ICAP

Brussels, 12 August 2011

Mr Werner Bijkerk
International Organisation of Securities Organisations (IOSCO)
Calle Oquendo 12
28006 Madrid
Spain

**Public Comment on Regulatory Issues Raised by the Impact of Technological Changes on Market Integrity and Efficiency**

Dear Mr Bijkerk,
Dear Werner,

As the world's largest interdealer broker (IDB), intermediating over €1.6 trillion in trading across all asset classes daily, ICAP has long been a proponent of electronic trading. The Group believes that electronic trading brings significant benefits to markets in terms of auditability, transparency, commercial efficiency, operational resilience and market integrity.

While ICAP does provide brokerage services in the cash equity markets and operates BlockCross, an equity crossing network, the vast majority of its broking operations are in the non-equity OTC markets, and it is from this perspective that the Group is responding to this consultation. It has also only been appropriate to respond to certain questions within the consultation as ICAP only observes algorithmic and high-frequency trading in a limited number of OTC markets.

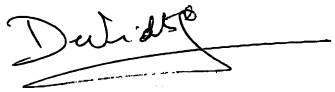
ICAP operates a number of electronic trading platforms in markets as diverse as foreign exchange, commodities, US Treasuries and EU public debt securities, and euro-denominated interest-rate swaps. Electronic broking is a significant part of ICAP's overall business, contributing 33% of ICAP's operating profit in 2010-11, up from 22% in 2006-7. During the period April – June 2011, daily average volumes traded by customers on BrokerTec – a fixed-income and repo trading platform – was $172bn, while over the same period, the comparable figure for EBS – a foreign-exchange and precious metals platform – was $166bn. Since its launch in September 2010, iSwap – ICAP's electronic euro-denominated interest-rate swap platform – has transacted over €510bn in volume, and accounts for nearly 23% of ICAP's total brokerage in this asset class over the period. Much of this volume was incremental, i.e. only an electronic system could have created the implied prices along the yield curve that allow the simultaneous execution of complex, multi-leg IRS trades. As the operator of the leading electronic market in many of these asset classes, and nine multilateral trading facilities (MTFs) overall, ICAP recognises that, above and beyond our regulatory obligations, it has a stewardship role to proactively promote the orderly and efficient functioning of these markets.

In contrast to the conceptually simple and relatively uniform equity markets, the scale and diversity of the non-equity OTC markets – which reflects the real-world economy that underlies them – has necessitated the development of a range of post-trade solutions to mitigate the different risks in each market. Such electronic post-trade services for wholesale market participants are an important and growing part of ICAP's business, and serve to reduce the aggregate risk facing market participants. Traiana, a platform for electronically processing OTC foreign exchange, futures, equities and equity derivatives, connects many major market participants through its Harmony network, and processes $800bn in foreign exchange transactions every day

prior to their clearing by CLS, the global foreign-exchange clearing bank. In June 2011, in partnership with several major banks and FX trading platforms, Traiana also launched Creditlink, a New York Fed-approved service that allows prime brokers to monitor and manage their clients' credit-risk across multiple FX platforms in real-time, specifically to ensure that, in light of the growth in high-frequency and algorithmic trading, they have adequate visibility of, and control over, their client's aggregate credit exposure.[1] Similarly, in the broader derivatives space, TriOptima, an ICAP post-trade service based in Stockholm, uses proprietary technology to identify and reconcile the totality of overlapping and unnecessary counterparty risk across the derivatives portfolios of a range of major financial institutions.

ICAP's experience of algorithmic trading is that while it only exists in a limited number of markets - characterised by the high-volume trading of a lower number of highly liquid instruments - it can bring significant benefits, particularly in terms of liquidity. However, algorithmic trading does also tend to alter certain aspects of markets - specifically by increasing volumes while reducing average trade sizes – to which ICAP has had to respond, on a case-by-case basis, to ensure that the Group's markets remain orderly, efficient and accessible to the broadest possible cross-section of market participant.

Yours Sincerely,



Godfried de Vidts

Director of European Affairs, ICAP plc

[1] ICAP Press Release: Citi, Deutsche Bank, J.P. Morgan, Morgan Stanley, Leading ECNs and Traiana Launch New Era in Risk Management for the FX Industry (27/06/2011) (http://www.icap.com/news-events/in-the-news/news/2011/leading-ecns-and-traiana-launch-new-era-in-risk-management-for-the-fx-industry.aspx)

**ICAP Response to IOSCO Consultation:** ***Public Comment on Consultation Report: Regulatory Issues Raised by the Impact of Technological Changes on Market Integrity and Efficiency***

**Q1) What impact have technological developments in the markets in recent years had on your own trading?**

It is important to note that as an inter-dealer broker (IDB), ICAP does not undertake any proprietary trading for its own book. Rather, ICAP's role is as an intermediary, matching buying and selling interest between customers on its trading platforms across a range of asset classes in the wholesale markets. This process – liquidity matching – is the core of the IDB function, and the Group's success in this area is a result of its commitment to operating transparent, impartial, efficient and orderly markets that become attractive trading venues for market users.

The migration of trading in financial instruments on to electronic platforms in recent years has occurred as a result of technological developments, market demand and risk mitigation. While certain wholesale markets – such as foreign exchange - opened up to electronic trading in the 1990s, other markets – such as interest-rates swaps – have only become suitable, in terms of their inherent characteristics, for electronic trading in more recent years.

ICAP has built several MTFs in order to be able to provide customers with electronic indicative and tradable prices, automated reconciliation and confirmation services and electronic links to OTC clearing. Such systems allow the Group to offer its customers trading opportunities with each other that simply couldn't exist in non-electronic markets, for example, the ability to execute against prices implied by the existence of other firm prices along the yield curve.

Back-office developments such as straight-through-processing (STP) and the automation of collateral management have significantly reduced operational risk for wholesale trading institutions, while technological post-trade offerings such as compression, basis-risk analysis and reconciliation significantly curtail unnecessary second-order and counterparty risk in OTC market portfolios. Electronic trading thus accounts for a significantly larger proportion of ICAP's revenues and profit, as well as its back and middle-office operations, than five year ago.

The vast majority of the focus on the growth and consequences of algorithmic and high-frequency trading centres on the equity markets, and specifically the complex interaction between single/multiple algorithms and the operating systems and rules of equity exchanges themselves.

In light of regulatory concern about a) the extent to which the growth of high-frequency trading has dissuaded 'manual' traders from participating in certain markets, and the b) necessity of pre-testing algorithms prior to their use on live trading systems, this consultation response will draw conclusions from across ICAP's non-equity market electronic trading platforms. While ICAP's electronic trading platforms provide an 'exchange-like' broking platform for wholesale (i.e. not retail) market participants, the varied nature of the instruments and contracts traded, the (large) average size of these trades, and the sophisticated market participants involved clearly differentiate these markets from equity markets.

Electronic trading in non-equity markets thus constitutes a spectrum of activity, rather than simply a unitary phenomenon. As Table 1 demonstrates, trading across these asset classes varies significantly by average wholesale trade size, benchmark trades per day, the proportion of algorithmic trading in the market, and whether certain segments of the market in these asset classes are voice-brokered, either on a hybrid basis, or on stand-alone voice-platforms. As such, it is impossible to generalise about automated trading in electronic non-equity markets, some of which have seen a significant growth in the phenomenon over recent years, while others – because of their inherent characteristics – remain the purview of the manual trading community.

**Table 1: Trading Characteristics of ICAP electronically traded asset-classes**

| Asset Class Traded | ICAP Platform | Average Wholesale Trade Size | Trades per Day in Benchmark Instrument | % of Algorithmic Trading on ICAP Platform | Hybrid (Electronic/Voice) Execution? | Voice-Negotiated? |
|---|---|---|---|---|---|---|
| Foreign Exchange | EBS | $1.4m | c. 80,000 | c. 50% | × | ✓ |
| 'On-the-Run' US Treasuries | BrokerTec | $2m | 23,000 (10Y) | 30-40% | × | × |
| 'Off-the-Run' US Treasuries | ETC | $30m | 1,200 | 0% | ✓ | ✓ |
| European Government Bonds | BrokerTec | €9m | 1-5 (10Y Bund) | 0% | × | ✓ |
| € Interest-Rate Swaps | iSwap | €75m | 8-12 (10Y) | 0% | ✓ | ✓ |

**Source: ICAP Internal Data**

- **The Growth of Algorithmic and High-Frequency Trading in electronic Non-Equity Markets**

As discussed, algorithmic and high-frequency trading only occurs in those non-equity markets that exhibit certain characteristics i.e. typically a low number of individual instruments traded in small increments. Algorithmic trading on the spot FX platform EBS was piloted on a limited basis in 2003, and made accessible to the whole market in 2004. Given that EBS had been a 'manually' (i.e. human inputs into an electronic system) traded market up until that moment, it would not be inaccurate to characterise the introduction of algorithmic trading as the advent of *de facto* high-frequency trading on the platform as well. Since that date, the deeply liquid nature of the global foreign exchange market has allowed a considerable growth in both algorithmic and high-frequency trading on platforms such as EBS. A similar evolution occurred in the trading of 'on-the-run' US Treasuries, with algorithmic trading in these bonds commencing in 2003 on BrokerTec. Unlike the foreign exchange market, where algorithmic trading was led by the dealer banks, algorithmic trading in US Treasuries was initially predominantly undertaken by non-bank financial institutions. By contrast, even the electronically-traded end of the euro-denominated interest rate swap (IRS) market, based on ICAP's experience of operating iSwap since September 2010, sees no algorithmic and high-frequency trading.[2] Despite the size of the global euro-denominated IRS market, trading is defined by large, infrequent orders, which to date appear inherently unsuitable for automated trading strategies, though it is likely that over time, average trade sizes in this market will shrink and interest in algorithmic trading in this market could emerge(with the caveat that there are already simpler and more cost effective means of hedging against interest rate risk in smaller sizes, which could reduce the commercial benefit of any smaller sized market).

[2] iSwap does however rely on streaming prices from participating dealer banks. These streaming prices in € IRS are automated, but are distinct from algorithmic trading because they are not seeking to profit from market-pricing anomalies. Rather, certain dealer banks operating in the electronic interest-rate swap market choose to stream prices – both bids and offers derived from a calculated "fair" or mid-price, at which they are willing to trade an IRS. Around that mid- price is a bid/offer spread, which constitutes their market-making 'fee', and which will fluctuate in size relative to market volatility. Price streaming is thus a market-making, rather than a traditional trading, function.

Even within asset classes – for example, sovereign debt – it is very difficult to generalise about the extent of algorithmic and high-frequency trading. The unified nature of the US Treasuries (UST) market, with its single set of 'on-the-run' benchmark (2Y, 3Y, 5Y, 7Y, 10Y and 30Y) bonds, is significantly more liquid than the European Government bond (EGB) market, which remains fractured across a range of benchmark instruments issued by individual member states on varied schedules. Moreover, primary-dealer quoting obligations in the EGB market compound this relative illiquidity vis-à-vis the UST market, where non-primary dealers, often operating automated-trading strategies, are heavily present in the secondary markets.

Indeed, the bifurcation of the UST market into on-the-run (i.e. new benchmark) and off-the-run (i.e. superseded benchmark) issues – which are traded on different electronic platforms at ICAP because of their differential liquidity – demonstrates the varying dynamics of electronically trading in the same instrument over the course of its lifetime. Once a UST benchmark issue (i.e. a 10Y) is superseded by a more recent 10Y issuance, it becomes an 'off-the-run' bond. For example, the 30Y UST is issued quarterly, which means that at any given time, there is 1 'on-the-run' 30 UST and 119 'off-the-run' 30Y USTs. In total, the 'on-the-run' UST market constitutes six individual benchmark instruments (2Y, 3Y, 5Y, 7Y, 10Y and 30Y), whereas the total 'off-the-run' UST market is comprised of over 400 instruments. As a consequence, the liquidity profile and trading characteristics of these markets differ significantly. In terms of volume, the daily trading in the off-the-run UST market is roughly a quarter of the notional size of comparable on-the-run trading. Consequently, average trade sizes are significantly higher than in the on-the-run market on a much lower typical number of daily trades. Equally, while traders in the on-the-run UST market will typically focus on a section of the curve, trading, for example, 2Y, 3Y and 5Y spreads, the off-the-run UST market tends to be sub-divided into maturity specialists who, for example, trade only the outstanding 5Y bonds.

Thus while the off-the-run market is also traded electronically – for example, by ICAP on its electronic ETC platform since 2000 – it is also a market that features significant volumes of voice-broking, by contrast with the 'on-the-run' US Treasuries market, which is purely electronic. Average electronic volumes in the 'off-the-run' market peaked at approximately 60% of total trading in 2007-8, but have since receded to around 40%, demonstrating the importance of ICAP's hybrid (voice/electronic) platform in providing trading flexibility to market participants, and the role of traditional telephone-based "voice" broking in matching diverse and sporadic buying and selling interests. It is critical to note that although an instrument can be traded electronically in significant volume, the liquidity of that instrument is not guaranteed simply by this fact, and that voice-broking continues to provide considerable liquidity in certain markets.

- **The Effect of Algorithmic and High-Frequency Trading in Non-Equity Markets**

Since the advent of algorithmic trading on EBS, several general phenomena have been observed in both the FX and US Treasuries market, where bid/offer spreads have tightened, average trade sizes have shrunk, and trading volumes – liquidity – have grown significantly**.** Academic studies have found broader systemic benefits to non-equity markets resulting from the growth in automated trading, most notably a paper authored by economists from the Board of Governors of the Federal Reserve System entitled *Rise of the Machines: Algorithmic Trading in the Foreign Exchange Market*[3]. The basis for this study was two years' worth (2006-7) of minute-by-minute trading data from EBS in three currency pairs: euro-dollar, dollar-yen, and euro-yen. As the authors note, the growth in algorithmic trading in the foreign exchange market was such that by 2007, a 'majority of foreign exchange transactions in the interdealer market currently involve at least one algorithmic counterparty'. Despite this preponderance of algorithmic trading, however, the authors found 'no evident causal link between algorithmic trading and increased exchange rate volatility. If anything, the presence of algorithmic trading is associated with lower volatility.' Moreover, in the context of market integrity and

[3] *Rise of the Machines: Algorithmic Trading in the Foreign Exchange Market*, Alain Chaboud, Benjamin Chiquoine, Erik Hjalmarsson and Clara Vega, International Finance Discussion Paper 980, Board of Governors of the Federal Reserve System (October 2009). See Appendix A for Abstract.

exogenous events, the authors studied 'the relative provision of market liquidity by computers and humans at the times of the most influential U.S. macroeconomic data release, the nonfarm payroll number'. They 'find that, as a share of total market-making activity, computers tend to pull back slightly at the precise time of the release but then increase their presence in the following hour. This result suggests that computers do provide liquidity during periods of market stress.'

- **Manual Trading in Markets with Significant Algorithmic and/or High-Frequency Trading**

Despite a weight of further academic evidence outlining similar effect of algorithmic and high-frequency trading across a range of assets, notably in equities, regulatory concern about manual traders' perception of being disadvantaged vis-à-vis automated traders is growing. Both EBS and BrokerTec have been aware of this issue since the advent of automated trading on their platforms in 2003-4 and have invested significant financial and technical resources in order to ensure a diversity of both automated and manual participation on the platform. In addition to a uniform set of dealing rules and counterparty support (post-trade) obligations which apply to all markets participants in order to ensure that no one trading methodology is favoured, a number of controls are built into EBS to ensure an orderly and efficient market that is counterparty neutral (notwithstanding individual institutions self-imposed credit limits). To this end, EBS also operates a 'no last look' policy, will not allow market participants to pay to move up the trading order. Overall, the primary intent of these rules and controls is to ensure efficient and impartial access to pricing and execution opportunities for all market participants.

Obviously, one of the major challenges for manual traders sharing markets with automated traders is the sheer speed of trading, so having researched the appropriate academic literature on humans' ability to observe, assimilate and react to information, EBS instituted a 'minimum quote lifespan' (MQL) of 250ms in five major currency pairs (and longer time periods in precious metals) in order to provide a level-playing field for manual traders. BrokerTec also operates a comparable 'hold-in timer' that requires orders to remain accessible to other market users for a minimum time. Equally, EBS also does not offer 'flash-trading' on its system, again to ensure that manual traders are able to remain competitive. Moreover, in addition to controls, EBS has also introduced a number of trading functionalities for manual traders that facilitate the automation of their own trading activities. Ensuring that manual traders remain willing to use EBS to transact foreign exchange is critical to the quality of liquidity on the platform, so EBS also seeks constant customer feedback on the introduction of new features and functionalities.

- **Automated Trading and the post-trade Environment**

ICAP has long been a proponent of clearing, and the vast majority of the $1.6 trillion of OTC trades brokered by the Group each day are sent onward for clearing (both voice-brokered and electronically executed trades). While regulatory fears exist about the ability of certain post-trade market infrastructures to cope with the volume and rapidity of activity in their markets that has resulted from a growth in algorithmic trading, a diverse range of steps have been taken by OTC market participants to develop innovative risk-mitigation solutions specific to each market in which algorithmic trading occurs.

For example, in the spot foreign-exchange market, the new Harmony Creditlink service - developed by Traiana, an ICAP subsidiary focussed on automating post-trade processing - proactively alerts prime-brokers to counter-party credit-limit breaches in their clients' aggregate FX portfolios, and allows them to modify credit lines or terminate trading activity in real-time, significantly reducing the counterparty credit-risk in the market. This service is used by over 500 of the world's leading financial market participants, and has significantly mitigated the second-order risks that exist in complex trading environments.[4]

[4] See Appendix B: 'Comment: Making FX safer from market disruption', *Financial Times (*27 July, 2011)

In 2009, and with the approval for the New York Federal Reserve, ICAP partnered with CLS, the global FX settlement bank, to provide trade aggregation services to participants in the FX market. Responding to a growth in trading volumes driven by increasing algorithmic trading, the joint-venture compresses smaller trades into larger, individual tickets before passing them to CLS for settlement. Crucially, the service is able to achieve a compression ratio of over 90%, which has dramatically reduced participating banks' processing burdens and capacity constraints and thereby reduced post-trade processing risks and costs. By monitoring trade flows in real time, the system also mitigates operational risk, further strengthening market infrastructure.

**Q13) Should market operators be required to provide testing environments to enable participants in stress test their algorithms? If so, what kind of minimum requirements are reasonable?**

ICAP would not presume to propose industry-wide requirements for pre-market algorithmic testing, especially given that the focus of this consultation is predominantly on the equity markets. However, ICAP has long required market participants seeking to engage in algorithmic trading on its platforms to undergo a rigorous pre-approval testing process. EBS operates EBS Lab, a simulated test environment in which market participants can build and test their algorithms and trading strategies. Each algorithm is subsequently required to pass a series of conformance and certification tests before it is allowed to operate in the live trading environment. These tests span the following areas:

- Market data consumption and correct interpretation of the order book
- Order routing and deal completion
- Adherence to throughput parameters and order throttling controls
- Adherence to other parameters that promote orderly trading
- Experience of automated 'logoff' procedures that would be triggered in the event of any violation of parameters, policies or other system controls

As part of its Data Mine services, EBS also makes its tick data from FX transactions that have occurred on that platform since 1997 (and metals trading since 2000) available to algorithmic traders. This data is available in considerable granularity, comprising EBS 'best prices' (which includes best bid and best offer) and dealt prices[5], which allows automated traders to more robustly back-test their algorithms during the development phase using real data.

BrokerTec also requires financial markets participants wishing to trade algorithmically in its US Treasuries market to both pre-test their algorithms in lab conditions isolated from the live market, and then to submit them to BrokerTec's market support desk for further testing before they are certified for use.

[5] The Best Bid is the highest bid price in the EBS market at the time regardless of credit; the Best Offer is the lowest offer price in the EBS market at the time, regardless of credit. The dealt prices are the highest buying deal price (the highest paid) and the lowest selling deal price (the lowest given) at the time. EBS Data Mine is created on a time-slice basis and includes a Price Record and a Deal Record. The Price Record lists the EBS Best prices at the end of a time-slice, and the Deal Record lists the highest paid and the lowest given deal prices during the period of a time-slice.

**Appendix A: *Rise of the Machines* Abstract**

# Rise of the Machines: Algorithmic Trading in the Foreign Exchange Market

Alain Chaboud Benjamin Chiquoine Erik Hjalmarsson Clara Vega*

September 29, 2009

Abstract

We study the impact that algorithmic trading, computers directly interfacing at high frequency with trading platforms, has had on price discovery and volatility in the foreign exchange market. Our dataset represents a majority of global interdealer trading in three major currency pairs in 2006 and 2007. Importantly, it contains precise observations of the size and the direction of the computer-generated and human-generated trades each minute. The empirical analysis provides several important insights. First, we find evidence that algorithmic trades tend to be correlated, suggesting that the algorithmic strategies used in the market are not as diverse as those used by non-algorithmic traders. Second, we find that, despite the apparent correlation of algorithmic trades, there is no evident causal relationship between algorithmic trading and increased exchange rate volatility. If anything, the presence of more algorithmic trading is associated with lower volatility. Third, we show that even though some algorithmic traders appear to restrict their activity in the minute following macroeconomic data releases, algorithmic traders increase their provision of liquidity over the hour following each release. Fourth, we find that non-algorithmic order flow accounts for a larger share of the variance in exchange rate returns than does algorithmic order flow. Fifth, we find evidence that supports the recent literature that proposes to depart from the prevalent assumption that liquidity providers in limit order books are passive.

JEL Classification: F3, G12, G14, G15.

Keywords: Algorithmic trading; Volatility; Liquidity provision; Private information.

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**Appendix B: 'Comment: Making FX safer from market disruption', *FT Trading Room,* 27/07/11**

FINANCIAL TIMES

July 27, 2011 11:27 am

# Comment: Making FX safer from market disruption

By Gil Mandelzis

Scanning the headlines in the foreign exchange (FX) industry press, you will notice a distinct lack of hyperbole in the coverage of high-frequency trading when compared with other asset classes.

In its place are stories covering the rapid rise in volumes from algorithmic, or algo, trading by traditional firms and high-frequency trading shops. The reason is not an industry in denial. It is rooted in the different path that the FX industry has taken to build a market that protects itself, and importantly its traders, from algo trading scenarios seen in the equity markets.

At its core, the FX market is built in a way that reduces the risk of these types of market dislocations because of its roots as a global over-the-counter traded asset with greater daily turnover than any other asset class. There are numerous, diverse venues on which to trade FX. This diversity brings with it a depth and resiliency which simply is not present for a given exchange-traded security, which typically has a small fraction of the active volume of a major currency pair, and trades on fragmented venues, which are correlated far more rigidly from a pricing standpoint. Furthermore, the FX industry has a history of “grass roots initiatives” to address the needs of market participants and regulators. The settlement bank CLS was created by the industry to address so-called Herstatt risk, and a decade later the CLSAS (Aggregation Service) was a further example of the industry identifying a need in the market and acting on it to stay ahead of innovations in trading methods and technology.

Last month, Traiana, Citi, Deutsche Bank, JPMorgan and Morgan Stanley, along with all the main FX trading platforms, announced an industry initiative further to reduce risk in algorithmic and high-frequency trading of foreign exchange. It is the latest in a long string of investments the industry has made to protect traditional and electronic FX traders, while embracing the growth in algorithmic trading that has brought significantly greater liquidity to FX markets. The result has been substantially greater trading opportunities and tighter spreads, all achieved without the market dislocations and drama that have roiled other asset classes.

This latest industry effort, launched with the support of such FX trading platforms as BloombergTradebook, Currenex, EBS, FXCM, Hotspot FX and Thomson Reuters deploys a comprehensive system to monitor algorithmic trading activity in real-time across every leading FX venue, giving prime brokers and their clients the ability to halt or limit trading activity via a “kill switch” if one of the “machines” begins to malfunction or a client breaches risk limits. With a “pattern-recognition” algorithm technology, it even looks for evidence that things are beginning to go wrong, before those limits get breached or losses start racking up.

While risk controls at the trading platform level provided a layer of protection against these dangers on a single platform, no solution in the market allowed a prime broker or client to look across all trading venues in real time, or allowed a prime broker or client to turn off trading activity quickly across all venues if something was going wrong. The primary benefit of this solution will be to ensure that counterparty technology failures or risks do not give rise to undesired market risk for FX trading firms – but the additional benefit will be another layer of insulation in FX markets.

*Gil Mandelzis is chief executive of Traiana, a post-trade company owned by Icap, an interdealer broker*