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Development and volume growth of organized derivatives trade in emerging markets*

Lourdes Treviño*

Abstract

This paper updates and extends reviews of the development of emerging market derivatives exchanges for a sample of 58 emerging countries and 83 derivatives exchanges from 1999 to 2005. Active exchanges are found in 29 emerging market countries, mostly trading financial products. Volume concentration measures suggest that smaller exchanges have increased their market shares outpacing larger ones. This is confirmed by a clear and significant reduction in the concentration index between developed and emerging market exchanges in favor of the latter. Non-US exchanges have dominated US counterparts, while trade has increasingly concentrated on financial derivatives rather than commodities. Exchange-traded derivatives showed a greater concentration than OTC markets, although these described a faster increase in concentration levels.

JEL Classification: G1; F1

Keywords: Emerging markets, Derivatives exchanges, Derivatives volume.

1. Introduction

At year-end 1999, just as the new millennium started, volume on U.S. futures exchanges had fallen 7%. It was due to an increase of 11% on the non-U.S. exchanges that global volume actually rose 10% that year to total 2.4 billion contracts traded. Six years later, at year-end 2005, global volume stood an astonishing 312% higher at 9.9 billion contracts traded.[1] And, although price discovery and risk management is happening all over the world, the number of active exchanges has not grown. While new exchanges have developed, almost an equal number have disappeared, mainly because of consolidation. Despite a total of 83 different exchanges reported as active by the Futures Industry Association during the period aforementioned, the association reports 58 exchanges in 2005, the same number reported in 1999.

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[1] Figures obtained using data of the Futures Industry Association. Reported percentage changes on US and non-US exchanges volume exclude individual equity contracts.

The first recorded instance of futures trading dates back to the 17th century in Japan, where merchants stored rice in warehouses for future use and sold "rice tickets" against the stored grain in order to raise cash. Eventually, such rice tickets became accepted as a kind of currency.[2] Puts and calls were traded at the London Stock Exchange in the early 1800s.

The futures industry has evolved over the years to give rise to standardized contracts traded in established exchanges. In 1848, The Chicago Board of Trade (CBOT) was founded in the United States and introduced the first traded derivatives contract in 1859 in agricultural products.[3] Over the next few decades a number of other commodities exchanges sprang up and the business expanded to other world latitudes such as Europe, Asia and Latin America.

The biggest increase in futures trading activity occurred in the 1970s, when futures on financial instruments were first introduced. A highly volatile world economic environment stimulated by the adoption of floating exchange rate regimes and the 1973 oil crisis made currency and interest rate risk a growing concern around the world.[4] In 1972, the Chicago Mercantile Exchange introduced the first financial products futures offering futures on the British pound, the Canadian dollar, the Deutsche mark, the Dutch guilder and the Japanese yen. Interest rate instruments such as U.S. Treasury Bonds and T-Bills were also to prove popular. In 1973, the Chicago Board Options Exchange (CBOE) was created and the option pricing formula of Black and Scholes (1973) contributed importantly to the development of the derivatives markets. Later, in the 1980s, stock market indices and weather derivatives began trading.

Just as the 1980s were marked by a rapid expansion of derivative instruments into other developed countries outside the United States, the 1990s was a period of expansion into developing countries and liberalizing economies. By the end of 1999, eleven exchanges in emerging countries were trading derivatives, and the number increased 55% by the end of 2005 when 17 such derivatives exchanges were operating.[5] The establishment of derivatives exchanges in emerging markets has allowed market participants to access local terminal markets. At the same time, these new exchanges

[2] Since the 1600s, options on Dutch tulip bulbs had been issued in Amsterdam and London and, in 1630, futures were traded at the Royal Exchange. However, this market was frugal and plummeted by 1636-37. (See Reuters Limited, 2001)

[3] Although the oldest forward contract recorded at CBOT is a corn futures contract registered on March 13, 1851, this contract lacked the standardization alluded to.

[4] In 1972, the United States left the gold standard and currencies began floating freely.

[5] See section two for the definition of emerging market used for this differentiation.

have lowered transaction costs, enhanced the transfer of local information, and facilitated the geographical transfer of risk and cross-border transactions.

A key feature of the progress experienced by derivatives is the global deregulation of financial markets, which has, in turn, created a climate conducive to new investment and trading opportunities. As a measure of market size, the Bank for International Settlements (2005) reports the notional amounts of OTC (over-the-counter) and exchange-traded positions in derivatives markets.[6] A significantly rapid expansion of the markets is denoted by an extraordinary increase in the OTC markets to 270 trillion US dollar at end-June 2005 from 72 trillion at end-June 1998. Correspondingly, notional amounts in the exchange-traded market climbed to 59 trillion US dollar from 15 trillion in the same period.[7] In average, both markets have experienced an annual compound growth rate of 21%. On the other hand, a measure of market activity, the daily average turnover in the OTC markets jumped from $825 billion in 1995 to $2.4 trillion in 2004.[8] For exchange traded derivatives, daily average turnover increased to $4.7 from $1.2 trillion in the same period.

Several market tendencies may be identified for derivatives when examining different segments. As noted before, the OTC market is bigger in size than the exchange-traded counterpart, although the latter has shown greater activity in the past few years. On the other hand, financial derivatives have grown dramatically during the past two decades, eclipsing the volume of the physical commodity contracts due mainly to the growth of the interest rate segment. As of end-June 2005, financial derivatives represented over 90% of the exchange-traded derivatives volume, whereas 98% of notional amounts of outstanding OTC contracts had financial underlying assets. At the same time, derivatives volume traded outside the United States exchanges increased from 53% to 64% from 1997 to 2005. The explosive growth of derivatives in emerging market countries is partly evidenced by their improved world rankings in global futures and options volume. Seven of the top 20 exchanges where located in emerging market countries by the end of 2005. In contrast, by the end of 1999, only 3 emerging market derivatives exchanges were in this group of countries.

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[6] Notional amounts are defined as the absolute gross nominal or notional value of all deals concluded and still open at end-June of the reporting year of the BIS survey. No distinction is made between sales and purchases of derivatives instruments.

[7] Calculations based on derivatives statistics of the Bank for International Settlements, which have been adjusted for double-counting.

[8] Turnover is defined as the absolute gross value of all deals concluded (but not closed) during a month, and is measured in terms of the nominal or notional amount of the contracts.

Recently, in 2004, the Bank for International Settlements (2004) had the initiative to publish a measure of OTC derivatives market concentration in response to the possible relevance of concentration levels in the performance of the market. For the period 1998-2004, market concentration remained stable or increased slightly. Moreover, larger OTC derivatives markets had lower and more stable concentration indices than smaller markets. The findings of this paper complement these statistics and suggest that volume concentration between derivatives risk categories is higher for exchange-traded derivatives than for the OTC markets, although the latter have shown a greater increase in concentration levels. Furthermore, emerging market derivatives exchanges appear to have been gaining volume share while the share of developed country exchanges has decreased, which is confirmed by a lower volume concentration index between these type of exchanges. US derivatives exchanges have been losing market participation, except for the last two years, whereas financial derivatives dominate both exchange-traded and OTC derivatives.

The vast majority of the research done on derivatives in emerging markets deals with issues related to the valuation and pricing of these instruments (Huang, 2004); issues on the effect derivatives have on the spot price of the underlying asset (Jochum and Kodres (1998), Hernandez-Trillo (1999)); the role of derivatives in the recent financial crises (Ghysels and Seon, 2005); and the risks associated with and mitigated through the use of these products (Ranciere (2002), Bartram, et al (2004), Chan Lau (2005)). However, little has been done on the understanding and description of the structure of this market. Tsetsekos and Varangis (2000) report the results of a survey conducted in 1996 on the microstructure of derivatives exchanges, Fernandez (2003) describes the different legal and regulatory frameworks that operate in Latin American derivatives exchanges, and the UNCTAD (2006) provides an overview of the development of commodities exchanges around the world.[9]

This paper extends previous research in several ways. First, it provides an updated and comprehensive review of the development of derivatives exchanges in emerging markets. The focus is on financial derivatives exchanges, as opposed to commodity exchanges, although the latter are described in the context of global trade aiming to provide an overall understanding of these markets. Second, it identifies the current trends driving the development of these exchanges and highlights the role played by derivatives in emerging market countries. Third, it extends the scope of research on concentration in OTC derivatives markets to exchange-traded derivatives. The paper reports volume concentration indices for exchange-traded derivatives and makes a comparison with OTC markets.

[9] Although dated 2006, this report appears to have information up to 2004.

The remainder of this paper is organized as follows. Section 2 presents an overview of the expansion and development of derivatives exchanges in emerging markets, whereas section 3 identifies some trends characterizing this development. Section 4 examines the roles played by derivatives exchanges in emerging market countries. Section 5 describes the derivatives markets both OTC and exchange-traded and discusses the relevance to calculate volume concentration indices as well as the methodology used. Section 6 reports the results. Finally, section 7 presents the concluding remarks and identifies key issues for further research.

2. The development of derivatives exchanges in emerging markets

The first recorded instance of futures trading occurred with rice in the 17th century in Japan, where merchants stored rice in warehouses for future use and would sell receipts against the stored rice. Organized futures trading started in the United States in the grain markets in the middle of the 19th century -virtually all of the futures exchanges in the United States date from the late 19th or early 20th century, and they all started as commodity exchanges. The Chicago Board of Trade was established in 1848 and introduced the first traded derivatives contract in 1859 in agricultural products. Futures expanded geographically. The London Metal Exchange was founded by metal traders in the City of London at the height of the Industrial Revolution in 1877 to manage their price risk. Over time, almost all developed country exchanges moved towards futures trade (a mechanism for risk transfer), as their services in physical trade (spot and forward) became superfluous. Most of the exchanges that were not able to make this change disappeared.

But the biggest increase in futures trading activity occurred in the 1970s, when futures on financial instruments were first introduced in Chicago. In 1972, the Chicago Mercantile Exchange introduced the first financial products futures offering futures on the British pound, the Canadian dollar, the Deutsche mark, the Dutch guilder and the Japanese yen. In the 1980s, futures exchanges began offering more sophisticated products such as stock market indices, for example the Standard & Poor´s 500, and weather derivatives.

The factors underlying the shift from physical toward futures exchanges can be summarized as follows (UNCTAD, 2006). First, improvements in communications technology has made less important for trades to gather in one place. Second, the growing concentration of trade into the hands of a few large firms has made it easier for these firms to gather information directly. Third, longer-term forward contracts have become possible because of improving creditworthiness of those active in the commodities exchanges. Finally, the introduction of a futures market reduces the relevance of an

exchange as a vehicle for physical trade. This is because the prices generated on the exchange act as a reference for price negotiations between buyers and sellers, and they no longer need to buy or sell the physical goods through the exchange.

Recent years have seen the rapid expansion of new derivatives exchanges and the continuing expansion of existing ones. A large number of new exchanges were created during the past decade in emerging market countries. Not all of them have progressed to the level of futures trading, and many have rapidly disappeared. The following paragraphs describe the development of derivatives exchanges in emerging markets. It is worth noting that the present study does not discuss in any detail the development of trading platforms.[10]

This paper adopts the country classification used by the International Finance Corporation (IFC) given that it is based on the level of development of a country´s stock markets. This, clearly, relates to the subject of this work. The IFC classifies a stock market as emerging if it meets at least two general criteria: i) it is located in a low or middle-income economy as defined by the World Bank, ii) its investable market capitalization is low relative to most recent GDP figures. The term emerging market, then, implies a stock market that is in transition, increasing in size, activity or level of sophistication. Pervasive investment restrictions on foreign portfolio investment should not exist in developed stock markets, and their presence is a sign that the market is not yet developed.[11] Table 1 lists the emerging market countries included in this study. Fifty-eight countries were reviewed, 30 of which currently have derivatives trading at exchanges.

The following pages provide a comprehensive and updated review –as well as relevant statistics- of the active derivatives exchanges in emerging markets by geographic region, both for commodities and financial products. The review was accomplished through the cross-examination of information contained in reports of international organizations such as the United Nations Commission for Trade and Development (UNCTAD, 2002 and 2006), the Futures Industry Association (FIA), the Bank for International Settlements (BIS), the International Monetary Fund, and the International Finance Corporation (IFC). Reports of the exchanges themselves and their websites, and related academic literature were also examined. Additionally, well-

[10] Derivatives exchanges differ from trading platforms mainly because they provide a mechanism (such as a clearinghouse) for intermediating, validating, and enhancing the creditworthiness of anonymous counterparts.

[11] Emerging Stock Markets Fact book, 1999. International Finance Corporation.

known websites on futures and options exchanges were visited and their contents reviewed in detail.[12]

2.1 Latin America

The oldest commodity futures exchanges in Latin America are found in Argentina. The Buenos Aires Futures Exchange- MATBA (Mercado a Termino de Buenos Aires) was founded in 1907 trading forwards on agricultural commodities. Similarly, trading has taken place at the Rosario Board of Trade- ROFEX (Mercado a Termino de Rosario) since 1909. In addition to agricultural commodities, the exchanges currently offer futures and options on currencies, interest rates, and stock indices. Tables 2 and 3 show a list of the derivatives exchanges active in emerging market countries and the products traded.

The first Brazilian institution to offer forward transactions was the Sao Paolo Commodities Exchange (BMSP), which was founded in 1917. As time went by, BMSP established a rich tradition in the trade of agricultural commodities, especially coffee, live cattle and cotton. In turn, the Brazilian Mercantile & Futures Exchange-BM&F (Mercado do Futuros & Mercadorias) was founded in 1985, and within a short time it became the region´s main commodity exchange. In 1991, BMSP and BM&F merged and the new exchange kept the name Brazilian Mercantile & Futures Exchange.[13] The Sao Paolo Stock Exchange (BOVESPA) was founded in 1890 and currently lists company stocks and stock options.

Although the regulatory framework for trading derivatives on exchanges and OTC markets exists in Chile since the mid-1980s, corporations, other than banks and large firms, have used derivatives infrequently to date. Despite the fact that the Santiago Stock Exchange lists futures on currencies and stock indices, as well as stock options, derivatives transactions are composed mainly by OTC operations. According to Fernandez (2003), these low exchange-traded derivatives transactions appear to be the result of low market liquidity and regulatory constraints faced by institutional investors.

In 1994, the Mexican Stock Exchange (Bolsa Mexicana de Valores, BMV) and the Mexican Central Securities Depository (SD Indeval) committed to create the Mexican Derivatives Exchange (MexDer). However,

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[12] Such websites included www.financialpolicy.org, www.numa.com, and www.libraries.rutgers.edu.

[13] Another exchange, the Brazilian Futures Exchange (BBF) of Rio de Janeiro, was founded in 1983. The exchange merged with BM&F to strengthen the domestic commodity market and consolidate BM&F as the major derivatives trading center in Mercosur.

it was not until December 1998 that trading began on MexDer with the support of the central bank, Banco de Mexico, and the ministry of finance. Currently, contracts traded range from futures on the exchange rate (US dollar against Mexican peso), the stock index of BMV (IPC), interest rates, Mexican Treasury bills, government bonds, and individual stocks. As of March 2004, options on individual stocks are also traded.

MexDer is perceived different from other exchanges in the developing world (Mathias, 2006). Unlike other exchanges in developing countries, MexDer no longer demands physical presence in the host country for trading members. Moreover, the structure of the clearinghouse, Asigna, allows smooth clearing and settlement of contracts. An important marked contrast is that, recently, the exchange has worked closely with the government to remove some withholding taxes. Finally, MEFF, the Spanish stock exchange, has a minor shareholding in MexDer and supplies its electronic trading platform to MexDer.

In response to the liberalization of domestic trade, as a mechanism for the organization of domestic commodity trade flows, exchanges in El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Ecuador, Peru and Bolivia were created. The oldest of these, the Colombian Stock Exchange, dates from 1973 and trades futures contracts on the exchange rate versus the US dollar. Options on domestic currency and government bond, as well as the US dollar are traded at the Nicaraguan Stock Exchange. The Ecuador exchange dates from 1986. The others have all been introduced since 1992. Most of the products traded are agricultural and most exchanges provide a forum for the trade in physical commodities. Projects not yet finalized have been proposed in Paraguay, Dominican Republic and Venezuela.

By the end of 2005, there were 7 emerging market derivatives exchanges among the world´s 20 largest futures and options exchanges (see Table 4).[14] The two Brazilian exchanges, BOVESPA and the Brazilian Mercantile & Futures Exchange, ranked eighth and eleventh, respectively, maintaining their positions from the previous year. The Mexican Derivatives Exchange occupied position 15 –down six places with respect to 2004-, and Mercado a Termino de Rosario finished as the 39th-largest exchange in terms of volume. Considering futures volume only, the BM&F ranked fifth and MexDer ranked eighth in 2005. Mercado a Termino de Rosario was the 28th-largest. Interestingly, at least one of the Brazilian exchanges has been participating in the top 20 exchanges –in terms of volume- in the past six years. BOVESPA has outperformed BM&F since 2003 by being part of the top 10 group, as a result of the introduction of equities options.

[14] Ranking is obtained from the Futures Industry Association and is based on the exchange's futures and options volume. See Burghardt (2006).

2.2 Europe

Europe is home to some of the world's oldest and some of the world's newest derivatives exchanges. Not surprisingly, the oldest exchanges in the region are located in advance economies such as the United Kingdom, France and the Netherlands. Many countries had commodities and securities exchanges by the beginning of the 20th century, but during World War II were forced to suspend operations. What follows is a brief account of the development of emerging market derivatives exchanges with an emphasis on the post-war period.

Among the emerging market countries, Turkey has several exchanges which act as physical trading centers. The oldest, Izmir Cotton Exchange, traces its origin back to 1891, and has now an active futures contract on cotton, but keeps trading mainly local. The Istanbul Gold Exchange (IGE) began its operations in 1995 and has three types of market: a physical precious metals market, a futures and options market, and a precious metals lending market. The futures and options market was launched in 1997. The metals traded are gold, silver, and platinum. In 2002, the Turkish Derivatives Exchange (TurkDex), headquartered in Izmir, was granted regulatory approval too introduce futures on currency, interest rates, equity index and commodities –such as cotton and wheat.[15]

The two largest Chicago exchanges, CME and CBOT, have become directly involved in the development of derivatives markets in Eastern Europe. In 1990, leaders of the exchanges signed memorandums of understanding in both Hungary and Russia. These memorandums included various commitments to assist in education and development efforts. Specifically, the two exchanges offered to share technical information and publications, as well as to train personnel.

The Chicago exchanges have had a more visible role in Hungary. The Budapest Commodity Exchange (BCE), launched in 1989, was the first futures market to become operational in Eastern Europe. It began trading in agricultural commodities and later expanded into financial futures products. The Budapest Stock Exchange (BSE), originally established in 1864, launched its derivatives market in 1995 trading futures on stock index, Treasury bills, the US dollar and the Deutsche mark. Standardized options were launched in 2000. In order to implement product harmonization between the BCE and the BSE, the dimensions of the financial futures contracts at the BCE were decreased in 2005, and in September of that year the integration of the two exchanges was announced. The products listed at BCE would trade at the Commodity Section of the Budapest Stock

[15] Equity derivatives were traded in the Istanbul Stock Exchange from 1994 to early 2005.

Exchange. The restructured exchange currently offers, in addition to commodities, currency and interest rate futures as well as equities and index options.

Several commodity futures contracts have been formulated by Russian exchanges. The first one, an aluminium contract, was launched by the Moscow Commodity Exchange in late 1992, and was very successful until 1996. However, a serious financial scandal at the exchange in that year forced the cease of operations shortly after. The fastest growing market is the screen-based derivatives exchange Futures and Options on RTS (FORTS) – created in 2001 after the merger of the derivatives division of the Saint-Petersburg Stock Exchange and the Russian Trading System (RTS). Another exchange, the Moscow Interbank Currency Exchange (MICEX) offers currency futures. Much smaller volumes of financial derivatives are also traded at the Commodity and Stock Exchange Saint-Petersburg and the Saint-Petersburg Currency Exchange (SPCEX), the latter a subsidiary of MICEX.

The modern history of the commodities exchange institution in Romania started in 1992, when the Romanian Commodities Exchange (RCE) was established in Bucharest. RCE is mentioned as the only commodity exchange in Romania which was up to international standards. The financial futures market was launched in 1998 with the introduction of currency futures contracts (US dollar and Deutsche Mark, followed by Euro contracts) and has shown a steady increase of the turnover. A year later, the exchange opened two specialized trading floors for spot markets, one for oil and another for grains. Interest rate futures were introduced in 2000 and, in 2001, the exchange launched options contracts and energy futures contracts. Another exchange, the Sibiu Monetary-Financial and Commodities Exchange (SMFCE), founded in 1997, currently trades futures and options on currencies, cross rates, stock indices and interest rates.

Poland has two established exchanges. The Warsaw Stock Exchange, founded in 1991, started trading stock index and currency (US dollar) futures in 1998. Futures on the Euro, on individual stocks, and on T-notes, as well as individual stock and stock index options have been gradually introduced since. The Warsaw Commodity Exchange, founded in 1995, currently lists commodity futures and, futures and options on currencies and interest rates.

In 1997, the necessary legal framework for the establishment of the formal and organized derivatives market in Greece was provided. The Athens Derivatives Exchange and its clearinghouse have been established for the organization, operation, and development of the market. In 2002, the exchange merged with the Athens Stock Exchange in line with the global trend of mergers between stock and derivatives exchanges. The corporate

name of the new company is Athens Exchange, S.A. and derivatives are traded in the Derivatives Market division (Athens Exchange Derivatives Market–ADEX). The move is aimed to achieve synergies in the activities of the two exchanges, to lower the operation costs and to improve the overall coordination of the two markets. ADEX traded products include futures and options on single stock and stock index, as well as currency and interest rate futures contracts.

Sofia Commodity Exchange, in Bulgaria, trades grain futures. The Bratislava Commodity Exchange, located in Slovakia, trades spot and forward contracts for commodities (wood) and currencies (US dollar). Other commodity exchanges, not trading futures contracts, have been created since 1990 in Ukraine, Lithuania and Estonia. Most of them concentrate on organizing trade for immediate physical delivery. In Estonia, Tallinn Stock Exchange has been authorized to list derivatives although no contracts are yet traded. Both, Tallinn Stock Exchange and Vilnius Stock Exchange (in Lithuania) belong to the OMX group.[16]

The Ljubljana Stock Exchange (LJSE), in Slovenia, began operations in 1924 initially trading securities and commodities (mostly in wood and grain), and later foreign exchange dealing was also allowed. Although trading in stock index futures started to be organized in 2003, it has not began at present.

In the Czech Republic, there have been plans since 1994 to create a commodity exchange to trade precious and non-precious metals, fuels, minerals, ores, timber, among others – a range of products quite different from those normally introduced in emerging economies whose exchanges tend to focus on agricultural commodities. Nonetheless, the Prague Stock Exchanges does not offer derivatives yet.

Compared to their Latin American counterparts, European emerging market exchanges did not fare as well in 2005. The Hungarian exchanges proved to be the most successful, ranking as the world´s 41th-largest (Budapest Stock Exchange) and 55th-largest (Budapest Commodity Exchange) in terms of global futures and options volume. The Warsaw Stock Exchange ended 43th. Based on futures volume only, Budapest and Warsaw stock exchanges were ranked 32th and 34th that year.

[16] OMX group owns the exchanges of Copenhagen, Stockholm, Helsinki, Riga (in Latvia), Tallinn and Vilnius offering access to Nordic and Baltic securities through its stock and derivatives operations.

2.3 Asia-Pacific

Asian derivatives exchanges, both developed and developing, accounted for more than 30% of global futures and options volume in the past two years. Asian share of total volume was 34% and 32% in 2004 and 2005, respectively. Accordingly, emerging market exchanges alone represented 31% and 28% of global volume in those two years.

Most of this substantial market share is owed to the enormous growth experienced by the KOSPI 200 options which rose 208% from 2001 and 2005. KOSPI 200 futures and options contracts are traded at the Futures Markets Division of the Korea Exchange (KRX). Only KRX´s volume accounted for over one fourth of global futures and options volume in 2005 (26%) and about 70% of emerging market derivatives volume. KOSPI contracts were originally introduced and traded at the Korea Stock Exchange (KSE), but were acquired by the Korea Futures Exchange (KOFEX) in January 2004. These two exchanges merged in 2005 to become Korea Exchange.

China hosts several active derivatives exchanges. The first official centralized marketplace was the China Zhengzhou Grain Wholesale Market which opened its doors in 1990. In the beginning, the Market was a center for spot and forward transactions on grains, which gradually transformed into futures contracts. In fact, futures operations started in 1993. Recognizing this change, the Market was later divided into two divisions –a cash market and a futures market. In 1999, the markets were formally separated into the Zhengzhou Grain Wholesale Market and the Zhengzhou Commodity Exchange.

Although Zhengzhou was the first exchange, it was not the only one in China. After the decision of the Chinese government of creating a central market place in 1988, over 40 futures exchanges had emerged by late 1993. Multiplicity of exchanges and overlapping of products were of great concern for the Chinese government. This, in turn, led to a reform that reduced the number of exchanges to 15 over the subsequent five years. A second reform, in 1998, further decreased the number of exchanges bringing it down to today´s three.[17] The Shanghai Futures Exchange (SHFE), the largest one, was established in 1999 after the merger of the Shanghai Metal Exchange, the Shanghai Cereals and Oil Exchange and the Shanghai Commodity

[17] See Xuequin & Ronalds (2005) and Xuequin & Gorham (2002) for a detailed description of the consolidation process undergone by the Chinese exchanges.

Exchange.[18] The other two are the Dalian Commodity Exchange (DCE) - founded in 1992- and the Zhengzhou Commodity Exchange (CZCE).[19] There are four futures products listed on the SHFE: copper, aluminium, natural rubber, and fuel oil.[20] DCE trades soybeans, soy meal and corn futures, whereas CZCE trades wheat, cotton and sugar.

Two eagerly awaited product classes are options and financial futures. On the one hand, all three exchanges are making efforts to get approval for the introduction of options on commodities and options on futures. On the other hand, The Chicago Mercantile Exchange signed, in 2004, a memorandum of understanding with the China Foreign Exchange Trading System and the National Interbank Funding Center to work toward the establishment of foreign currency derivatives in China. Stock index futures are also under active discussion.

Due to restrictions on settlement and trading, China poses a great challenge to foreign participants. It is significant that there is no cash settlement. Thus, the underlying commodity must be delivered within the prescribed time at the specified date. Moreover, at present, no person or entity outside China can trade on a Chinese exchange. Therefore, the most direct route for a foreign firm is to buy into a Chinese exchange member.

Commodity futures markets have a long history in India. The first organized futures market for various types of cotton appeared in 1921. In the 1940s, trading in forward and futures contracts as well as options, was either outlawed or made impossible through price controls. Trading on organized futures was finally regulated in 1952, but shortly after, in the 1960s, the government banned or suspended trading in several commodities.

India's largest derivatives exchange, the National Stock Exchange of India (NSE), was recognized as a stock exchange in 1992. The NSE commenced operations in the wholesale debt market segment in 1994. Later, that same year, the capital market (equities) segment started trading. Operations in the derivatives segment commenced in mid-2000. After such a short period of derivatives trading, the NSE became the 7th-largest exchange

[18] The original date of establishment of the Shanghai Exchange (alone) is 1992, but 1999 is the year it officially started operations after the market contraction (mergers) occurred between 1998 and 2000.

[19] At year-end 2004, on a notional value basis, the SHFE led the market with a share of 57%, followed by DCE (35%), and the CZCE (8%). Nevertheless, in terms of contract volume, Dalian's market share was 58%, whereas Shanghai had a 26% and Zhengzhou 16%.

[20] The Shanghai Gold Exchange, launched in 2002, trades primarily with gold (and platinum) for physical spot-priced delivery. It intends to expand further with derivatives products, moving into forwards.

in the world -in terms of futures volume- at year-end 2005. Other exchanges include the Bombay Stock Exchange, which offers futures and options on individual equities and a stock index, and the Multi Commodity Exchange of India Ltd. (MCX), which was inaugurated in 2003 and trades commodity futures such as agricultural and energy products, as well as plastics. The Bombay Commodity Exchange Ltd. offers futures contracts for agricultural products such as oil seeds and oils.

In Indonesia, the Surabaya Stock Exchange (SSX) opened officially in 1989. To serve as a one-stop financial center, in 2001 the exchange introduced the Derivatives Market. The market offers stock index futures on both domestic and international stock indices. Non-financial products are traded at the Jakarta Futures Exchange (JFX), which was established in 1999 and licensed to operate one year later. The exchange is designed as a multi-commodity futures exchange to serve the needs of the local market. Currently, the exchange trades futures on gold and olein.

The Malaysia Derivatives Exchange (Bursa Malaysia Derivatives Berhad) was created in 2001 as the result of the merger between the Commodity and Monetary Exchange of Malaysia (CONMEX) and the Kuala Lumpur Options and Financial Futures Exchange (KLOFFE). The prevailing products traded at the exchange include index futures and options, as well as interest rate and oil futures.

Taiwan Futures Exchange (TAIFEX) was established in 1998. It is now on the list of the fast-growing markets judging from its world ranking on trading volume which rose to 18th in 2005 from 48th in 1999. The exchange currently offers futures and options on major Taiwan stock indices, government bond futures, equity options and interest rate futures. Additionally to these financial products, the exchange trades gold futures.

The Thailand Futures Exchange Plc (TFEX) is a subsidiary of the Stock Exchange of Thailand (SET) and was established in 2004. TFEX is intended to lead the financial derivatives market in Thailand and is allowed to trade futures, options, and options on futures on underlying products which include equity indices, debt instruments and interest rates, and non-agricultural commodities and other financial indices (e.g., gold, crude oil and foreign currencies). Nonetheless, the only contract traded to date is the SET50 Index Futures. On the other hand, commodities are traded at the Agricultural Futures Exchange of Thailand (AFET). In 1999, the necessary provisions were enacted for the exchange to be established. AFET launched its first futures trading with natural rubber in 2004 followed by rice (the same year) and tapioca starch in 2005.

In Pakistan, the National Commodity Exchange Limited (NCEL) is the first futures commodity market in the country. Although it was incorporated in 2002, its approval to commence trading has not been yet received. Initially, NCEL will provide trading in gold, cotton, sugar, rice, and wheat. In a second phase, NCEL will also list financial futures contracts. The exchange is in the process of changing its name to Pakistan Commodity Exchange Limited to give it an international projection.

The Kazakhstan Stock Exchange deals in a small number of futures contracts on foreign currencies such as the US dollar and the Euro. In the Philippines, the Manila International Futures Exchange was active from 1985 to 1996, but was then closed down by government regulators. The Philippine Stock Exchange currently trades warrants. Projects to start commodity futures exchanges in Sri Lanka, Vietnam and Kyrgyzstan have been subject of debate, but little progress has been made so far.

2.4 Middle-East

Some of the least developed derivatives exchanges among the emerging markets are found in the Middle-East. In terms of volume, the most successful exchange is the Tel-Aviv Stock Exchange (TASE) ranked 21st among the world exchanges in 2005. TASE began operations in 1953 purely as a stock exchange. The TASE derivatives market opened in 1993, improving the investment community's ability to manage risk. The exchange currently offers put and call options and futures contracts on the domestic stock index and the local currency (shekel) exchange rate versus the US dollar and the Euro. Short-term interest rate futures are available as well. Since 1999, derivatives products are traded on a fully automated platform.

The Dubai Gold and Commodities Exchange (DGBX) is set to become the first international commodities derivatives market place in the time zone between Europe and the Far East. DGBX is a joint venture between Dubai Metals and Commodities Center (physical commodity market), Financial Technologies India Ltd (provider of electronic platforms) and Multi Commodity Exchange of India Ltd. DGBX provides trading in futures and options on a wide range of commodities such as gold, silver, energy, freight, steel and cotton. The exchange commenced operations in late 2005. Another exchange, the Dubai Mercantile Exchange (DME) is scheduled to open in 2006 and would be the first energy (crude oil) futures exchange in the Middle-East.

There are two futures exchanges in Iran –the Tehran Metals Exchange inaugurated in the fall of 2003, and the Agriculture Stock Exchange inaugurated a year after. The former trades futures on aluminium and copper, and the introduction of precious metals such as gold and silver is under

analysis. The latter awaits the commencement of its operations on agricultural commodities.

2.5 Africa

Alexandria's futures market (in Egypt) is one of the oldest in the world. The first locally recorded cotton transaction took place in 1865 in Alexandria's Café de l'Europe. It was there that cotton merchants met and cut deals based on supply and demand. Over the years, business grew and, in 1899, Alexandria Cotton Exchange was created. In 1909, cotton forward contracts were legalized. However, after a series of agrarian reform laws, the Bourse was nationalized in the 1950s and subsequently abolished. Initiatives about the re-introduction of the exchange are revived from time to time.

The development of exchange-traded derivative instruments in South Africa started in the late 1980s. The South African Futures Exchange (SAFEX) was informally launched in 1987 and over the years evolved as a leading emerging market. While for a long time the exchange only traded financial futures –including options on futures- and gold futures, the creation of the Agricultural Markets Division in 1995 led to the introduction of a range of agricultural futures contracts for commodities such as maize, wheat and sunflower seeds. Options on agricultural products were launched in 1998. In 2001, JSE Securities Exchange, in South Africa, absorbed SAFEX to become Africa's most active and important commodity exchange. JSE agreed to retain SAFEX branding and to create two divisions: SAFEX Financial Derivatives and SAFEX Agricultural Derivatives. As a result, JSE added to its own single-stock futures contracts, index futures and options, and some commodities futures.

The Zimbabwe Agricultural Commodity Exchange (ZIMACE), which was established in 1994, was Africa's first agricultural commodity exchange. According to the exchange's own information, volumes of commodities traded have increased by an annual average of 35% since its opening. The exchange currently trades spot and forward contracts on maize, soy and wheat.

In Kenya, an agricultural commodity exchange, the Kenya Agricultural Commodity Exchange (KACE), was established in 1997, as a forum for trade in spot and forward contracts for a range of commodities. A number of other countries are looking into the possibility of introducing commodity exchanges such as Côte d'Ivore, Ghana, Uganda and Morocco. Some other, like Malawi, Zambia and Nigeria have had short-lived exchanges for which factors including inappropriate trading software, staff training and government intervention undermined their success.

In the light of unsuccessful attempts to establish a commodity exchange in some countries coupled with the initiative of some other to investigate the possibility of establishing one, the Pan African Commodities and Derivatives Exchange proposal aims to offer the producers and traders of African commodities a vehicle to achieve international trading standards. PACDEX, as it is short-named, is intended to create a centralized market across Africa for offering derivatives in all the lawfully traded commodities (including currencies). The proposal is currently under approval.

3. Trends in emerging market exchanges

The review presented in the previous section draws attention to four trends. The first is the consolidation of exchanges within countries. This process can occur either as a result of privately coordinated mergers and acquisitions between exchanges, such as the case of the Malaysian exchanges or as the result of government intervention, exemplified by China. Where exchanges do not merge, they often share platforms as is the case between MexDer in Mexico and MEFF in Spain.[21] The continuing globalization of derivatives markets coupled with the improving communications technology are likely to foster the process of exchange consolidation in the future.

A second trend that can be identified is the increasing cooperation denoted by the signing of memoranda of understanding (MOUs) between exchanges in different countries. It was mentioned earlier, that the Chicago exchanges, CBOE and CBOT, have greatly contributed to the development of the exchanges in Hungary and Russia. Other examples are the MOUs signed between the Zhengzhou Commodity Exchange in China with Winnipeg Commodity Exchange (Canada), and with the Japanese Kansai Agricultural Commodities Exchange. MOUs serve a variety of purposes but commonly include personnel training, sharing of internet-based trading platforms, joint listing of products, as well as information sharing for the development of contract specifications, clearing and settlement procedures. The abovementioned cases of Dubai Gold and Commodity Exchange and the Pan African Commodities and Derivatives Exchange represent the utmost illustration of cooperation among exchanges.

[21] The trend toward consolidation started in developed countries exchanges. For example, EUREX is the merger of Germany and Switzerland exchange, and Euronext.LIFFE is the merger of the exchanges of Brussels, Paris, Lisbon, Amsterdam, and London-derivatives only. On the other hand, other emerging market exchanges –not currently trading derivatives- such as Riga, in Latvia, Tallinn, in Estonia, and Vilnius, in Lithuania share trading platform with the exchanges of Stockholm, Copenhagen, and Helsinki and the six exchanges conform the OMX group.

These two trends seem to be related to each other and to be best explained by two causes: competitive pressures and technological advance (UNCTAD, 2006). Competitive pressures force exchanges to adopt a demand-driven approach to listing products and to focus on their comparative advantages (e.g., avoid duplication of products, allow national vs. regional exchanges, and locate trading in one area to take advantage of economies of scale). Technological improvement –increased availability, decreased cost- is the means through which competitive pressures are transmitted.

The third trend refers to a preference for financial over commodity derivatives products. Most of the recently created exchanges in emerging markets trade financial derivatives or both commodity and financial products. This contrasts with older exchanges which usually started just as commodity exchanges. Tables 2 and 3 show that while there are 29 exchanges trading financial derivatives (sometimes combined with commodities), there are 16 exchanges trading only commodities in emerging markets.[22] Several reasons explain this. First, the liberalization of commodities markets has increased the pass-through of international commodity prices to domestic commodities, making the use of derivatives contracts traded abroad feasible for domestic hedgers. Second, financial markets are more country specific and the demand for derivatives instruments stems mainly from domestic users.[23] Finally, financial derivatives attract relatively higher liquidity than commodity derivatives as evidenced by the trading volume of each type of instrument. As of end-2005, financial derivatives represented about 90% of total exchange-traded volume of derivatives.

Fourth, in line with a recent world trend, emerging market derivatives exchanges have undergone the process of the demutualization (UNCTAD, 2006). This implies the segregation of trading rights and membership rights and allowing outside ownership of the exchange. Earlier, the exchanges functioned as mutual cooperative organizations and profit was not the foremost objective of the exchange. But in a demutualized corporate governance structure profit is one of the basic objectives as in the case of any corporate entity. According to Saha (2005), by 2001, most of the stock exchanges throughout the world had demutualized or were in the process of

[22] This figures exclude two exchanges. Slovenia has an organized derivatives exchange, but is not currently trading. Pakistan's exchange is awaiting approval to commence derivatives operations.

[23] There are some exceptions to this statement. For example, the Nikkei 225 is traded on the CME, while Italian and German bonds are traded on the London International Financial Futures Exchange (LIFFE), and the Brazilian real and the Mexican peso trade on the CME.

getting demutualized. Exchanges in India and the new DGCX, have undergone the process of de-linking the trading rights and ownership rights, effectively addressing concerns regarding perceived and real conflicts of interest.

4. The role of derivatives

4.1 Derivatives products

It is widely accepted that the primary function of the derivatives market is to facilitate the transfer risk among economic agents by offering mechanisms for liquidity and price discovery. A contract is liquid when it can be traded quickly, at low cost, and with the minimum loss in its intrinsic value. Derivatives are a vehicle for price discovery because price level accurately reflects the underlying conditions in the market. As discussed later, this attribute of derivatives is directly linked to the existence of exchanges. In a well-designed derivatives market, resources are efficiently allocated and risk-sharing arrangements are optimum.

According to Ilyina (2004), financial derivatives are essential for the development of efficient capital markets because of their contribution to a more efficient capital allocation, facilitation of cross-border capital flows, and creation of opportunities for portfolio diversification.

Garber (1998) and Dodd (2001) argue that the rapid expansion of derivatives products during the past decade was one of the key factors that facilitated the rise of global cross-border capital flows. By allowing market participants to unbundle and redistribute risks associated with traditional cross-border investment vehicles, derivatives made such investments more attractive, thereby increasing net flows and creating more opportunities for portfolio diversification.[24]

For example, currency derivatives are typically used by foreign investors to hedge foreign exchange risk associated with their local currency exposure (issued loans) in emerging markets. Similarly, local investors use these instruments to manage foreign exchange risk associated with external funding. Thus, the level of external fund-raising by local entities is supported by the availability of currency hedging instruments.

Likewise, swaps give borrowers an opportunity to exploit their comparative advantages for borrowing fixed versus floating rates in different

[24] Traditional cross-border investment vehicles include loans, bonds, and equities, among others, which can potentially expose both lenders and borrowers to foreign exchange, interest rate, market, credit, and liquidity risks.

markets.[25] Therefore, they may encourage borrowers to seek external financing at more favorable terms instead of borrowing locally, thereby generating cross-border flows.

Finally, credit derivatives represent another class of instruments that can potentially increase net flows into emerging markets. They allow investors (or lenders) to manage the default (or bankruptcy) risk without having to buy or sell the underlying security. Some analysts argue that onshore credit derivatives in emerging markets could encourage international banks to increase their exposure to local corporate clients.

Despite a growing acceptance that derivatives can contribute to the efficiency and stability of local financial markets, regulators in a number of emerging markets remain concerned about the potential risks involved in using instruments that have often been associated with financial crises. Nonetheless, as noted by the IMF (2002), financial derivatives have at times magnified volatility and the effects of a financial crisis, but they were seldom the cause of the crises themselves. The crises in the 1990s have shown that, it was not the use of derivatives per se, but the underlying weakness in domestic and global financial system as well as shortcomings in macroeconomic policies the origin of the problem.

The possibility that the rapid growth of derivatives may outstrip the risk management capabilities of end users and the supervisory capabilities of regulatory authorities is nevertheless a legitimate concern. While recognizing the positive role that can be played by derivatives, they can also allow market participants to take on excessive leverage, avoid prudential regulations, and manipulate accounting rules when financial supervision and risk management systems are weak or inadequate.

Several recent emerging market crises may illustrate the role of derivatives in financial crises. In the Mexican crisis of 1994-95, using swaps, local banks established leveraged positions financed by short-term US dollar loans from their offshore counterparties. In the face of rising political uncertainty and weakening fundamentals, authorities were forced to float the peso, which triggered margin calls on Mexican banks and further added pressure on the exchange rate. The Asian crises of 1997-98 were similar. Unhedged currency and interest rate exposures were key determinants of the severity and scope of the crises. The well-known poor state of Russia's fiscal accounts by mid-1998 and the surprising moratorium announcement later

[25] A plain-vanilla swap, for instance, allows the borrower with a floating interest rate loan or bond to hedge the interest rate risk by swapping floating rate payments for fixed-rate payments. Payments are calculated over a notional amount denominated in a single currency.

that year outlined the Russian crisis of 1998. These events highlighted the presence of convertibility risk even when local currency positions in emerging markets were hedged. In contrast to the Russian crisis, the Argentine default and devaluation in 2001 were widely anticipated and occurred at a time when the credit derivatives market was relatively more mature.[26]

In sum, the use of derivatives products by emerging market participants has made crisis dynamics in some recent episodes more unpredictable by accelerating capital outflows, amplifying volatility, and, in some cases, increasing the correlation between asset and currency markets. However, frequently, the negative impact of derivatives was either due to weak prudential supervision or to the immaturity of local derivatives markets, which allowed some financial institutions to build up leveraged positions before the onset of a crisis.

4.2 The role of derivatives exchanges

Whilst derivatives instruments have become more sophisticated in both form and application, commodity exchanges perform important functions that benefit producers, processors, traders and users of commodities in the developed as well as in the developing world. Derivatives exchanges contribute to the development of the financial infrastructure of a country by providing the links among cash markets, hedgers, and speculators.

Derivatives exchanges reduce transaction costs by concentrating sellers and buyers in one place. Cost reduction takes the form of the cost not incurred in the search for a suitable counterparty. Moreover, assuming that all market participants can have equal access to a neutral price level, the exchanges also provide price transparency.

The World Bank suggests (Tsetsekos and Varangis, 2000) that there are two distinct benefits to be gained from establishing a derivatives exchange in a local emerging market as opposed to using already established developed exchanges: improved price discovery and higher correlation between the prices of derivatives products and cash prices.

Firstly, in many lesser-developed countries, asset price determination is poor. A derivatives exchange aids this process by providing better and more

[26] See Dodd (2001), Garber (1998), and Ilyina (2004) for a more detailed description of the role of derivatives in these crises.

transparent information on market prices, both current and future.[27] Secondly, the presence of an exchange is more likely to lead to a better correlation between the local cash market and the price of the exchange derivatives, than derivatives on overseas exchanges. Related to this is the potential advantage of the contract being denominated in local currency, thus removing exchange rate risk.

There are other benefits in having a successful local exchange. A country's financial infrastructure is likely to be enhanced, as the exchange draws in a wider range of participants. Further benefits could be realized if the establishment of an exchange leads to a general increase in standards of market regulation. A successful exchange adds to the prestige of its host city and country. There will also be a direct economic benefit (although it is likely to be small) from the job creation possibilities and investment a successful exchange could bring.

5. Derivatives volume growth and distribution

While the number of exchanges remained unchanged, exchange-traded derivatives volume grew 312% between 1999 and 2005. However, this growth has not been evenly distributed among the active exchanges nor the different products traded. Table 5 shows the global options and futures volume traded differentiating between US and non-US exchanges. As illustrated by figure 1, the share of non-US exchanges has been increasing, except for the last two years. On the other hand, financial derivatives´ market share has been gradually rising at the expense of the non-financial products, as can be seen in table 6 and figure 2.[28]

Moreover, given the described trend toward consolidation experienced by the derivatives exchanges, it would naturally be expected a larger share for the merged exchange. Table 7 shows that the volume market share of the top-10 exchanges increased in the period 1999-2005. These exchanges accounted for 71% of world volume in 1999, whereas this share increased to 80% by year-end 2005. For the same period, the top-five exchanges accounted for 53% and 64% of world volume, respectively.

One way to account for the disproportionate growth of derivatives volume among exchanges and products is to use an index such as those used

[27] This is, however, not particularly relevant for the gold market, where there is a widely-known benchmark international price, but it might be relevant, for example, to the ferrochrome market, in South Africa, where prices are set by producers.

[28] Although financial and non-financial products serve different risk-hedging needs and are, therefore, not direct substitutes, the emphasis here is to denote the different speed at which these two market segments have been growing.

to measure market concentration.[29] This index is useful in that it can provide an easy graphic tool to identify exchanges or products that have outpaced other. However, caution should be given to the interpretation of such index here because exchanges, especially those located in different countries, may not necessarily be competing directly, i.e., offering the same products. Therefore, a higher index may not be indicative of an exchange or a group of exchanges growing at the expense of other, but rather the result of the volume increase of the products traded at the exchange or the inclusion of new products which cause the increase of market share of an exchange. In fact, it is argued that one of the reasons local derivatives exchanges exist in emerging markets is that they provide differentiated products which are not found in developed exchanges. For the purposes of this work, market concentration indices will be interpreted as "volume concentration indices" and they will indicate a more than proportional increase in the volume share of a given exchange, group of exchanges or products.

Hannah and Kay (1977) propose several criteria that a concentration index should meet. The more important are: i) higher levels of concentration are represented by one concentration curve lying entirely above another,[30] ii) mergers increase concentration, and, iii) a new entry increases the number of firms and therefore decreases concentration, but if the new entrant has a sufficiently large market share, it could increase concentration.

The Herfindahl index –or Hirschman-Herfindahl Index, HHI, as known in the industrial organization literature- is a simple, yet sophisticated way of measuring industry concentration.[31] The HHI has been extensively studied in relation to industrial concentration, and it is known to have several important properties in line with those discussed above.[32] The index is obtained by squaring the market share of the various players, and then adding up those squares. It takes values between the reciprocal of N -the number of market players- and one. If the market share of a player is increased at the expense of decreasing the share of a smaller player, the index will increase. If, on the contrary, a market share is increased at the expense of decreasing that of a larger player, the index will, then, be decreased.

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[29] A concentrated industry or market would be that in which there are relatively few firms operating, interdependence is more readily recognized, cooperation is facilitated, and cheating will be more easily detected. Such industries are therefore more likely to generate collusion, explicit or otherwise, and reap higher profits.

[30] The concentration curve is constructed by plotting cumulative shares of market output attributable to the largest 1,2,3…*n* firms in the market.

[31] See, Hirschman (1964).

[32] See, for example, Shy (1995), Tirole (1995), Cowell (1995), and Encaoua and Jacquemin (1980)

In order to examine how concentration relates to the notion that higher volume -or notional amounts outstanding- in fewer hands means more concentration, it must be consistent with the notion that maximum concentration occurs when trading takes place at a single exchange (or for a single derivative instrument) and the minimum is when all exchanges (or all instruments) have the same amount of trading.

Following the BIS methodology, the Hirschman-Herfindahl index HHI(*p*,*k*) for a market with *k* exchanges (or derivatives categories), each with a market share p_i, where *i*=1 to *k*, is given by:[33]

$$HHI(p,k) = 10{,}000 \times \sum_{i=1}^{k} p_i^2 \qquad (1)$$

where

$$p_i = \frac{Size\ of\ element}{Total\ market\ size} \qquad (2)$$

As explained later, the size of the element will be measured by either the volume traded or the notional amounts outstanding. The "element" will refer either to an exchange or groups of exchanges, or to a type of derivative (e.g., financial *versus* non-financial, currency *versus* interest rate or equity-linked, OTC *versus* exchange traded).

The maximum concentration occurs when, for some *i*, one has that $p_i = 1$, and, therefore, the maximum value of the index is 10,000. On the other hand, the minimum concentration occurs when $p_i = \frac{1}{k}$ for *i* = 1,2…..*k*, and the measure will have the minimum value of 10,000/k.

5.1 Volume concentration indices for exchange traded derivatives

[33] As of end-June 2004, the BIS started releasing statistics on concentration measures in the context of the semiannual OTC derivatives statistics. The central banks of the G-10 countries provided the BIS with data back to June 1998, including concentration measures for foreign exchange, interest rate and equity-linked derivatives. In order to be able to compare the results for exchange traded derivatives with the OTC markets concentration indices published by the BIS, the sum of squared market shares is multiplied by the constant 10,000 to obtain the HHI.

Seven different HHI, concentration indices, are calculated for exchange traded derivatives using different segmentations. The period under analysis depends on the availability of data for each segment of the market. The HHI calculated are:

1) Annual volume concentration between derivatives exchanges in terms of the number of contracts traded in each exchange with respect to the global futures and options volume (i.e., market share). The period analyzed is 1999-2005. The number of exchanges varies from 52 to 58 in a given year of the period. Volume is the total of futures and options contracts, including options on individual equities.[34]
2) Annual volume concentration index between developed and emerging market exchanges, in terms of options and futures volume. The period of study is 1999-2005. Calculations are based on the previous definition of volume. The classification of the exchanges follows the country classification given in section 2.
3) Annual volume concentration between countries for the period 1999-2005.
4) Annual volume concentration in the global derivatives market between US and non-US exchanges, in terms of volume. Data are available for the period 1997-2005.
5) Annual volume concentration between financial and non-financial products, in terms of volume. The period analyzed is 2000-2005.
6) Semiannual volume concentration in the financial derivatives both within the OTC markets and the exchange-traded derivatives, using as market share the notional amount outstanding by risk category (i.e., foreign exchange, interest rate, and equity-linked derivatives). Data are available semiannually for the period June-1998 to June-2005.[35] And,
7) Overall semiannual volume concentration index for financial derivatives between OTC and exchange-traded markets.

A note should be made on the classification of exchanges as emerging or developed. As described before, this paper follows the IFC country classification described in the 1999 edition of the *Emerging Stock Markets Fact book*. The classification of the exchange is not allowed to change over time. That is, the classification given to the country in which the exchange is located in 1999 is kept throughout the sample period. In this way, we keep

[34] Volume data are obtained from various issues of the Futures Industry Magazine published by the Futures Industry Association.

[35] Semiannual data on notional amounts outstanding are taken from the derivatives statistics of the Bank for International Settlements (BIS) available at www.bis.org.

the group of emerging market exchanges constant (at least by definition, because some will become active or inactive at different points in time) and should be able to capture the flow of trade from one group to another allowing for comparisons between the levels of the concentration indices. The results are presented in the next section.

6. Results

Table 8 and figure 3 show the HHI for the global futures and options derivatives, which test for volume concentration between exchanges. The results show that for the period 1999-2003, a decrease in the number of exchanges actively trading derivatives coincided with an increase in the level of concentration. During that period, some exchanges such as Paris Bourse, Brussels, LIFFE, and MEFF Renta Fija and Renta Variable merged with existing ones or to create a new exchange. Others, such as Cantor Exchange or Mercado a Termino de Rosario ceased or suspended operations due to financial distress caused by external shocks. Interestingly, even though the period 2003-2005 is characterized by a stable number of exchanges, the concentration index declined suggesting that volume growth has increased more than proportionately in smaller exchanges as compared to some of the larger exchanges. As will be discussed later, this is also the period when many emerging market derivatives exchanges were established and their operations were included in international statistics.

Table 9 presents the Hirschman-Herfindahl Index between developed and emerging market exchanges. As shown, the number of emerging derivatives exchanges internationally recognized increased 55% between 1999 and 2005, from 11 to 17 exchanges and the volume share of developed exchanges decreased from 91% to 63% in that period. Previous results are confirmed by a clear and significant reduction in the concentration index during the past six years, indicating an increasingly important volume growth at emerging market derivatives exchanges which has outperformed the growth of developed countries exchanges. This can be graphically seen in figure 4. It should be noted that, compared to the previous index, concentration measured in this way is much closer to the minimum level of the index (5000), thereby reflecting a more uniform volume distribution between developed and emerging exchanges. The higher level of the index, of course, also results from the fact that, for the purpose of this calculation, only two market participants exist.

It might be argued that the above described trend is the result of the explosive growth of trade in the KOSPI 200 at the Korea Exchange.[36] To test whether trade at other emerging market exchanges has also induced the

[36] The growth of the KOSPI 200 contracts was discussed in section 2.3.

decline in the concentration index, HHIs were recalculated both using Korea as an individual market participant and excluding the country from the calculation.[37] The results are shown in Table 10 and figure 5. It can be noted that, even when Korea is excluded from the analysis, the concentration in the exchange-traded derivatives falls suggesting that a larger share of derivatives volume growth has been captured by emerging market exchanges.

It is worth analyzing volume concentration between emerging market exchanges only. The upper panel of table 11 and figure 6 show an increasing concentration index from 1999 to 2002 followed by a decline thereafter. This reflects the Korea Exchange's volume share which rose from 45% to 90% for the period 1999-2002 which subsequently fell to 70% in 2005. However, when Korea Exchange is excluded from the calculation, it is noted that volume trading has been more evenly distributed among emerging market exchanges which results in a steady decline in the concentration index.

According to the FIA volume reports, during the period 1999-2005, there were 83 different derivatives exchanges operating at different points in time in 32 different countries, both developed and emerging. The bottom panel of table 11 reports the concentration indices for derivatives volume between these countries. The relative stability of the overall index displayed in figure 7 may be misleading. Although the index has barely increased, it reflects high concentration of volume among few countries. For example, the United States has kept a volume share of over 30% during the period, Germany and Switzerland (as Eurex) have had a share higher than 12%, and Korea which had a share of 4% in 1999 ended with a share of 26%. Among the emerging market economies, exchanges in countries such as Brazil, South Africa, and most recently, Korea, have experienced a decreasing rate of volume growth, whereas smaller derivatives markets in countries such as India, Israel, China and Mexico have shown higher rates of derivatives growth. This has resulted in the reduction of volume concentration indices between this group of countries.

The results for volume concentration between US and non-US exchanges, and between financial and non-financial derivatives are presented in table 12 and figure 8. When considering two market players, US and non-US exchanges, volume concentration in the derivatives market has increased since 2000, and although the index has decreased in the last two years, the level has not returned to pre-2000 levels. Attention should be drawn to the fact that non-US exchanges have been the dominant players in the period analyzed, in terms of volume share. The results suggest that the introduction of new non-US exchanges, both developed and emerging, has led to an

[37] When applicable, both exchanges were excluded: Korea Stock Exchange and Korea Futures Exchange.

increase in trading volume in this group of exchanges at a higher pace than the US counterparts, thereby increasing the concentration index until 2003. Partly, the explosive growth of the Korea Futures Exchange and EUREX has driven the trend between 2000 and 2003. On the other hand, the largest Chicago exchanges (CME, CBOE, and CBOT) have regained presence in the market and have influenced the decline of the index in the last two years.

In regard to the volume concentration between financial and non-financial derivatives, a slightly different trend is witnessed. As referred to before, volume growth of financial derivatives has been outperforming non-financial products, which has resulted in a steady rise of the concentration index between 2000 and 2005. The greatest increase is observed between 2000 and 2001 largely due to interest rate and equity trading. Moreover, volume concentration in financial derivatives is higher than concentration in non-US exchanges as shown by the level of the indices.

Having ascertained the importance of financial derivatives, let us turn to the examination of the volume concentration for these instruments in both exchange-traded and OTC markets. Tables 13 and 14 show the results. It can be noted that interest rate derivatives is by far the largest category in both markets followed by equity-linked instruments in the exchange-traded market, and by foreign exchange derivatives in the OTC markets. Hirschman-Herfindahl indices reflect a higher concentration in the exchange-traded markets as compared to OTC markets for every quarter in the sample period. Both markets described and upward tendency (increasing concentration), although the trend is clearer in the OTC markets (see figure 9). In addition, OTC markets showed a greater increase considering the whole period from end-June 1998 to end-June 2005. While OTC concentration index rose by 34%, exchange-traded concentration index did only by 5%.

While these findings indicate a fast growing trade of interest rate derivatives in the OTC markets, the BIS (2004) reports that, for the period end-1998 to mid-2004, concentration for contracts between reporting financial institutions in the main OTC derivatives markets (foreign exchange, interest rate and equity-linked) either remained stable or increased slightly.[38]

[38] The BIS reports Herfindahl index for the OTC derivatives markets, based on counterparty, risk category and type of contract. As of end-June 2004, the BIS started releasing statistics on concentration measures in the context of the semiannual OTC derivatives statistics. The central banks of the G-10 countries provided the BIS with data back to June 1998, including concentration measures for foreign exchange, interest rate and equity-linked derivatives.

Table 15 presents the concentration indices by risk category in the exchange-traded derivatives markets in terms of volume instead of notional amounts outstanding. It is shown that equity products are the predominant instrument instead of interest rate instruments as reported with notional amounts. The concentration measure, HHI, indicates that, from 2000 to 2005, concentration level increased over 20% due precisely to the rise in equity trading. These results are, therefore, in concordance with those obtained using notional amounts in the sense that concentration has increased, although the instrument toward which volume has flowed in each measure is different.

Finally, an overall Hirschman-Herfindahl index is calculated to measure the concentration for the financial derivatives between established exchanges and OTC markets. The results, reported in Table 16, seem ambiguous. On the one hand, the concentration index has fluctuated since 1998 showing rises (such as 1999-2000) and falls (such as Q2 2003 and Q2 2004). On the other hand, the level of the index in mid-2005 remained practically unchanged in contrast to the original level in mid-1998. It might be argued that, although OTC markets have a dominant market share in the derivatives markets, the volume distribution has remained at relatively stable levels.

Conclusions

Derivatives have attracted the attention of the academic literature and popular press in recent times on the grounds of the enormous level of global trading for both exchange-traded products and over-the-counter products. While most of the work has focused on the valuation and pricing of these instruments as well as on modeling the various effects the use of derivatives may have on a specific market or on firms, little has been researched about the structure of the derivatives markets.

This paper provides an updated and comprehensive review of the development of derivatives exchanges in emerging markets, placing emphasis on financial derivatives. It presents for the first time a comparison between the volume concentration in exchange-traded derivatives markets and OTC markets using various measures of Hirschman-Herfindahl indices.

Several trends are identified which have characterized the development of derivatives exchanges in emerging markets. First, the consolidation of exchanges within or between countries aimed to achieve higher efficiency and market depth, fostered by market globalization and communication technology improvements. Second, increasing cooperation denoted by the signing of memoranda of understanding between exchanges in different countries which serve a variety of purposes including personnel training, sharing of internet-based trading platforms, and joint listing of products.

Third, a preference for financial over commodity derivatives products in the newly created exchanges in emerging markets contrasting with older exchanges, which usually started trading just commodities. Finally, the segregation of trading rights and membership rights allowing outside ownership of the exchange. This follows a world trend of demutualization in stock and derivatives exchanges.

In addition to their primary function of providing risk hedge (facilitate the transfer of risk), derivatives contribute to the development of efficient capital markets by allowing a more efficient capital allocation, by facilitating cross-border capital flows, and by creating opportunities for portfolio diversification. Nonetheless, they can also allow market participants to take on excessive leverage, avoid prudential regulations, and manipulate accounting rules when financial supervision and risk management systems are weak or inadequate.

While derivatives exchanges perform important functions both in developed and developing countries –such as improving the development of the financial infrastructure and lowering transaction costs-, there are two distinct benefits to be gained from establishing a derivatives exchange in a local emerging market. As opposed to using already established exchanges in neighboring or commercial-partner developed countries, local derivatives exchanges provide an improved price discovery and higher correlation between prices of derivatives products and cash prices.

Several interesting findings are contributed by this paper regarding volume trading in the derivatives markets. A decrease in the number of exchanges actively trading derivatives led to an increase in the level of volume concentration between 1999 and 2003. The reduced number or exchanges obeyed mostly to a consolidation in the market, as well as periods of financial distress where small exchanges either ceased or suspended operations. On the other hand, although for the period 2003-2005, the number of exchanges remained stable, the concentration decreased suggesting that trade has increased in smaller exchanges more than proportionate than in larger exchanges. These results are confirmed when the HHI is calculated between developed and emerging exchanges. It is found that, for the period of analysis, there is a significant decline in the volume concentration index reflecting a faster growth of emerging market exchanges. Derivatives volume has been largely concentrated in very few countries. However, the establishment of new exchanges in some emerging market countries has led to a decrease in concentration allowing volume to be more evenly distributed.

Furthermore, the results suggest that the introduction of new non-US exchanges, both developed and emerging, has resulted in an increase in

trading volume for this group outpacing the US counterparts. Nonetheless, due mainly to the performance of the Chicago exchanges, US exchanges have regained market volume in the past two years, thereby decreasing the volume concentration index. On the other hand, concentration between financial and non-financial instruments has been steadily increasing since 1999 due to a growing market share of the financial products.

On the other hand, it is found that, although volume concentration between OTC and exchange-traded derivatives did not changed significantly between 1998 and 2005, there are important differences within the markets. When measured between risk categories, the concentration index showed an upward trend for both markets. However, concentration has been higher in the exchange traded derivatives markets than in the OTC markets. Moreover, the concentration index has been growing faster in the latter. In both markets, interest rate derivatives are the dominant risk category. This contrasts with previous findings suggesting that concentration in the OTC market has remained relatively stable.

The results discussed here outline some implications of interest to users of derivatives and financial market regulators. First, according to theory, industry profit margins should vary directly with the Hirschman-Herfindahl index and inversely with the elasticity of demand. Given the standardized nature of exchange-traded derivatives, their demand should be more elastic than for the "tailor-made" OTC contracts. This gives support for a continuing trend of mergers and acquisitions in derivatives exchanges and the expectation of a higher concentration in these markets than in the OTC markets. Second, referring back to theory again, this suggests that the fewer the number of market participants in a given industry, the greater the potential to exercise market power, and the larger some participants are relative to others, the greater is that potential. That poses the following question, is there an optimal number of exchanges in one country or even in the whole derivatives market?. Finally, given that derivatives may exacerbate the effects of a financial crisis in an emerging market in the presence of poor financial supervision and weak economic fundamentals, timely regulation is to play an important role in the sound development of derivatives in these markets given the rapid growth exhibited in the past few years.

The most important limitation of this work is to measure volume as the number of contracts traded instead of the dollar volume. It is recognized that the size of the contracts may vary greatly between exchanges and contracts. However, dollar volume is not available from the cited sources and would need to be estimated. In recognition of this limitation, issues to be addressed by future research may include the measurement of derivatives volume concentration between countries and within each country for a given contract

using dollar volumes; the investigation of the underlying reasons for the preference of financial derivatives in newly created emerging market derivatives exchanges, its sustainability and its implications; and, the analysis of the post-merger volume and abnormal returns of exchanges in developed and emerging markets.

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Table 1
Emerging markets included in the study

LATIN AMERICA	EUROPE	MIDDLE-EAST	ASIA-PACIFIC	AFRICA
Countries with derivatives exchanges				
Argentina	Bulgaria	Iran	China	Kenya
Brazil	Greece	Israel	India	South Africa
Colombia	Hungary	United Arab Emirates	Indonesia	Zimbabwe
Chile	Poland		Kazakhstan	
Mexico	Romania		Korea	
Nicaragua	Russia		Malaysia	
	Turkey		Pakistan[2]	
	Slovakia		Taiwan	
	Slovenia[1]		Thailand	
Countries without derivatives exchanges				
Bolivia	Czech Republic		Kyrgystan	Côte d'Ivore
Costa Rica	Estonia		Sri Lanka	Egypt
Dominican Republic	Latvia		the Phillipines	Ghana
Ecuador	Lithuania		Vietnam	Malawi
El Salvador	Moldova			Morocco
Honduras	Ukraine			Nigeria
Panama				Uganda
Paraguay				Zambia
Peru				
Venezuela				

[1]Trading on derivatives is organized but not realized
[2]Exchange is awaiting approval to start trading on derivatives

Table 2
Emerging market derivatives exchanges trading financials

COUNTRY	EXCHANGE ACRONYM	EXCHANGE NAME	DERIVATIVES TRADED
Greece	ADEX	Athens Exchange Derivatives Market	futures and options on stock indices, stock futures and options, interest rate futures, currency futures
Colombia	BVC	Bolsa de Valores de Colombia	foreign exchange forwards
India	BSE	Bombay Stock Exchange Ltd	Stock, index Futures & options
Slovakia	KBB	Bratislava Commodity Exchange	forwards on commodities and currencies (US dollar)
Hungary	BET	Budapest Stock Exchange	Commodities, Futures: currency/options, interest rate, equities & index/options
Russia	FORTS	Futures and Options on RTS	Index, currency, interest rate, bonds, single stock futures; single stock options
South Africa	JSE	JSE Securities Exchange (SAFEX)	single stock futures, index, currency, bond, commodities
Kazakhstan	KASE	Kazakhstan Stock Exchange	currency futures (dollar and Euro)
Korea	KRX	Korea Exchange	interest rate, index, currency and commodities
Slovenia	LJSE	Ljubljana Stock Exchange	Stock index futures are organized, but not traded yet
Malaysia	MDEX	Malaysia Derivatives Exchange	Index Futures & Options; Interbank Offered Rate, Oil Futures, Government Securities Futures
Argentina	MATBA	Mercado a termino de Buenos Aires	Futures on maize, wheat, sunflower seed and soybeans; Index future Options
México	MexDer	Mexican Derivatives Exchange	Futures: currency, index, debt, stock. Options: index, stocks, EFTs
Russia	MICEX	Moscow Interbank Currency Exchange	Futures: currency, exchange
India	NSE	National Stock Exchange	Futures and options on individual stocks and stock indices; interest rate futures
Nicaragua	BOLSANIC	Nicaraguan Stock Exchange	Options on currencies (US dollar VS cordobas) and government bonds
Romania	RCE	Romanian Commodities Exchange	currency and interest rate futures
Argentina	ROFEX	Rosario Board of Trade	Futures on currencies, interest rates (T-bonds). Agricultural commodities: maize and soy beans
Russia	SPCEX	Saint Petersburg Currency Exchange	currency futures and options
Chile	BOLSANT	Santiago Stock Exchange	Futures, exchange & index; stock options
Brazil	BOVESPA	Sao Paolo Stock Exchange	Options on individual stocks and stock index
Romania	SMCFE	Sibiu Monetary-Financial and Commodities	Futures & Options: Equity and Interest, Stock and Indexes, Commodities,

		Exchange	currencies
Indonesia	SSX	Surabaya Stock Exchange	stock index futures
Taiwan	TAIFEX	Taiwan Futures Exchange	stock indices, government bond futures, equity options and interest rate futures; gold futures
Israel	TASE	Tel Aviv Stock Exchange Ltd	Options & futures: index, interest rate, exchange rate
Thailand	TFEX	Thailand Futures Exchange	index futures
Brazil	BM&F	The Commodities & Futures Exchange	Futures, options, spot & fwd, Index, Gold, interest rate, exchange rates; futures on sovereign debt instruments. Swaps and Agricultural
Turkey	TurkDEX	Turkish Derivatives Exchange	futures on currency, interest rate, equity index and commodities
Poland	WGT	Warsaw Commodity Exchange	futures and options on currencies, futures on interest rates, futures on government debt, commodity futures such as wheat and hog.
Poland	WSE	Warsaw Stock Exchange	futures: index, stock, currency, treasury bonds; options: index, stock

Table 3
Emerging market derivatives exchanges trading non-financials

COUNTRY	EXCHANGE ACRONYM	EXCHANGE NAME	DERIVATIVES TRADED
Thailand	AFET	Agricultural Futures Exchange of Thailand	rubber, rice, tapioca starch futures
India	BOOE	Bombay Commodity Exchange Ltd.	oil seeds and oils
China	DCE	Dalian commodity exchange	soybeans, soy meal and corn futures
United Arab Emirates	DGCX	Dubai Gold and Commodities Exchange	gold, silver, freight, energy, steel and cotton
United Arab Emirates	DME	Dubai Mercantile Exchange	energy futures (crude oil)
Turkey	IGE	Istanbul Gold Exchange	gold, silver, platinum
Turkey	ITB	Izmir Cotton Exchange	cotton
Indonesia	JFX	Jakarta Futures Exchange	futures on gold and olein, later cocoa, plywood, rubber and pepper
Kenya	KACE	Kenya Agricultural Commodity Exchange	spot and forward contracts on agricultural commodities
India	MCX	Multi Commodity Exchange of India, Ltd.	agricultural products, energy, plastics
Pakistan	NCEL	National commodity Exchange, Ltd	agricultural products: cotton, sugar, rice and wheat and gold
China	SGE	Shanghai Gold Exchange	gold (platinum under analysis)
China	SHFE	Shanghai futures Exchange	futures products including copper, aluminium, natural rubber and fuel oil
Bulgaria	SCE	Sofia Commodity Exchange	grain futures (wheat, barley, corn)
Iran	TME	Tehran Metals Exchange	aluminium and copper, gold and silver under analysis
China	ZCE	Zhengzhou commodity exchange	wheat, cotton and sugar futures

Table 4
World Ranking for Emerging Market Derivatives Exchanges, by Global Futures and Options Volume

	1999	2000	2001	2002	2003	2004	2005
BOVESPA					9	8	8
BOLSA DE MERCADORIAS & FUTUROS	11	11	11	10	12	11	11
NATIONAL STOCK EXCHANGE OF INDIA			42	30	21	17	14
MEXICAN DERIVATIVES EXCHANGE					10	9	15
DALIAN COMMODITY EXCHANGE					16	16	17
SOUTH AFRICAN FUTURES EXCHANGE	14	17	17	20			
JSE SECURITIES EXCHANGE SOUTH AFRICA					26	24	24
SHANGHAI FUTURES EXCHANGE	40	40	33	31	22	23	29
ZHENGZHOU COMMODITY EXCHANGE					31	32	31
MERCADO A TERMINO DE ROSARIO			51	52	46	39	39
BUDAPEST STOCK EXCHANGE	28	32	41	48	40	43	41
WARSAW STOCK EXCHANGE						45	43
MALAYSIA DERIVATIVES EXCHANGE BERHAD		51	48	46	48	49	46
COMMODITY AND MONETARY EXCHANGE OF MALAYSIA [1]	54						
BUDAPEST COMMODITY EXCHANGE	45	45	39	43	43	54	55
MERCADO A TERMINO DE BUENOS AIRES [2]	55	53	52		59	58	58
KOREA FUTURES EXCHANGE [3]	49	41	29	28	1	1	1
KOREA STOCK EXCHANGE	8	5	1	1			
KUALA LUMPUR OPTIONS AND FINANCIAL FUTURES EXCHANGE [1]	53						
TAIWAN FUTURES EXCHANGE	48	46	34	33	27	20	18
TEL-AVIV STOCK EXCHANGE			19	16	23	22	21
Memo item:							
Total number of exchanges	58	55	56	52	58	58	58

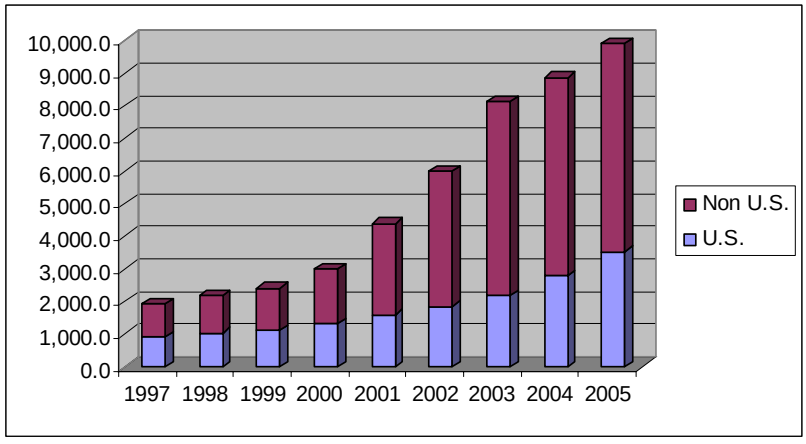
Source: Futures Industry Association
Notes:
[1] Kuala Lumpur Options and Financial Futures Exchange and the Commodity and Monetary Exchange of Malaysia merged in 2000 to become Malaysia Derivatives Exchange
[2] Due to the Argentine crisis in 2001, Mercado a Termino de Buenos Aires did not operate in 2002
[3] Korea Futures Exchange (KOFEX) acquired the KOPSI 2000 futures and options contracts from the Korea Stock Exchange in January 2004.

Table 5
Exchange traded derivatives volume, by region[1]

	U.S.	Non U.S.	Total	Non-US/Total (%)
1997	905.2	1,025.1	1,930.3	53.1
1998	1,033.2	1,143.0	2,176.2	52.5
1999	1,106.4	1,296.4	2,402.8	54.0
2000	1,313.6	1,675.5	2,989.1	56.1
2001	1,578.6	2,803.8	4,382.4	64.0
2002	1,844.9	4,148.8	5,993.7	69.2
2003	2,172.2	5,965.1	8,137.3	73.3
2004	2,795.2	6,069.5	8,864.7	68.5
2005	3,525.0	6,374.8	9,899.8	64.4

[1] Volume includes futures and options contracts and is reported in millions of contracts
Source: Futures Industry Association

Figure 1
Volume traded in derivatives exchanges, 1997-2005[1]



Source: Futures Industry Association
[1]Volume includes options on individual equities

Table 6

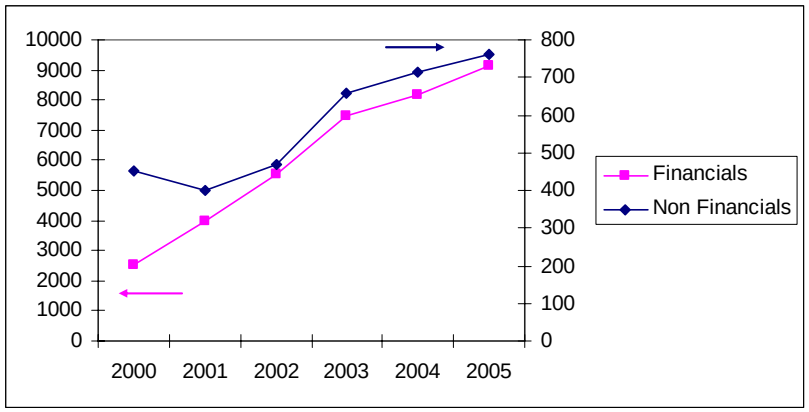
Exchange traded derivatives volume, by type of instrument[1]

	2000	2001	2002	2003	2004	2005
Financials	2535.80	3980.87	5524.80	7478.46	8152.68	9139.14
Variation		57%	39%	35%	9%	12%
Non Financials	453.70	401.57	468.90	659.17	712.02	760.65
Variation		-11%	17%	41%	8%	7%
Total	2989.50	4382.44	5993.70	8137.63	8864.70	9899.79
		47%	37%	36%	9%	12%
Market shares						
Financials	85%	91%	92%	92%	92%	92%
Non Financials	15%	9%	8%	8%	8%	8%

[1]Volume includes futures and options contracts and is reported in millions of contracts
Source: Futures Industry Association

Figure 2

Exchange traded derivatives volume 2000-2005, by type of instrument[1]



[1]Volume includes futures and options contracts and is reported in millions of contracts
Source: Futures Industry Association

Table 7
Top 10 Global Options and Futures Exchanges

World Ranking	1999	2000	2001	2002	2003	2004	2005
1	EUREX	EUREX	*KSE*	*KSE*	*KSE*	*KOFEX*	*KRX*
	365	395	855	1,933	2,913	2,587	2,593
2	CBOT	CBOE	EUREX	EUREX	EUREX	EUREX	EUREX
	255	326	674	801	1,015	1,066	1,249
3	CBOE	CBOT	Eurone xt. Liffe	Euronext.Li ffe	Euronext. Liffe	CME	CME
	236	233	614	696	640	805	1,090
4	CME	CME	CME	CME	CME	Euronext. L iffe	Euronex t.Liffe
	201	231	412	558	695	791	758
5	Paris Bourse SA	*KSE*	CBOE	CBOT	CBOT	CBOT	CBOT
	190	213	307	344	454	600	675
6	LIFFE	AMEX	CBOT	CBOE	CBOE	CBOE	CBOE
	134	208	260	268	284	361	468
7	NYMEX	Paris Bourse SA	AMEX	AMEX	ISE	ISE	ISE
	110	177	205	186	245	361	449
8	*KSE*	LIFFE	NYMEX	ISE	AMEX	*Bovespa*	*Bovespa*
	97	156	103	152	180	235	269
9	LME	PSE	PSE	NYMEX	*Bovespa*	*MexDer*	NYMEX
	62	109	103	134	177	210	205
10	Euronext Brussels	NYMEX	PHLX	*BM&F*	*MexDer*	AMEX	AMEX
	58	91	101	102	174	203	202
Total market volume	2,403	2,989	4,382	5,994	8,138	8,865	9,900
Share of top-10 exchanges (%)	71.1	71.6	82.9	83.2	83.3	81.4	80.4

Source: Futures Industry Association
Notes: a)Figures below the exchange acronym represent volume in billions of contracts
b)Emerging market exchanges are in italics

AMEX = American Stock Exchange
BM&F= Brazilian Commodities and Futures Exchange
Bovespa = Sao Paolo Stock Exchange
CBOE = Chicago Board Options Exchange
CBOT = Chicago Board of Trade
CME = Chicago Mercantile Exchange
EUREX is the merger of the exchanges of Germany and Switzerland
ISE = International Securities Exchange
KOFEX = Korea Futures Exchange
KRX = Korea Exchange
KSE= Korea Stock Exchange
LIFFE = London International Financial Futures Exchange
LME = London Metal Exchange
MexDer = Mexican Derivatives Exchange
NYMEX = New York Mercantile Exchange
PHLX = Philadelphia Stock Exchange
PSE = Pacific Stock Exchange
TOCOM = Tokyo Commodity Exchange

Table 8
Hirschman-Herfindahl Indices between derivatives exchanges

	No. of exchanges	Total volume[1]	HHI	Possible minimum HHI
1999	58	2,402,800,000	687	172
2000	55	2,989,500,000	640	182
2001	56	4,382,715,198	1042	179
2002	52	5,993,380,024	1528	192
2003	58	8,137,628,554	1653	172
2004	58	8,863,733,653	1274	172
2005	58	9,897,780,247	1150	172

[1] Global futures and options volume, including options on individual equities

Figure 3
HHI for global futures and options derivatives, among exchanges

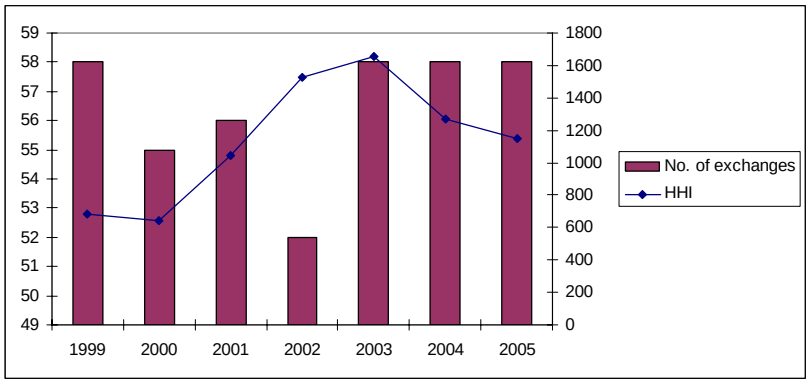


Table 9

Hirschman-Herfindahl Indices for exchange traded derivatives between developed and emerging market exchanges

	No. of exchanges		Volume[1]			Market share, %		
	Developed	Emerging Market	Developed	Emerging	Total	Developed	Emerging	HHI
1999	47	11	2,186,753,209	216,046,791	2,402,800,000	91.01	8.99	8363.4
2000	45	10	2,628,933,457	360,566,543	2,989,500,000	87.94	12.06	7878.7
2001	43	13	3,331,390,601	1,051,324,597	4,382,715,198	76.01	23.99	6353.3
2002	40	12	3,834,275,629	2,159,104,395	5,993,380,024	63.98	36.02	5390.6
2003	42	16	4,453,380,131	3,684,248,423	8,137,628,554	54.73	45.27	5044.7
2004	41	17	5,258,804,847	3,604,928,806	8,863,733,653	59.33	40.67	5174.1
2005	41	17	6,190,210,580	3,707,569,667	9,897,780,247	62.54	37.46	5314.6

[1] Global futures and options volume, including options on individual equities

Figure 4
HHI for exchange traded derivatives between developed and emerging market exchanges

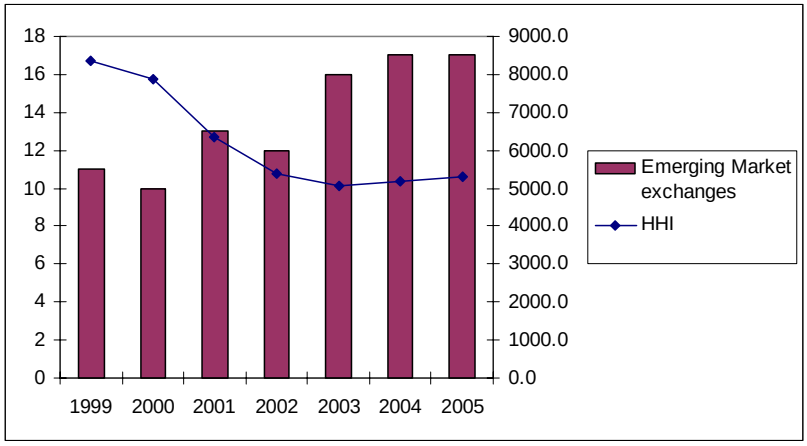


Table 10
Hirschman-Herfindahl Indices for exchange-traded derivatives, by exchange classification excluding Korea

	Volume				Market share, %			HHI
	Developed	Emerging	Korea	Total	Developed	Emerging	Korea	Korea individual participant
1999	2,186,753,209	117,902,983	98,143,808	2,402,800,000	91.0	4.9	4.1	8,323
2000	2,628,933,457	144,094,276	216,472,267	2,989,500,000	87.9	4.8	7.2	7,809
2001	3,331,390,601	185,063,814	866,260,783	4,382,715,198	76.0	4.2	19.8	6,186
2002	3,834,275,629	211,789,150	1,947,315,245	5,993,380,024	64.0	3.5	32.5	5,161
2003	4,453,380,131	771,354,389	2,912,894,034	8,137,628,554	54.7	9.5	35.8	4,366
2004	5,258,804,847	1,018,110,204	2,586,818,602	8,863,733,653	59.3	11.5	29.2	4,504
2005	6,190,210,580	1,114,481,212	2,593,088,455	9,897,780,247	62.5	11.3	26.2	4,725

Figure 5

HHI for exchange-traded derivatives, by exchange classification excluding Korea

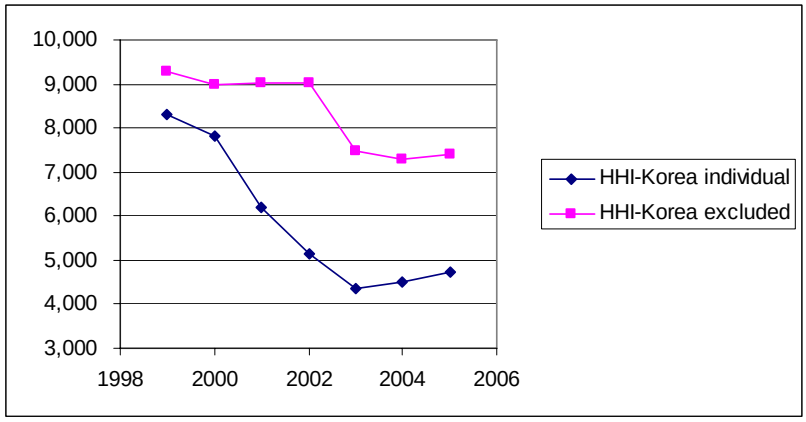


Table 11
HHI for exchange-traded derivatives, between emerging market exchanges and between countries

	1999	2000	2001	2002	2003	2004	2005
Between emerging market exchanges							
HHI	3,050	4,159	6,721	8,042	6,317	5,269	5,015
HHI excluding Korea	3,454	4,085	3,517	2,986	1,505	1,504	1,362
Between countries							
All countries	1,879	2,377	2,191	2,364	2,275	2,136	2,239
Emerging market countries	3,105	4,262	6,898	8,163	6,357	5,346	5,103
Emerging excl. Korea	3,498	4,118	3,521	2,987	2,422	2,466	2,340

Figure 6
HHI for exchange-traded derivatives, between emerging market exchanges

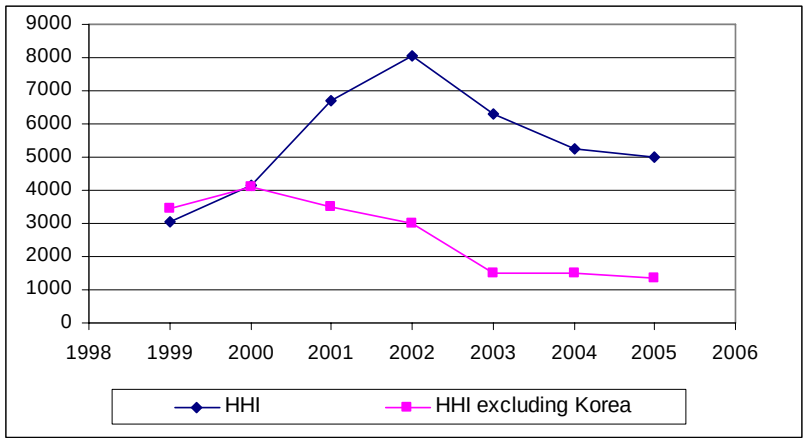


Figure 7
HHI for exchange-traded derivatives, between countries

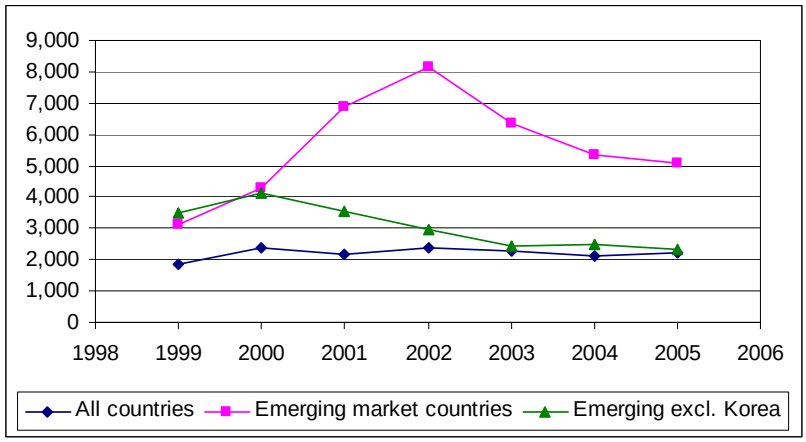


Figure 8
HHI for global derivatives between US and non-US exchanges and between financial and non-financial derivatives

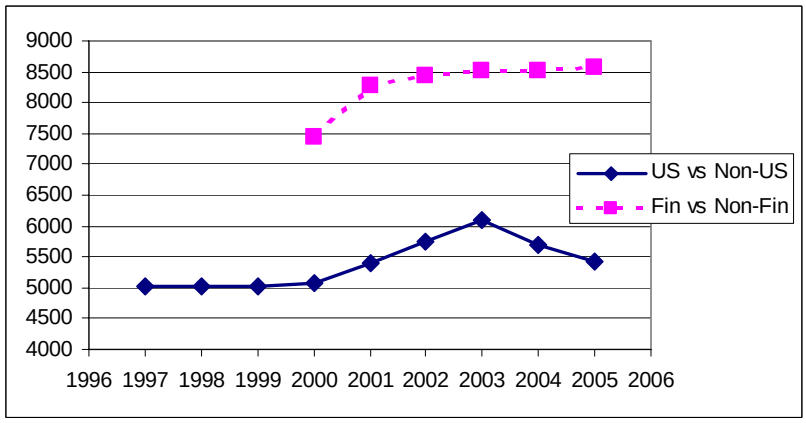


Tabla 12
Hirschman-Herfindahl Indices between US and non-US exchanges and between financial and non-financial derivatives

	Foreign Exchange		Interest Rate		Equity-Linked		Total	
	OTC	Exchange -traded	OTC	Exchan- traded	OTC	Exchange -traded	OTC	Exchang- traded
Q2 1998	18,719	139	42,368	13,216	1,274	1,435	62,361	14,790
Q4 1998	18,011	81	50,015	12,655	1,488	1,239	69,514	13,975
Q2 1999	14,899	80	54,072	13,819	1,511	1,672	70,482	15,570
Q4 1999	14,344	59	60,091	11,680	1,809	1,857	76,244	13,597
Q2 2000	15,494	51	64,125	12,322	1,645	1,747	81,264	14,120
Q4 2000	15,666	96	64,668	12,642	1,891	1,526	82,225	14,264
Q2 2001	16,910	66	67,465	17,515	1,884	1,924	86,259	19,505
Q4 2001	16,748	93	77,568	21,762	1,881	1,919	96,197	23,774
Q2 2002	18,068	79	89,955	21,893	2,214	2,080	110,237	24,053
Q4 2002	18,448	74	101,658	21,715	2,309	2,066	122,415	23,856
Q2 2003	22,071	105	121,799	35,481	2,799	2,644	146,669	38,230
Q4 2003	24,475	118	141,991	33,918	3,787	2,752	170,253	36,787
Q2 2004	26,997	98	164,626	49,385	4,521	3,347	196,144	52,830
Q4 2004	29,580	164	190,502	42,769	4,385	3,659	224,467	46,592
Q2 2005	31,075	170	204,393	53,794	5,145	4,553	240,613	58,517

Table 13
Notional amounts outstanding of financial derivatives (billions of US dollars)[1]

	Total Volume (millions)	NonUS/ Total (%)	Financial/ Total (%)	HHI US vs Non-US	HHI Financial vs Non-Financial
1997	1,930.3	53.1	N/A	5019	-
1998	2,176.2	52.5	N/A	5013	-
1999	2,402.8	54.0	N/A	5031	-
2000	2,989.1	56.1	84.9	5073	7431
2001	4,382.4	64.0	90.5	5391	8283
2002	5,993.7	69.2	91.4	5739	8436
2003	8,137.6	73.3	91.9	6086	8513
2004	8,864.7	68.5	92.0	5682	8523
2005	9,899.8	64.4	92.3	5414	8581

Source: Bank for International Settlements.
[1] Amounts have been adjusted for double counting

Table 14

Hirschman-Herfindahl Indices for financial derivatives in OTC and exchange-traded markets, by risk category

	OTC Market share (%)			Exchange Traded market share (%)			HHI	
	Foreign exchange	Interest Rate	Equity-linked	Foreign exchange	Interest Rate	Equity-linked	OTC	Exchange-traded
Q2 1998	30.02	67.94	2.04	0.94	89.36	9.71	5,521	8,080
Q4 1998	25.91	71.95	2.14	0.58	90.56	8.87	5,853	8,279
Q2 1999	21.14	76.72	2.14	0.51	88.75	10.74	6,337	7,993
Q4 1999	18.81	78.81	2.37	0.43	85.91	13.66	6,571	7,567
Q2 2000	19.07	78.91	2.02	0.36	87.26	12.37	6,594	7,768
Q4 2000	19.05	78.65	2.30	0.67	88.63	10.70	6,554	7,970
Q2 2001	19.60	78.21	2.18	0.34	89.80	9.86	6,506	8,161
Q4 2001	17.41	80.63	1.96	0.39	91.54	8.07	6,809	8,444
Q2 2002	16.39	81.60	2.01	0.33	91.02	8.65	6,931	8,360
Q4 2002	15.07	83.04	1.89	0.31	91.03	8.66	7,127	8,361
Q2 2003	15.05	83.04	1.91	0.27	92.81	6.92	7,126	8,662
Q4 2003	14.38	83.40	2.22	0.32	92.20	7.48	7,167	8,557
Q2 2004	13.76	83.93	2.30	0.19	93.48	6.34	7,239	8,779
Q4 2004	13.18	84.87	1.95	0.35	91.79	7.85	7,380	8,488
Q2 2005	12.91	84.95	2.14	0.29	91.93	7.78	7,387	8,512

Figure 9
HHI for financial derivatives between risk categories and market organization

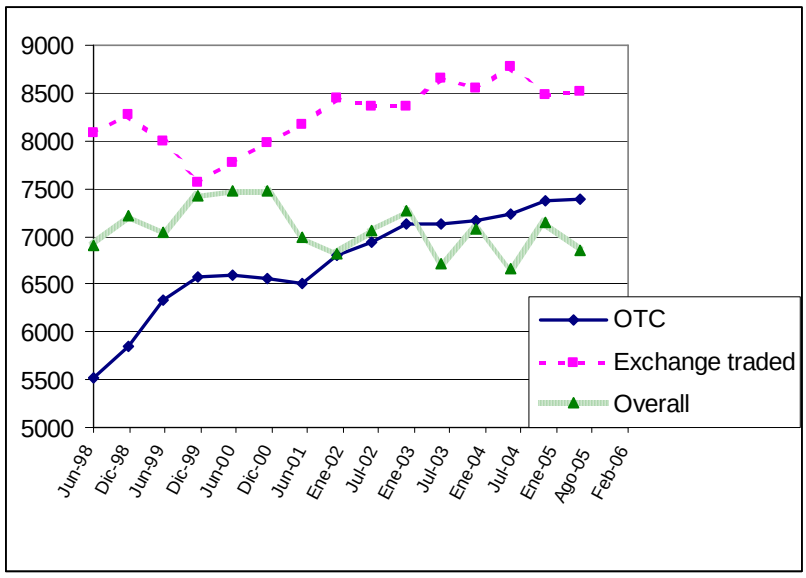


Table 15
Global Exchange-traded Options and Futures Volume, by risk category

	2000	2001	2002	2003	2004	2005
Volume (millions)						
Equity	1644.50	2677.16	4054.94	5519.34	5776.06	6436.87
Interest rate	844.30	1233.56	1394.27	1881.27	2271.25	2536.76
Foreign currency	47.00	70.15	75.59	77.85	105.37	165.51
Total financials	2535.80	3980.87	5524.80	7478.46	8152.68	9139.14
Total non-financials	453.70	401.57	468.90	659.17	712.02	760.65
Total volume	2989.50	4382.44	5993.70	8137.63	8864.70	9899.79
Market shares (%)						
Equity	55	61	68	68	65	65
Interest rate	28	28	23	23	26	26
Foreign currency	2	2	1	1	1	2
Non-financials	15	9	8	8	8	8
HHI	4056	4611	5181	5201	4968	4946

Source: Futures Industry Association
Note: Non-financial derivatives include agricultural commodities, energy products, precious and non-precious metals, and other commodities.

Table 16
Hirschman-Herfindahl Indices for financial derivatives between markets

	Notional amounts outstanding (billions of US dollars)			Market share (%)		
	OTC	Exchange-traded	Grand Total	OTC	Exchange-traded	HHI
Q2 1998	62,361	14,790	77,151	80.83	19.17	6,901
Q4 1998	69,514	13,975	83,489	83.26	16.74	7,213
Q2 1999	70,482	15,570	86,052	81.91	18.09	7,036
Q4 1999	76,244	13,597	89,841	84.87	15.13	7,431
Q2 2000	81,264	14,120	95,384	85.20	14.80	7,478
Q4 2000	82,225	14,264	96,489	85.22	14.78	7,481
Q2 2001	86,259	19,505	105,764	81.56	18.44	6,992
Q4 2001	96,197	23,774	119,971	80.18	19.82	6,822
Q2 2002	110,237	24,053	134,290	82.09	17.91	7,059
Q4 2002	122,415	23,856	146,271	83.69	16.31	7,270
Q2 2003	146,669	38,230	184,899	79.32	20.68	6,720
Q4 2003	170,253	36,787	207,040	82.23	17.77	7,078
Q2 2004	196,144	52,830	248,974	78.78	21.22	6,657
Q4 2004	224,467	46,592	271,059	82.81	17.19	7,153
Q2 2005	240,613	58,517	299,130	80.44	19.56	6,853