure (cf. chart 1). One of the fundamental features of this market is that the bulk of the trading takes place over-the-counter; that is to say, it is transacted bilaterally between individual parties, usually via an array of different electronic trading platforms. Because the market is fragmented and liquidity is distributed across many so-called 'pools', there is neither one marketplace nor one price for foreign exchange. One should therefore always bear in mind that a decentralised, fragmented market structure means that quotes on any given trading platform will only ever offer a partial view – but never a complete picture – of the market.

The FX market has been experiencing a dramatic transformation for several years now due to digital innovation. Exponential improvements in computing power, the ever-increasing speed of data exchange, and the declining costs of data storage have caused the share of trades that are executed electronically by both parties to a transaction to swell continuously. In 2019, 75% of spot transaction volume was already being traded electronically. Not only have transaction volumes grown significantly, but the market has also become much faster and more complex; it has genuinely evolved into a 'fast-paced electronic market'.

In the wake of this transformation, two major structural changes have occurred in this market, which we will discuss next.

First, fragmentation is increasing in the FX market and the importance of the primary markets is decreasing. For decades, the so-called ‘primary markets’ – the interbank trading platforms EBS and Refinitiv – set the tone for trading and price discovery in the decentralised FX market. The prices displayed in the primary markets are widely available and binding (‘firm’), i.e. once the trading interest has been communicated, prices can no longer be withdrawn or adjusted by the quote provider (no ‘last look’). This has made them an important anchor in certain currency pairs, especially during periods of heightened volatility. Secondary trading platforms, on the other hand, often provide ‘non-firm liquidity’, i.e. the prices shown are merely indicative quotes. Access to these secondary platforms and the prices shown on them is also more limited due to their less prominent position in markets.

In recent years, competition for trading volume has increased significantly and the market has become even more fragmented. In the early stages of the electronification of trading, it was technically very difficult and resource-intensive to set up a new trading platform. However, owing to sharp drops in the cost of the associated technologies, these barriers to entry for alternative trading platforms have fallen steadily; this has led to an increase in the number of secondary trading venues. In addition, for several years now, new players have been pushing into the market which has traditionally been dominated by banks, and they are taking over the classic intermediary function the latter used to perform.

Within this increasingly fragmented market, trading activity has been migrating from primary markets to secondary markets. While the market share of traditional primary markets is declining, secondary trading platforms are gaining market share. On the left-hand side of chart 2 we show the estimated primary market share for all currencies. Note that this share has more than halved over the last 10 years. And the Swiss franc is no exception here. On the right-hand side of the chart, we can see that the market share of the Swiss franc currency pairs has also decreased considerably and is currently stuck at a low level.

This migration of trading activity is due, among other things, to the fact that the new trading platform operators entering the market are offering technological improvements and attractive conditions in an effort to court volume. As a consequence, liquidity providers are choosing to distribute their quotes across multiple platforms. Thus, not only is the market becoming more fragmented, liquidity itself is as well.

Second, the trend towards internalisation is gaining momentum, making trading activity in the FX market less transparent. Internalisation is a less transparent form of trade execution. When executing transactions, professional market participants typically have a choice between more transparent and less transparent trading options. In other words, they can place their orders directly on widely accessible trading platforms (the primary and secondary platforms), or they can transact outside of this system, for example by using ‘dark pools’ or internalisation via intermediaries. We will discuss some of the implications of these less transparent forms of trading in the panel discussion that will follow after this talk. With internalisation, client

transactions within a financial institution are no longer traded on the interbank market. Instead, the financial institution, in its role as intermediary, offsets trade orders from client transactions internally against its own book of trade orders. The degree of internalisation may be geared to meet specific requirements – trading may take place entirely outside of the primary and secondary platforms, or a hybrid approach may be adopted that draws partly on an internal intermediary’s liquidity and partly on the liquidity of primary or secondary platforms. The informational content of these transactions thus remains more or less within a financial institution and is therefore more or less beyond the reach of price discovery on the primary market platforms. Which type of trade execution is chosen ultimately depends on the objective of the market participants, i.e. whether the goal is to reduce market risk, minimise transaction costs, or maximise the probability of a transaction being fully executed.

In recent years, the trend towards internalisation has gathered pace. Due to the growing volume of internalised trades, there is less and less need for dealers to execute transactions on widely accessible interbank trading platforms (cf. chart 3).

From an individual perspective, internalisation can be beneficial for both clients and intermediaries. Intermediaries that provide internalisation can avoid paying bid-ask spreads as well as other transaction and settlement costs associated with external platforms; this allows them to offer better prices to clients. For their part, clients hope that by avoiding widely accessible platforms they can reduce ‘information leakage’, and with it the price impact of their trades.

At the same time, however, this approach reduces transparency on the FX market as a whole, since fewer transactions take place on widely available platforms. This is because the more market participants conclude their transactions outside of the regular trading platforms, the less information about actual trading activity is reflected in posted prices. What can seem advantageous from an individual trader’s perspective may, from a certain point onwards, be detrimental from an aggregate market perspective.

Overall, prices on the FX market have become more competitive due to the greater number of players, while trading activity has simultaneously become more fragmented and less transparent. You are probably asking yourselves whether this development is positive or negative. We can already see some clear changes emerging as a result of the structural change. While these are not yet problematic from the point of view of market dynamics and market functioning, it is important to have a sound understanding of the impact of these developments. We will now discuss some of the challenges presented by these structural changes in the FX market.

## **Challenges**

The increasing fragmentation of the market potentially affects the relevance and reliability of reference prices, which in turn can affect the efficiency and robustness of the market. In a decentralised market such as the FX market, so-called ‘reference prices’ play a key role. They simplify the price discovery process, and they are used both as a real-time reference for

trading and for benchmarking transactions post-execution. Given the waning role of primary markets and the growing importance of internalisation, more and more players are questioning whether the prices on the primary markets can still be considered representative.

From today's perspective, it is safe to say that primary trading platforms remain relevant in the price discovery process and that they make a very important contribution to market liquidity and stability, especially in turbulent times. However, if more and more transactions take place outside of widely available trading platforms, the efficiency of the price discovery process will suffer. Identifying these structural changes at an early stage is a complex task and requires continuous exchange with other market participants.

In order to automate and facilitate access to the various pools of liquidity in this fragmented market, market participants are increasingly deploying so-called 'execution algorithms' (EAs). EAs are automated trading programmes that optimally execute transactions according to parameters and instructions set by the client. In the case of large orders, for example, market participants instruct their EAs to break a transaction down into small 'chunks' that are spaced out over time and across platforms so that they can draw liquidity from multiple trading venues simultaneously.

The SNB recently chaired a working group of central banks under the aegis of the Markets Committee at the Bank for International Settlements (BIS), in which we analysed the use of EAs and their impact on the FX market in considerable depth. The working group concluded in its report that EAs help their users improve transaction execution in terms of both cost and risk. How exactly does this work? By allowing users to spread their transactions across multiple trading platforms, EAs improve the price discovery and matching process in a fragmented market. An algorithm optimises transaction execution according to instructions and parameters defined by the user. At the same time, however, risks are also transferred to the user. This is because transactions are not carried out immediately in one big block; instead, they are optimised across small chunks according to user-defined criteria. For instance, should market risks or direct transaction costs be minimised? Or should speed of execution be prioritised? It is not possible to pursue all three goals simultaneously. Chart 4 illustrates this trilemma when it comes to defining the objective of algorithmic trading. For example, an algorithm that prioritises minimising transaction costs could, in an unfavourable environment, only partially complete the execution of a transaction. Optimisation based on one particular objective may thus harbour other risks that must be weighed against each other.

The working group's report also highlighted that the growing use of EAs is further reinforcing the trend towards fragmentation and internalisation and that they are thus themselves contributing to the ongoing transformation of the FX market. On the one hand, EAs are increasingly being used to compare pricing conditions on various platforms in real time in order to obtain the best overall price; they thereby facilitate trading outside of the widely available markets and strengthen the trend towards fragmentation and internalisation. On the other hand, as we have already noted, liquidity dynamics in the market have changed fundamentally. Since EAs split orders into small chunks, it is no longer the absolute volume

of liquidity that determines the choice of trading venue, as was the case until a few years ago. Instead, the focus is increasingly on identifying how quickly liquidity becomes available again in a given trading venue ('liquidity replenishment') after a trade occurs. Chart 5 compares a new metric for liquidity replenishment with the conventional metric – the bid-ask spread. Data for two different trading venues are presented in the chart. It is clear that the new metric contributes to a more differentiated assessment of liquidity conditions. In this example, while Trading platform 2 offers low transaction costs when measured according to the average bid-ask spread (left panel), the right-hand panel shows that, on Trading platform 2, it takes a relatively long time for liquidity conditions to normalise following a large transaction. By contrast, on Trading platform 1 participants are more able to trade large volumes even though its traditional measure of liquidity – the bid-ask spread – is higher.

These changed liquidity and market dynamics require new monitoring approaches. Fast-paced markets call for new monitoring metrics and technologies. On the one hand, as mentioned above, traditional measures of liquidity will need to be complemented by new measures that allow us to better understand the changing dynamics. Liquidity is a key feature of a well-functioning market, as it allows participants to trade large volumes at low cost at all times. On the other hand, the need for timely and interactive monitoring is increasing, as the growing importance of automated forms of trading, among other things, is creating new risks that influence the resilience of the market. How should or can a central bank respond to these challenges?

### **Implications for the SNB as a market participant and market observer**

In the third part of this speech, we take a closer look at what these changes mean for the SNB as a market participant and observer and how we intend to manage the various challenges.

As a market *participant*, the SNB needs its access to the fragmented FX market to be as comprehensive and technologically efficient as possible. The fragmentation and ongoing migration of trading activity to less transparent venues requires the SNB to have broad coverage of market developments and to be able to access multiple, disparate trading platforms. According to some market studies, the number of trading venues has more than tripled in the last 10 years. These new trading venues differ – in many cases substantially – in terms of technological design, type of participants, and market microstructure parameters. For one, it is important for the SNB to be able to select the most relevant platforms in order to obtain a picture of the market that is as complete as possible. In addition, the SNB must constantly review its access with respect to its relevance and technological setup.

To take a specific example, the two primary interbank platforms were recently bought by large financial market infrastructure providers. Refinitiv was acquired by the London Stock Exchange Group and EBS is currently being integrated into CME Globex, a major derivatives trading platform. The integration of EBS into the CME platform means that the associated trading activity for the G10 currencies will be concentrated in the New York Metropolitan Area.

This in turn means that the important interbank markets for the Swiss franc will be located in New York and the surrounding area, where there is already a cluster of established secondary markets. For market participants based in Europe, this translates into a greater physical distance and thus a time delay in the execution of transactions in the order of 30–35 milliseconds. In fast-paced electronic trading, this kind of latency can be very significant, and greater geographical distance can become a competitive disadvantage. This implies that the SNB must invest continuously in modern and flexible trading infrastructure and respond flexibly to change.

The SNB is also making greater use of EAs in its own investment activities in order to optimally distribute transactions over time and across trading venues. Doing so allows large orders to be broken down into small chunks (cf. chart 6). This, in turn, enables us to source liquidity from multiple trading venues over time; this is advantageous if liquidity is low on any given platform. It also reduces the price impact of large-volume transactions. The use of such algorithms also enables the SNB to stay close to market events and deepen its EA expertise.

As a market *observer*, the SNB needs to invest in new data, tools, infrastructure and analytical skills in order to be able to adequately monitor and analyse the Swiss franc and the FX market. Accessing data in a market with limited price transparency can be challenging. If there is no ‘one price’, a key question is: Which benchmark value should market participants rely on when evaluating their transactions and which price is relevant for price discovery? In order to be able to act in an evidence-based manner in this environment of limited price transparency, more data and deeper analysis are required. However, so-called ‘transaction cost analysis’ (TCA), as well as access to the underlying data, are usually resource-intensive. The SNB therefore regularly reviews which data it needs to obtain for which purposes, and it develops its market monitoring and analysis tools continuously.

In order to cope with ever-increasing amounts of data, we also need to develop a new data architecture that integrates innovative technologies and enables cutting-edge data analysis. Project Rio, which was recently launched at the BIS Innovation Hub’s Swiss Centre, is a specific example of what a state-of-the-art data architecture could look like and how central banks can go about managing huge volumes of data as well as the growing speed and complexity of trading. Project Rio is a flagship initiative, which is currently developing a cloud-based monitoring platform for fast-paced electronic markets.

This platform uses the latest streaming technology (hence the name ‘Rio’ – Spanish for ‘river’) and provides an overview of market conditions and relevant indicators in real time. Real-time processing is also crucial for ex-post analyses, as they frequently require precise and comparable time stamps.

Chart 7 presents screenshots of various indicators of market quality and market conditions that can be displayed for a single currency pair, the EURUSD, in order to obtain information about unusual market dynamics, liquidity shortages and volatility spikes. In the coming years, we aim to move the Project Rio platform prototype into a production environment. Ideally,



this will be done in close cooperation with other central banks in order to take into account these institutions' at times widely differing needs with regard to the conduct of monetary and financial stability policies.

While Project Rio has for now been customised for FX market monitoring, it can be used to analyse other fast-paced markets of interest as well. The shift we have described towards fast-paced electronic trading is not exclusive to the FX market, but also affects other markets, such as the bond market. The futures markets are even further along in their development than the FX markets. The monitoring platform thus needs to be flexible and allow a broad view across a variety of markets.

We are also continuously investing in the professional qualifications and analytical skills of our staff. This is important both for analytical activities, which involve the processing and analysis of ever greater volumes of data ('data science'), and for a sound understanding of trading activities and markets. For market participants on the buy side of the market, such as the SNB, it is also important to gain the broadest possible range of experience in the use of EAs and TCA. In order to use an execution algorithm effectively, market participants must understand its underlying decision logic, because the characteristics and operating principles of EAs are far from standardised.

The establishment of common standards and transparency in the FX market is becoming ever more relevant in light of the observed structural changes and their implications. The FX Global Code is key here. The Code – a uniform, global code of conduct for the FX market which is based on a voluntary commitment – was first published in 2017 by the Global Foreign Exchange Committee (GFXC) and it has recently been revised. Given the growing importance of EAs, the changes made during the recent review aimed, among other things, specifically to improve transparency and enhance market participants' understanding of the design and use of EAs, as well as to make risks more visible.

The SNB therefore supports the implementation of the FX Global Code. We ourselves signed the Statement of Commitment to the FX Global Code following its publication in 2018, and we have been involved in the review process. We will renew our commitment to the Code following the recent review, and we expect our regular counterparties to do the same.

## **Conclusion**

Ladies and gentlemen, as you can see, the FX market is undergoing structural change and this presents a host of challenges that we as a central bank must address systematically and without delay.

When it comes to structural change and the resulting challenges, the FX market is of course not unique. All of the world's financial markets have become more electronic, faster and more complex in recent years. If new technology is influencing the underlying dynamics of financial markets across the board, central banks and market participants alike must be able to identify and understand the core changes, track their evolution and analyse their broader

implications. In this context, collaborations between central banks – for example, in assessing the growing impact of EAs – make a substantive contribution.

Understanding structural change and its implications requires investment in the acquisition, processing and analysis of relevant data, as well as the creation of tools and novel architectures that can manage these data. Against this backdrop, shared commitments to flagship initiatives like Project Rio at the BIS Innovation Hub's Swiss Centre can play a pivotal role.

Furthermore, the strengthening of transparency in the FX market through the FX Global Code has an important role to play. The SNB therefore recommends that FX market participants in Switzerland and Liechtenstein follow the Code and underscore this by signing the Statement of Commitment. Ultimately, the FX Global Code provides a lever with which to improve transparency in a rapidly changing FX market – something which is, after all, in the interest of all market participants.

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# Structural change in the foreign exchange market: implications for the SNB

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Swiss National Bank

Money Market Event

Geneva, 11 November 2021

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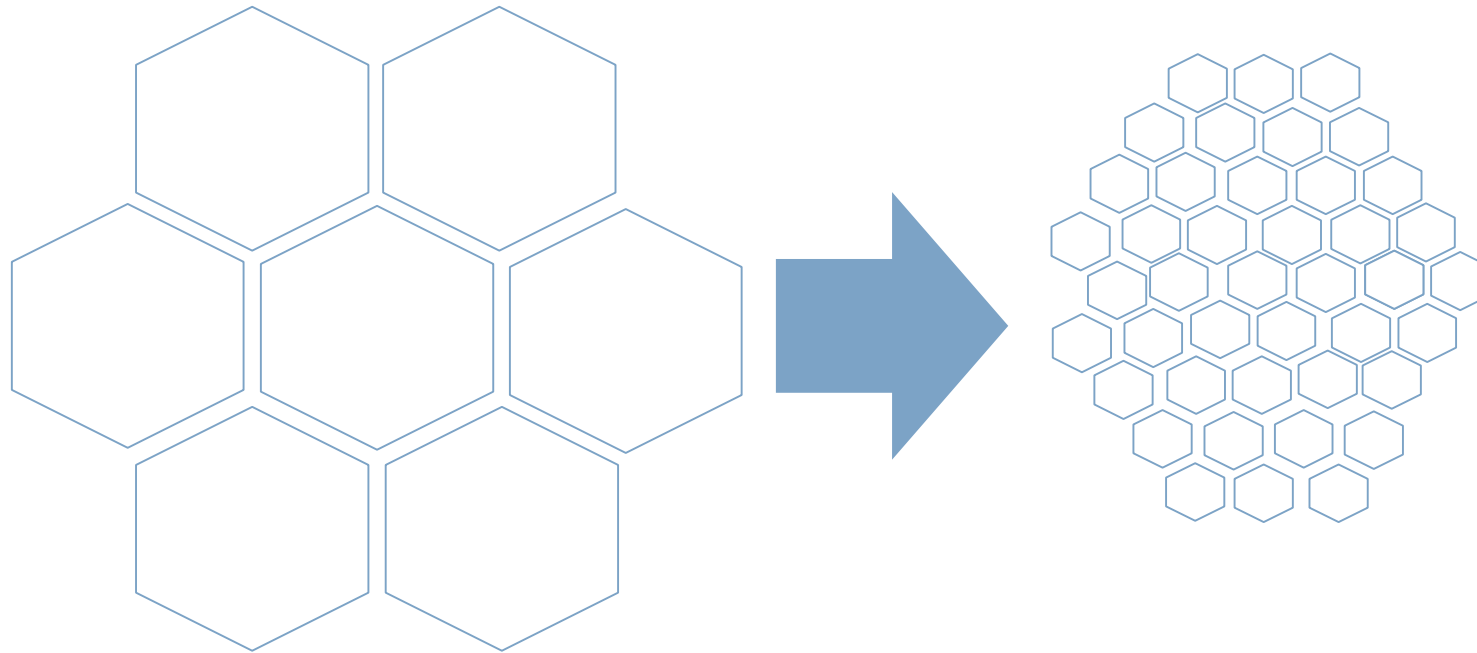
BANCA NAZIUNALA SVIZRA

SWISS NATIONAL BANK



# The FX market has changed fundamentally in recent decades: on the one hand, the market has become more fragmented...

**Chart 1**

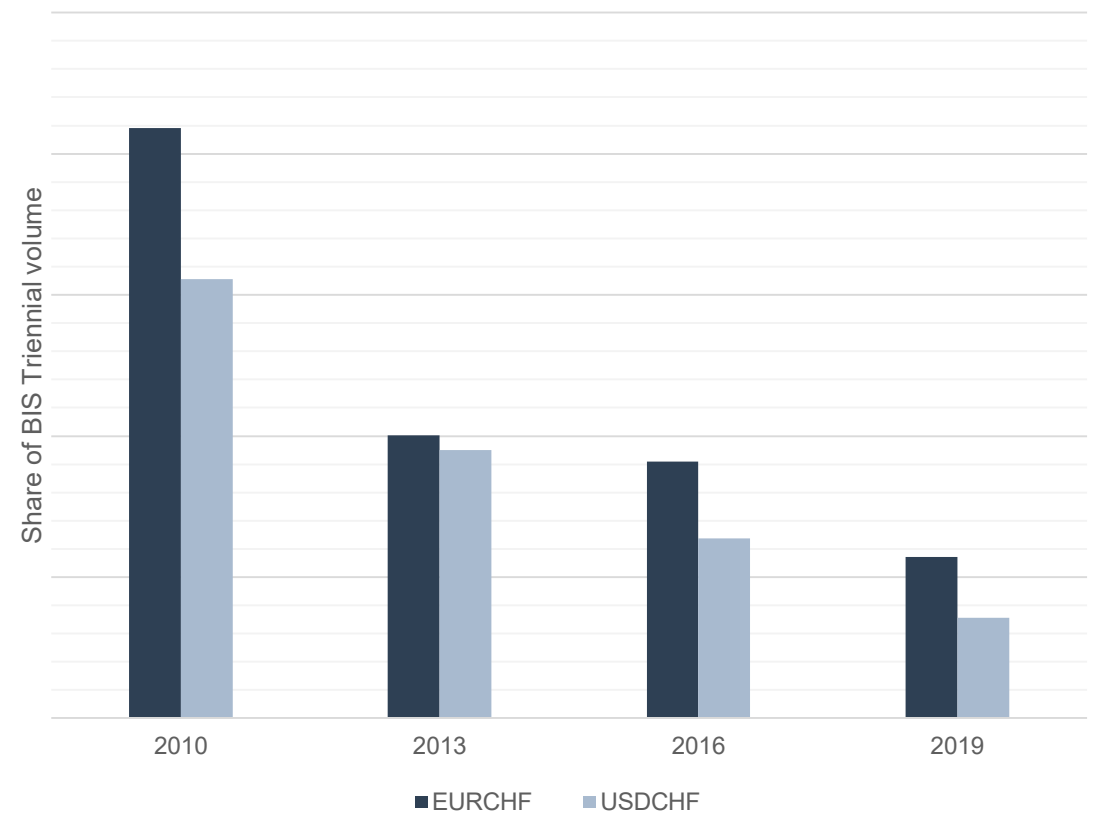


# ...and the role of the primary markets is waning

**Chart 2a: approximate primary market share of trading volume (all currencies)**



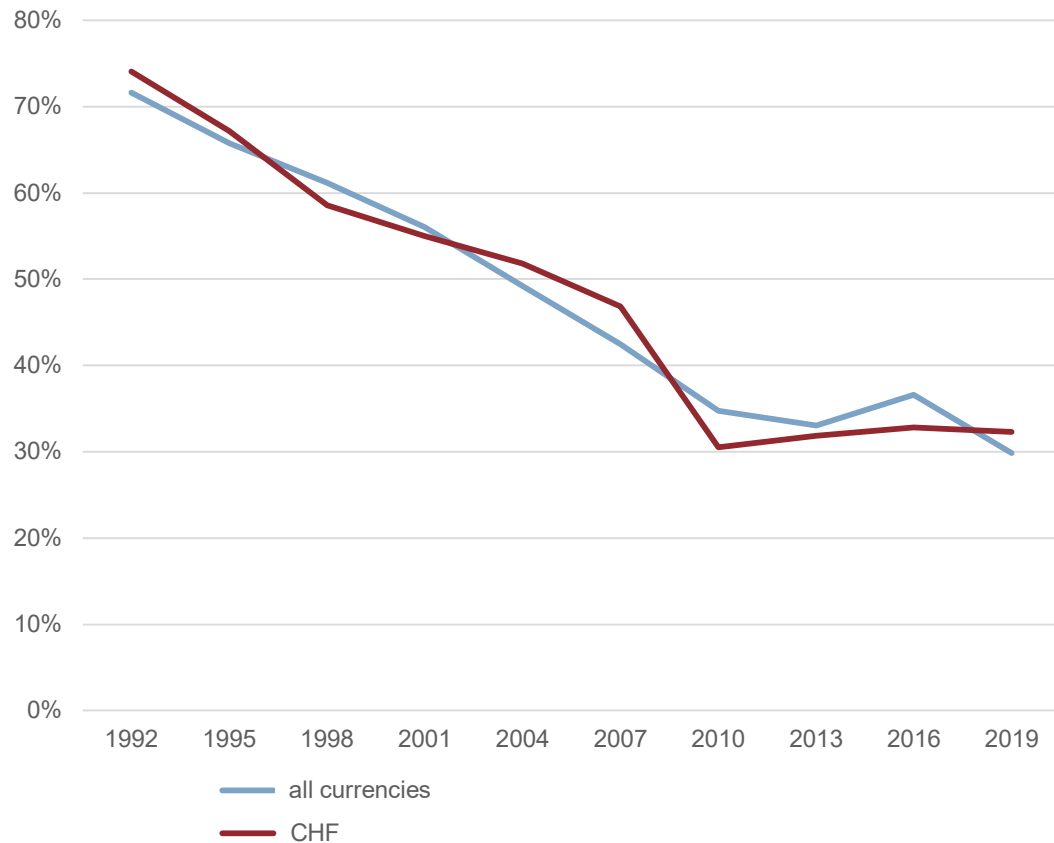
**Chart 2b: primary market share of trading volume (CHF pairs)**



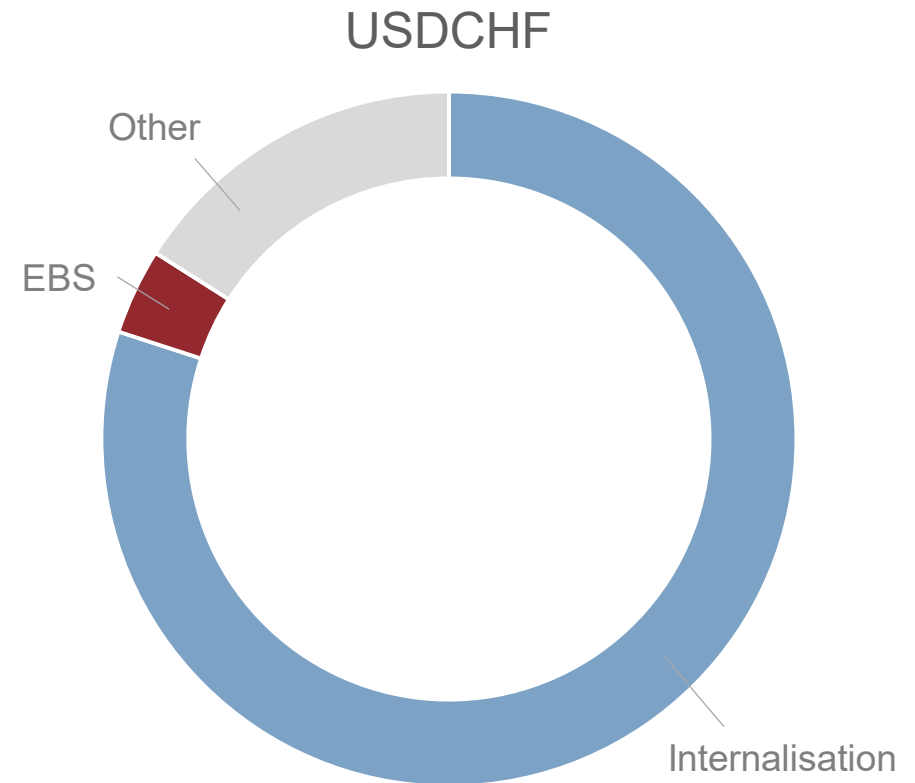
Source(s): BIS, SNB

On the other hand, the trend towards internalisation is gaining momentum, which is making FX trading activity less transparent

**Chart 3a: share of interdealers in spot market (%)**



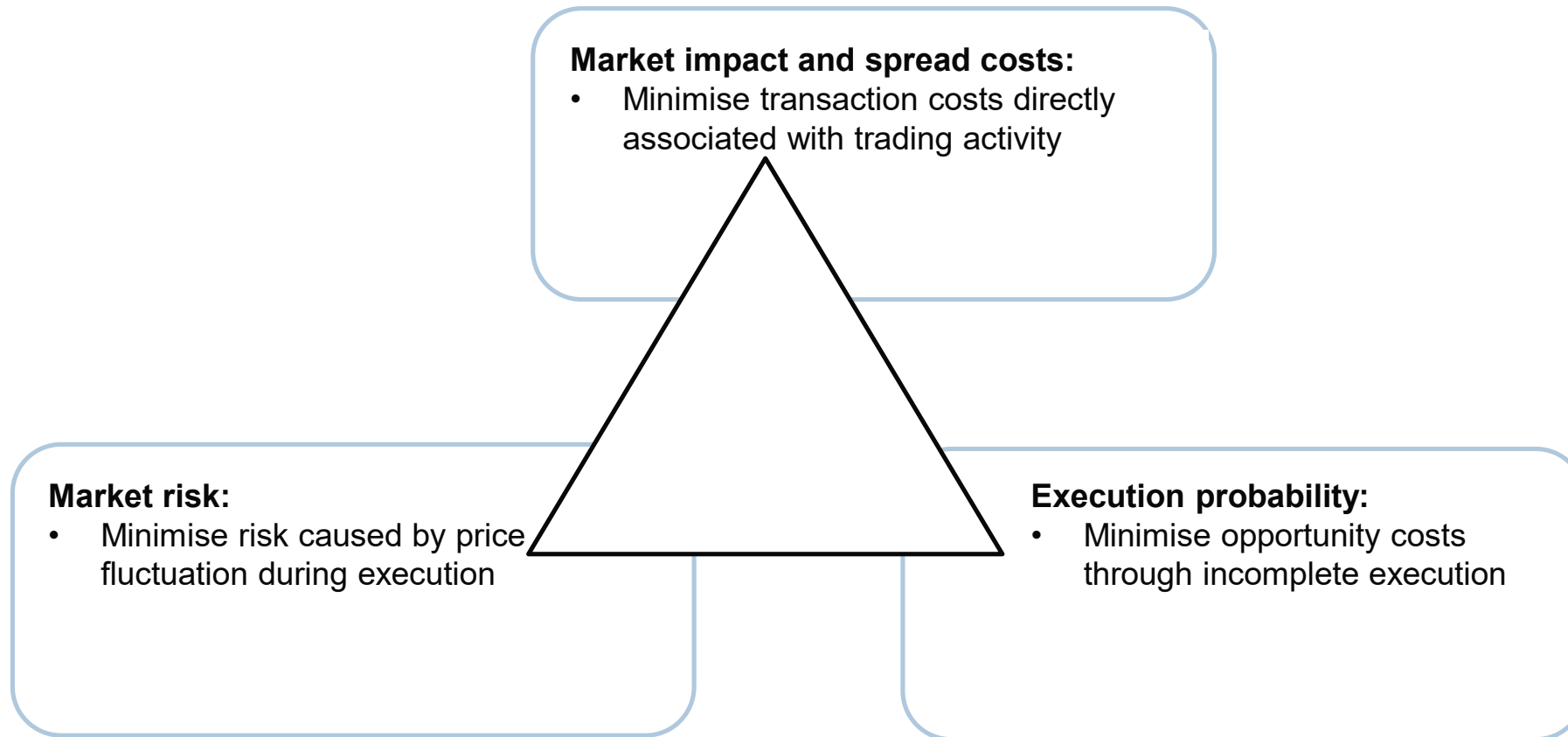
**Chart 3b: share of spot market in USDCHF**



Source(s): BIS

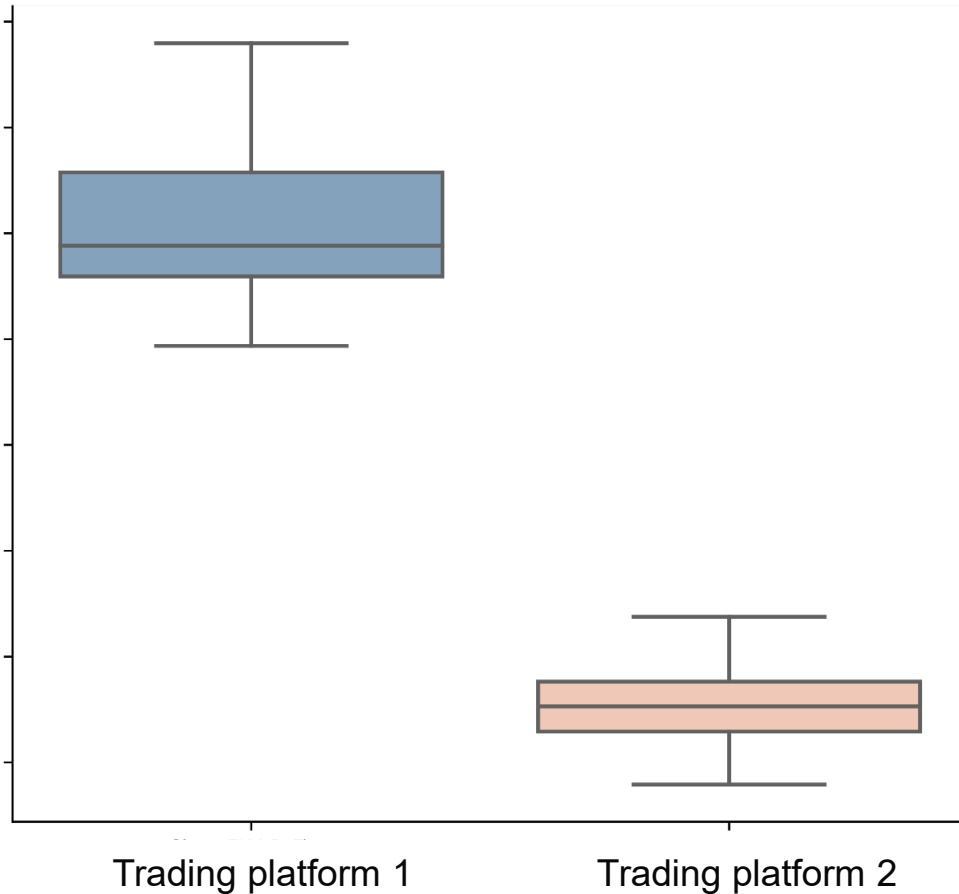
EAs facilitate access to a fragmented market, but require a good understanding of conflicting objectives; they are also contributing to the transformation of the FX market

**Chart 4: the 'execution algorithm trilemma'**

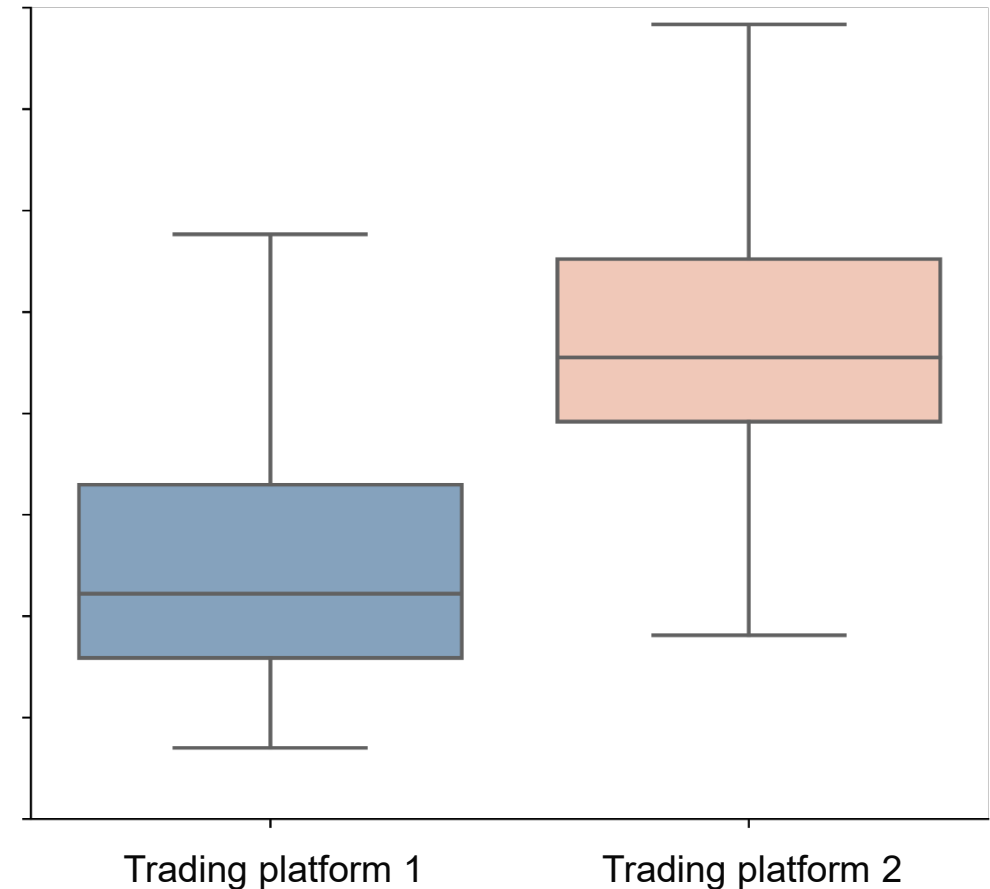


# Changing market dynamics require new monitoring approaches: 'liquidity replenishment' complements conventional liquidity indicators

**Chart 5a: traditional bid-ask spread (basis points)**



**Chart 5b: time until 'liquidity replenishment' (seconds)**

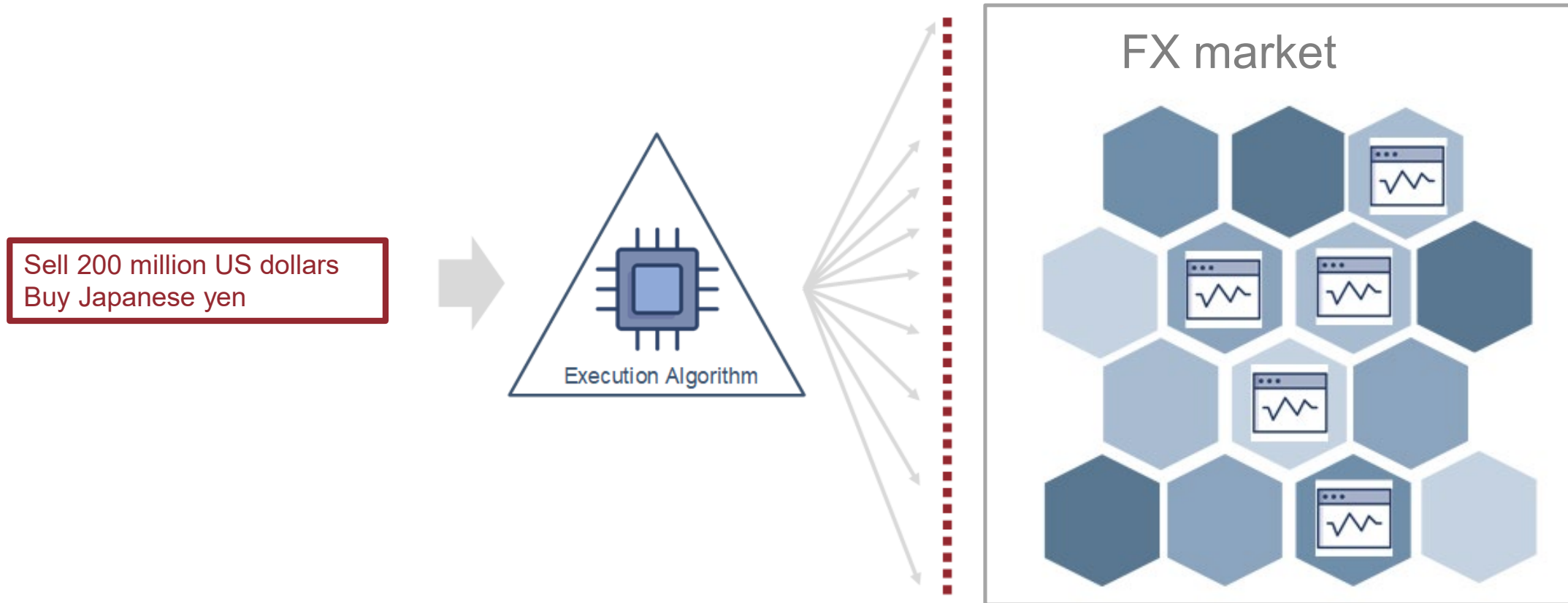


Source(s): SNB



# SNB is increasingly using EAs to manage currency reserves

Chart 6



Source(s): SNB

# Structural change is affecting all markets: investment in new data, tools and skills is key, as is cooperation among central banks

Chart 7: 'Project Rio' – cloud-based market monitoring in real time



Source(s): BIS Innovation Hub Swiss Centre

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# Thank you for your attention.

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# Fragmented FX markets and 'dark trading': what does it mean for market participants?

**Andréa M. Maechler**

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**Gaëlle Barlet**

Compenswiss

**Andreas Schrimpf**

Bank for International Settlements

**Alexandre Maillard**

UBS

**Sally Francis-Cole**

London Stock Exchange Group

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# Prochaines manifestations

Apéritif «Marché monétaire», Zurich

31 mars 2022

Apéritif «Marché monétaire», Genève

17 novembre 2022

