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The role of high-frequency traders
in the foreign exchange market
bid-ask spreads

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Роль высокочастотных трейдеров в формировании
«бид-аск» спреда на валютном рынке

На английском языке

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Abstract: This paper presents a review of the literature on high-frequency traders and their presence in the microstructure analysis of the foreign exchange, and how they fall under the determinants of the bid-ask spread of foreign exchange rates. The bid-ask spread is one of the key elements of the microstructure approach in the foreign exchange market. Understood as the difference between the price a participant buys the base currency and the price for which the participant sells that same currency. The understanding of what affects spread is important to assess dealers rent, price fairness and transparency and for transaction costs both in trading systems and settlement systems. It is shown, that algorithmic trading, and for that highfrequency traders, do not have a negative role in volatility, and are not a reason for widening bid-ask spreads. In fact, evidence shows that their presence is a key factor in the spreads being more narrow.

Keywords: high-frequency trading, spread, foreign exchange,
microstructure

JEL Classification: F31, G15, D23

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1. Introduction

The foreign exchange market is an important part of the financial market, and foreign exchange rates are often mentioned in different topics such as risk management or international finance. But one element is rarely touched — the bid-ask spreads of these rates. On one hand, as some typical academic literatures describes, one element that affects the spread of the foreign exchange rates is for example liquidity but, on the other hand it is also the spread that affects liquidity and not necessarily the other way around. Also of increasing importance are entities not previously present in the market. In the nineties and before, market participants were of limited types and the way transactions used to be performed were quite simple, typically made by phone or wire. With the technology revolution since the year 2000, the way transactions are performed and settled have changed significantly. Electronic trading has led to new types of entities, making the settlement of transactions faster and even making the inter-bank market directly available to investors. It was also observable that bid-ask spread of exchange rates, which used to be narrow only in the inter-bank market, has become narrow also outside of that market, directly to customers. If some opinions are based only on foreign exchange risk being the driver of bid-ask spread, then it seems that risk itself is not of less importance than in previous years, yet spread is narrower. Today, market makers

are not only bank dealers but other institutions as well. Of course, over 50% of market share still remain in the hands of 4 banks (Vaughan, 2013), there are other entities important to the foreign exchange market affecting the bid-ask spreads. It is due to these entities, also some of them acting as liquidity providers, that supervisors have introduced regulations in order to restrict or even prohibit their actions. Mainly it affects high-frequency traders which, in general seem to have a negative reputation but, studies are not so decisive. Although some studies show that high-frequency trading may be disruptive to markets due to the nature of high-frequency orders, other studies seem to favour this type of market activity because it provides liquidity to the market and possibly reduces the short-term volatility without necessarily changing the exchange rates direction (i.e., without a possible price manipulation). Of course, the volatility in periods less than a second may be higher but, in general it seems that these types of participants may limit volatility.

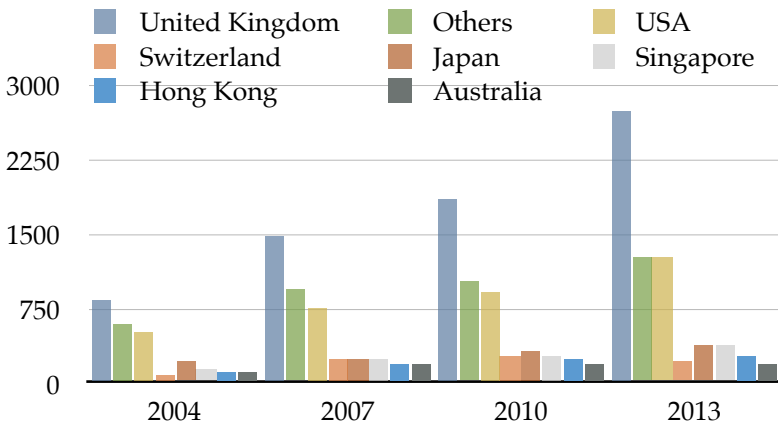
2. The foreign exchange market and its growth

While the foreign exchange market is considered to be the largest segment of the financial market in the world, it may be difficult to consider it a symmetric market where all participants have a relatively equal share in the market.

The foreign exchange market is evaluated by the Bank of International Settlements (BIS) at close 6'600 bln USD average

daily volume. One must take into consideration that as an OTC market makes it difficult to present with precise data. Nevertheless, as with other markets, the foreign exchange market shows a concentration in volume by countries. The United Kingdom is by far, the country that shows the highest turnover when comparing with other countries and that advantage has been increasing, according to data of the latest surveys. This can be related with the concentration of financial institutions in that country and with the relatively high number of offshore transactions. Chart 1 summarises how the volume in the most active countries presents against all of the countries in the world.

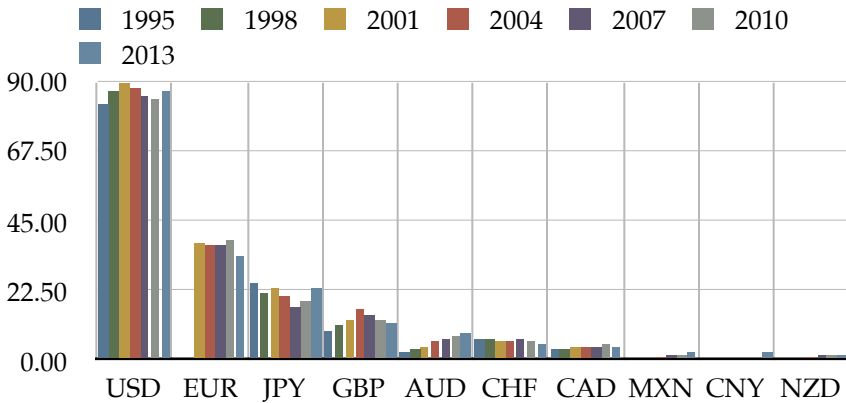
Chart 1 - Average daily volume in the Foreign Exchange market by country in bln USD



Source: According to BIS data

When taking into consideration the type of transaction made in the global foreign exchange market one may see that it is also concentrated in two types: Spot transactions and FX Swaps. While different transactions are a key element in the foreign exchange market greatly important are the currencies themselves and the turnover in each of these currencies. Chart 2 presents the top 10 currencies according to their respective volume in the forex market. This information is crucial for the microstructure approach of foreign exchange rates. When reaching for the literature of the subject, it is essential to segregate findings according to the types of currencies. In general, conclusions of the determinants of spreads for researches in low liquidity currencies should not be generalised. What determines the spread for one currency does not necessarily apply for others although, the conclusions and these determinants are still valid for that one currency.

Chart 2 - Share of the top 10 currencies by volume (1995-2013) in percentage

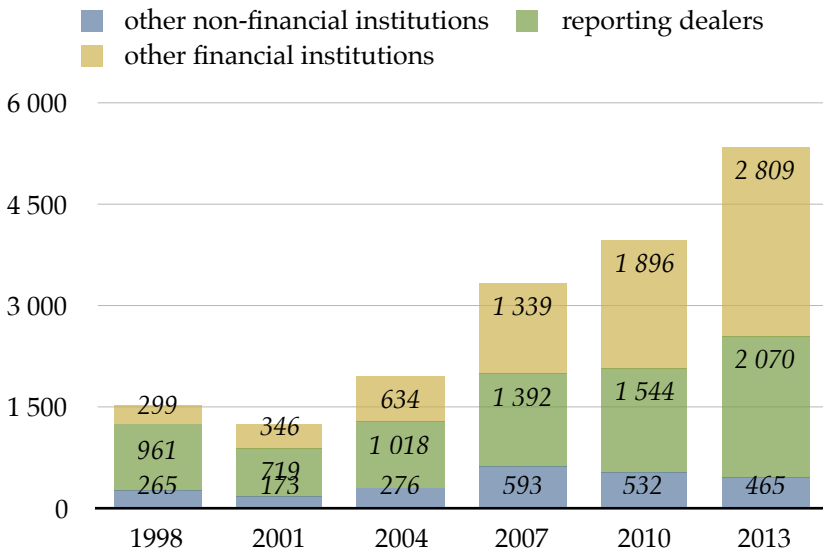


Source: According to BIS data

One information that is equally relevant to the analysis of the bid-ask spreads are the different participants present in the foreign exchange markets. Chart 3 presents a general segmentation of the foreign exchange market according to participants or, groups of participants to be exact. BIS divides participants into three categories: reporting dealers, other financial institutions and other non-financial institutions. For the purpose of the microstructure approach the most important groups are reporting dealers and financial institutions since, they include entities which have the ability to influence bid-ask spreads. The group reporting dealers represent mainly participants which make transactions in the inter-bank market, basically being commercial and investment bank dealers. The

second group, other financial institutions may include smaller commercial banks not regarded as market dealers, institutional investors, hedge funds, brokers and others. It is observable that the importance of this second group of institutions has risen since 2010. This may be related, in part, with the financial crisis of 2008 and therefore the need to hedge financial investments or to diversify portfolios.

Chart 3 - Volume in the foreign exchange market according to participants in bln USD



Source: According to BIS data

Although these categories of participants are important as an introduction, it is necessary to further discuss the types of institutions and their roles in the foreign exchange market because, even when only certain participants may influence the bid-ask spread of foreign exchange rates others may be the reason for why spreads are changed. A dealer may, for example, decide to widen the spread for a retail customer and, offer a better spread to a financial institution.

3. Types of market entities and their evolution in the foreign exchange market

The first, and very important participant in the forex market are liquidity providers (LP). Their function is to supply currency liquidity to the market, acting as market makers and thus hoping to make profit on the spreads. Traditionally, liquidity is assumed to be provided by commercial and investment banks but, currently that list is somewhat extended to include other participants such as high-frequency traders. Somewhat similar, are market makers which, not necessarily need to be liquidity providers but LP's will always be market makers. The reason is that some brokers act as market maker against their clients but do not provide any liquidity to the market. The market maker is basically the first party of a foreign exchange transaction acting as the price setting entity. Therefore, the market maker will profit, apart from the spread, on the losses at the other side of the transaction. History has shown that some market makers are

interested in price manipulation — evidence to this may be individual dealers of major banks who have been accused of manipulating exchange rates near the close of the market day. An example of such procedure is known as banging the close and led to severe losses of bank clients.

A specific type of participant in the foreign exchange market is known as No Dealing Desk (NDD). This can further be divided into Straight Through Processing (STP) and Direct Market Access (DMA). NDD entities, as the name suggests, implies that immediate access to the interbank market is offered, and they act therefore as intermediaries. These entities profit from spreads or transaction commissions charged to clients. DMA opposed to STP brokers offer only the inter-bank rates without any type of mark-up.¹ Electronic Communication Network (ECN), very widely used by investors, is a type of entity that may act either as a DMA or NDD/STP entity.

It is basically because of these groups of participants that the trading process in the foreign exchange market has changed so much and with it, how spreads are determined. Their existence derives from a new possibility of trading — electronic trading, which basically today determines the very way transactions are executed (Osler & Wang, 2012). Since electronic trading has been made available and interbank market accessible to investors, spreads have significantly become more narrow, and

¹ Mark-up is the addition of points to the client's spread - i.e., the spread may be wider for different types of clients or from STP broker to another STP broker.

with them trading costs. Since anyone has direct and fast access, not only to one bank dealer, but to most interbank dealers, it is currently more difficult to assume that solely bank dealers participate in the interbank market. This of course has introduced more transparency to the market since dealers quotations are fully available to every investor.

As previously mentioned, the foreign exchange market is a specific market, difficult to consider symmetric, and increasingly concentrated. As presented by (Osler & Wang, 2012), the number of banks accounting for 75% of the market turnover fell from 10 to 7 in the US, from 12 to 9 in the UK and from 9 to 8 in Japan. (BIS, 2013) also shows that although, inter-dealer trading has increased by 34% in 2013 when comparing to 2010, it has decreased by 25% since 1998. As of 2013, the general interbank dealer trading remains at 39% of the global foreign exchange transactions. Reasons for concentration of bank dealers trading are related with competition issues — due to the rise of electronic trading and new participants, banks have invested considerably in IT components. In spite of many changes in the structure of the foreign exchange market some aspects remain unchanged (King et al., 2011). Trading is continuous and highly liquid. The periods of higher and lower activity remain the same — the most active periods prevail when markets in Europe open, when US markets open and overlap with the european. A brief period of lower activity is likewise observed, when US markets close until Australian markets open (the first of the Australasia

markets). Spreads also, for reasons to follow below, also present some patterns.

4. Determinants of foreign exchange bid-ask spreads

Theory designates three main determinants for the bid-ask spread (Sarno & Taylor, 2001): cost of holding inventory, cost of dealer services, also known as order processing costs (Banti & Phylaktis, 2013), and the cost of adverse selection. Cost of dealer services are significantly straight forward as they may be considered fixed type costs and common among dealers. These costs may include news services payments or trading systems.

Adverse selection is related with the fact that, since dealers are assumed to have better information than other participants, this asymmetry should affect bid-ask spreads. (Stoll, 1978a) indicates otherwise, that spreads include the costs of information that some dealers bear from potentially having less information than investors. This opinion is based on the NASDAQ stocks trading and, it seems incomparable to the foreign exchange market where, it is difficult to find inside information available although, some traders may be better informed than others it will be later discussed. As foreign exchange market is concerned, literature, for example (Lyons, 1995), often assumes a positive correlation between information and deal size with spreads, since the size of the deals should be positively correlated to information — i.e. larger deals should bear better information behind them. But

many researches show that deal size bears little or no relation with bid-ask spread (Osler et al., 2011). As information is concerned, literature seems a little more divided. (Sarno & Taylor, 2001) present the problem of adverse selection as first examined by (Bagehot, 1971) and later widely debated when analysing the asymmetry of information affecting spreads. The discussion, involves market makers and both liquidity traders and “insider” traders, which the latter do not occur in the foreign exchange market but, are as such, assumed to be highly informed traders. Issues may arise with market makers to correctly identify which traders are they dealing with. On one hand, liquidity traders are willing to pay the offered price for the spot delivery of an instrument but, on the other hand, “insiders” are willing to speculate against market makers by using “better” information. The bid-ask spread becomes the market maker mechanism of defence against this uncertainty, meaning that as this uncertainty rises bid-ask spreads should widen. But, as previously mentioned, some empirical analyses shows that this relation doesn’t necessarily occur. Two recent interesting empirical analyses confirms that (Bjønnes et al., 2014) *“spreads are narrower for customer who are considered better informed by their dealers, specifically financial customers, and narrower for larger trades”* and (Osler et al., 2011) *“customer spreads are widest for the deals least likely to carry information”*. Both mentioned empirical researches post potential reasons for these findings. (Osler et al., 2011) refers, for example, to foreign exchange dealers offering narrow

spreads to informed customers which have a higher ability to predict exchange rates and so, dealers could benefit from decisions made by these financial customers (informed participants). (Bjønnes et al., 2014) underlines that although bank dealers narrow spreads to informed financial customers they will use some protection mechanisms when dealing with other bank dealers.

Order size is also an element taken into consideration apart from the adverse selection, in the inventory holding cost. This later one relates to costs dealers bear when engaging in large currency positions with their clients. Traditionally, customers would exchange large foreign currency positions with their dealers (usually banks) into the domestic currency. This would make the dealers exposed to risk from having large and maybe undesired positions in their portfolio (Stoll, 1978b), in foreign currencies. In order to protect themselves, dealers would simply widen spreads. Consequently, and not without merit, traditional theory finds a positive correlation of inventory holding costs with spreads although, empirical analysis shows otherwise. The larger the orders (and for that inventory costs), the larger the spreads offered. But order size may also be linked to information and for that, adverse selection related costs, since participants are more likely to increase order size on informed situations (Osler et al., 2011).

One additional determinant of the bid-ask spread, referred in some studies, is competition, market sophistication or market power. According to ((Green et al., 2004)), market power will

decrease as order sizes decrease as the bargaining necessity from dealers will increase. Also, market power is greater when customers are unsophisticated (technologically or informationally) making them target of wider spreads, without the risk for dealers, of losing significant future businesses (Bjønnes et al., 2014).

Taking the above determinants into consideration, it is natural that intraday patterns in the bid-ask spread will also be observable, somewhat similarly as the general foreign exchange volume. But as (Pasquariello, 2000) finds, in analysis on the DEMUSD, these patterns will be contrary to some patterns found in the stock markets where, regulated and time delimited exchanges function. Spreads in the foreign exchange market seem the lowest in the beginning of the day (GMT time), increasing in the Asian afternoon and remaining stable up to London's afternoon, when US exchanges trade, and declining again in the US evening. This presents with an interesting observation (Sarno & Taylor, 2001), relying in the fact, that volume and volatility in New York foreign exchange market is not affected by the close of the London market (also when volume and volatility is the highest in that location). (Hsieh & Kleidon, 1996) seem to explain this in two ways. The first, relying in the fact that dealers and traders learn the specifications of the trading day and the second, presumably near London's close, traders seem to remove unwanted inventories from their portfolio. In this situation, the inventory holding costs determinant may somewhat explain the widening

of the spreads at these times, what could not be explained through empirical analysis of information based models.

5. Electronic trading mechanisms and their role in the foreign exchange market

Technology is a key element affecting how financial markets function. With computer systems, exchanges have basically, disregarded open outcry trading embracing electronic trading favouring lesser costs and faster trading. Technology rarely brings a one time and violent change in the financial market but rather it accommodates itself in a continuous manner. Technology has changed the way information (either news or analysis) is propagated and how fast trade is performed. Additionally, as mentioned by (Aldridge, 2009) “*while these changes have made markets more transparent and reduced the number of traditional market inefficiencies, technology has also made available an entirely new set of arbitrage opportunities*”. It was not until the 1990s and especially 2000s that electronic trading became widely available to investors. While electronic execution was already available in the 1980s, it remained in the hands of few participants. The first electronic execution system (Designated Order Turnaround - DOT) was introduced by the New York Stock Exchange in 1976 for its traders, in order for them not to focus in small 100-share market orders (Leinweber, 2007). Even when much work had been made until the end of the 1990s in the capital markets,

such markets as the foreign exchange market, and other decentralised, did not benefit from such automatic mechanisms. As provided by (Goodhart & O'Hara, 1997) quotes in the foreign exchange market, would be aware to banks, but not other participants, through “indicative” quotes. This would mean that dealers could (but were not obligated to) trade according to these indicative bid-ask quotes. At that time, news agencies would gather these quotes, and make them available to other entities, without focusing much in storing them. It may be difficult today, to imagine how the this market could function when comparing to the current possibilities. This may be especially visible, when taking into account the difficulty of performing researches in the foreign exchange market for the 1990s since, extremely limited data is available. Research by (Goodhart et al., 1996) in 1993 of the USDDEM, was performed using seven hours of data from REUTERS D2000-2, what then, would be something very difficult to obtain. Now, every trader, even the retail investor, can have 1 minute data from whichever time period he desires.

Only when several exchanges introduced electronic trading mechanisms, computer technology evolved sufficiently and technology costs dropped enough, that new possibilities in trading and arbitrage were possible. As a result of this, algorithmic trading, high-frequency and systematic trading evolved (Aldridge, 2009). Algorithmic systems were supposed to “copy” manual traders decisions and optimise buy and sell orders. Usually, these trading mechanisms focus only on the

trading decisions and not portfolio allocation decisions, since these would be performed by “human” dealers. Algorithmic trading systems make these decisions according to current market conditions while rarely ever leaving positions open overnight. In general, an algorithmic system may identify an instrument that should be traded at small increments but will not necessarily execute them at high-speed (high-frequency). High-frequency trading is derived from algorithmic trading systems which allow for high-speed trading, even thousands of trades within one-second. A fully high-frequency system is considered to be the most complex computerised trading system available since it will make the same decisions made by traders, portfolio managers or risk managers usually, in short periods, up to one day. The last of the computerised trading methods is systematic trading system which is considered to be a rather long term decision system that could range from hours to even a month.

At first sight, this type of technology already shows signs of diminished costs: decreased costs from the lack of errors as a result from indecisions or bad judgement from dealers, and from the lack of necessity for overnight carry trades and a smaller need for “human” traders in favour of cheaper computer systems. These lower general operational costs already lead to narrower spreads. But, the increased use of algorithmic trading by financial institutions does not only derive from cost related preferences. A survey of algorithmic trading for 2015 (Trade, 2015) shows that companies prefer

this type of trading, mainly due to: ease of use (16.3%), anonymity (13.0%), price improvement (12.5%), reduced market impact (11.3%) and increased trader productivity (10.4%).

The understanding of algorithmic trading is currently important due to the increased usage of these types of systems in the financial market. (Leinweber, 2007) states that over 90% of hedge funds use electronic trading algorithms. Certainly, this value relates to all instruments traded and not only currencies but, a survey made by (King et al., 2011) show, for multi-bank platforms and retail platforms, that the turnover of foreign exchange transactions executed through algorithmic trading is 35% while, high-frequency trading is 18%. It is even suggested (King et al., 2011) that the values for high-frequency trading may exceed 50% of the turnover in most liquid currencies.

6. High-frequency trading and their role in the foreign exchange market bid-ask spreads

As mentioned before, high-frequency systems are considered the most complex trading systems within the group of algorithmic trading, that leads to many new arbitrage and trading techniques to the market. As far as algorithmic strategies are concerned (Almgren, 2009) states 3 generations of strategies employed by algorithmic trading participants while, (Gomber et al., 2011) includes a fourth strategy based on

(Johnson, 2010) includes a fourth one although, it seems that only the first and fourth generation can be considered to be used at the moment in the foreign exchange market. The first generation model is based on participation rate, at or up to, a certain defined volume. It could be determined to trade up to 0.5% of the volume in a certain currency or instrument. Examples of such methods are TWAPs (Time Weighted Average Price) or VWAPs (Volume Weighted Average Price algorithms). The second generation strategies, also called implementation shortfall algorithms, try to minimise the impact of an order taking into consideration the result of pricing movements during the execution of that order — accounting therefore, for latency of an order, and potential price movements. This strategy usually consists in dividing a large order into smaller ones minimising market impact. But, this strategy usually comes with a tradeoff. Although the longer the time of executing the large order, smaller might be the market impact, but the costs of negative changes in price increase (Johnson, 2010). The third generation models that close the algorithm generation classification according to (Almgren, 2009) have no specific and defined methods since they adapt to the market conditions, being therefore also called “adaptive algorithms”. The additional fourth generation, and one that could be considered highly important for any participant, is information algorithms or newsreader algorithms. Every investor basically, relies on information to perform trading decisions, portfolio allocation, and other decisions. Not every

trader will need news very quickly but, it can be stated that other dominant market participants, make trading decisions take into account the moment an information is released. Information algorithms are designed to digest all market data (basing on statistical and data-mining methodology) providing the potential impact on the market. (Almgren, 2009) shows that only equity instrument trading systems have evolved to the stage of using all four generations while, foreign exchange markets remain at the first generation strategies (apart of the forth model).

High-frequency trading has been, in the last years, widely implemented by many different participants reaching every high liquid financial instruments. Since, every instrument has its own characteristics, this results in the list of strategies used by this type of trading system to be wide and not suitable to cover individually in this paper although, relevant are the groups in which these strategies are classified. One of the most used and important is the Electronic Liquidity Provisions group. High-frequency liquidity providers as mentioned by (Gomber et al., 2011) have two sources of revenues: providing liquidity — earning from the bid-ask spread and, by receiving rebates or reduced transaction fees given from trading venues. The latter is rather applicable for stock or other regulated market. On the foreign exchange market, for the liquidity providers, apart from providing liquidity, the most important revenue element is the spread since, they will continuously buy and sell currencies at the best market conditions possible. One

other group of strategies is the Liquidity Detections group. These strategies which may affect the bid-ask spread are in general, considered an aggressive type of strategies of high-frequency participants. These strategies will, through different techniques, try to discover other participants liquidity by looking for hidden orders, or small portion orders. One way of how these high-frequency systems detect liquidity may rely in changing the bid-ask spread, as mentioned by (Xu, 2013). Example techniques are known as “sniffing” or “pinging”. When “pinging” inside the spread, the trading system will improve either the best bid or ask price by the smallest increment possible. Other techniques are not supposed to “detect” liquidity, but rather to generate it in its own favour. An example of this can be “quote stuffing” that relies in changing the bid (ask) while keeping the ask (bid) unchanged. This is an example of techniques that are often in the literature considered as “predatory” (Lauer et al., 2013). Their aim is to activate other algorithmic mechanisms, and participants for that matter, as a result of changing spreads. It is important to underline that, some of these aggressive or “predatory” techniques are considered illegal in many countries like the US and EU but, are very difficult to identify their character under thousands of other orders. This is why, that even illegal, they must be considered possible to exist in the market and to be a spread determinant as well.

Having in mind price and spread determinants previously discussed, it may be of some difficulty to place high-frequency

trading systems, or participants, and their role in the microstructure analysis. It might be strange to analyse a participant using computer algorithms and consider it to be, for example, equally informed as other participants. But, since some algorithmic systems are focused on information analysis, and other on order optimisation then, it seems logical that they could be just as well considered a different type of market participant with similar market impact. A study by (Chaboud et al., 2009) for example, shows “computers” to be equally informed as their “human” competitors in the EURJPY although in the EURUSD or USDJPY the “human” traders seem to be the ones more informed. If this is the case, then a question arises on whether algorithms might execute strategic trading decisions. The same study (Chaboud et al., 2009), shows that algorithmic trading can indeed generate strategic trades, but they will be less diversified than those of human trades. Based on these findings it is possible to conclude that if dealers have a higher tendency to offer narrower spreads to informed traders then, algorithmic and high-frequency trading systems, may explain in part the general market observation of spreads becoming more narrow (Cumming et al., 2012). Also, if these systems trade strategically, they may in fact not be the source of higher volatility in the foreign exchange market since, their orders may also be limit orders and not market orders. At this point, it may be relevant to make a distinction (Kearns et al., 2010) between “passive” and “aggressive” High-Frequency traders. Passive strategies by these traders are

considered strategies using limit orders — being possibly treated as liquidity providers, as opposed to aggressive strategies where only market orders are used. As previously mentioned, aggressive high-frequency traders may also influence the spread in the foreign exchange market by using, in the extreme case, “predatory” illegal (e.g. quote stuffing) or restrictive mechanisms (e.g. pinging), but their use should not be considered a rule. As a matter of fact, it may seem more logical that mainly aggressive high-frequency trading participants affect spreads when comparing to passive traders. The nature of passive traders by being more strategic, rather have a more significant medium-term effect on price discovery than in spreads.

Another determinant of spreads is inventory holding cost. High-frequency trading systems in general, do not keep open positions overnight meaning, that they aim for zero inventory holding (Easley et al., 2011). In a way, they could be considered discretionary most of the time and some nondiscretionary by the end of the day, a distinction first presented by (Admati & Pfleiderer, 1988). Discretionary traders are considered traders which have a complete freedom in the decision of timing their trade while, nondiscretionary traders may be restricted to a time period, for example all trades must take place before the end of the trading day. Furthermore (Hemberg, 2012), discretionary participants will usually prefer to trade when there is a higher market activity since their trades wouldn't affect the prices as much, what

seems a reasonable assumption for many high-frequency traders.

As dealers costs and high-frequency trading systems are concerned, for now, dealers are not high-frequency traders so, they do not benefit as much from the reduced human (employee) costs as high-frequency participants do, although it doesn't mean that the latter don't have high costs related for example with technology. High-frequency participants heavily invest in technology and highly specialised employees which prepare and maintain the trading system. Other costs are similar to those of human participants, as they must also invest in trading systems, electronic news systems, or other cost factors. Because as previously mentioned, some high-frequency participants also assume the role of liquidity providers, their costs should also be somewhat comparable to dealers costs and, affect in a similar way the bid-ask spread. In the end, when taking "dealers costs" only from high-frequency traders into account, the spread should be narrower than that of normal "human" dealers.

Regardless of the nature of spread determinants, many findings show that high-frequency trading does not have a negative effect in the market (either stock market or foreign exchange market), price discovery or the bid-ask spread. They even show the opposite. (Debelle, 2011) present that by high-frequency trading, spreads are narrower (tighter) in normal times. Findings by (Malinova et al., 2013), taking into account regulatory fees in Canada, show that a 30% drop of algorithmic

messaging, understood as number of orders, trades and order cancellations, induced a 9% increase in the bid-ask spread.

Summary

Opinions on the impact of high-frequency trading in the financial markets, including the foreign exchange market and for that, spreads, seem divided. Some general market reports show their impact to be considered positive in normal times but, in “stressed” market moments the high-frequency trading seem to limit the level of activity of normal “human” traders thus, negatively affecting the market. As a precautionary rule, some regulators have prohibited or imposed transaction fees in order to limit high-frequency trading. Many accuse algorithmic trading systems, and high-frequency trading systems for generating higher than normal volatility but findings show the opposite. Since not all high-frequency trading can be considered speculative but for example also as liquidity providing, these types of trading systems may actually decrease the volatility and induce spreads to be more tight (narrower). This may be a result of the fact that high-frequency trading systems have the same, or a bigger, impact on the bid-ask spread determinants than the rest of the participants, especially dealers. High-frequency trading systems seem more focused in specified instruments and less diversified than human traders, making more instrument strategic decisions. Decisions by high-frequency traders derive from fast news analysis and this may

bring very important information to other dealers, as these orders are backed by solid information, they may be recognised as better “value” than human decisions which may be irrational or simply wrong. This value of information is one of the reasons why bank dealers do not necessarily widen spreads to financial customers, but rather prefer to trade with them offering tighter spreads.

Further analysis is nevertheless necessary to fully understand the role of the “predatory” type of high-frequency trading systems and their impact in the foreign exchange market, since they may intentionally change spreads in order to attract other participants, independently if they are algorithmic or human traders. This type of activity is important from a research point of view because the reason behind bid-ask spreads “adjustments” of these “predatory” traders does not fall under the typical spread determinants as literature points out.

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