



NORGES BANK  
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## MANAGING INFORMATIONAL ASYMMETRIES IN FOREIGN EXCHANGE MARKETS

ASSET MANAGER PERSPECTIVE

The recent release of the FX Global Code of Conduct is an opportunity to revisit common market practices in global foreign exchange markets. These markets are critical to the functioning of the global economy, and provide robust solutions to the liquidity needs of both corporate and financial market participants.

The bilateral nature of foreign exchange markets naturally leads to significant informational asymmetries between dealers and clients. These asymmetries serve to limit the adverse price risk for dealers and ensure deep liquidity availability. However, they can also lead to excess intermediation profits and inefficient price discovery.

We identify three foreign exchange market practices where informational asymmetries are particularly relevant. In the spirit of the FX Global Code of Conduct, we suggest improvements that would further strengthen global foreign exchange markets.

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# Managing Principal Risks – The FX Spot Market Approach

The global foreign exchange (FX) markets are the most liquid in the world, with an estimated daily turnover of USD 5.1tn in April 2016, of which USD 1.7tn were in spot FX markets<sup>1</sup>. They are critical to the functioning of the global economy as they enable cross-border, international transactions.

Compared to other financial markets, FX markets have a number of unique features. Many of these features are due to the inherent cross-border and cross-jurisdiction aspects of FX transactions. These require intermediation by a network of organisations that can provide or receive funds in local currencies for both origin and destination countries. This intermediation means that the spot portions of FX transactions are generally structured as principal, bilateral transactions.

Banks have evolved to provide this vital service, leading to the development of deep and liquid derivatives markets, particularly in forwards and swaps. In the process, they have developed solutions to deal with the inherent credit and settlement risks in FX transactions. However, these solutions, and the principal nature of FX transactions, have also meant that banks as FX dealers enjoy unique informational advantages that are unparalleled in other asset classes. These informational advantages are often beneficial for the market, since they allow the FX dealer to improve on client pricing while controlling the price risk faced by the dealer. However, the same informational advantages also provide scope for rent extraction by dealers, where they are more than compensated for the risks they take on in providing liquidity.

As a large participant in many global financial markets, Norges Bank Investment Management is aware of the challenges of market clearing price discovery. These challenges are magnified when trading decisions are concentrated with relatively few, but large entities, consequently leading to few natural matches. FX markets are no exception to this. The client base is bifurcated into a diverse set of corporate participants on the one hand and a relatively concentrated set of financial participants on the other. Corporate participants' demand is primarily driven by global trade considerations; the demand is met primarily in derivative markets. Amongst financial participants' considerations is the need for international financial trade settlement in assets such as equities or bonds, which typically requires transactions in the FX spot market. FX market participants have developed robust solutions to allow this important market to find market-clearing prices. However, this may come at an unacceptably high cost of intermediation and rent-extracting behaviour by dealers.

In other financial markets, regulation is the common approach to ensuring a 'level playing field', and serves to limit the impact of structural advantages and rent extraction by some market participants. This is more challenging in FX markets due to the cross-border and cross-jurisdiction aspects of FX spot transactions. In the place of regulations, the FX community has re-

<sup>1</sup> See 'Triennial Central Bank Survey', Bank for International Settlement, September 2016.

cently developed the FX Global Code of Conduct<sup>2</sup>, addressing a number of issues stemming from the informational advantages enjoyed by dealers and banks. We are in support of the FX Global Code, and applaud its drafting and release. Norges Bank Investment Management is committed to the Code and has aligned its internal practices with the Code's applicable principles. We will also encourage and expect that our counterparties commit to the Code in the future.

The FX Global Code provides a strong foundation for the further development of FX markets. One of the key aims should be to introduce Pareto-improving changes to current market practices, which would allow for more cross-border transactions that would be of benefit to all. The high cost of intermediation stemming from structural informational advantages enjoyed by dealers and banks is one such area for improvement. In many cases, these structural advantages are the result of solutions developed by FX dealers to manage adverse price risk inherent in their liquidity provisioning activities. Ideally, the average bid/offer spread received by the dealer should compensate for the average adverse price move risk. However, particularly in a Request-for-Quote (RFQ) setting, competition amongst FX dealers will lead to very tight best bid/offer spreads, which might not be a sufficient risk-adjusted compensation for the liquidity being provided.

The dealer community has developed a number of approaches to mitigate this adverse price risk. The price risk can be divided into an instantaneous component (latency risk) and a temporal component (hedging risk). A dealer's quotes may be stale relative to those of the interdealer market due to latency in the dealer's systems. This would lead to an instantaneous loss for the dealer if the position was hedged immediately. In addition, the dealer faces a temporal price risk, where the price at which a position can be hedged in the future may be worse than the price at which the position was initiated. This temporal component is at the heart of liquidity provisioning, and should be rewarded by the bid/offer spread.

The industry practices developed to manage these price risks can give rise to systematic informational asymmetries and the potential for unacceptably high cost of intermediation. From an asset manager's perspective, three practices are particularly problematic. Each is designed to solve for a particular component of a dealer's price risk – and does so successfully. We do not advocate the abandonment of these practices, but believe that greater transparency and verifiability around their implementation would go a long way to mitigate the possibility of rent extraction.

The first practice, 'Last Look', is a device in FX spot markets to deal with the instantaneous price risk of stale quotes. It allows the dealer – over some pre-defined, short time period – to renege on an earlier quote. This may be due to a failed credit check. More commonly, it is due to an adverse price move, which could indicate the possibility of latency arbitrage. In an earlier Asset Manager Perspective<sup>3</sup>, we showed that this setup is equivalent to the

<sup>2</sup> See 'FX Global Code', Global Foreign Exchange Committee, May 2017.

<sup>3</sup> See 'The Role of Last Look in Foreign Exchange Markets', Asset Manager Perspectives, Norges Bank Investment Management, 03/2015.

client liquidity taker selling an option contract to the dealer. In exchange, they should receive tighter spreads and deeper liquidity as compensation.

The second practice concerns the implementation of algorithmic execution strategies, a way of sharing the temporal price risk between client and dealer. The dealer delivers a trade-weighted average price of executions over some time period, with the timing of executions driven by a specific algorithmic strategy. The transaction is ultimately still a bilateral transaction between client and dealer.

Third, there is an apparent disconnect between dealer quotes (in an RFQ process, for example) and the prevailing prices in the interdealer market. This can protect dealers from temporal price risk due to a particular client's actions. On the flip side, the general lack of post-trade transparency can make verification of prices challenging, particularly for algorithmic execution strategies. Making the state of the interdealer market more broadly known – possibly with some delay – would significantly help in improving accountability in FX markets.

## Last Look Implementation Transparency

Last Look was developed by FX dealers to manage several challenges inherent in principal transactions. Some of these challenges are idiosyncratic to the counterparty and revolve around potential credit risks. These can be dealt with in different ways – as in other asset markets, pre-negotiated credit lines are common in FX markets, for example. Other challenges are idiosyncratic to the dealer's infrastructure and reflect the potential for latency arbitrage due to the dealer providing stale quotes.

Last Look allows the dealer to step back from an earlier offer to trade if certain conditions are not met. Such a setup is equivalent to the client liquidity taker selling an option contract to the dealer. Provided that checks not related to price are satisfied (such as credit checks), the dealer will accept the trade if prevailing interdealer prices are within a range of the prices offered to the client, but reject if they are outside that range. Last Look can thus protect the dealer from instantaneous price risk. The dealer is thus able to provide tighter spreads and deeper liquidity to the client.

Principal transactions are characterised by a staggered release of information by both parties – from the client's interest in a trade, to the dealer's two-way quotes, to the client's revelation of trade direction, to the dealer's acceptance in the Last Look process. The informational advantage lies with the party that makes the ultimate decision – in FX markets, that is the dealer.

The dealer's fundamental informational advantage means that the details of the implementation of Last Look matter. Managing the implementation requires a robust governance structure at the dealer. Clear lines of command

and P&L attribution, as well as policy review processes and an independent compliance and surveillance function are important ingredients to robust governance.

Moreover, dealers need to be transparent to the client about the implementation details. To the extent that the client is controlling an execution plan that spans some time period, knowledge about what the dealer will do with information revealed by the client can matter. The client may not want to pick the tightest spread on offer, for example, if the Last Look implementation is seen as unfavourable to the bigger execution plan. Different Last Look implementations thus have potentially different use cases.

Last look has several implementation settings; for example whether a hold time parameter is permitted, which can induce latency. More importantly, there are also several actions the dealer may decide to take during the Last Look period. These actions can be ordered according to how aggressively they allow the dealer to make use of the information revealed by the client, before the client's trade is consummated or rejected. Accordingly, quoted spreads should tighten and size availability should increase as the risk to the dealer is reduced. We have identified eight such actions, ordered by aggressiveness:

- Credit checks
- Comparison of offered quote with latest quotes received from inter-dealer market
- Rejection of trade if interdealer prices have moved against the client
- Rejection of trade if interdealer prices have moved against the dealer
- Pre-hedging of trade in the interdealer market
- Partial fill or rejection of trade if pre-hedging was impossible/not profitable for dealer
- Communicating trade receipt with main dealer risk book before trade is consummated
- Main risk book position hedging/skew adjustment before trade is consummated

These actions are all intended to control a dealer's price risks. However, whether they are in a client's interest will depend on client preferences. There could certainly be cases of client liquidity demand where tighter spreads and greater liquidity depth compensate for the aggressive use of information by the dealer, and the lower probability of receiving a fill.

In other situations, some of the Last Look actions – such as pre-hedging and pre-trade risk book position adjustments – are unacceptable implementations of liquidity provisioning. They exploit institutional differences in the capabilities of dealers and clients, since dealers can access interdealer markets that clients cannot. Even if pre-hedging was transparent and verifiable, additional conditions would need to be met – including a partial fill to be offered back to the client. In our view, leakage of information to the main dealer risk book cannot form part of an acceptable implementation of Last Look.

We recognise there is room for different Last Look implementations; the key requirements are transparency and verifiability to clients about the implementation details. Some dealers have already started providing differentiated quote streams with different Last Look implementations. In other cases, dealers have introduced a 'No Last Look' quote stream as well, which removes the optionality.

On the client side, such an environment would enable a comparison of quotes received not just on the spread and instantaneous size, but also on fill probability and potential impact on future trades. This should be part of a more sophisticated trade planning, and ensure that the option provided by clients to the dealer through Last Look is fairly valued.

Greater transparency also includes an enriched information exchange between dealer and client. Two elements are critical and reasonable – order rejections need to specify the reason for rejection, and message timestamps should be accurate enough to enable an auditing of the dealer's actions relative to interdealer markets. Equally important, there needs to be a robust governance structure around the Last Look implementation, to provide for an audit trail. This is an area the FX Global Code should consider elaborating on.

## Dealer Electronic Algorithms and Trading Platforms

FX markets have been an early adopter of automation, electronic trading platforms and execution algorithms. The high trading volume in a relatively low number of traded currency pairs helped and necessitated this automation, particularly in interdealer markets. Electronic and automated markets come with their own set of specific issues, many of them common across asset markets. The latency 'race to zero' in equity markets, or the extreme fragmentation of electronic trading platforms in corporate bond markets, have their parallels in FX markets. In response, FX market participants have developed robust solutions that have contributed to the continued volume growth.

FX electronic algorithms are an example of such market-specific solutions. Unlike in other asset markets, the algorithms are built on a principal relationship between client and dealer. The dealer specifies a sequence of trades in the interdealer market, resulting in a series of executions at varying prices. Client and dealer pre-commit to a bilateral transaction at the trade-weighted average price achieved in these executions. The sequencing of trades will be impacted by the different 'flavours' of algorithms offered – from aggressive 'liquidity seeking' algorithms that tend to complete an order quickly, potentially at higher market impact cost, to scheduled algorithms that trade at pre-defined intervals.

The bilateral nature of the transaction between client and dealer raises important questions of liability. Algorithms are generally provided 'as-is' to the client, without explicit warranties on operational readiness or risk controls.

Dealer algorithm providers do typically run robust risk controls on their trading platform, but these are generally designed to protect the provider, not the client. We believe that this one-sided apportioning of liability significantly reduces the potential for wider algorithm usage in FX markets, and with it FX trading volume. From a dealer perspective, client usage of electronic algorithms should be attractive, because it allows for more temporal price risk sharing between client and dealer than the principal transactions stemming from a traditional RFQ process.

Increasing the appeal of FX algorithmic execution requires robust and transparent risk controls, a clear governance structure, and more detailed algorithm specifications than those currently provided. Risk controls should include parent order level controls on order size, for example. In addition, risk controls and operational readiness checks also need to cover the algorithms themselves and their interaction with trading venues.

In other asset classes, such controls are often driven by regulatory requirements – such as Reg SCI and Rule 15c3-5 of the Exchange Act in the US. Furthermore, compliance audits are facilitated, at least in principle, by the availability of time-stamped quotes and trades records. In FX spot markets, both the governance framework and post-trade transparency have much room for improvement. Moreover, there is significant potential for conflicts of interest if the dealer providing the algorithms routes the executions to the same dealer's trading venue/principal stream. Greater transparency on algorithm specifications and the routing decision framework can help to alleviate these issues. On the interaction with trading venues, the two key risks are connectivity problems and venue malfunction<sup>4</sup>. Dealers have instituted controls with venues that provide automatic cancel-on-disconnect features, connectivity heartbeats, drop copies using secondary connections, as well as order cancellation protocols (kill switches) that operate outside the routine communication channels between dealer and trading venue. While these controls are intended to mitigate risk in the dealer's own principal hedging flow, dealers should ensure that the same controls are extended to algorithmic flow undertaken on behalf of clients. This is particularly relevant if the flow from client's algorithmic orders is qualitatively different from the dealer's proprietary flow. In many cases, clients may have a more passive execution strategy, reflecting greater concern with market impact. Dealers should ensure that the lower-level risk controls first implemented for dealer proprietary flow are also appropriate for client flow.

For algorithms themselves, dealers need to ensure that there are prudent limits around the slices generated by the algorithms. This includes market impact checks, comparing the size of the generated order to prevailing volume, as well as dynamic and static price reasonableness checks against arrival price and current market prices. These checks should be implemented as a 'last look' before orders leave the dealer trade plant, and need to be independent of the algorithm infrastructure generating the slices.

<sup>4</sup> For a detailed discussion of industry best practice in an agency context, see 'Order Handling Risk Management Recommendations for Executing Brokers', Futures Industry Association, March 2012.

Implementing such robust risk controls and transparency could also provide a platform for the introduction of third party algorithms. Prime brokerage, and the separation between executing and clearing brokers in futures markets, provide examples of how such third party algorithms can be introduced. This would separate the bilateral, principal relationship between dealer and client from the agency provisioning of trade scheduling algorithms. We believe that this could further deepen liquidity in FX markets, and would be supportive of such a development.

## RFQ Feeds and Transparency

One consequence of the structure of the FX spot market is that there are no generally accepted pre-trade or post-trade transparency requirements or protocols. Moreover, RFQ feeds for clients tend to be highly fragmented and often tailored to specific client classes or even specific clients. As a result, reference prices for transaction cost analysis are generally lacking, apart from some benchmark fixings. This makes evaluation of execution quality more challenging for client firms, exposing them to fiduciary risks.

In the absence of publicly available and reliable market feeds across currencies, the FX spot market has developed an alternative in the form of RFQ feeds. Clients can subscribe to these proprietary quote feeds as an ongoing quote stream, or request quotes on an ad-hoc basis. Dealers can tailor the feeds to the requesting counterparty, reflecting historical risk characteristics and loss ratios. These characteristics are primarily driven by client parent order sizes. Larger parent orders may lead to a staggering of trades over time, possibly negatively impacting the hedging activities of the dealer and leading to higher loss ratios.

Linking the availability of liquidity to the identity of the requestor has a number of potential benefits. Everything else equal, it should lead to deeper liquidity at tighter spreads for clients, since dealers face less uncertainty over client intentions.

However, for the well-functioning of the FX market as a whole, client segmentation may lead to suboptimal outcomes. Dealers act as intermediaries between clients and the interdealer market, where supply and demand are ultimately balanced. The price discovery function of the interdealer market will only be able to operate with a delay if dealers segment clients and offer different quote feeds.<sup>5</sup> Some trades may not occur – quote differentiation across client groups may inhibit some clients that could provide offsetting liquidity. The extent of the delay in price discovery in the interdealer market is driven by two elements – on the one hand, the desire by the dealer to segment its client base and reduce the risks to its book, on the other hand from the carrying capacity of the dealer community. To some extent, exogenous

<sup>5</sup> For a discussion of market efficiency with price delays in the context of equity markets, see Hou, K. and T. Moskowitz, 'Market Frictions, Price Delay, and the Cross-Section of Expected Returns', *Review of Financial Studies*, 18/3, Oct 2005.



factors such as regulation can drive dealers' risk appetite and carrying capacity and may exacerbate the delay in price discovery.

These delays in price discovery, together with tailored quote feeds, will lead to instances of excessive intermediation. In these cases, offsetting liquidity would have been available but could not meet without the intermediate step of a dealer liquidity provider. In the limit, this could represent riskless profits for the intermediary.

We welcome more innovation in this area of market structure, striking a balance between ensuring fair compensation and risk controls for dealers on the one hand, and ensuring efficient price discovery on the other hand. In particular, the dependency of the quality of price discovery on the dealer community's 'state' (risk appetite and carrying capacity) should be reduced. This can be achieved by approaches that accommodate clients' willingness to carry more of the temporal risk, while still using dealers' services and compensating them for credit intermediation. Other asset markets have successfully developed block-matching solutions where membership is credit-screened/intermediated and limited to certain types of financial market participants – some block discovery venues in equity markets are good examples. We believe that such innovation could be beneficial for FX markets as well.

## Transparency for a Robust FX Market

FX markets have developed very robust solutions to the unique challenges inherent in cross-border and cross-jurisdiction transactions. FX markets are now the most liquid in the world, which is a significant achievement. However, the solutions have also tended to exacerbate the informational advantages enjoyed by dealers in bilateral, over-the-counter markets. Unlike other bilateral markets (such as much of fixed income), regulation has not been the answer to mitigating the impact of these informational advantages. Instead, the FX Global Code of Conduct serves as a set of guiding principles to manage the advantages.

Given the current FX market structure, and in the spirit of the FX Global Code, we believe that transparency and verifiability are key to mitigating the impact of these informational advantages, without negatively affecting the liquidity of this important market. Three practices particularly stand to gain from greater transparency and verifiability: Last Look, the implementation of electronic algorithms, and the linkages between RFQ feeds and interdealer market prices. In each case, we do not advocate for an abandonment of these practices – they have served a vital role in ensuring a robust FX market. Instead, we believe that greater transparency and verifiability in these areas would further strengthen the FX market and increase the scope for more liquidity.

A key requirement for greater transparency and verifiability are clear governance structures. We believe that governance standards are a natural extension for the FX Global Code. These would serve to further strengthen the well-functioning of this important market.