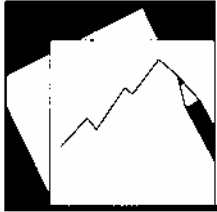


# Working Paper

---

INTERNATIONAL MONETARY FUND



WP/04/4

# IMF Working Paper

---

## Foreign Exchange Market Organization in Selected Developing and Transition Economies: Evidence from a Survey

*Jorge Iván Canales-Kriljenko*

## **IMF Working Paper**

Monetary and Financial Systems Department

### **Foreign Exchange Market Organization in Selected Developing and Transition Economies: Evidence from a Survey**

Prepared by Jorge Iván Canales-Kriljenko<sup>1</sup>

Authorized for distribution by Shogo Ishii

January 2004

#### **Abstract**

**This Working Paper should not be reported as representing the views of the IMF.**

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

The foreign exchange market microstructures in developing and transition economies are characterized by the results from the IMF's 2001 Survey on Foreign Exchange Market Organization. The survey found that these markets are usually unified onshore spot markets for U.S. dollars, where transactions are concentrated at the bank-customer level. The trading mechanisms are usually dealer or mixed dealer/auction markets; the degree of transparency is often low; settlement systems remain risky; and the scope for price discovery is variable.

JEL Classification Numbers: E58, F31, G28

Keywords: Market microstructure, foreign exchange regulation, net open foreign exchange positions

Author's E-Mail Address: [jcanaleskriljenko@imf.org](mailto:jcanaleskriljenko@imf.org)

---

<sup>1</sup> The author appreciates the very useful comments and suggestions received from Javier Duclaud, Shyamala Gopinath, Hervé Ferhani, Shogo Ishii, Cem Karacadağ, David Mitchem, Peter Quirk, and Mark Zelmer. He is also indebted for the comments received from the offices of several IMF Executive Directors. Natalie Baumer provided valued editorial assistance, and Nadia Malikyar and Joanna Meza-Cuadra efficiently and diligently assisted in managing the survey responses.

Contents	Page
I. Introduction .....	<a href="#">4</a>
II. Main Characteristics of Foreign Exchange Markets in Developing Countries.....	<a href="#">5</a>
A. Mainly Spot Market .....	<a href="#">5</a>
B. Typically Onshore .....	<a href="#">6</a>
C. Predominantly Against U.S. Dollars .....	<a href="#">7</a>
D. Prevalent Market Concentration .....	<a href="#">7</a>
E. Limited Interbank Trading .....	<a href="#">8</a>
III. Market Microstructure .....	<a href="#">8</a>
A. Usually Unified Market Structure.....	<a href="#">8</a>
B. Trading Mechanisms: Usually Dealer or Mixed Dealer/Auction Markets .....	<a href="#">10</a>
C. Variable Scope for Price Discovery .....	<a href="#">18</a>
D. Low Market Transparency .....	<a href="#">20</a>
E. Risky Settlement Systems .....	<a href="#">21</a>
IV. Cluster Analysis: Numerical Grouping of Market Characteristics.....	<a href="#">23</a>
V. Main Findings and Suggestions for Future Research .....	<a href="#">25</a>
References.....	<a href="#">45</a>
Figures	
1. Foreign Exchange Market Structures in Developing Countries, 2001 .....	<a href="#">11</a>
Boxes	
1. Interbank Market Size and Order Flow Information .....	<a href="#">9</a>
2. Prudential Regulation of Net Open Foreign Exchange Positions.....	<a href="#">13</a>
3. Selected Elements of Auction Design.....	<a href="#">19</a>
4. Cluster Analysis Methodology .....	<a href="#">23</a>
Appendix Tables	
1. Survey Response Rate, by Exchange Rate Regime and Market Access, 2001 .....	<a href="#">26</a>
2. Selected Regulations on Forward Foreign Exchange Transactions in Developing and Transition Economies, 2001 .....	<a href="#">27</a>
3. Survey Respondents Allowing Offshore Trading of Domestic Currency, by Exchange Rate Regime and Market Access, 2001 .....	<a href="#">28</a>
4. Share of the Main International Currencies in Foreign Exchange Market Turnover of Selected Countries, 2001 .....	<a href="#">29</a>
5. Number of Foreign Exchange Intermediaries, 2001.....	<a href="#">31</a>
6. Interbank Market Turnover in Selected Developing and Transition Economies, 2000 ....	<a href="#">33</a>
7. Net Open Foreign Exchange Position Limits in Developing and Transition Economies, 2001.....	<a href="#">34</a>

8. Electronic Dealing Systems in Developing and Transition Economies, 2001 .....	<a href="#">36</a>
9. Survey Respondents Adopting a Code of Conduct for Foreign Exchange Operations by Exchange Rate Regime and Market Access, 2001 .....	<a href="#">37</a>
10. Survey Respondents with Professional Dealers' Associations, by Exchange Rate Regime and Market Access, 2001 .....	<a href="#">38</a>
11. Survey Respondents Requiring Foreign Exchange Licenses, by Exchange Rate Regime and Market Access, 2001 .....	<a href="#">39</a>
12. Electronic Broking Systems in Developing and Transition Economies, 2001 .....	<a href="#">40</a>
13. Sources of Variables Subject to Cluster Analysis, 2001.....	<a href="#">41</a>
14. Cluster Analysis Results .....	<a href="#">43</a>

## I. INTRODUCTION

**Foreign exchange markets are often the most active and important asset markets in developing and transition economies, yet few research papers on the subject have systematically documented their structures or main characteristics.**<sup>2</sup> To bridge this gap, this paper characterizes the foreign exchange market microstructures in these economies with information from the IMF's 2001 Survey on Foreign Exchange Market Organization, which targeted those developing economies that are IMF members.<sup>3</sup> Ninety-one members responded to the survey. Together, these respondents accounted for 85 percent of the exports of developing economies in the year 2000, 91 percent of their imports, and 85 percent of their GDP. These countries also held about 90 percent of the developing economies' international reserves.<sup>4</sup>

**The most important observation from the survey is that rules and regulations heavily affect the microstructure of the foreign exchange markets in developing economies.**<sup>5</sup> These rules involve a broad range of directives on everything from currency exchange and legal use to the type of traders who can interact in the markets and the degree of market transparency. More specifically, they affect the overall market design by establishing the rules of the game for the currency exchange within the country. Regulations determine the legally permitted uses and sources of foreign exchange, the type of market participants, and the rules for their interaction at different levels of trading. They establish who can trade with whom and under what conditions, including the type of contract and trading location. In addition, regulations heavily influence the degree of transparency of the foreign exchange market, which is a central element of market microstructure.<sup>6</sup> Besides official regulations,

---

<sup>2</sup> For convenience, developing and transition economies are hereinafter referred to as developing economies.

<sup>3</sup> The survey results presented in this paper thus expand upon the work of Cheung and Chin (2001). Canales-Kriljenko (2003) discusses the results of the IMF's survey that are relevant to a discussion about foreign exchange intervention and Canales-Kriljenko, Guimarães, and Karacadağ (2003) discuss elements of best practice in official intervention.

<sup>4</sup> The overall response rate was 60 percent. The list of respondents is presented in Appendix Table 1.

<sup>5</sup> The market microstructure literature emphasizes the effects of market participants, information asymmetries, and trading mechanisms on order imbalances, liquidity, and price discovery in the foreign exchange market (Lyons, 2001).

<sup>6</sup> Market structure is, to a certain degree, endogenous. Governments issue regulations but the private sector decides and modifies its strategy and behavior based on those rules of the game (Kirilenko, 2000).

professional dealers associations often adopt rules of conduct and provide guidelines for professional behavior in the market. Many central banks also affect the microstructures of their foreign exchange markets by limiting the scope for price discovery.

**The paper is organized in five sections.** Section II describes the main characteristics of foreign exchange markets in developing countries and Section III their market microstructures. Section IV conducts econometric analysis relating the main foreign exchange market characteristics to each other and to macroeconomic developments. Section V concludes and identifies areas for future research.

## II. MAIN CHARACTERISTICS OF FOREIGN EXCHANGE MARKETS IN DEVELOPING COUNTRIES

Foreign exchange markets in developing countries are predominantly unified onshore spot markets for U.S. dollars, where transactions are often concentrated at the bank-customer level.

### A. Mainly Spot Market

**Foreign exchange markets in developing countries are predominantly spot markets.**

Foreign exchange transactions usually involve the exchange of domestic for foreign currencies for settlement within two days. More complex financial contracts involving currency exchange are notoriously scant, usually with very low market turnover.

**Forward foreign exchange markets are undeveloped despite most survey respondents allowing forward currency (and other foreign exchange derivative) trading.** Only 9 percent of survey respondents consider their forward foreign exchange markets to be developed, liquid, and deep, while 30 percent of survey respondents consider them to be undeveloped, illiquid, and shallow.<sup>7</sup> Outright forward contracts were allowed in about 75 percent of the survey respondents and futures contracts, nondeliverable foreign exchange forward contracts (NDFs), and foreign exchange options were allowed in 40–50 percent of the survey countries (Appendix Table 2). In countries where forward contracts are prohibited, regulations also ban contracts that yield equivalent payoffs. For example, regulations may ban swap contracts, which combined with spot contracts, could have the same payoff as a forward contract.

---

<sup>7</sup> In contrast, about 40 percent of the survey respondents perceived their spot foreign exchange markets to be developed, liquid, and deep, while only 6 percent perceived them to be undeveloped, illiquid, and shallow. The responses reflect the authorities' individual perceptions since the terms were not precisely defined in this version of the survey. For a thorough definition of liquidity and depth, see Harris (1991 and 2002).

**The lack of forward market development may reflect many factors, including the presence of exchange rate insurance provided by the central bank.** Besides limited exchange rate flexibility, the lack of forward market development may also reflect the absence of a yield curve on which to base forward prices or shallow money markets in which market-making banks can hedge the maturity risks implicit in forward positions. In turn, shallow money markets may reflect limitations on short-term capital mobility. These markets also reflect the fact that forward contracts required regulation in some countries. For example, forward contracts were allowed to cover only the exchange rate risk of legally permitted foreign exchange transactions, supported by an underlying contract of an approved international transaction in a few survey countries. In other survey countries, regulations limited contract maturity, sometimes relating it to the timing of the underlying transaction.

### **B. Typically Onshore**

**Most legally-permitted foreign exchange activities in developing countries take place onshore, partly reflecting exchange and monetary regulations.** A large number of survey respondents determine the geographical location where the domestic currency can be traded in exchange for foreign currencies. Regulations in these countries often did not authorize offshore trading of the domestic currency and restricted its export and import. In particular, about half of the survey countries actually prohibited the operation of offshore markets for their currencies (Appendix Table 3). In addition, over 60 percent of survey respondents regulated the export and about 50 percent the import of domestic currencies.

**Only the currencies of a limited number of developing economies can be traded in major international exchanges and over the electronic networks created by international vendors.** In particular, futures contracts on the currencies of Brazil, Mexico, Russia, and South Africa are listed on the Chicago Mercantile Exchange (CME).<sup>8</sup> South Africa also allows futures trading of the rand in the New York Board of Trade exchange. Any dealer with access to Reuters' *broking* systems can trade the currencies of the eight developing economies listed in them. The same applies to the currencies of Mexico and Singapore traded through EBS Spot (EBS), the electronic broking system provided by the EBS Partnership, Inc., as well as to the currencies of the countries that permit offshore trading of their currencies and have banks that make use of Reuters *dealing* systems.

**The domestic currency can also be indirectly traded with offshore counterparties through the branches and subsidiaries of foreign banks.** International voice brokers that operate in the developing countries also may connect foreign dealers willing to take positions in domestic currencies with domestic dealers willing to take positions in foreign currencies.

---

<sup>8</sup> For this trading to be possible, the CME must be authorized to open a foreign currency and a domestic currency account in an agent bank that acts on its behalf in the country whose currency is being traded.



International voice brokers and the main banks active in foreign exchange may advertise trading in “exotic” currencies, as those of developing economies are known in the market.

### **C. Predominantly Against U.S. Dollars**

**The U.S. dollar is the most traded foreign currency in developing economies.**<sup>9</sup> It is even the most traded foreign currency in several countries applying for European Union membership (the Czech Republic, the Slovak Republic, and Poland). The exceptions are those countries that peg the value of their currencies to other foreign currencies. For example, the euro explains close to 70 percent of the foreign exchange market turnover in countries firmly pegging their currencies to the euro, like Estonia and Bulgaria. Appendix Table 4 illustrates the share of the U.S. dollar in total trading, using turnover information available from the survey and from the triennial survey of foreign exchange, together with over-the-counter derivative markets that the Bank of International Settlements (BIS) has conducted since 1989. The IMF survey also asked the authorities about their subjective rankings of foreign currencies by their perceived weight in total market turnover so as to capture information from those countries that did not compute turnover statistics. Eighty four percent of the 87 developing economies that responded the corresponding survey question ranked the U.S. dollar first, while only 10 percent ranked the euro and euro-legacy currencies first.

**This predominance contributes to the role of the U.S. dollar as a vehicle currency.** The U.S. dollar plays the role of vehicle currency in cross-currency transactions when the two other currencies being exchanged are first converted into U.S. dollars. For example, the purchase of Canadian dollars with Mexican pesos is conducted by first purchasing U.S. dollars with Mexican pesos and then using the U.S. dollars to purchase the Canadian dollars. This turns out to be the cheapest way of settling the cross currency transaction because the foreign exchange market turnover of the Mexican peso and the Canadian dollar are concentrated in the U.S. dollar market. Consequently, it is easier to find counterparties willing to trade Mexican pesos and Canadian dollars for U.S. dollars than finding one willing to exchange Mexican pesos for Canadian markets. The markets for U.S. dollars are more liquid and have lower transactions costs, as measured by bid/offer spreads Hau and others (2000).

### **D. Prevalent Market Concentration**

**The degree of concentration in the foreign exchange market is large despite a sizable number of intermediaries in some developing countries.**<sup>10</sup> Appendix Table 5 reports the

---

<sup>9</sup> Other international currencies traded in the foreign exchange markets of developing economies include the euro, the pound sterling, and the Japanese yen.

<sup>10</sup> Concentration in the foreign exchange market is also prevalent in developed foreign exchange markets (European Central Bank, 2003).

number of banks, foreign exchange bureaus, voice brokers, and other market participants in several survey countries. It also identifies how many of those participants play the role of market makers in the economy. Only a few banks tend to operate in small countries, mainly because the relatively small markets do not support a large banking system. Moreover, in many countries, the banking system comprised of many banks is highly concentrated, with a few institutions controlling the bulk of transactions in foreign exchange and financial intermediation.<sup>11</sup> Some additional competition is provided by exchange bureaus, whose number exceeds that of banks in about half of the survey respondents.<sup>12</sup> However, exchange bureaus account for only a small portion of foreign exchange transactions.

### **E. Limited Interbank Trading**

**The foreign exchange interbank market is relatively small in many of the survey countries.** Foreign exchange market turnover at the interbank level was below 50 percent of turnover at the bank-customer level in 14 of the 18 countries for which information was available (Appendix Table 6).<sup>13</sup> This contrasts with the large volume of interbank trading in developed markets relative to customer level transactions. For example, according to the 2001 BIS triennial survey, the volume of interbank market turnover in the spot market in the United States was 7 times and in Germany more than 12 times the turnover at the bank customer level. The small size of the interbank market suggests a limited scope for price discovery (see below), but could provide the central bank a good grasp of the order flow in the market (Box 1).

## **III. MARKET MICROSTRUCTURE**

### **A. Usually Unified Market Structure**

**Most developing countries legally have a unified market structure.** In particular, most survey respondents have just one foreign exchange market for the trading of all legally permitted foreign exchange transactions. Multiple foreign exchange markets with separate exchange rates officially exist in only four of the survey countries. However, parallel foreign

---

<sup>11</sup> The institutions that concentrate the amount of activity in the foreign exchange market do not necessarily coincide with those concentrating the level of activity in financial intermediation.

<sup>12</sup> However, since bureaus usually cannot make or deal in banking transfers abroad, the competition may bring rise to sharp differences between the dollar cash rate and dollar transfer rate.

<sup>13</sup> Casual observation suggests that turnover at the interbank level is higher in countries with either higher external debt or greater capital mobility.

exchange markets, where illegal but tolerated foreign exchange transactions take place, may be present in some survey countries.

### **Box 1. Interbank Market Size and Order Flow Information**

**The low level of interbank market activities in some developing countries suggests that the authorities could make good estimates of the order flow in the market.** To infer exchange rate pressures embedded in foreign exchange market activity, the literature on the microstructure of foreign exchange markets emphasizes the importance of a concept related to foreign exchange market turnover: order flow. It is not enough to know whether banks are buying or selling foreign exchange to gauge market pressures; but it is necessary to know whether those initiating the foreign exchange transaction are buying or selling. Fortunately, order flow can be inferred from foreign exchange market turnover at the bank customer level. In transactions between banks and their customers, foreign exchange market turnover usually equals order flow because customers are usually those initiating the foreign exchange transaction at the exchange rate quoted by dealer banks, especially in competitive foreign exchange markets in which market makers operate.

**This information is lost as the volume of interbank market turnover increases, unless reporting requirements are modified.** In transactions among banks, foreign exchange market turnover usually differs from order flow. It is not possible to know in a transaction among banks which bank initiated the transaction by just looking at the volume of the transaction. In countries where the central bank observes transactions that take place among banks through an electronic broking system, the central bank may be able to compute order flow directly. This would, however, only cover a fraction of the total order flow in the market, since banks can usually trade among each other outside the broking systems. Alternatively, central banks that impose reporting requirements on foreign exchange market turnover could directly request banks to provide order flow statistics. This would allow for better research and could provide a way to confirm information informally obtained in the market to identify the source of pressures on the exchange rate. Nevertheless, the information could also be used to exert moral suasion on market participants taking positions contrary to central bank interests.

**Official multiple foreign exchange markets with separate exchange rates arise when country authorities try to influence the sources and uses of foreign exchange through foreign exchange regulation.**<sup>14</sup> In official dual foreign exchange markets, for example, the use of the foreign exchange obtained from some sources is strictly limited to a certain type of activities or transactions in one market, while the use of foreign exchange from other sources may be freely allocated in another official market. Multiple foreign exchange markets may also arise when regulations establish that transactions between certain types of market participants take place exclusively in a specific trading mechanism. Market segmentation is usually supported by surrender requirements, which require the sale of foreign exchange receipts to the central bank or markets.

---

<sup>14</sup> Multiple foreign exchange markets may give rise to multiple currency practices (MCPs) subject to Fund jurisdiction. An MCP emerges when no mechanism is in place to prevent the exchange rates in these markets from differing by more than 2 percent. An MCP that arises solely from capital controls is generally not considered as such for the use of Fund resources, but the consistency of particular measures with the Articles of Agreement should be vetted by the Fund's Legal Department.

**Parallel markets handle foreign exchange transactions, which although illegal, are sometimes tolerated.** Parallel markets may arise to evade not only exchange and capital controls but also monetary regulations, which are prevalent in survey countries (Canales-Kriljenko, 2003). These regulations define the monetary uses residents can make of foreign exchange and those uses that nonresidents can give to the domestic currency. Thus, parallel market spreads may reflect not only capital flight pressures, but those arising from changes in the degree of currency substitution and dollarization in the economy.<sup>15</sup>

#### **B. Trading Mechanisms: Usually Dealer or Mixed Dealer/Auction Markets<sup>16</sup>**

**Most foreign exchange markets in developing countries are either pure dealer markets or a combination of dealer and auction markets.**<sup>17</sup> In particular, almost all survey countries report dealer markets and about half of them report some type of auction market.<sup>18</sup> Most markets with auction structures were reported to be either periodic or continuous, with less than 20 percent having both periodic and continuous auction markets (Figure 1). Most foreign exchange intermediaries interact among themselves and with their customers in a decentralized fashion, but in a large number of countries they can also interact through auction market structures, including sophisticated electronic broking systems.

---

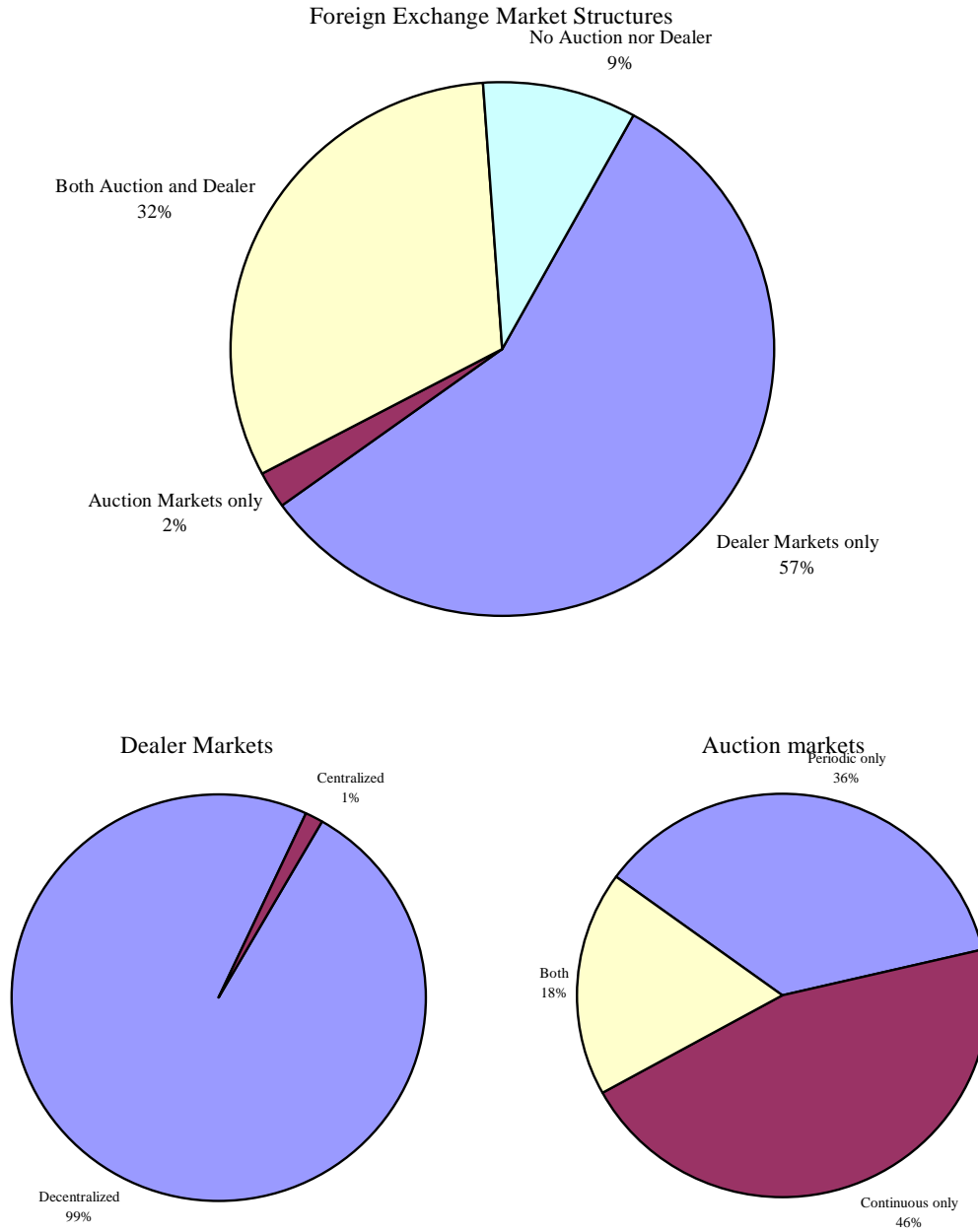
<sup>15</sup> Reinhart and Rogoff (2002) review developing countries' experiences with parallel markets up to 2001. Their study identifies 12 countries with parallel markets in 2001, of which 8 responded the survey (9 percent of respondents). This number is surprisingly low, which could reflect the fact that parallel market spreads remained low in 2001. The author is not aware of other database on parallel market rates and would recommend including a corresponding question in a future version of the survey. The description of foreign the exchange market organization in these countries based on the survey refers only to the foreign exchange market for legally permitted transactions.

<sup>16</sup> The microstructure literature has defined trading mechanism as the set of rules that govern the trading process (Ohara, 1995 and Venkataraman, 2001).

<sup>17</sup> Thus, they are hybrid markets that mix different execution systems. Dealer markets typically adopt quote-driven execution systems, while auction markets adopt order-driven or brokered execution systems. In quote-driven markets, dealers quote the prices at which they buy and sell. Order-driven markets use order-precedence rules to match buyers to sellers and trade-pricing rules to price the resulting trades. In brokered executions systems, voice brokers actively search to find buyers and sellers of foreign exchange (Harris, 2002).

<sup>18</sup> The coexistence of auction and dealer markets is the norm in developed foreign exchange markets (Flood 1994).

Figure 1. Foreign Exchange Market Structures in Developing Economies, 2001



Source: IMF, 2001 Survey on Foreign Exchange Market Organization.

**The adequacy of competing market places depends on several factors**, including the types of market participants, the stage of development, and the incentives for the creation of efficient trading systems (World Bank, 2001). When given the option, banks choose among trading platforms with different microstructures depending on the purposes of the transaction, on the type of counterparty, and on the level of the transparency or visibility that they want to assign to their operations. In turn, these decisions may depend on the amount of privileged information that they have and on the size of the order they need to fill (Harris, 2002).

### **Dealer Markets**

**Dealers absorb order flow imbalances, providing liquidity (or immediacy) to the market.** The arrival of buying and selling orders in foreign exchange markets usually does not coincide. In pure dealer markets, order imbalances are cleared by a combination of exchange rate adjustment and dealers' inventory management. Dealers set two-way exchange rates at which suppliers and demanders of foreign exchange can trade, absorb any excess supply or demand of foreign exchange, and adjust their exchange rates to manage their net open foreign exchange positions.

**Some dealers become market makers and play a central role in the determination of exchange rates in flexible exchange rate regimes.** Market makers set two-way exchange rates at which they are willing to deal with other dealers, with a bid/offer spread that reflects many factors including the level of competition among market makers. The bid-offer spread covers the exchange rate risk associated with possible exchange rate fluctuations between the time at which they buy and the time at which they sell foreign exchange. The quoted rates are usually valid up to a given amount understood by market participants (sometimes established in bilateral or in general market-making agreements), and which may depend on country income level and juncture. About two-thirds of survey respondents indicated the presence of market makers in their economies. In about 50 percent of the survey countries, market makers emerged of their own volition and in about 20 percent of the survey countries, the central bank appointed them.

**The scope for market making is limited by regulations about net open foreign exchange positions.** Most survey countries permit banks and bureaus to hold overnight net open foreign exchange positions subject to quantitative limits.<sup>19</sup> A few countries impose daily variation limits to banks' net open position to avoid a sudden build-up of these positions

---

<sup>19</sup> About half of the survey countries require the consolidation of foreign exchange positions across branches. Consolidation has its pros and cons. It may reduce the possibility that banks obscure the exchange rate risks in unsupervised institutions, but it may also complicate or cloud the analysis when the branches are in different time zones and in countries with exchange controls (Abrams and Beato, 1998).

from sharply affecting the exchange rate (Box 2).<sup>20</sup> Some countries require banks, instead or besides, to hold extra capital for the exchange rate risk they assume. Capital requirements for exchange rate risk are present in about half of the survey countries. Most of these countries measured the exchange rate risk in terms of net open positions but a few measured them in terms of internal models, following value-at-risk calculations.

### **Box 2. Prudential Regulation of Net Open Foreign Exchange Positions**

**Most survey respondents impose quantitative limits on the overall position, although they differ in their choice of the methods proposed by the Basel Committee for computing them.** Of the respondents imposing overall limits, about 40 percent used the net aggregated position, defined as the absolute value of the difference between the sum of all long positions and the sum of all short positions. Another 35 percent used the shorthand method, which is defined as the sum of all long positions or the sum of all short positions, whichever is greater. Finally, about 25 percent used the gross aggregated position, defined as the sum of all long positions plus the sum of all short positions. About 40 percent of survey respondents also limit single currency positions.

**Quantitative limits are usually set as a percent of capital.** Most countries set the limits in terms of a measure of overall capital. A few establish the limit in terms of tier I capital. One country set its limits in terms of banks' working capital (Appendix Table 7). Most countries impose symmetric limits for long and short positions, but a few have markedly different limits for short and long positions.<sup>2</sup> The limits on the overall positions as a percent of capital ranged from 1 to 150 percent, with a large number of countries setting the limit at 20 percent of capital. Similarly, limits on short positions as percent of capital ranged from 5 to 100 percent, with several countries setting the limit at 10 percent of capital. A few respondents set the limits as a nominal figure.

**Most quantitative limits apply either continuously or for overnight positions.** In over half of the respondents that imposed quantitative limits, the limits applied on overnight positions, with banks being able to exceed the limits during the day. In about a third of the countries imposing quantitative limits, the limits apply continuously, with banks in principle not being able to exceed the limits during the day. In a few countries, the limits are not as tight, as they only apply to the positions at the end of the week or month.

**The frequency of verification of compliance with the limits varied widely.** The most popular response was that compliance was verified monthly. Ten countries verified compliance every day, twenty other verified randomly, and other ten verified compliance during normal onsite examinations, several of which took place annually (Canales-Kriljenko, 2003).

---

<sup>1</sup> See Abrams and Beato (1998).

<sup>2</sup> A few countries used the limits as a policy tool, tightening them when facing exchange rate pressures and relaxing them when those pressures were not present.

<sup>3</sup> Most countries include all on-balance sheet foreign currency-denominated assets and liabilities in the positions subject to limits. About 60 percent of respondents to the particular question also included off-balance sheet positions. A few countries also included assets indexed to a foreign currency.

---

<sup>20</sup> Most survey respondents indicated that the supervisory authority imposed the limits. A few countries indicated that the limits were set directly by bank management, but the supervisory authority did monitor the foreign exchange positions.

**The limits on net open positions balance the desire for liquidity, prudential concerns, and worries about speculation.** Net open foreign exchange positions allow dealers to provide liquidity to the market by absorbing innovations to the order flow, but expose them to exchange rate risk. These positions also allow dealers to speculate against the domestic currency (and the central bank) by building the positions before expected currency depreciation takes place. Expectations of currency depreciation that lead banks to take sizable foreign exchange positions might become self-fulfilling. Long position limits protect banks against a sudden appreciation and reduce the scope for speculative attacks in the face of pressures for the depreciation of the domestic currency. In contrast, short position limits protect banks from a sudden depreciation and reduce banks' ability to take speculative short net open foreign exchange positions that could lead to sharp currency appreciation.

**Dealers use a variety of trading platforms for communicating and trading with each other on a bilateral basis.** They agree to bilateral trades in telephone conversations that are later confirmed by either fax or telex. Some dealers also trade on electronic trading platforms that allow for bilateral conversations and dealing, like the Reuters Dealing 2000-1 and 3000 Spot Dealing systems.<sup>21</sup> Bilateral conversations may also take place over networks provided by central banks and over private sector networks. These private networks may or may not grant access to the central bank. Ninety percent of the countries responding to the survey reported dealing through telephone lines. Many countries also traded through one of the electronic dealing systems (Appendix Table 8).<sup>22</sup>

**A code of conduct establishes the principles that guide the operation of dealers in several survey countries.** Sixty-seven survey respondents have adopted a code of conduct, of which at least 27 were consistent with the code of conduct prepared by the international Financial Markets Association (ACI) (Appendix Table 9). A code of conduct sets the rules of the game for participants in the interdealer foreign exchange market, focusing on the behavior of dealers and back-office personnel. The code usually establishes guidelines summarizing accepted practice in the market, including that of counterparty limits, taping of telephone calls, confirmations, and payment instructions. It also describes arbitration mechanisms in place for the settlement of disputes. The principles also make concrete suggestions for the internal organization of the foreign exchange trading units of financial institutions to alleviate the effects of agency problems that could lead to fraud and abuse,

---

<sup>21</sup> The most widely used system for online decentralized trading is Reuters 2000-1. It provides a medium for secure one-on-one electronic conversations (similar to e-mail messages) between dealers. Reuters explicitly allows only authorized dealers to trade in the system and the information exchanged in these conversations remains private to the parties, so other dealers cannot act on that information.

<sup>22</sup> It is not clear from the survey, however, in which countries the Reuters systems were used for the trading domestic currency.



including through personal dealing, dealing at nonmarket rates, and bribing through entertainment, gifts and gambling.

**The central bank or professional dealers associations normally issue the code of conduct.** The codes of conduct are sometimes issued and enforced by the central bank, which could, in some instances, even withdraw the foreign exchange dealing license if one party deviates from the principles and practices established in the code. Sometimes the codes of conduct are issued by professional associations. In particular, more than half of the survey countries have established national dealers' associations, in which dealers agree on market practices, establish ethical standards, and even set trading terminology.<sup>23</sup> They usually serve as forum for raising the professional standards of foreign exchange dealing, establishing channels for the resolution of disputes, and providing training opportunities at different levels (Appendix Table 10).

**Most developing countries restrict foreign exchange intermediation to those institutions licensed by the central bank.** The licensing requirement is prevalent in developing economies across exchange rate regimes and degrees of market access (Appendix Table 11). Most developing countries license dealers and many countries also license voice brokers as foreign exchange intermediaries. In some countries, the intermediaries include foreign-owned institutions. All survey respondents permit domestic banks to deal in foreign exchange and half of them allow branches and subsidiaries of foreign banks to conduct foreign exchange intermediation. Dealers included resident foreign exchange bureaus in about two thirds of the respondents. Resident and foreign brokerage firms (voice brokers) were present in less than one-quarter of respondents.

**Licensed intermediaries assist the central bank in enforcing regulations.** Often, they can only make a currency exchange once they have verified that the underlying transaction is legally permitted. They must comply and verify compliance with regulations involving the use and exchange of foreign currencies, including reporting requirements, prudential regulations on net open positions, capital controls, and anti-money-laundering and anti-fraud legislation, among others.

### **Auction Markets**

**In auction markets, an auctioneer or auction mechanism allocates foreign exchange by matching supply and demand orders.** In pure auction markets, order imbalances are cleared only by exchange rate adjustments. In contrast, when dealer markets also operate, order imbalances may also be cleared by permitting some agents to take net open foreign exchange positions on their own behalf outside of the auctions.

---

<sup>23</sup> More than half of the national dealers' associations identified in the survey were affiliated to the ACI.

**Pure auction market structures are now rare.** Less than 5 percent of the respondents reported only auction markets. In these structures, the auction rate applies to all transactions (after compensating for some transaction costs of the intermediary that participates in the auction on behalf of its customers) so that further price discovery does not take place. In some of them, a few central banks still conduct centralized periodic auctions of the foreign exchange surrendered to the central bank.<sup>24</sup> Most central banks that experimented with these arrangements have abandoned them because they make the central bank directly associated and, in the view of politicians and the public at large, responsible for exchange rate fluctuations.

**In pure auction markets, auction frequency is a crucial determinant of exchange rate volatility.** Exchange rate volatility is affected by market depth and liquidity as well as on the stability of order flows from market participants. In thin markets with erratic order flows, periodic auctions may allow sufficient supply and demand to accumulate. This increases the likelihood of finding counterparties willing to trade at prevailing exchange rates, smoothing the unnecessary exchange rate volatility that could result from the timing difference in order arrival (Dattels, 1995 and World Bank, 2001).<sup>25</sup> The benefit of lower volatility, however, should be measured against the costs of lack of immediacy (an important dimension of liquidity) between auction dates, which would affect impatient traders (Harris, 1991).

### **Brokered Interdealer Transactions**

**Brokered interdealer transactions are transactions among dealers conducted through auction market structures.** In particular, they are dealer transactions completed with the assistance of voice brokers, electronic broking systems, and periodic foreign exchange auctions.

#### *Voice Brokers*

**Voice brokers conduct foreign exchange intermediation by matching dealers' foreign exchange supply and demand without taking a position themselves.** They reduce search costs for their clients while preserving the anonymity of the trading counterparties. In particular, voice brokers connect dealers who may not be willing to reveal their trading intentions to other dealers or may not realize that they have matching interests otherwise.

---

<sup>24</sup> For a description of the early experience with this type of foreign exchange auctions in developing countries adopting flexible exchange rate regimes, see Kovanen (1994) and Quirk and others (1987).

<sup>25</sup> Note that auction frequency is more important in pure auction markets in which dealers do not operate than in those in which the two types coexist, as dealers could also smooth the unnecessary exchange rate volatility by managing their net open positions between the arrivals of market orders.

Voice brokers actively engage in search trading counterparties, often discovering customers willing to trade only when presented with a concrete offer and who may not want to advertise their interest to the market (Harris, 2002). The brokers can offer firm two-way exchange rates from the firm orders they receive from dealers willing to sell and from those willing to buy foreign exchange. If a dealer trades at the broker quotations, the broker reveals the name of the counterparty only to the dealer initiating the transaction. Voice brokers charge a commission for their intermediation services, which lower the searching costs of finding a matching counterparty through economies of scale.

### *Electronic Broking Systems*

**An electronic broking system is a centralized scheme for electronically matching dealers' orders to buy or sell foreign exchange.** Transactions could take place, in principle, on a continuous basis. The systems rank and display the best available exchange rates for buying and selling to all dealers selected from competing limit orders, but they do not reveal the name of the dealers making the orders until the deal is agreed upon.<sup>26</sup> Because dealers typically do not know the identity of the counterparty—and foreign exchange dealing implicitly involves bilateral credit, dealers must negotiate credit lines before they can start trading through electronic broking systems. The broking system can only match orders that fall within the bilateral credit limits.

**The providers of electronic broking systems vary by country** (Appendix Table 12). The most widely used electronic broking systems in developing countries are the Reuters 2000-2 and 3000-Spot matching systems. Only the currencies of Mexico and Singapore are currently traded in the EBS Spot Dealing System, which is the most widely used electronic broking system for the main international currency pairs. The domestic private sector provides the electronic broking system in several countries, usually adapting infrastructure available for securities' trading at stock exchanges. These private sector platforms may or may not give the central bank, as the regulator, privileged access to trading information. In some countries, the providers are well-known international vendors. The central bank provides the electronic broking system in one country.

### *Periodic Foreign Exchange Auctions*

**Brokered interdealer transactions take place through periodic foreign exchange auctions when auctions participants can freely trade the foreign exchange obtained in the auction.** The periodic foreign exchange market is essentially a call market which coordinates trade in the time dimension when the market is "called," that is, when the foreign exchange auction takes place. This arrangement can enhance market liquidity and increase dealers' profits (Economides, 1995).

---

<sup>26</sup> Limit orders specify an amount to buy or sell when the exchange rate reaches a given level while market orders specify an amount to buy or sell at the best available exchange rate.

**According to the IMF survey, central banks play an important role in foreign exchange auctions.** First, the central bank conducts most of the auctions, playing the role of auctioneer. Second, it participates on its own behalf in the auctions in three countries and decides the amounts auctioned in several others. Finally, it usually auctions government funds in its condition of foreign exchange agent to the government (Canales-Kriljenko, 2003). The most widely reported source of foreign exchange assigned in the auctions is foreign currency receipts accruing to the government, obtained mainly from financial aid, export receipts from state enterprises, and government borrowing abroad.

**The adequacy of periodic foreign exchange auctions depends critically on auction design,** which determines the scope for collusion, the possibilities of achieving an efficient outcome, and the revenue prospects. Some auction formats facilitate collusion because the ring can monitor the rates offered by its members. Auction rules varied significantly across the foreign exchange auctions captured in the survey (Box 3).

**Freedom in periodic auction design, however, is limited by members' obligations to the Fund.** Periodic foreign exchange auctions may give rise to exchange restrictions and multiple currency practices (MCP) that require Fund approval. An exchange restriction arises if the periodic foreign exchange auction (i) is an official auction, (ii) is the only legal source of foreign exchange in the market, and (iii) does not satisfy the demand for current international payments and transfers at the exchange rate determined in the auction. A multiple currency practice arises if the auction rate in a single-price auction differs by more than 2 percent than the prevailing exchange rate outside auctions, and the amount auctioned is not enough to satisfy the demand for current international transactions. Fund jurisprudence has determined that an MCP also arises in an official periodic multiple-price auction if winning bids can differ by more than 2 percent (Cisse, 1997).

### **C. Variable Scope for Price Discovery**

**Many central banks also affect the microstructure of their foreign exchange markets by limiting the scope for price discovery.** This scope may be limited by an explicit adoption of an exchange rate regime with limited flexibility, by explicit regulation discouraging the process of price discovery, or by other central bank behavior.

**Most survey respondents adopted exchange rate regimes that limited exchange rate flexibility.** In particular, six countries adopted a hard peg, 36 followed regimes of intermediate flexibility including soft pegs, crawling pegs, and crawling bands, and 25 adopted managed floating exchange rate regimes. The degree of exchange rate flexibility was limited by monetary and foreign exchange operations that affected foreign exchange order flow and short-term interest rates. In fact, almost all central banks in developing economies actively participate in their foreign exchange markets regardless of the exchange rate regimes, whether on their own behalf or on behalf of public sector entities. They usually enjoy a significantly wider information advantage over other market participants relative to the one recognized in the literature, partially arising from their ability to require confidential

information from main market participants and sometimes exercise moral suasion to influence pricing decisions of foreign exchange intermediaries (Canales-Kriljenko, 2003).

### Box 3. Selected Elements of Auction Design

Auction rules varied significantly across the foreign exchange auctions captured in the survey.<sup>1/</sup>

**Auction participation:** Auction participation was typically limited to primary dealers, which usually were chosen among resident financial institutions. Other institutions admitted in the auction included foreign exchange bureaus, importers and exporters, nonresident financial institutions, the public treasury, and mutual funds, cooperatives, private financial funds.

**Exchange rate determination mechanism:** The survey countries with periodic foreign exchange auctions were evenly divided between single-price and multiple-price auctions.<sup>2/</sup> In single or uniform price auctions, all winning bidders pay the same market clearing exchange rate, while in multiple-price auctions, all winning bidders pay their winning bids.

**Acceptable bids:** In most countries, the bids were only allowed on a competitive basis, meaning that all bids were considered in making the pricing and allocation decisions. In noncompetitive bids, some participants may be allowed to buy at a representative rate exchange rate computed from successful competitive bids. About half of the countries restricted the number of bids per bidder and auction participation required minimum bid amounts in all countries, but one.

**Frequency:** The frequency of periodic foreign exchange auctions in the sample varied significantly across countries. Most periodic auctions were not conducted on a regular schedule. However, daily auctions took place in four countries and weekly auctions in one. In Colombia, the auctions to buy foreign exchange could take place every month, while those to sell foreign exchange took place in response to a trigger event

**Other rules:** In several countries, bidders were required to document the domestic currency cover for the bid to be valid, to minimize settlement risk. The reasons for disqualification were often detailed in writing.

---

1/ Bartolini and Cottarelli (1994) discuss the pros and cons of specific auction rules for government securities.

2/ The term “Dutch auction” should be avoided because it is an ambiguous term: It denotes multiple-price auctions under the French practice but single-price auctions under English practice.

**In some countries, foreign exchange regulations prohibit the operation of an interdealer foreign exchange market.** Dealers can trade on their own behalf with their customers, but cannot trade among themselves. A few countries allow dealers to buy and sell foreign exchange but only on behalf of the central bank. This gives the central bank a central role in foreign exchange intermediation. These regulations are sometimes supported by surrender requirements directed to the central bank.

**Other countries impose conditions on interdealer trading.** In particular, a few countries allow dealers to buy and sell foreign exchange, but only on behalf of their customers. Thus, banks behave as brokers in the foreign exchange market and either adjust exchange rates freely or transfer the order imbalance to the central bank. This regulation avoids “hot-potato”

trading and discourages banks from venturing into market making, reducing the scope for price discovery.

**Some central banks become dealers, managing their net open foreign exchange positions to provide liquidity to the market.** These central banks absorb innovations in the order flow at prevailing exchange rates, usually with the intention of reducing exchange rate volatility. The exchange rate is still a market-determined rate in the sense that, at that rate, markets clear, but with the central bank absorbing part of the excess demand or supply. A few central banks offer two way prices in the market with narrow spreads that banks cannot beat and become the main foreign exchange intermediary in the country (Canales-Kriljenko, 2003).

#### **D. Low Market Transparency**

**The degree of market transparency is an important aspect of the microstructure of foreign exchange markets.**<sup>27</sup> Part of the literature on market microstructure emphasizes the information sets available to market participants in different types of market structure rather than the institutional aspects (Lyons, 2001). The degree of transparency is especially important in flexible exchange rate regimes, where the amount of available information influences the pricing decisions of foreign exchange intermediaries. Moreover, the availability of information for pricing and allocation decisions is a critical determinant of market efficiency.<sup>28</sup>

**The degree of transparency in survey respondents was low since most market structures are decentralized dealer markets.** Information could in principle be more easily disseminated when the market structure is centralized. Auction markets are by nature centralized, but dealer markets can be centralized or decentralized. Centralized and decentralized dealer markets differ on the ability of dealers to observe the exchange rates set by other dealers and the amounts they trade. In a centralized dealer market, quotes by market makers are publicized. This may be achieved by establishing a physical trading location (like a trading pit in an exchange) or a medium (like an electronic dealing system that announces the market orders of market makers).<sup>29</sup>

---

<sup>27</sup> Market transparency is the ability of market participants to observe information about the trading process (Madhavan, 2000).

<sup>28</sup> For an analysis of the efficiency of alternative microstructures of the foreign exchange market, see Flood (1994).

<sup>29</sup> Madagascar is the only survey country where spot market trading takes place in a trading pit.

**According to the survey results, the authorities generally do not disclose the information obtained from reporting requirements, which could improve the degree of market transparency.** Authorized dealers must report information on a wide array of variables affecting the foreign exchange market. These include data on exchange rates, foreign exchange transaction volumes at different levels of trading, open foreign exchange positions, and domestic currency balances for meeting reserve requirements. The scope of the data requested varies significantly across countries, ranging from all information on each of the foreign exchange transactions made by each authorized dealers to summary statistics, sometimes weighted by the size of the transactions. The central bank usually only discloses a subset of all the information that it collects (Canales-Kriljenko, 2003). This could reflect central bank strategic behavior, but could also reflect legal limitations on the ability of the central bank to disclose proprietary information.

### **E. Risky Settlement Systems**

**Settlement was completed faster in the survey countries than in developed foreign exchange markets.** In particular, it was completed within one day in more than half of the respondents to the corresponding question. Less than 40 percent followed the common practice in more developed markets of setting a two-day value date for settlement.

**Many survey countries allow the settlement of one and sometimes both legs of foreign exchange transactions at central bank accounts.** A foreign exchange transaction is not settled until the bank account of the seller is irrevocably credited and that of the buyer is debited. Such debiting and crediting takes place at central bank accounts in many survey countries in which financial institutions must make deposits at the central bank to meet reserve requirements. The settlement of the foreign currency leg requires that foreign currency accounts be opened at the central bank, a situation that often arises in dollarized economies in which the reserve requirements on foreign currency deposits are denominated in foreign currency.<sup>30</sup>

**The foreign currency leg is often settled abroad.** In particular, about 75 percent of survey respondents indicated that the foreign currency leg of the transactions was settled through correspondent bank accounts. Thus, the debiting and crediting of the foreign currency took place in nostro accounts opened by domestic banks abroad. More than half of the respondents use SWIFT, a worldwide interbank telecommunications network, as the main system for transmitting messages with international payment instructions and confirmations of foreign exchange transactions.<sup>31</sup> For example, a bank in Latin America may send a SWIFT message

---

<sup>30</sup> In some countries, reserve requirements on foreign currency deposits can be met by keeping domestic currency in the bank vault or deposited at the central bank.

<sup>31</sup> SWIFT is the acronym for the Society for Worldwide Interbank Financial Telecommunications, which is a nonprofit cooperative of member banks, based in Brussels,

to its correspondent in New York instructing it to deliver U.S. dollars from its nostro account into the nostro account of the beneficiary. The corresponding bank in New York could then make the transfers to settle the transaction through the Fedwire payment system. A few survey respondents indicated that the settlement of the foreign currency leg took place at accounts of domestic financial institutions because their domestic banks are not viewed as good counterparties abroad.

**Only a few countries have fully eliminated settlement risk.** The settlement of foreign exchange transaction takes place on a payment-versus-payment basis in 40 percent of survey countries. Payment versus payment means that the final transfer of the foreign currency occurs if, and only if, the final transfer of the domestic currency takes place, which is the only way of eliminating the risk of losing the entire principal in a foreign exchange transaction. Given this settlement risk, common practice in developing countries is that the counterparty in the stronger bargaining position gets paid first.

**A few countries reported the existence of netting arrangements, which reduce the amount of funds that need to be settled.** In particular, when a netting arrangement is in place, only the net amounts of the transactions among participants are settled. In active foreign exchange markets, banks often make many foreign exchange deals during the day, sometimes buying from one bank and sometimes selling to another bank. In any one transaction, if the two banks involved have a bilateral netting arrangement, they would only settle the net buying or selling position at the end of the day. In a multilateral netting arrangement, banks trade with many other participant banks and only settle the amount it bought or sold during the day on a net basis.

**CLS Bank International (CLS) has been able to fully eliminate settlement risk in the cross-border trading of the major currency pairs since 2002.**<sup>32</sup> Cross-border currency transactions channeled through this bank can be settled intradaily on a payment-versus-payment basis. CLS simultaneously transfers the funds only when the counterparties's payment instructions have been received and the description of the transaction coincides. This can take place in real time during the window in which the hours of operation in the eleven real-time gross settlement systems to which CLS is linked coincide.<sup>33</sup> Outside of this window, the CLS bank runs a multilateral netting system in the eligible currencies, whose

---

Belgium. By end 2001, the network was composed of over 2000 member banks in 196 countries, of which 175 were Fund members.

<sup>32</sup> CLS gathers 65 of the world's largest global financial institutions, but it is unclear what share of market turnover it has been able to capture.

<sup>33</sup> These systems are those for the central banks issuing the U.S. Dollar, euro, pound sterling, Japanese yen, Swiss franc, Canadian dollar, Australian dollar, Swedish krona, Danish krone, Norwegian krone, and Singapore dollar.



balances are then settled during the next coincidence window.<sup>34</sup> This netting reduces settlement amounts by about 90 percent.

#### IV. CLUSTER ANALYSIS: NUMERICAL GROUPING OF MARKET CHARACTERISTICS

**The cluster analysis in this section explores how several characteristics of the foreign exchange market are related to each other and to several other country characteristics.** The country characteristics include selected exchange rate regimes, levels of development, the status under the Fund's Articles of Agreement, the main sources of financing, and the type of legal system, among others (Appendix Table 13). The variables are grouped using a complete linkage agglomerative hierarchical cluster analysis, using a Jaccard measure to gauge the degree of similarity between variables and clusters (Box 4). The relationship among the variables can be interpreted to be stronger at the largest degrees of similarity.

##### **Box 4. Cluster Analysis Methodology**

The variables are grouped using a complete linkage agglomerative hierarchical cluster analysis. In a hierarchic classification, the analysis produces a series of partitions of the data. In agglomerative hierarchic methods, the first partition consists of single-member clusters and the last partition consists of a group containing all individuals, with the intermediate partitions resulting from a series of fusions of the  $n$  variables into broader groups.<sup>1/</sup> The variables or groups that are closer according to a given distance measure are grouped first. Under the complete linkage or furthest neighbor clustering method used in this exercise, the distance between groups is defined as that of the most distant pair of individuals, one from each group (Evveritt, 1993).

The distance measure employed in this paper is the Jaccard binary similarity coefficient, which is one of the similarity measures designed for binary data. The coefficient is defined for two dummy variables and is computed based on the values of those dummy variables across the observations in the sample, in our exercise corresponding to developing countries. The coefficient measures the number of matches (in which the two dummy variables take the value of one for a given country) relative to the total number of countries in which at least one of the dummy variables takes the value of one, thus excluding from the total the countries in which both dummy variables take the value of zero.<sup>2/</sup>

1/ In divisive hierarchic methods, the first partition consists of all individuals, which are separated into finer subdivisions.

2/ The measure is undefined when all the values in both dummy variables are all zeros, which is not the case in our sample.

<sup>34</sup> Although possible, it is unclear whether this financial innovation will tend to reduce the current two-day settlement practice.

**Five clusters are worth highlighting, although they are formed at low degrees of similarity (Appendix Table 14).**<sup>35</sup> First, dealers' associations were present in countries that permitted the offshore trading of their currencies, and were associated with floating exchange rate regimes and emerging markets. Second, multiple foreign exchange markets were associated with countries that have not yet accepted the Fund's Article VIII obligations and still availed themselves of the transitional arrangements under Article XIV. Third, a degree of dollarization above 20 percent was especially important in transition economies in Eastern Europe whose legal structure is based on the civil legal system.<sup>36</sup> Fourth, surrender requirements are common in countries prohibiting residents from making payments in foreign currency to each other. Fifth, countries where the central bank is the exclusive foreign exchange agent of the government often have forward markets that are undeveloped, shallow, and illiquid.<sup>37</sup>

**The results can be intuitively interpreted.** First, dealer's associations may be more likely to be present when dealers are involved the process of price discovery, which is the case in floating exchange rate regimes. Most emerging market countries have adopted such regimes. Second, while some Article VIII countries eventually impose multiple currency practices, countries that have not yet accepted those obligations may follow these practices more freely. Third, countries in Eastern Europe are known to have dollarized systems. While many of the Western Hemisphere countries are highly dollarized, dollarization is perhaps not an essential characteristic of these countries as a group. Fourth, exporters may be expected to surrender their proceeds at least to the foreign exchange market when residents are restricted in their use of foreign currencies. Curiously, the cluster involves countries prohibiting currency substitution (the making of payments in foreign currencies) rather than financial dollarization (the use of foreign currencies as store of value). Finally, forward markets may be slow to develop if the central bank uses the operations conducted on behalf of the government instead of or besides official intervention to stabilize exchange rates, thus implicitly providing exchange rate insurance. These interpretations, however, are only intuitive and further research is necessary to confirm or reject them. Moreover, cluster analysis does not allow the determination of causal relationships.

---

<sup>35</sup> The groups with more than one element formed at four degrees of similarity (0.0001, 0.25, 0.5, and 0.75) are presented in Appendix Table 14, providing a stylized presentation of the corresponding dendrogram, which is a branching, tree-like diagram that illustrates the grouping of elements into the hierarchical clusters. At high degrees of similarity, the results do not provide much insight.

<sup>36</sup> The sample included also several countries in the Western Hemisphere with very high dollarization, particularly in Latin America.

<sup>37</sup> The cluster analysis reveals the presence of ties at the most general level of aggregation. Thus, it is not possible to consolidate any of the seven clusters presented to the right of Appendix Table 14.

## V. MAIN FINDINGS AND SUGGESTIONS FOR FUTURE RESEARCH

**Foreign exchange markets in developing countries are usually represented by unified onshore spot markets for U.S. dollars, where transactions are often concentrated at the bank-customer level.** The trading mechanisms are usually dealer or mixed dealer/auction markets; the degree of transparency is often low; settlement systems remain risky; and the scope for price discovery is variable. Their organization is heavily influenced by foreign exchange regulations and the role that the corresponding central bank plays in the foreign exchange market. The regulations determine what organizations can play the role of foreign exchange intermediaries and how these can interact among themselves and their customers. Banks play the prominent role of dealers with many of them becoming market makers. Central banks actively participate in their country's foreign exchange markets, regardless of the exchange rate regimes, either on their own behalf or on behalf of public sector entities. They often enjoy a greater information advantage than is recognized in the literature, partially because of their ability to require confidential information from the main market participants. Many central banks also affect the microstructures of their foreign exchange markets by limiting the scope for price discovery.

**Future research could provide guidance on the best foreign exchange market structures for developing countries.** The most appropriate microstructure may vary with the exchange rate regime, the presence of capital controls, the number of institutional participants having market power, and the depth of domestic money markets. These factors may also influence the role that the central bank could play in the foreign exchange market. In addition, future research could study how changes in the microstructure of the foreign exchange market could assist a country's authorities in managing a crisis situation.

Table 1. Survey Response Rate, Classified by Exchange Rate Regime and Market Access, 2001 1/  
(In percent of Fund member countries in each category)

Exchange rate regimes 2/	Developing and Transition Economies		Total
	Emerging Markets 3/	Other	
No country-specific currency	--	8	7
CAEMC 4/	--	17	17
Other	--	17	13
Country-specific currency	86	54	67
Currency board	67	50	57
Conventional fixed pegs against a single currency	88	63	70
Conventional fixed pegs against a composite	100	71	80
Pegs with horizontal bands within a cooperative arrangement	--	--	--
Pegs with horizontal bands within a Fund supported program	--	67	50
Crawling pegs	100	67	75
Exchange rates within crawling bands	100	100	100
Managed floating, no preannounced path for exchange rate	79	46	60
Independently floating	100	42	63
Total	83	43	56
<u>Memo item:</u>			
Total Fund Members in Developing and Transition Economies (In number of countries)	53	107	160

Source: IMF, 2001 Survey on Foreign Exchange Market Organization.

1/ The 2001 Survey on Foreign Exchange Market Organization was sent to country authorities in all Fund member developing and transition economies on October 2001. Ninety answers were received by March 2002. Emerging market economies are underlined and italicized below.

The Survey respondents are Albania, Angola, Armenia, Azerbaijan, *Bahamas*, *Bahrain*, Bangladesh, Barbados, Belarus, Bhutan, Bolivia, *Brazil*, Bulgaria, Cambodia, Cape Verde, *Chile*, *China (Mainland)*, *Colombia*, Republic of Congo, *Costa Rica*, *Croatia*, *Czech Republic*, Djibouti, *Dominican Republic*, Egypt, El Salvador, *Estonia*, Fiji, *Ghana*, *Guatemala*, Guyana, Honduras, *Hungary*, *India*, *Indonesia*, Iran, *Israel*, *Kazakhstan*, Kenya, *Korea*, Kuwait, Kyrgyz Republic, Lao, *Latvia*, *Lebanon*, Lesotho, Libya, *Lithuania*, Macedonia (FYR), Madagascar, *Malaysia*, *Malta*, *Mauritius*, *Mexico*, *Moldova*, *Morocco*, Mozambique, Namibia, Nepal, Nicaragua, *Oman*, *Pakistan*, Papua New Guinea, Paraguay, Peru, *Philippines*, *Poland*, *Qatar*, *Romania*, Samoa, Sierra Leone, *Singapore*, *Slovak Republic*, *Slovenia*, *South Africa*, *Sri Lanka*, Swaziland, Syria, Tanzania, *Thailand*, Tonga, *Trinidad and Tobago*, *Tunisia*, *Turkey*, *Ukraine*, United Arab Emirates, *Uruguay*, Vanuatu, *Venezuela*, Yemen, and Zambia.

2/ Follows the IMF's de facto exchange rate regime classification as published in the IMF's International Financial Statistics.

3/ Corresponds to the Fund member developing and transition countries considered as emerging markets in the Fund's internal quarterly publication named "Emerging Market Financing: A Quarterly Report on Developments and Prospects". Some countries have become emerging markets after March 2002, which is the cutoff date for this study.

4/ The Central African Economic and Monetary Community (CAEMC) is itself a conventional fixed peg arrangement.

-- stands for not applicable, zero, or negligible amount.

Table 2. Selected Regulations on Forward Foreign Exchange Transactions  
in Developing and Transition Economies, 2001  
(In percent of countries answering the Survey in each category)

	Market Access		Exchange Rate Regime 1/			Total
	Emerging Markets 2/	Other	Pegged	Intermediate	Flexible	
Forward markets allowed	89	63	70	58	84	76
Forward markets not allowed	5	24	18	8	13	14
Not able to determine	7	13	12	33	2	10
Types of derivative contracts allowed						
Outright forward contracts	89	63	70	58	84	76
Nondeliverable forward contracts	59	28	33	42	51	43
Futures	61	30	39	42	51	46
Options	77	30	45	42	62	53
Requirements for offering forward contracts						
Quantitative limits	11	20	18	17	13	16
Verification of existence of legally permitted underlying current or capital transactions	27	33	39	17	27	30
Transaction made only on behalf of their Customers	5	11	15	0	4	8
Freely	66	24	30	33	58	44
Not able to determine	2	0	0	0	2	1
Subjective Assessment of forward markets						
Developed	34	7	21	8	22	20
Undeveloped	48	52	42	67	51	50
Other	11	2	6	0	9	7
Not able to determine	7	39	30	25	18	23
Developed, liquid, and deep	14	4	6	0	13	9
Undeveloped, illiquid, and shallow	32	30	27	42	31	31

Source: IMF, 2001 Survey on Foreign Exchange Market Organization.

1/ The exchange rate regimes group categories from the IMF's de facto exchange rate regime classification as published in the IMF's International Financial Statistics. Pegged regimes include countries without a country specific currency, currency boards, and conventional fixed peg arrangements. Intermediate regimes include pegged exchange rate within horizontal bands, crawling pegs, and exchange rates within crawling bands. Flexible regimes include managed and independently floating exchange rate regimes.

2/ Corresponds to the Fund member developing and transition countries considered as emerging markets in the Fund's quarterly publication "Emerging Market Financing: A Quarterly Report on Developments and Prospects".

Table 3. Survey Respondents Allowing Offshore Trading of Domestic Currency,  
by Exchange Rate Regime and Market Access, 2001 1/  
(In percent of countries answering the corresponding Survey question in each category)

Exchange rate regimes 2/	Developing and Transition Economies		Total
	Emerging Markets 3/	Other	
No country-specific currency	--	--	--
CAEMC 4/	--	--	--
Other	--	--	--
Country-specific currency	70	32	51
Currency board	100	50	75
Conventional fixed pegs against a single currency	71	8	32
Conventional fixed pegs against a composite	67	60	63
Pegs with horizontal bands within a cooperative arrangement	--	--	--
Pegs with horizontal bands within a Fund supported program	--	50	50
Crawling pegs	--	50	33
Exchange rates within crawling bands	80	--	57
Managed floating, no preannounced path for exchange rate	53	55	54
Independently floating	91	13	58
Total	70	30	50
<u>Memo item:</u>			
Number of countries answering question	44	46	90
In percent of survey respondents	100	100	100

Source: IMF, 2001 Survey on Foreign Exchange Market Organization.

1/ The 2001 Survey on Foreign Exchange Market Organization was sent to country authorities in all Fund member developing and transition economies on October 2001. Ninety answers were received by March 2002. Table 1 shows the list of respondents.

2/ Follows the IMF's de facto exchange rate regime classification as published in the IMF's International Financial Statistics.

3/ Corresponds to the Fund member developing and transition countries considered as emerging markets in the Fund's quarterly publication "Emerging Market Financing: A Quarterly Report on Developments and Prospects".

4/ The Central African Economic and Monetary Community (CAEMC) is itself a conventional fixed peg arrangement.

-- stands for not applicable, zero, or negligible amount.

Table 4. Share of the Main International Currencies in Foreign Exchange  
Market Turnover of Selected Countries, 2001

Countries 1/	Source	(In percent)					Total
		U.S. dollar	Euro 2/	Pound sterling	Japanese yen	Other	
Angola	Survey	98.0	1.0	0.1	--	0.9	100.0
Australia	BIS Local 3/	95.5	1.0	0.8	1.5	1.2	100.0
Austria	BIS Local 3/	77.4	--	2.2	8.3	12.0	100.0
Azerbaijan	Survey	99.0	n.a.	n.a.	n.a.	n.a.	99.0
Bahamas	Survey	98.0	--	1.0	1.0	--	100.0
Bahrain	BIS Local 3/	67.9	0.9	1.8	0.9	28.6	100.0
Belarus	Survey	80.0	15.0	--	--	5.0	100.0
Belgium	BIS Local 3/	79.6	--	7.4	2.7	10.2	100.0
Bolivia	Survey	75.0	11.0	3.0	10.0	1.0	100.0
Brazil	Survey	89.0	6.5	4.0	0.4	0.1	100.0
Brazil	BIS Local 3/	93.1	2.3	0.0	2.3	2.3	100.0
Bulgaria	Survey	31.6	66.4	0.9	0.0	1.0	100.0
Canada	BIS Local 3/	98.1	0.8	0.5	0.3	0.3	100.0
Chile	Survey	99.3	0.3	0.0	0.3	0.1	100.0
Chile	BIS Local 3/	99.8	0.1	--	0.0	--	100.0
Colombia	Survey	97.4	1.1	--	1.3	0.2	100.0
Colombia	BIS Local 3/	97.4	1.1	--	1.3	0.3	100.0
Congo, Republic of	Survey	90.0	5.0	2.0	0.5	2.5	100.0
Czech Republic	Survey	39.2	33.4	--	0.0	1.0	73.7
Czech Republic	BIS Local 3/	57.8	41.2	0.2	0.1	0.7	100.0
Denmark	BIS Local 3/	76.4	18.2	1.6	0.6	3.2	100.0
Estonia	Survey	22.9	70.5	1.0	0.1	5.5	100.0
Finland	BIS Local 3/	71.0	--	5.5	1.8	21.6	100.0
France	BIS Local 3/	90.2	--	3.9	2.8	3.1	100.0
Germany	BIS Local 3/	80.3	--	5.7	5.5	8.5	100.0
Greece	BIS Local 3/	61.3	--	1.0	36.4	1.4	100.0
Honduras	Survey	97.0	--	--	--	3.0	100.0
Hong Kong SAR	BIS Local 3/	98.7	--	--	--	1.3	100.0
Hungary	Survey	47.0	52.0	0.4	0.1	0.6	100.0
Hungary	BIS Local 3/	28.2	66.5	2.1	0.5	2.7	100.0
India	BIS Local 3/	95.0	1.9	2.2	0.2	0.6	100.0
Indonesia	BIS Local 3/	98.1	0.5	--	0.5	0.9	100.0
Iran	Survey	90.0	9.0	1.0	--	--	100.0
Ireland	BIS Local 3/	77.0	--	12.6	7.4	3.0	100.0
Israel	Survey	87.0	n.a.	n.a.	n.a.	n.a.	87.0
Italy	BIS Local 3/	77.8	--	5.4	10.6	6.2	100.0
Japan	BIS Local 3/	92.6	5.7	0.6	--	1.1	100.0
Korea	BIS Local 3/	98.6	0.4	0.1	0.7	0.3	100.0
Latvia	Survey	54.0	30.0	3.0	--	13.0	100.0
Lesotho	Survey	30.0	10.0	5.0	1.0	54.0	100.0
Lithuania	Survey	88.2	9.7	0.5	n.a.	n.a.	98.4

Continued on next page

Table 4. Share of the Main International Currencies in Foreign Exchange Market Turnover of Selected Countries, 2001 (concluded) (In percent)

Countries 1/	Source	U.S. dollar	Euro 2/	Pound sterling	Japanese yen	Other	Total
Luxembourg	BIS Local 3/	80.1	--	5.9	4.8	9.3	100.0
Malaysia	BIS Local 3/	96.7	1.0	0.3	1.1	1.0	100.0
Mexico	Survey	99.0	0.3	0.3	0.3	--	100.0
Mexico	BIS Local 3/	99.9	0.0	0.0	0.0	0.0	100.0
Moldova	Survey	86.7	4.0	0.0	--	9.3	100.0
Netherlands	BIS Local 3/	81.6	--	7.4	4.9	6.1	100.0
New Zealand	BIS Local 3/	90.1	1.9	1.6	1.6	4.9	100.0
Nicaragua	Survey	95.0	n.a.	n.a.	n.a.	n.a.	95.0
Norway	BIS Local 3/	85.9	11.4	0.8	0.7	1.2	100.0
Papua New Guinea	Survey	66.0	--	2.0	3.0	29.0	100.0
Peru	Survey	100.0	--	--	--	--	100.0
Peru	BIS Local 3/	100.0	--	--	--	--	100.0
Philippines	BIS Local 3/	98.9	0.2	0.4	0.4	--	100.0
Poland	Survey	75.0	15.0	n.a.	n.a.	n.a.	90.0
Poland	BIS Local 3/	79.2	5.3	--	--	15.6	100.0
Portugal	BIS Local 3/	70.0	--	11.4	9.4	9.2	100.0
Russia	BIS Local 3/	98.2	0.3	--	--	1.4	100.0
Saudi Arabia	BIS Local 3/	96.9	0.8	0.2	0.2	1.9	100.0
Singapore	BIS Local 3/	97.8	0.6	0.2	0.5	0.9	100.0
Slovakia	BIS Local 3/	76.4	22.6	0.3	--	0.8	100.0
Slovenia	BIS Local 3/	9.9	54.9	1.1	--	34.1	100.0
South Africa	BIS Local 3/	97.0	1.4	0.8	0.5	0.4	100.0
Spain	BIS Local 3/	90.0	--	3.6	3.2	3.2	100.0
Sri Lanka	Survey	84.0	8.0	3.0	2.0	3.0	100.0
Sweden	BIS Local 3/	56.3	21.3	2.2	0.7	19.4	100.0
Switzerland	BIS Local 3/	77.1	18.4	2.2	1.7	0.6	100.0
Syria	Survey	50.0	20.0	10.0	10.0	10.0	100.0
Taiwan, China	BIS Local 3/	95.4	0.6	0.2	2.2	1.7	100.0
Thailand	BIS Local 3/	97.2	0.6	0.3	1.5	0.5	100.0
Trinidad and Tobago	Survey	90.0	3.0	4.0	1.0	2.0	100.0
Tunisia	Survey	56.5	35.7	0.4	4.7	2.7	100.0
Turkey	BIS Local 3/	88.8	11.2	--	--	--	100.0
Ukraine	Survey	70.0	21.6	4.6	2.5	1.3	100.0
United Kingdom	BIS Local 3/	83.2	13.9	--	1.4	1.6	100.0
United States	BIS Local 3/	--	35.7	9.6	26.3	28.4	100.0
Vanuatu	Survey	99.0	n.a.	n.a.	n.a.	n.a.	99.0

Sources: IMF's 2001 Survey on Foreign Exchange Market Organization and Bank of International Settlements.

1/ Countries are repeated when two sources are available.

2/ Includes euro-legacy currencies (Deutsche mark, French franc, among others) in the Survey responses.

3/ Foreign exchange turnover of the local currencies against the main international currencies, net of local interdealer double-counting by country and currency in April 2001.



Table 5. Number of Foreign Exchange Intermediaries, 2001

	Foreign Exchange Dealers				Of which:	Market makers	Voice brokers
	Banks	Bureaus	Others	Total			
Albania	13	24	3	40	1/	10	n.a.
Angola	8	13	--	21		1	--
Armenia	29	216	15	260	2/	n.a.	n.a.
Azerbaijan	52	--	--	52		--	--
Bahamas	7	--	2	9	1/	--	--
Bahrain	n.a.	--	--	0		n.a.	4
Bangladesh	605	518	--	1123		n.a.	--
Barbados	8	1	--	9		8	--
Belarus	26	--	--	26		--	--
Bhutan	2	--	--	2		--	--
Bolivia	12	44	39	95	1/	--	--
Brazil	119	--	285	404		30	51
Bulgaria	35	760	--	795		6	64
Cambodia	28	17	--	45		--	--
Cape Verde	4	3	--	7		--	--
Chile	25	5	--	30		n.a.	--
Colombia	26	12	52	90	1/ 3/	90	26
Congo, Republic of	13	24	--	37		24	--
Costa Rica	21	2	11	34	1/	--	2
Croatia	42	--	13	55	1/	5	--
Czech Republic	n.a.	13	--	13		12	13
Djibouti	3	4	--	7		--	--
Dominican Republic	14	100	--	114		n.a.	n.a.
Egypt	51	126	--	177		--	--
El Salvador	15	10	--	25		n.a.	--
Estonia	7	190	--	197		7	n.a.
Fiji	5	11	--	16		n.a.	n.a.
Ghana	17	350	--	367		n.a.	--
Guatemala	31	8	16	55	1/	3	--
Guyana	7	28	--	35		--	n.a.
Honduras	21	--	4	25	1/	--	7
Hungary	28	700	--	728		12.5	--
India	100	470	--	570		10	--
Iran	10	--	--	10		n.a.	n.a.
Kazakhstan	--	626	--	626		29	--
Kenya	52	48	--	100		n.a.	--
Korea	70	--	--	70		9	--
Kuwait	9	29	--	38		9	2
Kyrgyz Republic	19	259	--	278		n.a.	n.a.
Lao	13	12	--	25		--	--
Lebanon	68	367	28	463	1/	1	5

Continued on next page.

Table 5. Number of Foreign Exchange Intermediaries, 2001 (concluded)

	Foreign Exchange Dealers				Of which:	Market makers	Voice brokers
	Banks	Bureaus	Others	Total			
Lesotho	2	--	--	2		2	--
Libya	27	--	--	27		--	--
Lithuania	14	--	3	17	1/	3.5	--
Macedonia, FYR	10	--	--	10		18	--
Madagascar	1	1	--	2		--	--
Malaysia	32	627	--	659		n.a.	--
Malta	4	11	--	15		2	--
Mauritius	21	--	--	21		10	n.a.
Mexico	40	26	--	66		7	--
Moldova	440	182	--	622		5	--
Morocco	15	--	--	15		--	--
Mozambique	13	31	8	52	1/	--	--
Namibia	5	1	--	6		4	--
Nepal	15	63	--	78		--	--
Nicaragua	5	4	2	11	1/	11	--
Oman	15	--	--	15		--	--
Pakistan	43	--	--	43		10	--
Papua New Guinea	6	--	--	6		6	--
Paraguay	20	23	--	43		n.a.	--
Qatar	15	16	--	31		15	--
Romania	41	370	--	411		n.a.	--
Samoa	3	4	--	7		--	--
Sierra Leone	6	31	--	37		6	--
Slovak Republic	n.a.	600	--	600		n.a.	n.a.
Slovenia	20	--	--	20		3	--
South Africa	36	7	--	43		8	--
Sri Lanka	24	32	--	56		13	--
Swaziland	4	--	--	4		--	--
Tanzania	17	--	6	23	1/	n.a.	--
Thailand	32	--	3	35	4/	n.a.	--
Tonga	3	2	--	5		3	n.a.
Trinidad and Tobago	10	7	--	17		--	--
Turkey	75	778	--	853		n.a.	--
Ukraine	149	3931	--	4080		n.a.	n.a.
Uruguay	22	57	25	104	1/ 5/	n.a.	--
Venezuela	38	19	7	64	1/	3	--
Yemen	14	264	--	278		20	--
Zambia	16	44	--	60		4	--

Source: IMF's 2001 Survey on Foreign Exchange Market Organization and country authorities.

1/ Nonbank financial institutions

2/ Independent dealers

3/ Includes two state enterprises

4/ Export-Import Bank of Thailand, Industrial Finance Corporation of Thailand, and a finance company.

5/ Includes 6 offshore institutions

Table 6. Interbank Market Turnover in Selected Developing  
and Transition Economies, 2000

(In percent of foreign exchange market turnover at bank-customer level)

---

Country 1	636.4	Country 10	20.0
Country 2	188.4	Country 11	18.6
Country 3	85.9	Country 12	17.7
Country 4	83.1	Country 13	17.0
Country 5	49.2	Country 14	10.6
Country 6	48.8	Country 15	6.1
Country 7	47.1	Country 16	3.8
Country 8	24.7	Country 17	1.9
Country 9	20.1	Country 18	0.0

---

Source: IMF, 2001 Survey on Foreign Exchange Market Organization.

1/ The different levels of foreign exchange market turnover exclude transactions with the central bank.

Table 7. Net Open Foreign Exchange Position Limits  
in Developing and Transition Economies, 2001  
(In percent of capital)

	Overall Positions				Single Currency Positions			
	Long		Short		Long		Short	
Albania	30	1/	30	1/	20	1/	--	
Armenia	25	1/	25	1/	5	1/	--	
Azerbaijan	20	1/	20	1/	10	1/	--	
Bangladesh	12.5	1/	--		--		--	
Belarus	10	2/	10	2/	10		--	
Bolivia	80	1/	20	1/	80	1/	20	1/
Brazil	60	1/	60	1/	60	1/	60	1/
Bulgaria	30	1/	30	1/	15	1/	--	
Cambodia	--		15	1/	5	1/	5	1/
Chile	20	1/	20	1/	--		--	
China, Mainland	20	3/	--		--		--	
Colombia	20	1/	5	1/	--		--	
Costa Rica	100	1/	--		--		--	
Croatia	20	1/	--		--		--	
Czech Republic	20	1/	20	1/	15	1/	--	
Egypt	20	1/	20	1/	10	1/	--	
El Salvador	10	1/	--	1/	--		--	
Estonia	30	1/	30	1/	10	1/	--	
Fiji	25	1/	25	1/	12.5	1/	--	
Ghana	30	2/	--		--		--	
Guatemala	60	1/	20	1/	60	1/	--	
Hungary	30	1/	30	1/	--		--	
India	--		25	1/ 5/	--		--	
Indonesia	20	1/	20	1/	20	1/	--	
Kazakhstan	30	1/	30	1/	5	1/	5	1/
Kenya	20	2/	20	2/	20	2/	20	2/
Korea	20	2/	20	2/	--		--	
Kyrgyz Republic	20	1/	20	1/	10	1/	--	
Lao	20	1/	--		15	1/	--	
Latvia	20	1/	20	1/	10	1/	10	1/
Lebanon 4/	1	2/	1	2/	--		--	
Lesotho	20	1/	20	1/	10	1/	--	
Lithuania	25	1/	25	1/	15	1/	--	
Macedonia, FYR	40	1/	10	1/	20	1/	--	
Malta	20	1/	20	1/	5	1/	--	
Mauritius	15	2/	15	2/	--		--	
Mexico	15	1/	15	1/	--		--	

Continued on next page

Table 7. Net Open Foreign Exchange Position Limits  
in Developing and Transition Economies, 2001 (concluded)  
(In percent of capital)

	Overall Positions				Single Currency Positions			
	Long		Short		Long		Short	
Moldova	20	1/	20	1/	10	1/	--	
Morocco	20	1/	20	1/	10	1/	--	
Mozambique	20	1/	--		10	1/	--	
Namibia	15	1/	15	1/	15	1/	--	
Oman	40	1/	--		--		--	
Pakistan	10	2/	10	2/	--		--	
Papua New Guinea	15	1/	15	1/	10	1/	--	
Paraguay	100	1/	75	1/	100	1/	--	
Peru	100	1/	2.5	1/	--		--	
Philippines	5	1/	--		--		--	
Poland	--		--		15	1/	15	1/
Qatar	--		--		1	1/	--	
Romania	10	1/	10	1/	--		--	
Sierra Leone	25	1/	--		15	1/	--	
Slovak Republic	25	1/	25	1/	10	2/	10	2/
Slovenia	20	1/	20	1/	--		--	
South Africa	10	1/	10	1/	10	1/	--	
Swaziland	25	1/	--		10	1/	10	1/
Tanzania	20	2/	20	2/	20	1/	--	
Thailand	15	2/	15	2/	--		--	
Turkey	20	1/	20	1/	--		--	
Ukraine	30	1/	5	1/	--		--	
Uruguay	150	1/	--		--		--	
Venezuela	12	1/	12	1/	--		--	
Yemen	25	1/	25	1/	15	1/	--	
Zambia	15	1/	15	1/	10	1/	--	

Source: IMF's 2001 Survey on Foreign Exchange Market Organization and country authorities.

1/ In percent of overall capital.

2/ In percent of tier I capital

3/ In percent of working capital

4/ In addition, Lebanon imposes a 40 percent limit on the overall net open foreign exchange position, estimated by the shorthand method.

5/ The net open foreign exchange positions can be raised up to 25 percent of capital with central bank approval.

Table 8. Electronic Dealing Systems in Developing and Transition Economies, 2001

	Central Bank Platform	Private Sector Platform	Reuters Dealing System		Central Bank Platform	Private Sector Platform	Reuters' Dealing System
Albania			♦	Libya			♦
Angola			♦	Lithuania			♦
Armenia	♦			Macedonia, FYR	♦		♦
Bangladesh			♦	Malaysia			♦
Belarus			♦	Malta			♦
Brazil		♦		Mauritius			♦
Bulgaria			♦	Moldova			♦
Chile		♦		Morocco			♦
Colombia		♦	♦	Oman			♦
Croatia			♦	Pakistan			♦
The Czech Republic			♦	Papua New Guinea			♦
Egypt			♦	Peru			♦
Fiji			♦	The Philippines		♦	♦
Guatemala		♦		Poland			♦
India			♦	Romania			♦
Indonesia			♦	The Slovak Republic			♦
Iran			♦	Slovenia			♦
Israel			♦	Sri Lanka			♦
Kazakhstan		♦	♦	Syria			♦
Korea		♦	♦	Turkey			♦
Kuwait			♦	Ukraine	♦		♦
The Kyrgyz Republic	♦			The United Arab Emirates			♦
Latvia			♦	Uruguay		♦	
Lebanon	♦		♦	Venezuela			♦

Sources: IMF, 2001 Survey on Foreign Exchange Market Organization, country authorities, and Reuters.

Table 9. Survey Respondents Adopting a Code of Conduct for Foreign Exchange Operations.  
by Exchange Rate Regime and Market Access, 2001 1/  
(In percent of member countries responding the Survey in each category)

Exchange rate regimes 2/	Developing and Transition Economies		Total
	Emerging Markets	Other	
No country-specific currency	--	50	50
CAEMC 4/	--	100	100
Other	--	--	--
Country-specific currency	89	61	75
Currency board	100	100	100
Conventional fixed pegs against a single currency	86	75	79
Conventional fixed pegs against a composite	67	40	50
Pegs with horizontal bands within a cooperative arrangement	--	--	--
Pegs with horizontal bands within a Fund supported program	--	50	50
Crawling pegs	100	50	67
Exchange rates within crawling bands	80	--	57
Managed floating, no preannounced path for exchange rate	93	64	81
Independently floating	91	63	79
Total	89	61	74
Memo item:			
No answer available	2	13	8

Source: IMF, 2001 Survey on Foreign Exchange Market Organization.

1/ The 2001 Survey on Foreign Exchange Market Organization was sent to country authorities in all developing and transition economies on October 2001. Ninety answers were received by March 2002. Table 1 shows the list of respondents.

2/ Follows the IMF's de facto exchange rate regime classification as published in the IMF's International Financial Statistics.

3/ Corresponds to the Fund member developing and transition countries considered as emerging markets in the Fund's internal quarterly publication named "Emerging Market Financing: A Quarterly Report on Developments and Prospects". The emerging markets that answered the survey are The Bahamas, Bahrain, Brazil, Chile, China (Mainland), Colombia, Costa Rica, Croatia, The Czech Republic, Dominican Republic, Ecuador, Estonia, Ghana, Guatemala, Hungary, India, Indonesia, Israel, Kazakhstan, Korea, Latvia, Lebanon, Lithuania, Malaysia, Malta, Mauritius, Mexico, Moldova, Morocco, Oman, Pakistan, The Philippines, Poland, Qatar, Romania, Singapore, Slovak Republic, Slovenia, South Africa, Sri Lanka, Thailand, Trinidad and Tobago, Turkey, Ukraine, Uruguay, and Venezuela.

4/ The Central African Economic and Monetary Community (CAEMC) is itself a conventional fixed peg arrangement.

-- stands for not applicable, zero, or negligible amount.

Table 10. Survey Respondents with Professional Dealers' Associations,  
by Exchange Rate Regime and Market Access, 2001 1/  
(In percent of member countries responding the Survey question in each category)

Exchange rate regimes 2/	Developing and Transition Economies		Total
	Emerging Markets 3/	Other	
No country-specific currency	--	100	100
CAEMC 4/	--	100	100
Other	--	100	100
Country-specific currency	77	43	60
Currency board	--	50	25
Conventional fixed pegs against a single currency	57	42	47
Conventional fixed pegs against a composite	67	20	38
Pegs with horizontal bands within a cooperative arrangement	--	--	--
Pegs with horizontal bands within a Fund supported program	--	50	50
Crawling pegs	--	50	33
Exchange rates within crawling bands	100	--	71
Managed floating, no preannounced path for exchange rate	86	55	72
Independently floating	91	50	74
Total	77	46	61
<u>Memo item:</u>			
Number of countries answering question	43	46	89
In percent of survey respondents	98	100	99

Source: IMF, 2001 Survey on Foreign Exchange Market Organization.

1/ The 2001 Survey on Foreign Exchange Market Organization was sent to country authorities in all developing and transition economies on October 2001. Ninety answers were received by March 2002. Table 1 shows the list of respondents.

2/ Follows the IMF's de facto exchange rate regime classification as published in the IMF's International Financial Statistics.

3/ Corresponds to the Fund member developing and transition countries considered as emerging markets in the Fund's quarterly publication "Emerging Market Financing: A Quarterly Report on Developments and Prospects".

4/ The Central African Economic and Monetary Community (CAEMC) is itself a conventional fixed peg arrangement.

-- stands for not applicable, zero, or negligible amount.



Table 11. Survey Respondents Requiring Foreign Exchange Licenses,  
by Exchange Rate Regime and Market Access, 2001 1/  
(In percent of member countries responding the Survey in each category)

Exchange rate regimes 2/	Developing and Transition Economies		Total
	Emerging Markets	Other	
No country-specific currency	--	100	100
CAEMC 4/	--	100	100
Other	--	100	100
Country-specific currency	82	89	85
Currency board	100	100	100
Conventional fixed pegs against a single currency	100	75	84
Conventional fixed pegs against a composite	67	80	75
Pegs with horizontal bands within a cooperative arrangement	--	--	--
Pegs with horizontal bands within a Fund supported program	--	100	100
Crawling pegs	100	100	100
Exchange rates within crawling bands	80	100	86
Managed floating, no preannounced path for exchange rate	87	91	88
Independently floating	64	100	79
Total	82	89	86
Memo item:			
No answer available	0	2	1

Source: IMF, 2001 Survey on Foreign Exchange Market Organization.

1/ The 2001 Survey on Foreign Exchange Market Organization was sent to country authorities in all developing and transition economies on October 2001. Ninety answers were received by March 2002. Table 1 shows the list of respondents.

2/ Follows the IMF's de facto exchange rate regime classification as published in the IMF's International Financial Statistics.

3/ Corresponds to the Fund member developing and transition countries considered as emerging markets in the Fund's quarterly publication "Emerging Market Financing: A Quarterly Report on Developments and Prospects".

4/ The Central African Economic and Monetary Community (CAEMC) is itself a conventional fixed peg arrangement. -- stands for not applicable, zero, or negligible amount.

Table 12. Electronic Broking Systems  
in Developing and Transition Economies, 2001

	EBS	Reuters Systems	Central Bank Platform	Private Sector Platform
Brazil				♦
Chile				♦
China, Mainland			♦	
Costa Rica				♦
Czech Republic		♦		
Guatemala				♦
Hungary		♦		
Israel		♦		
Kazakhstan				♦
Korea				♦
Mexico	♦	♦		
Peru				♦
Philippines				♦
Poland		♦		
Singapore	♦	♦		
Slovak Republic		♦		
South Africa		♦		
Uruguay				♦

Source: IMF, 2001 Survey on Foreign Exchange Market Organization.

Table 13. Sources of Variables Subject to Cluster Analysis, 2001

<b>Characteristics of the Foreign Exchange Market</b>		<b>Developing countries, Classification Criteria 8/</b>	
Foreign exchange license	Survey	By main source of export earnings	
Voice brokers	Survey	Fuel	WEO
Domestic	Survey	Primary	WEO
Foreign	Survey	Services	WEO
Foreign exchange bureaus	Survey	Manufactures	WEO
Code of conduct	Survey	Diversified	WEO
Dealer Association	Survey		
Central bank as exclusive foreign exchange agent of the government	Survey	By main source of financing	
Periodic foreign exchange auction	Survey	NetCreditor	WEO
Electronic broking systems	Survey	Official	WEO
Net open position limits	Survey	Private	WEO
Forward markets	Survey	Diversified fin	WEO
Developed, liquid, and deep	Survey		
Undeveloped, illiquid, and shallow	Survey	<b>Transition countries 8/</b>	WEO
Offshore markets	Survey		
		<b>Developing and transition economies by geographic region</b>	
Surrender requirements 1/	AREAER	Africa	IFS
Residents prohibited from making domestic payments in foreign currencies.	Survey	Asia	IFS
Restrictions on the use of the domestic currency by nonresidents	Survey	Middle East	IFS
Dollarization of deposits (above 20 percent) 2/		Western Hemisphere	IFS
Segmented foreign exchange markets 3/	AREAER	Eastern Europe	IFS

Continued on next page

Table 13. Sources of Variables Subject to Cluster Analysis, 2001 (Concluded)

<b>Exchange rate regime 4/</b>		<b>Emerging markets 9/</b>	IMF quarterly
Hard peg 5/	IFS	<b>HIPC countries 10/</b>	WEO
Intermediate flexibility 6/	IFS	<b>Legal system</b>	
Floating regime 7/	IFS	English common law 11/	CIA
<b>Articles of agreement, status</b>		Civil law system 11/	CIA
Article VIII	AREAER	<b>Monetary Regime 12/</b>	
Article XIV	AREAER	Inflation targeting	IFS
		Monetary Targeting	IFS

Sources: IMF 2001 Survey on Foreign Exchange Market Organization (Survey), World Economic Outlook (WEO), International Financial Statistics (IFS), Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER); and United States Central Intelligence Agency.

1/ Includes surrender requirements on invisible transactions.

2/ Computed on the deposits of the nonfinancial private sector, which according to the methodology of the monetary accounts includes state enterprises.

3/ Includes countries with dual and multiple exchange rate structures.

4/ Follows the IMF's de facto exchange rate classification for June 2001 as published in the IMF's International Financial Statistics.

5/ Includes countries with no separate legal tender and currency boards.

6/ Includes conventional fixed peg arrangements, crawling pegs, and crawling bands exchange rate regimes.

7/ Includes managed floating and independently floating exchange rate regimes.

8/ Corresponds to the Fund's World Economic Outlook (WEO) Classification, as presented in the October 2000 publication.

9/ Corresponds to the Fund member developing countries considered to be emerging markets in the Fund's quarterly publication entitled "Emerging Market Financing: A Quarterly Report on Developments and Prospects," available at the IMF's external website.

10/ Heavily indebted poor countries, as presented in the October 2000 World Economic Outlook publication.

11/ Based on description of the historical roots of the country's legal system as presented in "The World Factbook 2001," available at <http://www.cia.gov/cia/publications/factbook/index.html>.

12/ Based on the table "Exchange Rate Arrangements and Anchors of Monetary Policy" for June 2001, published in the IMF's International Financial Statistics.

Table 14. Cluster Analysis Results, 2001 1/

Similarity = 0.75	Similarity = 0.5	Similarity = 0.25	Similarity = 0
Code of conduct Net open position limits	Code of conduct Net open position limits Article VIII status Foreign exchange bureaus	Code of conduct Net open position limits Article VIII status Foreign exchange bureaus	Code of conduct Net open position limits Article VIII status Foreign exchange bureaus
	Forward markets, undeveloped, shallow, and illiquid Central bank as exclusive foreign exchange agent of the government	Forward markets, undeveloped, shallow, and illiquid Central bank as exclusive foreign exchange agent of the government	Forward markets, undeveloped, shallow, and illiquid Central bank as exclusive foreign exchange agent of the government
	Residents prohibited from making domestic payments in foreign currencies. Surrender requirements	Residents prohibited from making domestic payments in foreign currencies. Surrender requirements	Residents prohibited from making domestic payments in foreign currencies. Surrender requirements
		Exchange rate regime with intermediate flexibility Nonresidents restricted in their use of the domestic currency abroad	Exchange rate regime with intermediate flexibility Nonresidents restricted in their use of the domestic currency abroad
		Asia Manufactures, main source of export earning	Asia Manufactures, main source of export earning
			Diversified financing, Main source of foreign exchange financing English common law Monetary target, monetary regime
	Dealer's association Offshore currency markets	Dealer's association Offshore currency markets	Dealer's association Offshore currency markets
		Floating exchange rate regimes Emerging markets	Floating exchange rate regimes Emerging markets
		Electronic brokered system Inflation target, monetary regime	Electronic brokered system Inflation target, monetary regime
		Private sector financing, main source of foreign financing Western Hemisphere	Private sector financing, main source of foreign financing Western Hemisphere
			Diversified, main source of export earning
			Forward market, developed, liquid, and deep

Continued on next page

Table 14. Cluster Analysis Results, 2001 1/ (Concluded)

Similarity = 0.75	Similarity = 0.5	Similarity = 0.25	Similarity = 0
Transition Eastern Europe	Transition Eastern Europe	Transition Eastern Europe	Transition Eastern Europe
		Dollarization, above 20 percent	Dollarization, above 20 percent
		Civil law	Civil law
			Foreign exchange auction
			Voice brokers
		Segmented foreign exchange markets	Segmented foreign exchange markets
		Article XIV status	Article XIV status
			Services, main source of export earnings
		Fuel, main source of export earning	Fuel, main source of export earning
		Net creditor	Net creditor
		Middle East	Middle East
		Primary goods, main source of export earnings	Primary goods, main source of export earnings
		Official, main source of foreign financing	Official, main source of foreign financing
		HIPC	HIPC
			Africa
			hard peg, exchange rate regime

Source: IMF's IFS, WEO, Survey of Foreign Exchange Market Organization; and author's estimates and calculations.

1/ The variables have been grouped using clustering analysis, at different degrees of similarity. The analysis used a hierarchical complete linkage algorithm with a Jaccard similarity measure, which is appropriate for grouping binary variables.

## REFERENCES

- Abrams, Richard, and P. Beato, 1998, "The Prudential Regulation and Management of Foreign Exchange Risk," IMF Working Paper 98/37, March (Washington: International Monetary Fund).
- Bartolini, Leonardo, and Carlo Cottarelli, 1994, "Treasury Bill Auctions: Issues and Uses," IMF Working Paper ; WP/94/135 (Washington: International Monetary Fund).
- Canales-Kriljenko, Jorge Iván, 2003, "Foreign Exchange Intervention in Developing and Transition Economies: Results of a Survey," IMF Working Paper 03/95 (Washington: International Monetary Fund).
- , Roberto Guimarães, and Cem Karacadağ, 2003, "Official Intervention in the Foreign Exchange Market: Elements of Best Practice," IMF Working Paper No. 03/152 (July) (Washington: International Monetary Fund).
- Cheung, Y.W., and M.D. Chinn, 2001, "Currency Traders and Exchange Rate Dynamics: a Survey of the U.S. Market," *Journal of International Money and Finance*, Vol. 20, pp. 439–71.
- Cisse, Hassane, 1997, "Concepts of Exchange Restriction and Multiple Currency Practice Under the Fund's Articles" (unpublished; Washington D.C.).
- Dattels, Peter, 1995, "The Microstructure of Government Securities Markets," IMF Working Paper 95/117 (Washington: International Monetary Fund).
- Economides, Nicholas, 1995, "How to Enhance Market Liquidity," in R. Schwartz (ed.) *Global Equity Markets* (New York: Irwin Professional).
- European Central Bank, 2003, "Review of the Foreign Exchange Market Structure," March (Frankfurt: European Central Bank).
- Everitt, Brian S., 1993, *Cluster Analysis*, Third edition (London: Oxford University Press) p.170.
- Flood, Mark D., 1994, "Market Structure and Inefficiency in the Foreign Exchange Market," *Journal of International Money and Finance*, Vol. 13, No. 2, pp. 131–158.
- Harris, Lawrence, 1991, *Liquidity, Trading Rules, and Electronic Trading Systems*, Salomon Center Monograph Series in Finance and Economics, Monograph 1990-4 (February) (New York: New York University).
- , 2002, *Trading and Exchanges: Market Microstructure for Practitioners*, pp. 643 (Oxford: Oxford University Press).

- Hau, Harald, William P. Kileen, and Michael Moore, 2000, "The Euro As An International Currency: Explaining Puzzling First Evidence," Queen's University of Belfast and CEPR.
- International Monetary Fund, *Annual Report on Exchange Arrangements and Exchange Restrictions* (Washington, various issues).
- Kirilenko, Andrei, 2000, "On the Endogeneity of Trading Arrangements," *Journal of Financial Markets* 3 287–314.
- Kovanen, Arto, 1994, "Foreign Exchange Auctions and Fixing: A Review of Performance," IMF Working Paper 94/119 (Washington: International Monetary Fund).
- Lyons, R., 2001, *The Microstructure Approach to Exchange Rates* (Cambridge, Mass.: MIT Press).
- Madhavan, Ananth, 2000, "Market Microstructure: a Survey," working paper electronically available at [http://www.shh.fi/cefa/downloads/module1/hedvall\\_madhavan.pdf](http://www.shh.fi/cefa/downloads/module1/hedvall_madhavan.pdf).
- O'Hara, Maureen, 1995, *Market Microstructure* (Cambridge, Mass.: Theory Blackwell Publishers).
- Quirk, Peter J., and others, 1987, *Floating Exchange Rates in Developing Countries Experience with Auction and Interbank Markets*, IMF Occasional Paper No. 53 (Washington: International Monetary Fund)
- Reinhart, Carmen M., and Kenneth S. Rogoff, 2002, "The Modern History of Exchange Rate Arrangements: A Reinterpretation," NBER Working Paper 8963 (Cambridge, Mass.: National Bureau of Economic Research).
- Venkataraman, Kumar, 2001, "Automated Versus Floor Trading: An Analysis of Execution Costs on the Paris and New York Exchanges," *Journal of Finance*, Volume LVI, No. 4 (August).
- World Bank, 2001, "*Developing Government Bond Markets: a Handbook*, (Washington: World Bank) p. 413.