

Foreign Exchange Market: Institutional Structure, Regulation, and Policy Implications

Fei Su^{1,*}, Jun Zhao²

¹Finance Discipline Group, GTA Finance and Education Group, Shenzhen, China

²School of English Studies, Tianjin Foreign Studies University, Tianjin, China

*Corresponding author

Abstract Electronic trading has transformed foreign exchange markets over the past decade, and the pace of innovation accelerates. This formerly two-tier market (namely, the interdealer and customer market) is now evolving into a multi-tier market and transaction costs are only a fraction of their former level. Entirely new agents have joined the fray, including retail and high-frequency traders, while foreign exchange trading volumes have almost tripled to 5.3 trillion dollars daily according to Bank for International Settlements 2013. Market concentration among dealers has risen reflecting the heavy investments in technology. This paper outlines the players in this market and the structure of their interactions. It also presents new evidence on how that structure has changed over the past two decades. Throughout, it highlights issues relevant to market regulation and exchange rate modelling.

Keywords: *foreign exchange market, institutional structure, regulation, policy implication*

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1. Introduction

It would be hard to overemphasize how important the foreign exchange market is. The average daily trade volume of the foreign exchange market reached to 5.3 trillion dollars in April 2013, which is more than the monthly volume of New York Stock Exchange (NYSE) in 2013 [1]. FX market plays a central role in the financial markets as it provides a way for funding foreign liabilities, for hedging FX risks, for facilitating global portfolio rebalancing, and for implementing monetary policy. Over the last two decades, the importance of the FX market has drawn great interests of policy makers, academics, and the media [2].

When referring to foreign exchange market, it is important to bear in mind the existence of various submarkets and their heterogeneous roles in the FX market. For example, the markets for the emerging market currencies are organized in a different way compared to the markets for the developed market currencies. Also, the FX derivatives markets behave quite differently from the spot market. This thesis mainly focuses on the spot market, which is the second-largest submarket, closely following the FX swap market in 2013 (BIS, 2013a, Table 1), and where most of the price discovery takes place [3]. The FX spot market is a decentralized multiple-dealer market. Traditionally, trades are triggered in a two-layered market, namely, the customer market and interdealer market. The customer market is driven by quotes and the liquidity is provided by the market makers. The customer trades have been conducted through the phone, electronic platforms (i.e. sing-bank, multi-bank, and independent trading platforms), and most recently, electronic brokerage

systems and internet-based retail (margin) trading platforms. In the interdealer market, dealers quote prices and trade with each other. Historically, the interdealer market has been characterized by direct dealing (bilateral negotiation) or voice brokers. Nowadays the interdealer trading is largely carried out through electronic brokerages (for example, two of the primary electronic brokerage systems – EBS and Thomson Reuters FX Matching) and Electronic Communication Networks (ECNs). The interdealer market is at the center of the FX market in the sense that the best posted interdealer prices (better known as the “quotes”) are used as benchmarks for the customer market and the dealers provide liquidity to other dealers and to their customers. Another market sharing similar characteristics is the US Treasury Bond market.

Unlike the equity or other securities markets, a unified empirical model for the foreign exchange rate is absent. Since the seminal work of Meese and Rogoff argued that the existing model of exchange rate based on macroeconomic fundamentals could not reliably outperform the “naïve” alternative of the random walk forecast for yearly changes in major currency exchange rates, the predictability of the foreign exchange rate movements has been examined extensively [4]. However, no one has yet been able to uncover macroeconomic fundamentals that could explain a modest fraction of the changes of the exchange rate in the real world [5]. Frankel and Rose describe the traditional empirical research on exchange rate as “... the case for macroeconomic determinants of exchange rates is in a sorry state” [6]. Since the mid-1990s, with the availability of proprietary data from the large dealing banks, research on foreign exchange microstructure, or so-called “the new micro exchange rates economics” [5], has accelerated. The researchers on FX market microstructure make an attempt

to understand the mechanisms generating those deviations from macro fundamentals at short time horizons, which is of great importance for practitioners and regulators (e.g., [7,8,9]). For example, the empirical evidence proves that up to two thirds of the level changes and volatilities of exchange rate movements are associated with order flows [10,11].

It is worth noting that the FX market is essentially unregulated like the “wild west”, and some well-known regulations in other financial markets are missing in this market [12,13]. For example, there are no government-backed authorities to set rules for FX trading practices; local banking regulators are limitedly responsible for the registration of the dealers/brokers and supervision of clearing and settlements; the self-regulating bodies (i.e. ACI Financial Markets Association (ACI FMA) and regional foreign exchange committees) publish and maintain practical guidance, however, they have neither statutory underpinnings, nor enforcement powers [13]. The breakdown of fixed exchange rate system in 1973 has opened a new era for exchange rates and interest rates volatility [14]. Meanwhile, the FX market in most finance centres has been deregulated as a result of the intensive lobbying activities since the FX is a worldwide attractive industry and the operations would move elsewhere if regulated, which is an undesired result for the policy makers. With lax structure supplying the opportunity and big bonuses creating the motive, “the FX market is designed to encourage crime” [15]. Recently, the ongoing global probes into suspected rigging of Libor (London interbank offered rate), presumably “one of the biggest financial scandal ever” [16], have raised concerns about the vulnerabilities in the international currency markets.

After the financial turmoil of 2008, significant regulatory reforms aiming at stabilizing the financial system and improving financial surveillance in the global financial markets have been proposed and partially implemented [17,18]. However, there have been very few concrete regulatory reforms in the FX market. This has raised the question, on the one hand, of how to evaluate the recent developments in the FX market structure. On the other hand, there is also the question of how to explore the connections between market structure and its regulations, particularly for Emerging Market (EM) currencies. This chapter aims at filling the blank of the previous studies. Firstly, I examine the recent development of the FX market. Secondly, I investigate the evolving structure of the foreign exchange market and its regulations. Last but not least, I provide policy implications regarding the factors that might facilitate improving the transparency of the FX market. Overall, this chapters provides a detailed overview of the FX market structure and lays a foundation for the empirical analysis of the price discover in the FX market in this thesis.

The rest of the chapter is organized as follows: Section 2.2 presents stylized facts on the global FX market. Section 2.3 describes the two-tier market structure and its evolution. A brief comparison of regulations on the U.S. financial markets is given in Section 2.4. The final section concludes with the summary and policy implications.

2. An Overview of FX Market

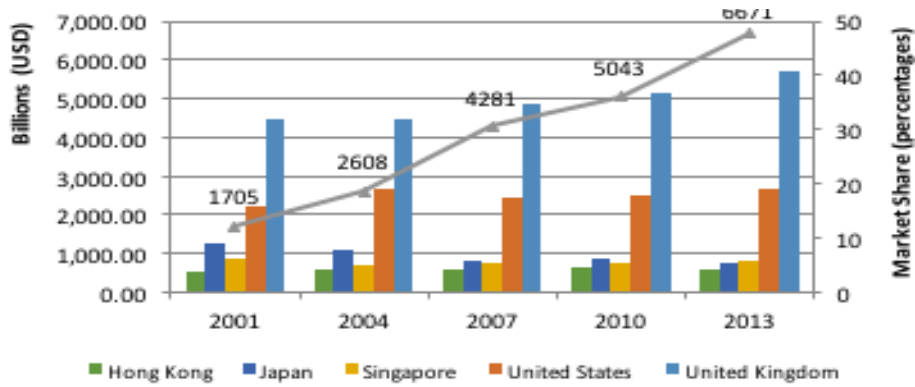
Foreign exchange trading is conducted on a worldwide basis. FX transactions occur continuously from Asia-Pacific to Europe to America. Throughout the day, the trading peaks during the “London-New York overlapping period” (13:00 GMT to 15:00 GMT) when London’s afternoon trading overlaps with New York’s early morning trading, and tapers off over the “overnight period” (22:00 GMT to 23:00 GMT) when the New York market closes and the Sydney market traders are still on their way to work.

2.1. Geographical Distribution of Turnover

Trading in the FX market hits a record high of \$5.3 trillion daily in April 2013 – a significant rise from \$4.0 trillion in April 2010 and \$3.3 trillion in April 2007 respectively [1]. Foreign exchange market transactions remain heavily concentrated in a few global financial hubs, namely, the United Kingdom, which accounts for 41%, the United States 19%, Singapore 5.7%, Japan 5.6%, and Hong Kong SAR 4.1%, of which the United Kingdom plays a dominant role in FX trading [1]¹. The top five financial centers accounted for roughly three quarters of global foreign exchange trading volume in March 2013 (Figure 1). Besides, due to the increasing internationalization of the emerging market (EM) currencies, the United Kingdom also has established its leading role in the offshore markets for EM currencies. Its market share of volume involving EM currencies has largely expanded from 13% in 2007 to 30% in 2013, followed distantly by the United States with a 16.4% share in 2013 [19]. Geographically, West Europe, North America, and Asia-Pacific are the regions where the foreign exchange trading concentrated in. In contrast, Latin America, Africa, and the Middle East each account for less than 1% of global FX volume. While the traditional finance centers maintain their status as global financial hubs, the emerging markets (e.g. Shanghai, Taipei, and Kuala Lumpur) are gaining market shares rapidly with the efforts of the local government to promote their cities as global financial centers.

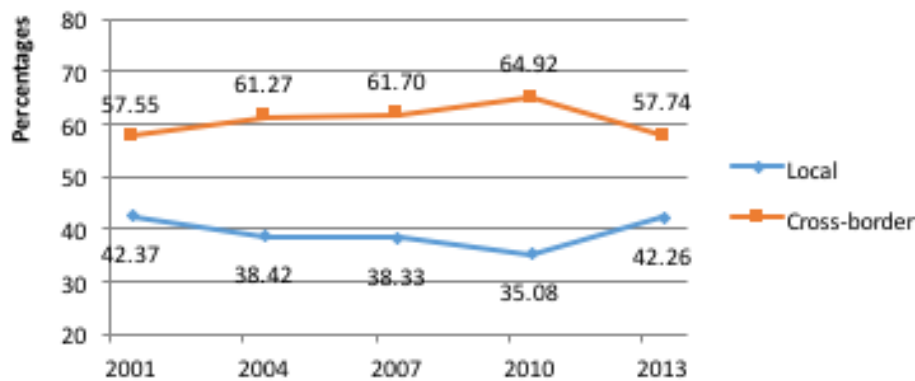
From 2010, foreign exchange trading has been conducted more locally (Table 4). The volume of local transactions has reached a historical high of 42.26% of total FX trading volume. Correspondingly, the share of cross-border FX transactions fell to 57.74% in 2013 from 65% in 2010, reversing the trend since the 2001 BIS survey (Figure 2). The decreasing importance of cross-border transactions is also evident in other over-the-counter (OTC) markets, such as interest rate derivatives [1]. The shrinking cross-border trading is not indicating that trading activities are becoming more local. Instead, with the FX trading increasingly concentrated within a few large financial centers as documented above, a larger proportion of FX trading has been conducted between counterparties located in the same place, but their headquarters could be elsewhere [1].

¹ United Kingdom’s dominant role in the FX market grew out of its traditional domination for economy in the nineteenth century as well as its unique geographic place – London’s afternoon trading overlaps with New York morning trading.



Sources: The BIS Triennial Central Bank Survey, BIS calculations.

Figure 1. Geographical distribution of global FX market turnover



Sources: Triennial Central Bank Survey, BIS calculations

Figure 2. Local and cross-border transactions in global FX market activity

2.2. Turnover by Currency Pairs

Among the major currencies, the dominant role of the U.S. dollar in the FX market remains, for example, to trade almost any currency which is not U.S. dollars demands one to exchange the first currency for dollar then convert it from dollars into another currency. The U.S. dollar constituted one side or the other in 87% of all FX transactions initiated in April 2013, about 2 percent higher than that in 2010 (Table 2). The trading through the “vehicle currency” concentrates foreign exchange liquidity within a relatively narrower range, thus essentially reduces overall transaction costs [13]. Compared with other major currencies, the Japanese yen has surged over the past three years and expanded its market share by 4 percentages to 23% in 2013. Besides, the market share of the Australian dollar has doubled from 4.3% in 2001 to 8.6% in 2013. In contrast, even though the euro remains the second most-traded currency, the market share of euro has dropped to the lowest level (33.4% in April 2013) since the outburst of the euro area’s sovereign debt crisis in early 2010 (Table 1).

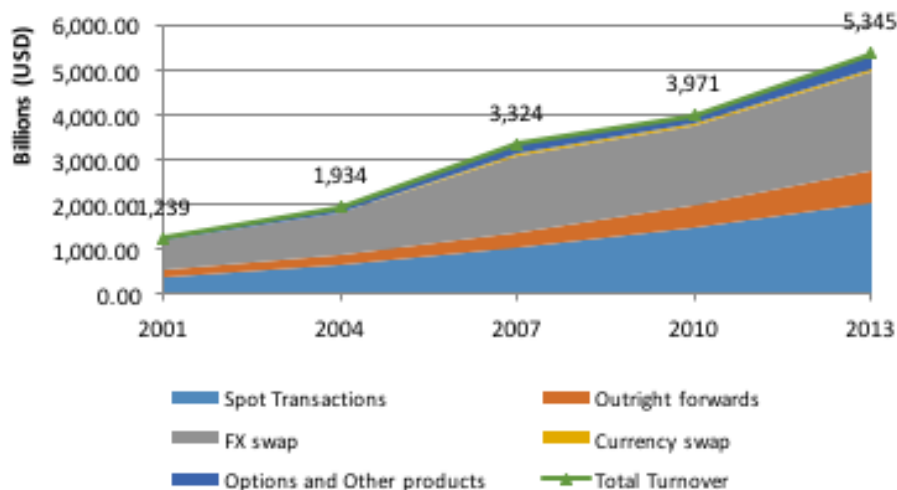
Trading in the emerging market currencies has grown rapidly, which averaged \$1.1 trillion daily in April 2013 [19]. More than a decade ago, the authorities in more than half of the emerging market economies strictly prohibited operating in offshore currency markets [20]. Nowadays, the offshore trading has accounted for roughly 68% of total volume of emerging market currencies, far exceeding the volume of onshore markets [19]. As an important gauge of currency internationalization, the high proportion

of off shore trading indicates that the emerging market currencies are increasingly international, among which the Chinese yuan (Renminbi) is playing a dominant role in emerging Asia [2]. With a 2.2% market share of global FX volume, the renminbi has been the 9th most actively traded currency in April 2013, mainly driven by the increasing efforts of the Chinese government to internationalize its currency and a significant expansion of Offshore Chinese renminbi (CNH) trading via Hong Kong. However, a breakdown of the offshore activities showed that the renminbi mainly served as a regional instead of an international currency [19].

Table 1. Geographical Distribution of Global FX Market Turnover (Daily averages in April, in percentages)

Currency	2001	2004	2007	2010	2013
Advanced Economy Currency					
US dollar	89.9	88.0	85.6	84.9	87.0
Euro	37.9	37.4	37.0	39.1	33.4
Japanese yen	23.5	20.8	17.2	19.0	23.0
Pound sterling	13.0	16.5	14.9	12.9	11.8
Australia dollar	4.3	6.0	6.6	7.6	8.6
Emerging Economy Currency					
Mexico peso	0.8	1.1	1.3	1.3	2.5
Chinese yuan	0.0	0.1	0.5	0.9	2.2
Russian ruble	0.3	0.6	0.7	0.9	1.6
Turkish lira	0.0	0.1	0.2	0.7	1.3
South African rand	0.9	0.7	0.9	0.7	1.1

Sources: Triennial Central Bank Survey, 2013.



Sources: Triennial Central Bank Survey, 2013.

Figure 3. Global FX market turnovers by instruments (Daily averages in April, in billions of US dollars)

2.3. Turnover by FX Instruments

FX swaps were the most traded FX instruments, expanding to \$2.2 trillion per day in April 2013. Like repurchases (repos) in the fixed income markets, FX swaps were utilized initially for bank's night position management [2]. After Lehman Brothers' bankruptcy in late 2008, the central banks expanded swap activities to stabilize the world banking system, a primary reason for the large expansion in the volume of swap [21]. Spot transactions ranked a close second in the FX instruments, rising to \$2.0 trillion per day in April 2013 (Figure 3). Besides, spot transactions deserve particular attention because extensive empirical research on FX microstructure focuses exclusively on spot market, where most of the trading and the price discovery occurs [7].

As been true for decades, the vast majority of FX trading (including spot transactions) is transacted over-the-counter (OTC). The OTC trading volume greatly exceeds that of exchange-traded products (ETP), e.g. the daily average of standardized products traded on exchanges was \$160 billion in April 2013, less than 3% of the OTC volume (Table 1). A potential consequence is that the common market practice of reading speculative positions in currencies from open interest on exchanges remains risky and subject to inaccuracy [1].

2.4. Turnover by Market Participants

Among the two-tier markets, the interdealer trading has kept pace with the growth in the global FX activity over the past three years, standing at 39% of total global volume in 2013. The share of FX interdealer trading is comparable to that of the London Stock Exchange (LSE), for which the estimated share is between 25 to 35 percent in 2005 [22].

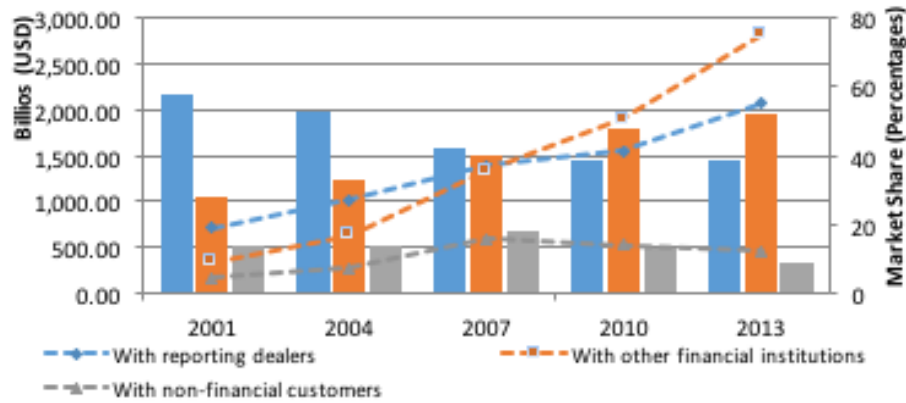
In the customer market, the market share of dealers' transactions with financial customers has almost doubled in the last decade, from 28% of total FX volume in April 2001 to 52% in April 2013 (Figure 4). As these non-dealing financial institutions are heterogeneous in their levels of risk tolerance, liquidity requirements, and trading motivations, a detailed breakdown of the FX financial customers sheds further light on their market

shares and trading patterns than ever before [1]. As shown in Figure 2- Figure 5, an important part of dealers' trades is with non-reporting banks. These small and regional banks are responsible for almost one fourth of global FX volume in April 2013, even though they are not engaged in market making activities.² Another two quantitatively significant groups of FX financial customers are institutional investors, and funds and proprietary trading firms. Both groups have a market share of about 11% in global FX activity (Figure 5).

Dealers' transactions with non-financial customers (e.g., corporates, governments, and individuals), by contrast, decreased from \$532 billion in 2010 to \$465 billion in 2013. As a result, the share of trading with non-financial customers has been cut in half since 2007, accounting for 9% of global FX volume in 2013. The FX market is still mainly dominated by the institutional investors, and only a small fraction of trades recorded was with retail customers in 2013 (i.e., about 3.5%). The decreased volume in the retail market is probably due to more stringent investor protections after the financial crisis of 2008. The new regulatory controls on the retail market, which require enhanced transparency and oversight, make retail FX less attractive and lead currency managers to shift away from the market [23].

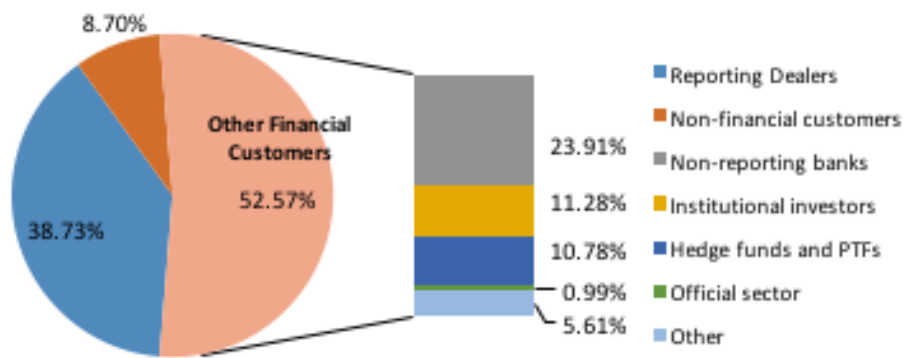
Dealers' trading with official sector (e.g., central banks and sovereign wealth funds) is responsible for less than 1% of global FX volume in April 2013. Rime and Schrimpf emphasize that these institutions, albeit a small amount, can have a strong impact on currency prices with their intervention operations [2]. For example, the central banks usually possess superior information over other market participants, partially from their ability to require confidential information and their influential power to affect price discovery of other banks [20]. The strong influence of the central banks may also lie in the fact that monetary authorities are better at detecting and interpreting the financial stress [24]. Thus, central bank may have a substantial impact on the currency price as their.

² As the non-dealing banks are hard to compete with the dealing banks to offer competitive prices, these small and regional banks work as customers of the large dealing banks and exploit their competitive edge towards local clients [2].



Sources: Triennial Central Bank Survey, 2013.

Figure 4. Global FX market turnovers by counterparty (Daily averages in April, in billions of U.S. dollars)



Sources: Triennial Central Bank Survey, 2013.

Figure 5. Global FX market turnovers by institutions (Daily averages in April, in billions of US dollars)

3. Market Structure of the FX Market

The FX market has arisen to facilitate international trade and investment through the trading of currencies. With the motivation for currency exchange expanding through centuries to include arbitrage, hedging, and speculation, the scope of important players has expanded accordingly. Beyond commercial firms which are mainly involved in imports and exports, the major market participants now include brokers, dealing and non-dealing banks, currency managers, central banks, and recently, high-frequency traders and individuals.

The conventional foreign exchange market is a two-layered market. In the first layer, dealers trade internally with each other. The second layer is the customer market where the dealers can trade with customers externally. The interdealer market lays the foundation for the FX trading in the sense that the best interdealer price available forms the basis of the customer price (also known as the “quotes”) and the dealers provide liquidity to each other as well as to their customers [13]. Besides, the dealers need to hedge inventory risk in the interdealer market, i.e. to lay off inventory on other dealers quickly [13].

3.1. Interdealer Market

In the FX market, dealers (or “market makers”) have appeared naturally to fulfil the searching function among counterparties in the transactions. Before the mid-1990s, roughly half of the interdealer trading was conducted via

direct dealing, for example, a dealer needing liquidity could ask for a quote from another dealer, while the other half was conducted in a limit order market where orders were placed and matched through voice brokers [26]. A dealer who wants to supply liquidity will place a limit order, which specifies the price at which he/she is willing to buy (the “bid”) or sell (the “ask”) for a certain amount of currencies. The best posted bid or ask prices are known as the “quotes”. The set of unexecuted limit orders, which represents the supply of liquidity, is maintained by the brokers and called the “limit order book”. Trade occurs when another dealer who demands liquidity enters a market order.³ Compared to direct trading, the limit order market is more transparent in the sense that the orders are partially revealed and publicized. Also, the limit order market is anonymous as it is impossible to identify the counterparty until the deal is struck.

Dealers generally prefer to keep their inventory as close to zero as possible, intraday and overnight, i.e. the dealer usually passes any inventory imbalance quickly to others via aggressive order strategies [27]. The estimated half-life of an inventory position ranges from one minute for mostly active dealers at large banks to below half an hour for less active dealers at small banks [13,28]. In this respect, it differs markedly from other OTC markets. On

³ The liquidity-demanding dealer can trade immediately at the market price as well as place a price-contingent order (i.e., stop-loss or take-profit order) to trade at the market price once the price has risen (fallen) to a pre-specified level. For a full discussion of the informativeness of different order types, please see Osler et al. and the references therein [9].

the New York Stock Exchange (NYSE), for example, the half-life of inventory averages over a week [29]. Even on a more active interdealer market such as the London Stock Exchange (LSE), the inventory half-life averages 2.5 trading days [30]. Traditionally, after trading with customers the dealer will keep passing the position onto another dealer until the inventory imbalance is eliminated through customer trades, a process known as “hot potato trading” [7]. On some other OTC markets (e.g., the US bond market), in contrast, the dealers typically “warehouse” the risk (i.e. holding the inventory for their own account) and “shade” the quoted prices to attract the customer trades coming in directions they prefer [31].

Since the emergence of the electronic brokerages, the interdealer trading in the FX market has been changed hugely. In 1992, the first electronic limit-order market was introduced by Reuters, now it is called “Thomson Reuters Matching”. Worried about Reuters’ threatened monopoly in interbank spot trading, a consortium of major market-making banks created another platform – the Electronic Broking Service (EBS) a year later, which was then acquired by ICAP – the world’s largest interdealer brokerage firm, in 2006. By the end of the 1990s, the liquid currencies have been dominated by the electronic brokers, while voice brokers remained important in illiquid currencies as well as various “complex” FX instruments which were not suitable for trading over electronic brokerage. Voice-executed transactions accounted for about 42% of global FX volume in April 2013, of which 45% of FX swaps and 34% of spot transactions were executed via voice brokers [1]. Due to network externalities, liquidity is naturally concentrated on one platform for each currency. For example, the interbank trading for the EUR, the JPY, and the CHF has long been dominated by EBS, while Reuters dominates the trading of “commonwealth currencies” (i.e. the GBP, the AUD, the CAD, and the NZD) and the emerging market (EM) currencies [13].

As the electronic brokers rapidly gained popularity, their best posted quotes became the benchmark for market prices, which enhanced transparency and narrowed bid-ask spread.⁴ The electronic brokers have enhanced pre-trade transparency by providing streamlined real-time quotes. Post-trade transparency has also been enhanced in the sense that mandatory reporting of trade deals has been proposed and implemented in some cases.⁵ The introduction of interdealer electronic markets also benefits the small banks, since the anonymous trading environment does not permit price discrimination, thereby reduces transaction costs [13]. However, the interdealer FX market is still perceived as much less transparent compared to most other limit-order markets. As for pre-trade information, currency prices are limited to the best bid and offer quotes. The only post-trade information is a listing of transaction prices. Besides, unlike equities markets where trading volume must be disclosed on a regular basis, the only information source on aggregated trading volume

is the BIS Triennial Central Bank Survey, which is updated every three years.⁶

3.2. Customer Market

The customer market is driven by quote and market makers provide the instantaneous liquidity [32]. To initiate an FX trade, a customer can call a dealer and ask for the quotes for a certain amount of currencies. Correspondingly, the dealer would quote the prices at which he/she is going to buy (the “bid”) and to sell (the “ask”). As in most other such over-the-counter (OTC) markets, compensation will be provided to the dealer for the risks associated with liquidity provision (i.e. inventory risk, counterparty risk, among others) by a favourable gap between the buying and selling quotation, better known as the “bid-ask spread”. Dealers on the FX market have no formal obligation to make market, unlike specialists on the NYSE or designated market makers (DMM) on the NASDAQ who are obligated to maintain a fair, orderly market [33]. However, if dealers can’t provide the liquidity as required, it will cause trouble such as ruined reputations; in this case, dealers have to be reliable. For example, the FX market continued uninterruptedly and functioned successfully even in the events of September 11, 2001 [34]. However, the traditional customer market is fairly decentralized and opaque. The information on quotes and transactions is private to the dealers and the customers involved.

Customers began to use electronic trading around 1996 when the custodian bank State Street launched the first proprietary single-bank trading platform FX Connect, which became a multi-bank system in 2000 [13]. The first multi-bank trading system Currenex was launched in 1999. In these multi-bank ECNs, instead of calling to find the best quotes, customers could send a “request-for-quote” (RFQ) to many FX dealers electronically and then choose to trade with the dealer offering the best quotes [13]. On some other new entrants, like Hotspot FX and Lava, electronic limit-order markets have been introduced which allow customers to trade anonymously and continuously. Responding to the competitions from the new entrants, the major banks continued to invest heavily in IT infrastructure to develop and implement the proprietary single-bank trading system for their own customers, as well as banded together to set up multi-bank trading platforms, such as FXall. An overview of the top multi-bank trading systems in the FX customer market is presented in Table 2.

The rise of electronic trading has also quickly led to narrower spreads for customers. Before the late 1990s, the average bid-ask spread paid by non-financial corporates in customer market was roughly 20 times that in interdealer market [28,35]. Till now, the difference in spreads between the two FX segments has almost disappeared or even reversed [13].⁷ Besides, “straight-through processing” (STP) is enabled via electronic trading, which means

⁴ For example, for the most liquid currency pairs (i.e., EUR/USD), the bid-ask spread during active trading hours are often narrower than one basis-point (BP).

⁵ For example, for the most liquid currency pairs (i.e., EUR/USD), the bid-ask spread during active trading hours are often narrower than one basis-point (BP).

⁶ Now, semi-annual regional surveys are regularly conducted by local foreign exchange committees in major financial centers, such as Australia, Canada, London, New York, Singapore, and Tokyo.

⁷ On some of the new entrant platforms, customers enjoy a narrower spread than in the traditional interdealer market, probably driven by intensive competitions to attract customer order flows between dealers [13].

anything related to trade can be done with electronic devices. Because the straight-through processing enables the trading process to be operated electronically, the human errors are minimized, and operational risk and operating costs are being dramatically lowered.

Table 2. An Overview of Multibank Trading Systems for Customer Market

Request-for-quote (RFQ) service		
Platform	Year	Mkt Share
FX Connect	1996	14.71%
FXall	2001	26.08%
360 Treasury Systems	2002	13.23%
Reuters Trading for FX	2005	n.a.
Pre-trade anonymous limit order book		
Platform	Year	Mkt Share
Reuters Dealing 3000	1992	11.46%
EBS Market	1993	12.31%
Currenex	1999	11.91%
Hotspot FX	2000	5.43%

Sources: Euromoney FX Survey 2013.

4. Regulations of the FX Market

The vast majority of FX trading is essentially unregulated, in striking contrast to the extensive regulations on securities markets. Some well-known regulations on illegal practices (e.g., insider trading, front running, flash trading, etc.) are essentially missing in the wholesale FX market. Overall there is no governmental authority to define acceptable trading practices. Local banking regulators are limited to supervising trading processing such as clearing and settlement. The self-regulating bodies publish and maintain the codes of conduct to promote best market practices; however, the members are not bound by any of the recommendations and opinions in a legal sense [14].

Spot transactions, which were on the order of \$2 trillion per day in April 2013, are not even considered as financial instruments in the context of market regulation. For

example, as implemented in practice, many FX deals including spot transactions are outside the scope of direct regulation pursuant to the Financial Services and Markets Act 2000 (FSMA) – the principal legislation governing the foreign exchange market in U.K. (Bank of England, 2009). From an EU regulation perspective, FX spot transactions as well as forward transactions are not considered to be financial instruments under MiFID – the Markets in Financial Instruments Directive, a comprehensive regulatory framework in the European Union (European Commission, 2009). Spot foreign exchange transactions are also exempted from the Dodd-Frank Act, which seeks to regulate OTC derivative markets in US (Commodity Futures Trading Commissions, 2009). The views of the regulators may partly explain the scarcity of regulations concerning FX trading. For example, it is claimed by the Bank of England that the FX market performed resiliently after the bankruptcy of Lehman Brothers (Bank of England, 2009). Also, in the US Treasury Secretary's statement on December 2, 2009, it claimed that “[the FX] markets actually work quite well. . . ., and our judgment is because of the protection that already exists in these foreign exchange markets” (Timothy Geithner, Dec 2, 2009).

Yet the largely unregulated global FX market thrived and expanded for decades in the major financial centers, the collapse of the fixed exchange rate system in 1973 has opened “a new era in exchange and later interest rate volatility”, which highlighted the need for a more formal international approach to market conduct and ethics. In 1975, the first practice guideline, known as “the ACI Model Code”, was published by ACI – The Financial Markets Association, an international self-regulating body in the wholesale financial market. There followed similar guidelines published by local foreign exchange committees in major financial centers, i.e. New York (1980), London (1990), Singapore (1991), Hong Kong (1992), and Tokyo (1995). Across these financial centers, the foreign exchange committees in Hong Kong, London, New York, Singapore and Tokyo publish and maintain their own codes of conduct. The European Union and Australia, along with a number of other regions or countries, use the ACI Model Code. The self-regulating bodies and their practice guidelines are presented in Table 3.

Table 3. Self-regulating Bodies and Practice Guidelines in FX market

Country/ Region	Year	Self-regulating Body	Codes of Conduct
Global	1901	ACI – The Financial Markets Association	The ACI Model Code (January 2013)
European Union	1995	ECB's Foreign Exchange Contact Group	The ACI Model Code (January 2013)
Hong Kong SAR	2005	The Hong Kong Treasury Markets Association	Code of Conduct and Practice (January 2011)
London	1973	The London Foreign Exchange Joint Standing Committee	The Non-Investment Products Code (November 2011)
New York	1978	The Foreign Exchange Committee	Codes of Best Market Practice and Shared Global Principles (May 2013)
Singapore	1991	The Singapore Foreign Exchange Market Committee	The Singapore Guide to Conduct and Market Practice for Treasury Activities (February 2012)
Tokyo	1995	The Tokyo Foreign Exchange Market Committee	The Tokyo Foreign Exchange Market Committee Code of Conduct (September 2008)
Australia	1984	The Australian Foreign Exchange Committee	The ACI Model Code (January 2013)

Note: The dates in parentheses are the release dates of the latest practice guidelines. Sources: The Financial Markets Association - ACI, European Central Bank, and local foreign exchange committees of Hong Kong SAR, London, New York, Singapore, Tokyo, and Australia.

Table 4. Brief Comparisons of Regulations on Financial Markets in the U.S.

	Equities	Treasury Bond	OTC Derivatives	Foreign Exchange
Government Legislation & Oversight	SEC ♦ SEC registration of prospectuses ♦ Disclosure requirement ♦ SEC enforcement of market manipulation prohibitions ♦ Prohibition on false & misstatements ♦ Net capital Rule ♦ Corporate governance ¹	The Treasury ♦ Rules regarding government securities transactions ♦ Minimum capital requirements; ♦ Large position reporting rules; SEC ♦ SEC registration as Government Securities Dealers Federal Reserve Bank of New York ♦ Maintaining of prime list	CFTC ♦ Dealer registration with CFTC ♦ Oversees trading on the futures exchanges ♦ Disclosures in the OTC derivatives market • Capital requirement • Margin requirements • Real-time public reporting and recordkeeping	The Federal Reserve ♦ Registration of foreign exchange dealers
Co-regulation	Approved exchanges ♦ Listing rules ♦ Surveillance of members and trading ♦ Obligation to report wrongdoing to the SEC		Approved exchanges ♦ CME Business Conduct Rules ♦ List rules ♦ Trade reporting rules ♦ Obligation to report wrongdoing to the SEC and CFTC	
Self-regulation	Financial Industry Regulatory Authority ♦ Corporate governance ♦ Code of Ethics and Practice Notes ♦ Standard management contracts ♦ Regular disclosure requirements	National Association of Securities Dealers ♦ Sales practice rules ♦ Suitability rules	National Futures Association ♦ Capital requirements	The Foreign Exchange Committee ♦ Codes of Conduct

Note: ¹ For example, say-on-pay rules which aims at the overpay of the executives. For a comprehensive overview of U.S. financial regulatory policy for banking and securities markets, see Murphy (2013).

Over the past few decades, it has been thought that the absence of regulation is not a problem due to the uniqueness of the FX market [13]. Short-sales restriction, for example, though severe in most other markets, can't even be defined in the FX market because any sale of one currency is accompanied by a purchase of the other. Other practices that are illegal on exchanges are discouraged by market best practices in FX market. For example, front-running of customer orders is widely considered bad practice even though it is not illegal.⁸ Flash order, a prohibited practice on most equity exchanges (e.g., Nasdaq stopped allowing brokerages to make flash orders since 2009), is discouraged in the FX market. It has been long believed that the FX market is sufficiently liquid that significant manipulation by any single party is all but impossible during active trading hours for the major currencies [13]. However, the alleged manipulation of London interbank offered rate (hereafter referred to as "Libor fixing"), "the biggest crisis FX market has ever faced" [36], showed that the market concentration has provided the monopolies an opportunity to collude with their competitors and manipulate the benchmark interest rates in currency markets.

Table 4 provides a brief comparison of the financial regulations on securities and foreign exchange markets in US. As documented above, there are essentially neither government-backed regulations nor co-regulations by the approved-exchanges in the FX market, a striking contrast

to those on other financial markets. There comes the question of how to enforce compliance when the policy is powerless. Furthermore, the FX market, as a key underpinning of the global financial system, become even more dependent on a small handful of major banks whose failure might pose systemic consequences. Even though in the financial crisis around eight years ago, the FX market performed resiliently (Bank of England, 2009). With the diminishing number of liquidity providers in FX markets, would the remaining banks be capable of absorbing risks in a high-volume, complex-structure currency market? Would the increased concentration lead to systemic risk through contagion and amplification under conditions of extreme stress? These are the important questions left for the regulators on currency market in a global context.⁹

5. Summary and Implications

In summary, this chapter discusses the evolution of the market structure and regulations on the FX market over the last few decades. The evolving structure of the FX market has provided us with the motivation behind the issues addressed in this thesis, which will be of great interest to regulators, practitioners and academics.

⁸ A front-running dealer who has the information advantage would buy (sell) before the customer buy (sell) order, thus driving up (down) the price before filling the buy (sell) order from the customer [13].

⁹ As a forum bringing together central banks and private sector participants, the Global Foreign Exchange Committee (GFXC) was established in May 2017. Meanwhile, it published the FX Global Code with the aim to promote a robust, fair, liquid, open, and appropriately transparent Foreign Exchange (FX) market. For a detailed introduction to the GFXC, please refer to <http://www.globalfxcode.org/>.

On the one hand, a fundamental paradigm shift from two-tier to multi-layered market is occurring in the FX market as a result of rising electronic trading. At the same time, the prohibitively high cost of technology investment required to compete with the top-tier FX banks has helped the largest players to consolidate their market leader positions, which has been described as “an unhealthy market share concentration” [37]. These shifts may have a permanent effect on the price discovery process. On the other hand, public concerns regarding under-regulation and market manipulation have arisen in the wake of money market scandals. The lessons from the Libor scandal are also relevant for the trading of emerging market currencies in the internationalization process. Coupled with the absence of government regulation and market share concentration, the manipulations in the FX market have a substantial impact on the trading practice and behaviour of market participants. For example, when asked what causes exchange rates to deviate from fundamental values, 68% of US dealers blame institutional customers and hedge fund manipulations [26].

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