



# **The Structure of Derivatives Exchanges: Lessons from Developed and Emerging Markets**

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*Derivatives exchanges can provide certain important benefits to emerging market economies. These include risk transfer, price discovery, and more public information. However, derivatives exchanges should not be considered a substitute for financial, capital and commodity market reforms. The success of a derivatives exchange depends on the structure adopted and products traded. Empirical evidence supports the proposition that the core functions of a derivatives exchange while the same across markets are fulfilled with different institutional arrangements.*

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## **Abstract**

This study examines the architecture, elements of market design and products traded in derivatives exchanges around the world. The core function of a derivatives exchange is to facilitate the transfer of risk among economic agents by providing mechanisms to enhance liquidity and facilitate price discovery. We test the proposition that organizational arrangements necessary to perform this function are not the same across markets. We also examined the sequencing of products introduced in derivative exchanges.

Using a survey instrument we find that the form of ownership structure of derivatives exchanges is not identical across markets; exchanges are regulated directly or indirectly through a government law; and the rather typical, although not exclusive, market-making system is based on open outcry with daily mark-to-market and gross margining. However, electronic systems are gaining popularity among exchanges. Several exchanges indicate that they maintain ownership of clearing facilities and use netting settlement procedures. However, this structure is not unique across exchanges. The evidence supports the proposition developed by Merton and Bodie (1995) that while the performance of core functions in the financial system are the same across time and place, the institutional arrangements are not.

In terms of derivative products traded, we find that while most of the older exchanges started with commodity derivatives (mainly agricultural commodities), newer exchanges first introduce financial derivative products. According to our survey, higher potential for success have derivatives based on a domestic stock index, followed by derivatives based on local interest rates and currencies.

## Introduction

Derivatives exchanges contribute to the development of the financial infrastructure of a country by providing the links among cash markets, hedgers, and speculators.<sup>1</sup> Along with the global deregulation of financial markets, derivatives exchanges have attracted the attention of both academic literature and popular press. Among others, the academic literature has dealt with issues of valuation and pricing of derivative products (Bensaid, Lense, Pages, and Scheinkman (1992), Bick (1982)); issues related to the information content of prices in derivative contracts (Damodaran and Subrahmanyam (1992), Scott (1992)); the relationship between derivatives and cash markets (Ely (1991), Figlewski (1987)); the pricing of complex instruments under different specifications of underlying assets parameters (Hodges et al. (1992), Hull and White (1993), Lee (1994)); and issues related to efficiencies of derivatives markets (Craig, Dravid, and Richardson (1995)). The popular press has also dealt with derivatives markets by reporting the risks caused by derivatives trading and the regulation of derivatives markets (Herz (1993), Jordan (1995)).

Attention to derivatives markets is justified on the enormous levels of global trading for both exchange-traded products and over-the-counter products (Abken (1994), Beckett (1993), Stout (1996)). The explosive growth in derivatives during the last ten years brings trading at levels exceeding \$20 trillion (Remolona (1992)).<sup>1</sup> However, there is little known and published about the internal organization and functioning of these exchanges. Both academic research and the popular press have dealt with the exchange mainly from the perspective of a “black box.”

A variety of elements make up the microstructure of a derivatives exchange. Elements include the regulatory oversight, the order flow and trade execution, market making mechanisms, settlements and clearing procedures and exchange monitoring and enforcements. Study of the microstructure of derivatives exchanges around the world yields policy recommendations for designing new derivatives markets. The examination of derivatives architecture also offers rich data useful in analyzing the relationships and linkages among critical exchange parameters on the one hand and the broad economic environment on the other hand.

It is widely accepted that the primary function of the derivatives market is to facilitate the transfer of risk among economic agents by offering mechanisms for liquidity and price discovery. In a well-designed derivatives market resources are efficiently allocated and risk-sharing arrangements are optimum. Since derivatives markets perform the same function, we pose the following questions: are elements of exchange architecture and microstructure the same across derivatives markets? Are the institutional

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<sup>1</sup> According to the BIS, at the end of 1996 the notional principle outstanding of financial derivatives approached \$35 trillion, of which approximately \$10 trillion was in exchange-traded instruments and the rest in over-the-counter.

and regulatory structures uniform across derivatives markets? Provided that there are differences, what does explain these differences?

One point of view advocating similar structures (architecture) of derivatives exchanges across markets is based on the idea of competitive global services. Derivatives exchanges provide services to economic agents regardless of their location. Mobility of capital and globalization of securities trading requires an exchange to maintain a microstructure comparable to other exchanges competing in the international market. Since the function of the derivatives exchange is the same across countries -- to facilitate risk transferring -- local institutional structures are adapted to accommodate this function. In this broad setting, the financial infrastructure consists of the legal and accounting procedures, the organization of trading and clearing facilities, and the regulatory structures that govern the relations among the users of the derivatives exchange. Therefore, according to this view, the global competitive environment presumes an exchange microstructure which is exogenously specified. Organizational arrangements and elements of market microstructure are uniform across countries in order to accommodate a standardized exchange function.

An opposing view advocates the notion of uniqueness and specificity in derivatives exchange architecture. The premise of this view is based on the conceptual research of Merton and Bodie (1995) that links the functions of the financial system with the organizational arrangements that these functions are performed. Although the basic functions performed by the financial system are stable across time and place, the institutional arrangements employed to perform these functions are not. As innovation and competition produce greater efficiency in the performance of functions, over time, institutional form follows function. According to this view one would expect that while the function performed by a derivatives exchange is the same across countries, the institutional arrangements that allow an exchange to perform these functions may not be uniform across countries.

It becomes an empirical issue to investigate the extent to which elements of derivatives exchange architecture and microstructure differ across markets. Empirical research will document variations, if any, in infrastructure parameters.

The paper is organized in two parts. Part one presents the general principles in setting-up an exchange. In section A we discuss the relevance of architecture for derivatives markets and in section B we analyze major elements of architecture in derivatives exchanges. Part two presents the results from the survey. In section A we discuss the development of the survey instrument and data gathering. In section B we report the empirical analysis and in section C we present the lessons learned. This is followed by the summary and conclusions.

## **PART 1: GENERAL PRINCIPLES IN SETTING UP AN EXCHANGE**

### **A. The relevance of market architecture**

Exchange architecture encompasses formal structures and systems created to ensure orderly trading and execution of exchange transactions. These are elements of design that make up a complex organization. The architecture may become a form of competitive advantage to the degree that it motivates, facilitates, or enables price discovery and eliminates asymmetric information. Perhaps the largest single influence on exchange architecture has been the evolution of technology (Chapman (1994)). Modern finance theory treats a derivatives exchange as an information processor -- a mechanism that facilitates information production and transfer of information across agents and constituencies with the ultimate objective of improving fair price discovery.

The architecture of an exchange follows an evolutionary process. Advances in communications and technology make the study of derivatives exchanges even harder (Chapman (1994), Stout (1996)). The evolution has raised innumerable policy issues relating to market structure and stability.

Derivatives exchanges are considered intermediaries part of the financial system. The institutional structure of the financial system changes and evolves over time. Merton and Bodie (1995) argue that financial intermediaries differ across borders; they present a framework that explains how and why the institutional structure of the financial system changes over time. They advocate that the financial system performs six core functions which are the same across time and place. These functions include methods of clearing and settling payments, mechanisms for pooling of resources, ways of transferring economic resources across time and distance, methods of managing risk, including risk pooling and risk sharing, methods for pricing information, and ways to resolve incentive problems. Provided that markets are not integrated, organizational arrangements to fulfill these functions are different across markets. With intense competition and continuous innovation, institutional arrangements always follow the functions.

The framework developed by Merton and Bodie (1995) is applicable at the institutional level, that is, at the level of the derivatives exchange, and helps explain the uniqueness of the institutional form of the exchange and the particular (indigenous) features of the exchange structure. The core function of a derivatives exchange is to facilitate the transfer of risk among economic agents by offering mechanisms for liquidity and price discovery. While the same across time and place, this function may be performed under various organizational arrangements in different countries. For example, the organizational arrangements for clearing and settling transactions may be different between an American and a European derivatives exchange, although both may trade similar contracts. The application of this conceptual framework allows us to explain why we observe different derivatives market structures and why the architecture and regulation for derivatives is not the same across markets. Most importantly, the functional perspective offers explanations about the differences in elements of microstructure and regulation across exchanges. Therefore, we examine the features of derivatives exchanges and elements of market lay out. To investigate the extent to which

the functional perspective by Merton and Bodie (1995) has validity, we take a rather empirical perspective and rely solely on factual data. We look at schemes that work and make an effort to determine if there are commonalities across markets and exchanges.

We suggest that this examination of derivatives market architecture is important for several reasons. First, knowledge of architecture provides insights into the workings of derivatives market through examination of features of the exchange, including the market-making mechanism, the exchange ownership structure, and the linkages among several exchange functions that allow disciplined order flow and execution of transactions. Second, the architecture is important in that it may encourage or prevent the smooth transferability of risk through trading. Third, the architecture is critical to the debate over information dissemination in the market place. As long as derivatives contracts traded in an exchange complete investors' information set, the architecture of the exchange plays a role in the production of information. Fourth, the architecture of the exchange may enhance or reduce problems arising from high or low volume of transactions (market liquidity). Fifth, market arrangements have relevance for the long-term properties of derivatives contracts and the underlying asset returns or for investors who have horizons beyond the trading session. Both trading activity and price determination are sensitive to institutional arrangements. The architecture of the market seeks to illuminate this connection and provide a scientific basis for preferring one form of market design over another. Finally, aspects of architecture may indicate the importance of private versus public information in determining investors' demands for un-bundling, separation, and transfer of different types of risk to the public sector via the exchange.

## **B. Elements of Architecture**

### *1.0 The role of information*

The objective of a derivatives market design is to maximize investor risk protection by offering liquidity in contracts designed for hedging purposes or risk containment. It is well understood that a contract is liquid when it can be traded quickly, at low cost, and at a price that reflects its intrinsic or fair value. For a given supply and demand of derivatives contracts, liquidity decreases with the time that traders have available to trade. However, increases in the time available for trading contributes to market continuity.

In a continuous market, there may be asymmetric information among participants. Asymmetric information results in price deviations from true value and creates market destabilization problems. There is no empirical evidence that provides precise measures of the length of such periods of destabilization, but we do know of persistent deviations as a result of a market crash or overheated expectations (the case of speculative bubbles). With the availability of information technology and disclosure rules imposed by regulatory authorities, deviations resulting from temporary asymmetric information among agents are likely to be short-lived.

A derivatives exchange is complete only when there is a supporting infrastructure. The infrastructure includes the management of order flow, the price stabilization features

or circuit breakers introduced in the market, the market-making mechanism, the settlement and clearing procedures, exchange monitoring, and control and enforcement functions.

### *2.0 Order Flow and Trade Execution*

A distinct feature of design in a derivatives exchange is the form of order flow and trade execution. Depending on the automation and sophistication of the market, the order flow may be (a) face to face between the interested parties; (b) via telephone; or (c) via computer. Trading may be completed (a) through floor trading; (b) telephone trading; and/or (c) computer trading (Genotte and Leland (1994)).

Central to the issue of order flow is the way orders arrive for execution in a derivatives exchange and the possibility of excessive supply or demand of orders arriving in the market place (Domowitz (1995)). In some instances, the order flow may be transitory or temporal; that is, buy and sell orders are short-lived. Temporal imbalances in order flow could occur occasionally over a long trading day. As orders accumulate, there is less chance of making an error to offset a true price, because the order flow imbalance is short-lived (i.e., orders are quickly executed). Under this scenario, continuity in the market, although desirable, should be sacrificed in order to provide time for more orders and information to accumulate. Therefore, temporal consolidation of order flow allows the market to self-correct possible transitory imbalances in the flow of orders.

In other instances, however, the order flow may be highly fragmented (spatial). Consolidation of a fragmented order flow creates the potential for asymmetries in observing the aggregate spectrum of volume. If the order flow is consolidated (aggregated), it will be unclear if each market participant can observe the whole order flow prior to responding to the signal of high volume or whether the market participant is responding to only a small part of the order flow. Under this scenario, the market participant must exercise judgment in assessing two simultaneous possibilities (a) an observed order flow imbalance is either short-lived and temporary, or long-term and permanent; and (b) the imbalance is offset by an opposite imbalance faced by another market participant.

### *3.0 Price Stabilization Features*

Generally, price stabilization helps the market to adjust to temporal imbalances. Derivatives exchanges in an effort to avoid overreaction to market news and information have introduced two basic mechanisms that provide price stabilization: trading halts and price limits. Trading halts suspend trading for a period of time to allow for a cool-off period and reassessments of expectations and market information by market participants. Trade then resumes. Price limits allow for a maximum variation of price changes in a contract relative to previous day's closing price. After the maximum price limit allowed is reached, trading is suspended for the next day. All these mechanisms work as circuit-breakers in the market and allow participants to absorb more information prior to making informed trading decisions.

However, circuit breakers were controversial when they were introduced and they have remained so. Their advocates claim that trading restrictions are essential to keep market declines from turning into panics. Their critics argue that circuit breakers could lead to increased market volatility.<sup>2</sup> The debate over the usefulness of such mechanisms is centered on the argument of what causes extreme changes in derivative prices. One possible cause could be that economic fundamentals have suddenly changed leading market participants to drastically revise their expectations. If this argument is true, mechanisms that restrict trade are damaging because they reduce the efficiency of the price discovery system of the exchanges. An alternative cause of price swings is that price changes may be due to a temporary surge of supply or demand for a particular derivative contract. It is this second argument that lies behind the concept of circuit breakers. By halting trade, it gives market participants a time-out in which they work out whether a large price swing is due to something temporary (transitory) or something more fundamental (permanent).

#### *4.0 Market-Making Mechanisms*

The agents that provide continuity and smoothness in the order flow are the market-makers. The physical and legal form of the agents who participate at the exchange, their obligations, and the nature of their buying and selling activities determine the degree of market liquidity. The amount of market continuity provided by market-makers may be more or less similar to that provided by brokers, depending on differences in their position vis-à-vis the order flow, their obligations, and their capital requirements. The number of members involved in the order flow may create increased competitive conditions in the market and thus enhance market liquidity. We can identify alternative market-making agents: firms, individuals/speculators, brokers, or dealers. The differences among these alternatives are based on the institutional setting of organizing the activity.

#### *5.0 Settlement and Clearing Procedures*

The most critical function in a derivatives exchange is the settlement and clearing of trades. The function of the clearing house or clearing organization is to smooth possible problems of counterparty credit risk by standardizing and simplifying transaction processing between participants and the organization (the clearing house). The clearing organization by design represents a secure environment for absorbing settlement failures (Hentschel and Smith (1996), Mengle (1995)). The potential for credit losses is dependent on the provisions for sufficient capitalization of agents involved in clearing the transactions (Iben and Ratcliffe (1994)).

Critical parameter choices concerning the settlement and clearing procedures include the ownership of the services, the organizational form, and the nature of netting services. There are four alternative ownership forms for clearing houses: government ownership, single-sector ownership, multisector ownership and exchange ownership. Sector ownership involves the participation of financial institutions (such as banks) or institutions/firms from other sectors of the economy in the ownership of the clearing

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<sup>2</sup> According to some analysts, the introduction of circuit breakers had negligible effect in the volatility of US stock prices (see for example Lauterbach and Ben-Zion (1993)).

facility. In deciding the ownership of a clearing house, there are trade-offs between long-term financial support and balancing competing interests. The organizational form of the clearing facility is a function of the structure of a country's financial services sector, public policy goals and the bargaining power of market participants. One approach in the organizational structure is to form a single entity that handles both clearing and settlement/custody services. Another approach is to separate the facilities of clearing services from those of settlement/custody services.

### *6.0 Ownership Issues*

Clearing typically involves processing the details of the transactions including trade reporting, confirmation, matching, reconciliation, and sorting of trades. The processing of trades has been traditionally the business of exchanges. Settlement involves the exchange of securities for funds. This has traditionally been a business for banks and other intermediaries acting as safekeepers.

One critical issue is the ownership structure for each of the functions and its links to the exchange. Clearing and settlement may be performed in separate organizations or in a combined entity. The state or government may exercise control over these organizations and dictate ownership structures that serve its interests. For example, to achieve efficiencies and economies of scale, a country may want to clear transactions in both the treasury/bond market and the derivatives market via a central government entity.

### *7.0 Netting*

Netting is defined as a process of reducing multiple obligations with various counterparties to fewer obligations or a single obligation. The use of netting in the settlement of transactions produces greater efficiencies at high transaction volumes, and operating procedures for netting transactions are considered essential in minimizing credit losses among agents (Hendricks (1994)). There are several forms of netting, each with its own peculiarities. Bilateral netting is an arrangement between two parties to net the payment obligations on certain contracts between them. A variation of bilateral netting is position netting. This is an agreement that nets payments across multiple contracts but keeps each contract distinct.

Netting by novation involves the merging of all traded contracts into a single net position requiring one party to pay the other. Multilateral netting involves replacing a participant's many transactions with many other participants by relatively few transactions done with the clearing company. "Buy" transactions are offset with "sell" transactions to arrive at a net position -- obligation or gain -- relative to the clearing company. The important element here is that the connections in the transaction between individual participants are erased. In this environment, each participant faces the risk of dealing with the clearing company. Depending on the risk control mechanisms adopted by the clearing company, participants may be exposed to zero counterparty credit risk.

Two variations of multilateral netting appear to be very popular. Trade-for-trade netting involves a process of matching each transaction on an individual basis. Individual transactions retain their identity while passing through the clearing and settlement

services. Continuous net settlement (CNS) combines all transactions in a given security. These transactions are netted together to determine a single (positive or negative) position. In essence, all a participant's transactions in a given security are combined. The result is a single obligation to deliver securities to the clearing house or the right to obtain securities from the clearing house. A net funds position is calculated. Rights and obligations between participants are replaced with rights and obligations to and from the clearing house.

In addition to multilateral netting, there are other forms of transaction settlement. Settlement can take place through physical delivery of certificates to the clearing company. Certified based settlement (CBS) is not an efficient method of achieving settlement for even small transaction volumes because of the manual process of issuing certificates, sealing certificates in envelopes addressing them to participants. Since the clearing house acts as a post office by receiving the envelopes, sorting them and delivering them to the participants, the process is slow.

Delivery versus payment (DVP) involves the simultaneous exchange of securities and payments. To achieve efficiencies in delivery versus payment, netting requires settlement mechanisms to move securities and funds positions at the same time, since the method requires the final delivery of securities to occur if and only if final payment occurs.

To manage an effective the settlement process in a derivatives market, several ancillary services are required: centralized contract depository system that interfaces with the clearing system, an automated coding system of identifying participants within the process, risk monitoring and control mechanisms that assess the credit risk of participants in the market, and rigorous disaster recovery procedures to guard against the unexpected. The legal and regulatory environment should also allow netting and contracts assignments.

#### *8.0 Exchange Monitoring, Control, and Enforcement Functions*

The exchange functions as a club where interested parties participate with the objective of risk reallocation. It is obvious that beyond any social benefits, agents involved in the trading of derivatives contracts essentially "trade quantities of risk" with the objective of attaining profitability in their transactions. Provided that profitability has no upper limits, it is necessary for the exchange to develop a function to monitor members, control trading activities, and enforce professional conduct in a symmetric fashion and ensure a level playing field for all participants. This simple idea, although universally accepted, is difficult to implement.

A great variety of mechanisms for monitoring and enforcement may be used to achieve the same basic objective of self-regulation in a derivatives market. Yet, there is a trade-off. Too much self-regulation imposes constraints on participating members and hampers the development of an exchange market. Too little regulation, on the other hand, opens the possibility of misconduct.

Some critical issues for smooth self-regulation of a derivatives exchange include:

(a) Ownership and control. Shareholders of the exchange include parties that represent the broad constituency of the derivatives market. Specialization and division of labor today has resulted in separation of ownership and control in exchanges. As in corporations, managerial talent has been developed for administering the activities of a derivatives exchange on behalf of its owners (Jensen and Meckling (1976)). In some cases, government in developing countries appoint the management team to ensure relevant experience. Owners of the exchange then become passive shareholders. The resulting separation of ownership from control could create several conflicts of interest between appointed managers and constituents of the exchange. This could result in sub-optimal decisions regarding monitoring, self-regulatory enforcement, and risk-allocation. The well known agency problem refers to the divergence of interests between the decision-makers (management) and the owners (constituents). Conflicts of interest, deadweight losses, and agency-related costs are reduced through three mechanisms: (1) when the exchange constituents are the owners of the exchange, (2) the constituents develop the capacity to monitor effectively the activities of appointed managers, and (3) the exchange operates in a competitive global environment.

(b) Independence and objectivity in the self-regulatory process. The internal organizational structure of the exchange plays a critical role in ensuring independence and objectivity in decision-making. Decisions that lead to an optimal self-regulatory structure depend on the internal organization of the exchange. To ensure maximum benefits, decisions should be decomposed into two categories of tasks, decision management and decision control, with each category assigned to different officers within the exchange organization.

Decision management refers to the initiation of decisions for new contracts and self-regulation of participating members of the exchange, and the implementation of such decisions. Decision control refers to the ratification and monitoring of the decisions and the provision of rewards or penalties to those implementing the decisions. By delegating the functions of decision management and decision control to different individuals, the exchange minimizes the chance that opportunistic behavior of agents-members will lead to actions detrimental to the reputation of the exchange.

The separation of decision management from decision control ensures that professional actions are consistent with the interests of the general constituency of the exchange, and makes it more difficult for any individual within the organizational structure to engage in counter-productive behavior. To allow for efficient decision-making while controlling possible agency costs, an exchange should establish an internal organizational structure in which professionals who initiate and implement the new contracts are different from those who perform the ratification and monitoring of the new contract introduction. If this is not the case, and separation is not present, the top management of the exchange could introduce and implement a new regulation or contract that is potentially in the interest of only a small constituency of the exchange.

## *9.0 The Dynamics of Derivatives Exchange Regulation: Self-regulation and external regulation*

Two additional issues for the organization of the derivatives markets remain for discussion. First, the regulation of derivatives exchanges at the level of the exchange itself (internal regulation), and the second, the external regulation of derivatives exchanges.

While a variety of mechanisms are used for exchange monitoring and enforcement, it is the exchange itself that determines a self-imposing rules for its members. We suggest that in determining member rules a derivatives exchange follows a rather economic approach by looking at the marginal benefits and marginal costs of the self-imposed rules.

The necessity of attracting investors who have alternatives leads exchanges to choose rules and listing standards that produce benefits to investors until the marginal value that investors attach to further benefits outweighs the marginal cost of providing them. Self-interested exchange members will produce rules that investors want for the same reasons that self-interested economic agents produce the kind of products that consumers want. Like all economic agents, an exchange competes with other exchanges by providing mechanisms for liquidity, by attracting specialized contracts characterized by uniqueness and specificity, and by inducing investors to purchase listed contracts. The securities market as a whole also competes for investor funds with other sectors of the economy.

The exchange's incentives to provide rules and enforcement mechanisms that increase investors' returns, is justified by the desire to increase investors' demand for listed contracts. The competition for investors funds and for the use of exchange trading facilities depends on the desirability of listed contracts as hedging or speculative tools. A contract may attract the investor interest only by offering attractive risk-adjusted returns. Appropriate disclosures reduce the difference between investors' expectation and contract's performance. The exchange then may reduce the divergence by making necessary rules to maintain financial and other disclosures.

In fact, for most of their history exchanges, especially stock exchanges, have been the primary regulators of securities markets. Among other items, they determine internal standards of financial responsibility for brokers and dealers, intermediate between issuers and investors, enforce disclosures that listed contracts need to maintain for investors' protection, and they supply rules for member contact.

While derivatives exchanges have incentives to increase investors' demand for traded contracts, the desirability of the contracts depends on the specific organization of the trading market and the supporting institutional infrastructure. A specific market organization may offer contracts with more or less liquidity, price impact, speed of execution and reliability of performance at a greater or lesser cost. Investors as a heterogeneous group with ample alternatives typically differ in terms of preferences.

Some investors may prefer lower trading costs to more rapid execution and others prefer a less liquid but more transparent market. We therefore, observe markets adopting dissimilar rules and procedures to cater to different clienteles (Harris (1993)). An exchange survives only if a sufficient member of investors find it worthwhile to purchase exchange-listed contracts. The above discussion suggests that self-regulatory rules for derivatives exchanges may not be uniform across markets. Derivatives exchanges offer contracts and specific disclosure rules to serve the needs of investors who hold heterogeneous objectives.

While there is a wide range of alternatives when it comes to the self-regulation of a derivatives exchange, the external regulation is subject to limited choices. The regulation may be the function of state, local, or national agencies. It may be based on the oversight of an independent agency of the government such as the CFTC in the United States. Still, another alternative is the regulation to follow the approach of the state member of the European Union which has adopted directives relating to disclosures and market structure to which national legislation must conform. Despite the institutional choices for setting up an external regulatory environment, there are certain principles that an external regulatory agency follows. These are presented in Box 1. below.

**Box 1. Elements of Regulation**

- authorization to do business based on “fitness” (registration criteria)
- financial and market integrity and fair trading requirements
- customer protection requirements including disclosure of the “rules of the game”
- mandated record generation and retention, and inspection authority
- compliance monitoring
- enforcement sanctions
- dispute resolution
- crisis intervention
- oversight information sharing capability

Taken into account the theory and practice for derivatives exchange regulation several alternatives may be considered for global derivatives exchange regulation. At one end of the spectrum, regulation may be performed through a global regulatory body that maintains the authority to adopt and enforce exchange rules. Another alternative would have been to harmonize national regulations in a way that exchanges are subject to the same rules. A third alternative for global derivatives regulation requires greater coordination in the sense that national regulatory agencies would agree to give priority status to the removal of gaps or inconsistencies in national regulation that make it difficult for capital to flow freely or easy for fraud to flow freely.

## **PART 2: EMPIRICAL RESULTS FROM A SURVEY**

### **A. Data --The Survey Instrument**

To examine the organization form of derivatives markets and especially issues of derivatives microstructure, we relied on factual data. Due to lack of other primary empirical sources of information we designed a questionnaire and identified parameters that reflect the functioning of the derivatives market.

#### *1.0 Questionnaire Design*

For data gathering we construct an instrument in the form of a formal survey questionnaire. This consists of four parts. The first part requests participants to give the year the exchange was founded, its ownership, and the exchange membership. We make an attempt to differentiate between full or regular members and associate or limited members and clearing/non-clearing members of an exchange. We further decompose the categories of members into financial institutions, security firm, independent broker, independent market-maker, individual, and foreign entity, and request information on capital requirements and annual membership fees. To learn more about membership, we request information on the requirements for each membership category. Finally, in the first section of the questionnaire we ask about the regulation of the exchange by providing predetermined answers such as via parliament, via parliamentary law, via a government committee, self-regulated, or via government ministry.

The second part of the questionnaire focuses on exchange-traded products and contracts. We seek to identify the type of contracts traded on the exchanges, the number of contracts, and the annual combined volume for each contract traded. To provide some degree of uniformity across exchanges, we specify ten categories of contracts traded: agriculture: grains, food and fiber; agriculture: meat and livestock; currencies; energy; equity; index; interest rates; non-precious metals; precious metals; and swaps. The categorization allows comparisons of products across different country economies.

Also in the second part of the survey, we ask questions related to the sequencing of contracts introduced in the derivatives market. We ask participating exchanges to identify the date and the contract type that was first introduced for trading. We also request information on contracts de-listed from the exchange. De-listed contracts may indicate lack of market depth or absence of certain economic/financial conditions (such as low volatility in interest rates) for the trading of particular contracts. We request information about the type of contract, the date the contract was introduced, and the date the contract was canceled.

The third part of the survey explores issues of market-making, by asking participants to indicate the market-making system used on their derivatives exchange. Market-making arrangements include open outcry, market-maker, integrated registration and real-time clearing systems, electronic screen-based systems, and open outcry with mark-to-market gross margining. For exchanges with some history, we also sought to determine whether there has been any change in the market-making, a change that may reflect changes in the technological environments and/or the regulatory infrastructure.

In the fourth part of the survey, participating exchanges are asked to identify procedures used for clearing transactions. Clearing transactions may involve a central bank, or be performed through bank guarantees, an independent company organized separately from the exchange, or a company affiliated with the exchange that sets its own margin requirements. Particular attention is paid to uncovering the ownership of the clearing house with explicit requests to account for each one of the six most common categories of members (banks, securities firm, independent brokers, market makers, foreign entities, individuals) in terms of number of members and proportion of the corresponding ownership. Finally, a settlement system may involve different procedures for completing the order flow of transactions. The survey asks participating exchanges to specify one of three types of settlement procedure: bilateral netting, netting by novation, or multilateral netting.

## *2.0 Survey Distribution*

We distributed the survey to 75 exchanges located in 29 countries. Table 1 reports the exchanges to which the survey was distributed. The survey was distributed during June and July 1996. Original responses were received by the end of July 1996, but by August 20, reminder letters were sent to those that had not responded. Answers were compiled and analyzed during the fall of 1996.

Special attention is given to sampling errors, which occur because observations are not homogeneous. Because of systematic biases, survey data can be very reliable but still be low in validity. To ensure the validity of the gathered data a high response rate was required. Alreck and Settle (1985) report that validity problems are not an issue when in survey responses exceeding 50 percent.

As of the deadline of September 30, 1996, we counted 42 responses. Table 2, Panel A, reports the survey responses by exchange name. Given the response rate of 56 percent, the survey data are considered reliable, and problems of validity are considered limited.

## **B. Empirical Evidence**

### *1.0 Emerging vs. Developed Derivatives Markets*

This conjecture raises the crucial issue of distinguishing between developed and emerging exchanges. To make inferences about differences between emerging and developed derivatives exchanges, it is necessary to develop an objective way to separate exchanges into these two groupings.

We considered three classification procedures. First, we focus on a country's economic development. Using as a proxy the World Bank's classification of countries as developed or developing according to income level, we classified derivatives markets in developed and emerging. Countries like the US, Canada, and Japan are considered developed. Countries like Brazil, Argentina, South Africa, China, Philippines, Hungary, Malaysia, India, and Russia with upper-middle-income levels or low-income levels are

considered emerging. Only 27.5 percent of the countries in the total sample are considered emerging.

The second classification focuses on the stage of development of the country's equity capital market. To find the stage of development of the capital market, we rely on the International Finance Corporation (IFC) "Emerging Stock Market Fact Book" (1988-1995) for various years and classify capital markets as emerging or developed. In an emerging market, we considered the derivatives exchanges as emerging. All other derivatives exchanges were classified as developed. This classification yields again the same proportion of countries of 27.5 percent emerging derivatives exchanges.

Third, we considered the maturity or aging of the derivatives exchange measured by the number of years the exchange has been in operation. We identified years in which the first derivatives exchanges were established in all countries and calculated that the median number of years a typical exchange in the sample of 29 countries has been in operation is 14 years. Exchanges in operation for more than 14 years were considered developed, and exchanges in operations for less than 14 years were considered emerging. According to this criterion, in 51 percent of the countries, the exchanges are considered emerging. This approach is more ambiguous than the previous two, however, and requires caution. An exchange that has been established recently is not necessarily less advanced than one established some time ago. Recently established exchanges are actually more technologically advanced than older ones. What is different, however, is a lack of experience and less historical information about volatility in a recently established market, which may relate to a market's success or failure.

In our analysis, we distinguish exchanges based on the stage of development of the country's capital market. That is, using the classification provided by the IFC emerging markets factbook, we identified the stage of development of a country's capital market and classified derivatives exchanges as developed and emerging.

## *2.0 Products and Contract Classification*

### *2.1 Chronology of Contract Introduction*

We analyze contracts by examining the contract type, sequence of contract introduction, and distribution of contracts across exchanges. The most popular derivatives contracts in exchanges are index (equity) based products, followed by interest rate based products, and then agricultural commodities.

To determine the sequencing of products introduced on a typical exchange, Table 3 reports the chronology of the type of exchange-traded contracts introduced, the exchange, and the country in which the exchange is located. The first agricultural contract introduced was in 1859 at the Chicago Board of Trade. A currency contract was introduced at the Chicago Mercantile Exchange in 1968, and an equity product was introduced in 1973 by the Chicago Board of Options Exchange. The sequence over all is agricultural, followed by non-precious metals, precious metals, currencies, interest rates, equities, energy, indexes and swaps.

The examination of the total sample reveals that historically derivatives exchanges first introduced agricultural contracts reflecting the significance of a sector that contributed to economic development at that time. Globalization of transactions and exchange rate volatility led to the development of currency contracts. These were followed by interest rate contracts and contracts based on domestic stocks or an index of stocks as a result of capital mobility and the development of domestic capital markets in emerging markets.

To determine if the sequence of derivative product introduction is the same for developed and emerging derivatives markets, we examine the chronology of product introduction for developed markets and emerging markets. Emerging markets lag developed markets in terms of the length of time it takes to introduce derivatives products. In other words, it takes relatively more time to introduce a derivatives contract in emerging markets compared to developed ones. A noticeable difference is that emerging markets introduce (stock) index products relatively more quickly than developed markets.

The data also reveal that while historically exchanges first introduced derivative instruments for agricultural commodities, more recently exchanges first introduce interest rate products followed by index-based and equity derivative products. The globalization of commodity markets and agricultural market liberalization in emerging economies has reduced the interest in the development of commodity derivatives relatively to financial derivatives. This can be due to the following reasons. First, commodity market liberalization has increased the pass-through of international commodity price movements to domestic commodity prices making the use of existing commodity derivative contracts feasible for domestic hedgers. In other words, the basis risk for using existing derivative contracts has been declining. For example, Mexican wheat producers may now find that using the CBOT wheat futures contract as an appropriate one for hedging Mexican wheat price risk. Thus, the need to develop a Mexican wheat contract may be reduced.

Second, financial markets are more country specific and the demand for derivative instruments mainly comes from domestic users. Equity based products are based on equities in the local stock market and interest rate derivatives are based on the local bond market. More recently institutional investors have taken an interest in these products. For example, an institutional investor who would like to take a position in the local stock market could purchase (or sell) futures on the equity index. Also, an investor who would like to purchase a stock of a local company but would like to be hedged against a drop that would affect local stocks across the board could purchase a put option on the domestic equity index. Thus, the market (country) specificity of financial instruments (stocks, bonds, currencies) usually makes derivatives based on these instruments to appear in local markets. The introduction of derivative instruments usually follow as a natural development of the domestic capital markets. However, there are cases where derivative instruments based on one market are traded in another market. For example, the Nikkei 225 stock average is traded at CME in Chicago, LIFFE in London trades Italian and German bonds, and the Brazilian real trades at CME.

Third, experience has shown that financial derivatives attract relatively higher liquidity compared to the commodity derivative contracts. For example, the Budapest Commodity Exchange experienced a dramatic increase in the volume traded when it introduced financial derivative contracts (mainly currency) in addition to its commodity derivatives contracts. In the Sao Paulo Commodities and Futures Exchange (BM&F), the turnover of all agricultural contracts traded was about \$3.5 billion for 1996, representing only one percent of the total value of contracts traded which amounted to no less than \$4.2 trillion. At the two Chicago exchanges, CBOT and CME, agricultural trading volumes were less than 30% and 5% of the total trading volumes, respectively.

### *2.2 Sequencing of Contract Introduction*

For all derivatives contracts introduced in the global marketplace, we seek to determine the most frequently introduced first contract and the type of contracts that follow. Table 4 reports for all markets that the most representative contract first introduced on an exchange is an agricultural contract with a count of 24 contracts and fraction of occurrence of 30.4 percent (Panel A, first group). The second contract introduced is the equity or index-related contract with equal counts of 12 cases each and fraction of occurrences of 28.6 percent (second group). The third contract is an interest rate product.

This sequence of contract introduction is different for emerging and developed exchanges (Panel B and C). In emerging markets, index products are introduced first then followed by another (equity) index product and an interest rate product, and then a currency product. Developed markets introduce agriculture products followed by equity and interest rate products. This is mainly because several exchanges in developed countries have been established some time ago when agricultural products (and commodities in general) were more important in the overall economy and capital markets were less developed. However, more recently, newly established exchanges in developed markets introduce first financial derivative products based on equity indexes, individual stocks, interest rates and currencies. Thus, among newly established derivative markets there is little distinction between emerging and developed in the sequencing of contract introduction.

### *2.3 Timing of Successive Product Introduction*

Table 5 describes the time elapsed between successive contract introductions on derivatives exchanges. It reports the number of contracts, the median, the mode, the standard deviation, the skewness, and kurtosis of time elapsed between the first, second, and successful contracts introduced in all derivatives markets.

For the time elapsed from the first to the second contract introduction, we search all exchanges and identify the years the first and the second contracts were introduced for trading. The median number of months required between the first and the second contract introduction was 36 months. Between the second and third contract the time was 18 months; between the third and the fourth was 48 months.

## *2.4 Contract de-listing*

The survey allowed to identify the type of derivative contracts that are no longer traded in exchanges. Agricultural derivative products were the first to stop trading in an exchange followed by index products. The data does not cover exchange traded products that are inactive (i.e., still listed but not traded or traded but illiquid).

## *3.0 Exchange Structure*

### *3.1 Lifespan of Derivatives Exchanges*

To estimate the aging or the maturity of a typical derivatives exchange we find the date the exchange was established and calculate the number of years that has been in operation. Panel A of Table 6 reports that the exchange median years in operation is 14 years. Panel B of the same table reports the number of exchanges established after 1990. Almost 24% of the responses to our survey come from exchanges that have been recently established (after 1990).

### *3.2 Exchange Ownership*

Table 7 reports clusters of exchanges that maintain similar ownership. Almost 34 percent of the exchanges surveyed operate as non-profit self-governing entities (Panel A), while another 25 percent indicated that they are privately owned, government regulated exchanges (Panel C). Smaller percentages of the responses indicated that exchanges operate as a subsidiary, as a part of a larger organization (Panel B) or as a limited liability company (Panel D). We are unable to infer any statistical differences between developed and emerging derivatives markets as far as the status of the exchange ownership is concerned.

### *3.3 Regulatory structure*

Table 8 reports the number of exchanges and exchange name for each type of regulatory regime identified in survey responses. Each of the panels appearing in Table 8 shows the type of regulation that the corresponding exchange is subject to. Statistical analysis of responses indicates that the prevailing regulatory structure in the survey responses was exercised via a parliamentary law.<sup>3</sup> In almost all cases the government played an important role in market regulation in addition to the exchange's own self-regulatory arrangements.

### *3.4 Market-making systems*

Table 9 reports the variety of market-making systems in derivatives exchanges. Statistical analysis shows that the relatively more frequently cited market-making system was based on an open outcry, daily mark-to-market with a gross margining.<sup>4</sup> However, electronic trading systems are also frequently used among exchanges. While nine exchanges of the 39 exchanges that provided information rely exclusively on electronic trading system, nineteen exchanges in total employ some form of an electronic trading system, either exclusively or in conjunction with an open outcry system (8 exchanges), or some other system. Also recently established derivatives exchanges are more likely to use electronic based systems for trading. Advocates of the electronic trading systems

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<sup>3</sup> F-value of 3.17 and p-value of 0.082

<sup>4</sup> F statistic 2.96, p-value 0.0928

claim that their adoption leads to lower trading costs and thus using futures and options will become more attractive to businesses and investors. An exchange using an electronic system could also draw business from traders around the world, significantly expanding the potential market. And according to its advocates, it could be safer.<sup>5</sup>

The survey has also found that the daily mark-to-market with a gross margining system seems to apply also to the majority of recently established exchanges. Finally, we find no statistical significant differences in market making systems between developed and emerging market derivatives.

### *3.5 Clearing House arrangements*

More than 50% of the survey participants indicated that they require initial margin deposits and margin calls, with the exchange guaranteeing the contracts through its own clearing house. In 30% of the survey participants the clearing was performed through an independently organized company. And in just three exchanges transactions are cleared through the Central Bank or by applying bank guarantees in settling transactions.

While there is some uniformity in margin requirements across the exchanges surveyed (i.e., most exchanges require initial and variation margins with settlements made daily), there are disparities in the ways that margin deposits are collected, whether gross or net, and in what the clearing house accepts as collateral. Many clearing houses accept cash and securities as collateral. Letters of credit could be another form of collateral.

Table 10 reports the ownership of the clearing house. Panel A of Table 10 reports the number and name of exchanges that maintain an in-house clearing organization. From the 39 responses to that question, 24 exchanges indicated that they own in-house clearing facilities. Panel B of the same table reports alternative ownership arrangements for the ownership of the clearing house. These include ownership by banks, financial institutions, other exchanges, and/or multiple institutions. Among the alternatives to the own in-house clearing facilities, ownership by other exchanges appears to be more prevalent. Overall, examining the clearing houses in our survey, it is evident that their relationships with exchanges differ, but having a clearing house affiliated with the exchange as opposed to existing as a separate entity appears to be the more prevalent arrangement.

### *3.6 Settlement Procedures*

Table 11 reports survey responses on the type of settlement used in completing derivatives trades. Although netting is frequently used, there is not a predominant settlement procedure used by exchanges. Many exchanges use netting by novation (merging of all traded contracts into a single net position requiring one party to pay the other) and multi-lateral netting (replacing a participant's many transactions vis-à-vis other participants with fewer transactions vis-à-vis the clearing house). The table reports

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<sup>5</sup> For example, at the Beijing Commodity Exchange each trade is checked for adequate margins before the computer accepts it. And the BM&F in Sao Paulo performs back-office trade clearing and processing; a task performed by member firms in most developed markets.

the type of settlement used for each exchange. There are only 25 responses to this survey question.

### *3.7 Exchange membership*

Exchange membership distinguishes between full (or regular) and associate (or limited) members. Full members are entitled to full voting privileges pertaining to the self-regulation of the derivatives exchange. Although associate members have the same rights as full members in terms of trading, they do not have full voting privileges and often their activities do not cover clearing of transactions. The promotion of associate members to a full membership status is conditional on tenure on the job, several certification requirements and sometimes of posting a bond required for security in clearing transactions. The median percentage of full or regular members is 80%, with a 76% of full members having clearing rights. The percentage of associate members with clearing rights is much smaller, at 16% (of the total associate members). In emerging market derivatives exchanges, the total number of members is much smaller than in developed market derivatives exchanges.

### *4.0 Economic and capital market conditions*

Using economic and capital market data, an attempt was made to examine the extent to which differences in economic and capital market conditions (indicators) between developed and emerging economies explain differences in the degree of development of their derivative exchanges. In other words, an attempt was made to establish certain indicators related to economic and/or capital market conditions for the development of derivatives markets. These are indicators of market readiness for the development of derivatives exchanges.

As economic proxies we use changes in consumer prices, prime interest rates, government bond yields, industrial production, real GNP growth, the level of GNP, and the share of investments in GNP. We use data from the IMF International Financial Statistics for the period 1984-92. As proxies for capital market conditions we use the stock market turnover, the stock market capitalization, the variance in stock market capitalization, the value traded, the volatility in value traded and the number of listed companies in the stock exchange. We obtain data for these variables from the IFC Emerging Markets Stock Guide.

To examine if differences between emerging and developed derivatives markets can be explained by differences in economic and capital market conditions we estimate the differences in means (between proxies in developed and emerging economies), via an F-test and a p-value for all economic and capital market proxies. We find no statistically significant differences between emerging and developed derivatives markets with respect to the economic proxies. We find some differences in capital market conditions between derivatives exchanges in emerging and developed markets, but these differences may be explained by the size and maturity of developed capital markets. We conclude that our tests give no conclusive indicators for the degree of market readiness for developing a derivatives exchanges. In this respect, additional research is needed to establish if such indicators exist and if they do, to quantify them.

### C. Lessons Learned

Derivatives exchanges are here to stay and are likely to expand substantially in emerging markets, as they did in developed markets over the last ten years (see also Box 2 below). The research findings could provide several lessons to those involved in the development of derivatives exchanges in emerging market economies. These include:

- Index-based and interest rate derivative products stand a relatively better chance to be introduced first in an emerging derivatives exchange. Recent experiences indicate that derivative instruments on agricultural products are more difficult to introduce initially.<sup>6</sup>
- The process of introducing successful derivative products could be lengthy. Both government regulations and a self-regulatory structure are usually needed. There is a fine balance between government's regulatory role and an exchange's self-regulations. The basic assumption is that having a well-functioning derivatives market is in the interest of all concerned. Governments could encourage and support assessments of the feasibility of such markets; to assure a broad domestic and foreign participation in the process; and to clearly define and implement the regulatory framework. It is up to the market participants and the exchanges to develop appropriate products, trading mechanisms, and self-regulatory systems compatible with the degree of market development.
- Clearing is an extremely important function. The most preferred way is using margins (initial and variation). Most exchanges own their in-house clearing operations. The second most frequently used approach is for the clearing house to be owned by other exchanges or banks.
- Electronic trading systems appear to be more popular among newly established exchanges. Lower transactions costs, easier to set-up and monitor and better accessibility by users are frequently cited as the key benefits of the electronic trading systems.
- Partnerships and joint ventures between existing exchanges and newly emerged ones can be mutually beneficial.<sup>7</sup> Newly emerged exchanges can benefit from the technology and know-how of existing exchanges and existing exchanges (their members) can gain access to a potentially high growth emerging market. The

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<sup>6</sup> This is because of several reasons. First, agricultural markets in several emerging economies are lagging behind in terms of liberalization compared to financial markets. Second, financial markets tend to create much more liquidity compared to agricultural markets. For example, during 1996 the Budapest Commodity Exchange increased its liquidity by 400% when it introduced financial contracts (mainly currency) to its existing agricultural contracts. Third, with the globalization of commodity markets the potential for using existing contracts in already established exchanges reduces the need to develop agricultural contracts at local exchanges.

<sup>7</sup> For example, CBOT is forming such joint ventures with exchanges in countries such as Argentina, Poland and Turkey.

development of regional exchanges could improve market liquidity.<sup>8</sup> However, they may be harder to develop as they require high coordination.

- Our empirical results did not provide conclusive indicators related to the degree of market readiness for developing a derivatives exchange.

**Box 2: Why develop a derivatives exchange in an emerging market?**

Benefits of derivatives exchanges are not limited to risk reallocation and price discovery within a country. Additional benefits include, more publicly available information, improved transmission of price and other market-related information, improved credit systems, more responsive capital markets (including providing means for firms to secure further operating capital), higher uniformity in repayment rules and market surveillance, reduced transaction costs, more accurate forward prices and, hence, a better allocation of resources. And in several emerging market economies, the development of derivatives exchanges, along with stock markets, sends a message to international investors that capitalism is not a dirty word.

However, the desirability and effectiveness of a derivatives exchange depends primarily on the state of the country concerned but also on the design of that exchange, and then on the nature of local commodity and financial markets. After all, an illiquid derivatives exchange will very likely not inspire confidence to neither a foreign or even a domestic agent. In several circumstances, rather than setting up their own derivatives exchanges, many emerging economies could do better by using other well established exchanges and listing their products in them. For example, derivative instruments on Latin American stocks are traded in Chicago and not in their countries. Also, regional exchanges could benefit a number of smaller emerging markets.

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<sup>8</sup> The Stockholm-based Options Market (OM) is building a regional electronic exchanges linking exchanges in Norway, Finland and perhaps Denmark.

## **Summary and Conclusions**

The establishment of derivatives exchanges is driven by economic, financial reasons and, in some cases, also by national pride. The global deregulation of financial markets and market liberalization have created new investment opportunities and risks that require the development of new instruments. For example, institutional investors look in other developed and emerging markets for investments and need to hedge their risks from these cross-border transactions. Agents in liberalized market economies are exposed to more risks, such as commodity price and interest rate volatility, and require appropriate hedging products to deal with these risks. And with the economic liberalization in emerging economies, corporations also need better ways to manage financial and commodity risks.

Derivatives markets are, to some extent, complementing developments in the stock markets in many countries. For instance, by the end of 1996, over 78 developing countries have stock markets and their capitalization has increased over ten-fold over the past decade. Also, the number of domestic companies listed has more than doubled. Derivatives exchanges have played a major role in these developments. They have contributed to more balanced allocation of resources, transfer of risk among agents in a country, and even contain risks across countries. Although there are concerns about the explosive growth of derivatives and the risks that they may create, it appears that these exchanges are increasing their business. The global derivatives market continues to grow with emphasis on the introduction of new products.

Derivatives markets facilitate the transfer of risk among economic agents by offering mechanisms for liquidity and price discovery. This function is performed efficiently with proper institutional arrangements and a suitable exchange microstructure. Current research supports the proposition that the core functions in the financial system are the same across time and place, but the institutional arrangements through which these functions are performed are not (Merton and Bodie (1995)). Core functions in the financial system include clearing and settling payments, pooling resources and providing shares to facilitate diversification, transferring resources across time and space, managing uncertainty and controlling risk, providing information for pricing instruments and contracts, and dealing with asymmetric information and agency problems. The functional approach advocates that the institutional form follows function. We apply this conceptual finding at the micro-level for the case of derivatives exchange architecture.

We seek to identify commonalities of organizational infrastructure for derivatives exchanges across countries. Our research is not theoretical. We do not search for models to determine the structure of derivatives exchange as a part of the capital market system in an economy. Nor we are interested in addressing the question of an optimal organizational arrangements which should be provided prior to establishing a derivatives market. The issues of derivatives exchange architecture are important for many of the current policy debates regarding the organization of financial markets. However, we want to provide factual information about elements of exchange microstructure. We address the following questions: How do derivatives exchanges emerge and evolve? What is the spectrum of products offered by these exchanges? What is the typical

sequencing of products introduced in an exchange? What kind of settlement procedures used in a derivatives exchange? How similar are market-making activities of derivatives exchanges? Are there differences in the microstructure of derivatives exchanges? These questions are particularly interesting in the context of the emerging country economies.

It is in this spirit that the study provides factual information about parameters of market architecture of derivatives exchanges. Analysis of a survey instrument of 42 derivatives exchanges reveals that the median number of years an exchange has been in operation is 14 years, with almost 23 percent of the exchanges established after 1990. There is no predominate form of ownership for the derivatives exchanges, although most of them are regulated directly or indirectly through the government via a parliamentary law. The most frequently cited market-making system is based on an open outcry, daily mark-to-market with a gross margining. However, electronic systems are also frequently used either solely or together with mainly an open outcry system. More recently established derivatives exchanges choose electronic trading systems. Only 30 percent of the exchanges organize their clearing facilities through an independently organized entity separately from the exchange. Almost 45 percent of the survey participants indicated that they maintain ownership of clearing facilities while a large percentage of clearing houses maintain multiple ownership. Most of the exchanges use netting in the settlement procedures. We assess the country environment within which derivatives exchanges operate and find no significant differences in proxies of economic conditions between emerging and developed country derivatives. We find, however that proxies for capital market conditions somewhat explain differences between developed and emerging countries, but these differences may be explained by the larger size of capital markets in developed countries. Thus, our analysis does not provide conclusive evidence of the degree of market readiness for the development of a derivatives exchanges and more research is required in this area. Overall the empirical evidence supports the proposition that core functions of a derivatives exchanges while the same across markets are fulfilled with different institutional arrangements.

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<sup>1</sup> BIS reports on derivatives (1992,1993)