THE DERIVATIVES MARKETS IN LATIN AMERICA WITH AN EMPHASIS ON CHILE

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ABSTRACT

Between the 1970's and the 1980's, the derivatives market flourished. Forwards, futures and options began to be regularly traded. According to information gathered by The Bank of International Settlements, at the end of April 2001 the value of over-the-counter (OTC) positions outstanding was over US$99 trillion, while the value of positions outstanding in organized exchanges was approximately US$20 trillion. In Latin America the largest derivatives exchanges are located in Argentina (MATBA, ROFEX), Brazil (BM&F, BOVESPA), and Mexico (MexDer). In addition, OTC markets exist in Chile and Peru. Excluding Peru, Chile's derivatives market is to date the least developed. Most domestic transactions are OTC, and consist of currency forwards (US dollar-Chilean peso). The use of other derivatives, such as options on stocks and futures on stock indices, has not gained ground. Economists claim that the blame should be put on regulatory constrains faced by institutional investors, and on market illiquidity. However, recent amendments to the Law of Capital Markets might boost the derivatives market by providing additional investment opportunities. Meanwhile, the market of currency forwards continues to be the most active. In particular, the elimination of the floating band of the US dollar against the Chilean peso in September 1999 increased currency risk, and made investors turned to shorter-maturity contracts.

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I Introduction

Prior to the 1970's, currency and interest rates risk was not generally a concern around the world. It was not until the failure of Bretton Woods that the volatility of the US dollar against the Japanese yen rose dramatically. At the same time, the yields on US long-maturity bonds fluctuated considerably at the end of the 1970's, and at the beginning of the 1980's. This highly volatile economic environment was sharpened by the 1973's oil crisis. These changes underlined the importance of corporate risk management, namely, the strategy of eliminating costly lower-tail outcomes that might cause financial distress or interfere with investment plans (Stulz, 1996).

Specifically, between the mid-1970's and the mid-1980's, the market of derivatives—financial instruments whose value depend upon the price of an underlying asset—flourished. Forwards, futures, and options, began to be actively traded on and outside exchanges in most industrialized countries. A seminal contribution to the adoption of these instruments was the development in 1973, by Fisher Black and Myron Scholes, of an analytic formula to price European options—those that can only be exercised at maturity. Such finding, as widely known, led Scholes to win the Nobel Prize in 1997.[1]

Notional amounts—a measure of market size—involved in derivative contracts are sizeable. Information gathered by the Bank of International Settlements (BIS) shows that, at the end of June 2001, the notional amount of outstanding positions reached US$99.7 trillion outside exchanges (OTC markets), and US$19.5 trillion on exchanges. Among OTC transactions, positions on interest rates contracts represented 76 percent of the notional amount outstanding, whereas those on foreign exchange and other contracts (equity, commodities, credit and other derivatives) amounted to 20.5 and 3.4 percent, respectively. Among exchange-traded derivatives, interest rate contracts also predominated, reaching 89.9 percent of the notional amount outstanding. Meanwhile, turnover—a measure of market activity—reached US$1,342 billion in OTC markets and US$2,209 billions on exchanges at the end of June 2001.

In Latin America the largest derivatives exchanges are located in Argentina (MATBA, ROFEX), Brazil (BM&F, BOVESPA), and Mexico (MexDer). In addition, OTC markets exist in Chile and Peru. At *Mercado a Termino* of Buenos Aires (MATBA), the largest market of derivatives in agricultural products in Latin America, futures and options on futures on wheat, soybean, sunflower seeds are traded. The *Mercado a Termino* of Rosario (ROFEX) offers derivatives on agricultural products (futures and options on soybean, corn, wheat, among others), feeder cattle, and financial products, but it is much smaller in size than the MATBA. For instance, for 1993-2001 the volume in tons of agricultural contracts in ROFEX amounted to only 11.2 percent of that of the MATBA.

The *Bolsa de Mercadorias y Futuros* (BM&F) is the leading futures exchange in Latin America, and it is among the top exchanges in the world. According to information gathered by the Futures Institute, in 1998 the volume traded (number of contracts) at the BM&F amounted to 8.4 and 7.6 percent of the total volume traded in and outside the

[1] For an excellent background on the mechanics of derivatives contracts, see Hull (2000).

United States, respectively. The BM&F offers a rich menu of derivative contracts, which includes futures and options on agricultural commodities (coffee, cotton, and wheat), the BOVESPA index, interest rates, foreign exchange rate, gold, among others. The BOVESPA-Sao Paulo Exchange also offers derivatives, but the it is small relative to the BM&F. For example, the financial volume traded in 2000 at BOVESPA only reached 2.7 percent of that at BM&F. The products available at BOVESPA are options on one-day interbank deposits, the BOVESPA index, US dollar denominated Brazilian equity, among others.

Although created in 1994, the Mexican market for derivatives (MexDer) began to operate four years later. The financial volume negotiated at MexDer has been increasing over time, but the exchange is still relatively small when compared with the Mexican Stock Exchange (*Bolsa Mexicana de Valores*). The products currently available at MexDer are futures on US dollars, *Bolsa Mexicana de Valores* stock index (IPC), interbank and Mexican Treasury notes, three-year government bonds, and futures on individual stocks.

Finally, in Chile and Peru domestic transactions of derivatives essentially boil down to OTC exchange rate derivatives. According to information gathered by the BIS, the average daily turnover in OTC markets in April 2001 amounted to US$635 million and US$36 million in Chile and Peru, respectively. The contracts regularly traded in Chile are US$/Chilean peso and US$/*Unidad de Fomento* (UF) forwards.[2] These financial instruments, aimed at reducing currency risk, were introduced in the domestic market in 1992 and 1994, respectively. They are primarily traded between financial institutions, and between financial institutions and large firms. Other types of derivatives, such as individual stock options and stock indices options, introduced in 1990 at the Santiago Stock Exchange, have been barely traded. For example, futures contracts on the Price Index of Selective Stocks (IPSA), which includes the 40 most actively traded stocks at the Santiago Stock Exchange, were only traded between 1990 and 1994. Options on stocks of the firms *Telefonica* (telecommunications) and *Endesa* (electricity), introduced in 1994, were traded only in 1994, 1995, and 1998.

Besides the low frequency of transactions of these financial instruments, the trading volumes were also very small as compared with the total trading volume at the Santiago Stock Exchange. Indeed, between 1990 and 1994 the total trading volume of futures was US$60.9 million, whereas that of options just amounted to US$0.45 million between 1990 and 1994. In percentages, these figures corresponded with 0.022 percent of the trading volume between 1990 and 1994 (US$26,597 million), and almost zero percent of the trading volume between 1994 and 1998 (US$92,499 million), respectively. (All figures in US dollars of 2000). One plausible explanation for such failure is that pension funds (AFP), the key investors of the Chilean financial market—their total assets reached 53.3 percent of GDP in 2000, are not allowed to enter into futures and options on stocks. AFP can only take positions on currency forwards in the domestic market, and on options and forwards on foreign interest rates, foreign interest rate indices, and foreign currency in foreign markets.

[2] *Unidad de Fomento* is an inflation-indexed accounting unit, which was introduced in 1977. Its value is daily adjusted according to the previous month inflation, expressed on a daily basis.

However, there have been additional attempts to expand derivatives contracts domestically. In particular, interest rates derivatives and fixed-income assets derivatives were introduced in August 1999 and September 2000, respectively. So far these instruments have been traded in OTC markets (typically, between commercial banks), and have taken the form of Forward Rate Agreements (FRAs) and swaps on interest rates denominated in local currency. Although the Central Bank of Chile has contributed to increase the liquidity of the domestic market for long maturity interest rates, through a reform of September 1999 that allows to strip coupons of long maturity bonds, the spot market of interest rates is probably not liquid enough to guarantee transactions of these instruments on exchanges. [3]

In addition, other measures, aimed at increasing the trading volume of domestic exchanges and creating new investment opportunities, have been introduced. In March 1999 the Superintendence of Securities and Insurance (*Superintendencia de Valores y Seguros*) authorized the use of stock short-selling. Unfortunately, this type of transaction was infrequent. Two reasons are plausible. First, stock short-selling were not tax free until November 2001. Second, AFP are not authorized to short stocks, even though they could be the main lender of such instruments. To illustrate, as of December 2001, stocks of private companies and financial institutions reached 10.61 percent of AFP total assets, that is to say, approximately US$3,681.4 million.

By the above facts, Chile's derivatives market do not seem to enjoy significant growing perspectives. However, a package of amendments to the Law of Capital Markets, which was passed by the Chilean Congress in November 2001, might change this scenario. This consists of 15 reforms aimed at providing alternative funding to emerging companies, and to firms with growth potential, but no track record; increasing the liquidity of the domestic capital market by enhancing the participation of new investors; offering a wider range of alternatives to investors, in terms of risk/return profiles; eliminating the remaining financial flows restrictions; and, finally, boosting long term domestic savings.

The main contributions of this article are the following. First, it takes a close look at the institutional framework of the Chilean derivatives markets. Given that Chile has been one of the most successful Latin American economies in the last decade, it appears relevant to analyze why its derivatives market has not deepened further. Second, the article looks at the evolution of the financial and physical volume at important Latin American derivatives markets in Argentina, Brazil, and Mexico. Third, it gives a flavor of how active are derivatives markets in the industrialized economies on exchanges and in over-the-counter markets. Fourth, the article also analyzes recent changes in the Chilean Central Bank's exchange rate policy on the domestic currency forwards markets As far as the author of this paper knows, nobody has yet pursued similar research. Previous studies have been primarily concerned with the use of derivatives by both financial and non-financial firms in the United States (e.g., Cummins, Phillips, and Smith, 1997; Guay and Kothari, 2001; Hentschel and Kothari, 2001), and with the benefits from using options on theoretical grounds (Neuberger and Hodges, 2002).

[3] As of April 2002, there was no public information on trading volumes of interest rates and fixed-income assets derivatives. The Central Bank of Chile is in the process of collecting the relevant data.

This study is organized as follows. Section II presents an overview of the derivatives markets in Latin America, with an emphasis on Chile (Section 2.1), and also gives a glance at the derivatives markets around the world (Section 2.2). Section III studies the evolution of currency forwards in Chile, and analyzes the impact of recent changes of the exchange rate polity on this market. Finally, Section IV summarizes the main findings of this study.

II An Overview of the Derivatives Markets in Latin America and Elsewhere

2.1 Latin America

In this section, we look at the main derivatives markets existing in the region. As previously mentioned, Chile has been one of the most successful Latin American economies in the past few years. According to information gathered by the World Bank, between 1990 and 2000, Chile grew at an average rate of 6.8 percent, while Argentina, Mexico and Brazil did only at 3 percent, approximately. In addition, thanks to the autonomy of the Central Bank, inflation went down from 26 percent in 1990 to 4 percent in 2000. By contrast, at the beginning of the 1990's Argentina and Brazil struggled against inflation rates that reached over 2,000 percent a year. Chile has also presented relatively low ratios of total debt service to exports of goods and services: 26 percent in 2000 as opposed to 71.5, 90.7, and 30 percent of Argentina, Brazil, and Mexico, respectively. In addition, gross capital formation in Chile has been slightly higher (23.4 percent) than the average for Latin American countries in 2000 (19.9 percent).

Despite these good indicators, stringent regulation has dampened the development of the Chilean financial market, and this has lagged behind the main Latin American economies. As explained in the Introduction, the most important investors in the economy are pension funds. However, their investment decisions are subject to several constraints that have hindered market liquidity and the emergence of new financial instruments. Only last year have authorities introduced important amendments to the Law of Capital Markets that might boost the domestic financial market. This will be discussed in more detail in the next sections.

2.1.1 Chile

Even though institutions, other than banks and large firms, have used derivatives infrequently to date, the regulatory framework for trading these instruments on exchanges and in OTC markets dates back to the mid-1980's and the early 1990's. Table 1 gives a detailed description of different derivatives, which can be in principle traded by domestic institutions either locally or in foreign markets. [4]

[4] The regulation applicable to derivatives contracts is contained in the Law of Banks and Financial Institutions, and in the Law of Capital Markets. From them, several rules draw up, which regulate transactions made by banks and other financial institutions, institutional investors (i.e., pension funds, mutual funds, and insurance companies), and non-financial firms. Derivatives transactions have also to comply with the Central Bank of Chile's regulations applicable to the exchange rate market and to financial institutions. Taxation relevant to these transactions is described in the Law of Income Tax of the Chilean Internal Revenue Service.

[Table 1 about here]

As previously pointed out, transactions of derivatives in the domestic market are composed primarily by OTC US$/peso and US$/UF forwards. (This is studied in more detail in Section 3). Although since July 1999 and September 2000, respectively, OTC interest rates and fixed-income assets derivatives are also available in the domestic market. By contract, exchange-traded derivatives have been unsuccessful. As Table 2 shows, futures contracts on the Price Index of Selective Stocks (IPSA) and options on stocks were barely traded on the Santiago Stock Exchange in the 1990's.

[Table 2 about here]

The current legislation allows domestic banks and financial institutions to write futures, forwards, swaps, and combinations of these on the Chilean peso, indexes linked to past inflation (i.e, *Unidad de Fomento*, UF), domestic interest rates, domestic fixed-income assets, foreign currency, and foreign interest rates. The counterpart must be either another bank or financial institution, or a third party residing in Chile. The contracts can be written only when a daily quote of the underlying asset is publicly available .

Specifically, interest rates derivatives were introduced in September 1999. Banks and financial institutions are allowed to write contracts on interest rates of the Central Bank of Chile coupon bonds (PRC), interbank rates, the average interest rate (TIP), the interest rate quoted by the Association of Banks and Financial Institutions (TAB), LIBOR, Prime, and interest rates of bonds and credit notes issued by banks and financial institutions residing in Chile, and quoted on domestic exchanges.[5] Derivatives on fixed-income derivatives in turn date back to September 2000. Permissible underlying assets are Central Bank bonds, bonds and credit notes, denominated in Chilean pesos and issued by commercial banks and financial institutions residing in Chile.

Nevertheless, commercial banks are not constrained to domestic derivatives. They can take long and short positions in futures on foreign currency and interest rates, and take long positions in calls and puts on foreign currency and interest rates futures on official exchanges. Entering into such positions is bound to hedge the interest rate risk arising from having assets at fixed rates and liabilities at floating rates, and vice versa, and from having assets and liabilities at floating rates but with different maturities. In addition, banks are authorized to enter into foreign currency forwards, foreign currency and interest rates swaps, forward rate agreements (FRA's), interest rates caps, floors, and collars, and puts and calls on foreign currency and interest rates in over-the-counter (OTC) markets.

Figure 1(a) shows the evolution of the monthly net position on derivatives subscribed by commercial banks both at home and abroad (in millions of 1997 Chilean pesos), for the time period January 1997-October 2001 (source: Superintendence of Banks

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Detailed information of the current regulation is available at the web sites of the Central Bank of Chile, www.bcentral.cl, and of the Superintendence of Banks and Financial Institutions, www.sapf.cl.

[5]TIP is a weighted average of the interest rates paid by the financial system on 30-89 day nominal deposits and on 90-365 day indexed deposits. TAB is the minimum rate at which banks can lend money and break even.

and Financial Institutions). The net position is defined as assets (long positions) minus liabilities (short positions) on derivatives in a given month. As Panel (a) depicts, the net position shows a decreasing trend since May 2000, approximately. This is better understood by looking at Panel (b), which shows that the ratio of short positions to total liabilities (excluding capital) has steadily increased since January 1999, whereas long positions to assets have fell behind. This pattern suggests that banks net position on derivatives is pro-cyclical. Indeed, in 1997 and 1998 GDP grew by 7.4 and 3.9 percent, respectively, whereas in 1999 GDP fell by 0.8 percent. Pessimistic expectations about future growth might explain the negative balance in 2000 and 2001, despite positive GDP growth rates (5.3 and 2.8 percent in 2000 and 2001, respectively).

[Figure 1 about here]

The legislation that allowed domestic banks to enter into derivatives contracts dates back to the mid-1980's. At first, transactions were limited in number, primarily due to rigid controls. It was not until 1992, after the Central Bank of Chile amended the prevailing regulation, that financial volume substantially grew. To illustrate, transactions in foreign currency and interest rates derivatives carried out in the domestic and foreign markets reached US$1,766.2 million and US$215.2 million in 1993, respectively, while they jumped up to US$7,293.2 million and US$2,431.6 million in 1994, respectively.

The regulation prevailing until 1992 stated that long and short positions on exchange rate derivatives could take place only at the reference exchange rate (*dolar acuerdo*)[6], and that contract maturity could be neither less than 15 days or greater than 180 days. In addition, derivatives transactions were subject to special margins. As a result, the trading volume was small. The amendments introduced by the Central Bank of Chile allowed cash settlement of contracts, and eliminated the lower and upper limits of contract maturity. At the same time, banks were authorized to hedge exchange rate derivatives with Chilean-peso deposits indexed to the reference exchange rate.

The Law of Capital Markets of 1994 opened new investment opportunities to institutional investors in domestic and foreign markets. Indeed, pension funds (AFP) were now allowed to hedge their positions either at home or abroad, as long as they had as a counterpart an entity previously approved by the Risk-Rating Commission (*Comision Clasificadora de Riesgos*). However, they could not engage in speculative transactions. Table 3 shows the asset composition of AFP, in percentages, at end of year from 1998 through 2001. Public Sector bonds and securities issued by the domestic financial sector accounted for nearly 70 percent of their portfolios (Type 1 funds).[7] Derivatives contracts (forwards) entered into both at home and abroad, however, had a negligible share of total assets. This might be explained by the fact that AFP had to meet a certain 12-month period

[6] The reference exchange rate served as the basis to determine the floating band within which the observed market exchange rate was allowed to fluctuate freely. It was calculated as a weighted average of the parities of Chilean peso against the US dollar, the Japanese yen, and the Deutsche mark, adjusted by foreign inflation. The exchange rate floating band was eliminated in September 1999.

[7] Pension funds are not allowed to invest more than 15 percent of their total assets abroad.

rate of return, which led, in practice, all AFP to invest on similar and low risk portfolios. (This is the so-called flock effect).[8]

[Table 3 about here]

Transactions in derivatives by non-financial firms are regulated by Chapters VI and VII of Title I of the Compendium of Foreign Exchange Regulations of the Central Bank of Chile (CNCI).[9] Figure 2 shows data on derivatives contracts on foreign interest rates entered into by domestic banks and non-financial firms with foreign counterparts, under Chapter VI, for the sample period January 1998-December 2001. As we see, the dollar amount outstanding in fixed-rate contracts has predominated over the whole sample period, and the share of floating-rate contracts was always below 6 percent until September 1999. From November 1999 onwards, however, this situation reverted, and the amount outstanding of floating-rate contracts reached about one fifth of the total. Interestingly, this break in trend coincided with the liberalization of the nominal exchange rate by the Central Bank of Chile in September 1999. Indeed, as currency risk went up, banks and firms seemed to have found it more desirable to increase their shares of floating-rate contracts in their portfolios.

[Figure 2 about here]

Table 4 shows that the amounts outstanding have increased annually, in real terms, from December 1996 through December 2001 .The share of non-financial firms has been over 70 percent for the whole sample period. In order to have a sense on how large are these positions in banks and firms portfolios, we report the total notional amount outstanding held by banks to banks assets, and the total amount outstanding to firms market capitalization. As we see, these two ratios are generally below 10 percent for the sample period. In the case of banks, interests rates derivatives with foreign counterparts have gained ground over time (from 1.8 percent in 1996 to 8.7 percent in 2001), while for firms, there was a significant increment in 1998, from 4.6 to 10 percent, staying the ratio at approximately 7 percent in 1999 and 2000.

Panel (b) of Table 4 shows the notional amount subscribed (turnover) at end of year 1996 through 2001. For the whole sampling period, firms played a predominant role in market activity, with shares ranging between 63 and 90 percent. The last column of Panel (b) shows the ratio of the total amount subscribed by banks and firms to the financial volume at end of year on the Santiago Stock Exchange. The ratio reached its peak in 1997,

[8] Until 2001 the legislation stated that the rate of return in a 12-month period on any pension could not be lower than the minimum between the average rate of return of all pension funds minus 2 percent points, and half the average rate of return on all pensions funds.

[9] Chapter VI contains the regulation applicable to payments in foreign currency to foreign residents, and payments in foreign currency to domestic residents, which arise from futures, forwards, swaps, options, credit derivatives, and combinations of these, on foreign or domestic currency, UF, foreign or domestic interest rates, fixed-income assets, commercial liabilities, commodities, individual stocks and on stock indices traded in foreign exchanges, whenever the fore-mentioned contracts are initiated either on exchanges or in OTC markets. Chapter VII in turn regulates transactions of forwards, futures, and swaps on foreign interest rates and foreign currency, which take place in Chile, between a domestic bank and any other entity of the formal exchange rate market, and between an entity of the formal exchange rate market and a domestic firm or an individual who lives in Chile—whether she/he is a permanent resident.

prior to the aftermath of the Asian crisis, of 16.3 percent. However, it only reached 3.1 percent in December 2001, suggesting that derivatives have not played a key in risk management.

[Table 4 about here]

The Central Bank of Chile provides with monthly information of the evolution of trading volume of US$/Chilean peso and US$/UF forwards, carried out under Chapter VII. In 2001 total US$/Chilean peso transactions reached US$112,609 million (75.4 percent), whereas US$/UF transactions amounted to US$30,604 million (20.5 percent). By contrast, in the mid 1990's the trading volume of US$/UF contracts reached over 55 percent of the total. It appears that the process of declining inflation that Chile has been through in the past few years has reduced the appeal of contracts designed to hedge against both inflation and currency risk. [10] In May 2000 commercial banks were allowed to entered into foreign exchange forwards with foreign counterparts. To date, however, such contracts have a small share of the total (4.1 percent in 2001). The evolution of domestic forwards through time will be analyzed in more detail in Section III.

2.1.2. Argentina

Transactions of forwards on agricultural commodities in Argentina dates back to the beginning of the 20th century. Forwards have been traded on The Buenos Aires Futures Market—MATBA (*Mercado a Termino de Buenos Aires*)—since the exchange was founded in October 1907. Similar trading has taken place at the Futures Market of Rosario—Rofex (*Mercado a Termino de Rosario*), Argentina's second largest city. The most actively traded futures contracts are those on agricultural and livestock products, which include grains, oilseeds, cattle and hogs. Only call options on individual stocks, such as Perez Companc (oil and gas) and Acindar (steel), are traded at The Buenos Stock Exchange. Trading volumes, however, are relatively small. For example, for the time period 1990-2001 the share of options averaged only 1.1 percent of all transactions.

Settlement procedures for all futures and options contracts are handled by each individual exchange. The National Commission of Securities (CNV) assumes regulatory duties on trading of forwards, futures, and options contracts unless otherwise specified. Foreign entities may participate in any and all derivative markets, through the CNV or any major local broker.

MATBA is administered by a Board of Directors comprising 12 members. Traditionally, each of these has always represented a different union or trade sector. Trading is effected by open cry and deals are guaranteed by the market. The contracts available at the MATBA are futures on corn, soybean, sunflower seed, and wheat, and options on corn futures, soybean futures, sunflower futures, and wheat futures.

[Table 5 about here]

[10] The average annual inflation over 1990-1994 was 13.2 percent, whereas over 1995-2001 it reached only 4.7 percent (source: Central Bank of Chile).

Panel (a) of Table 5 shows a world ranking in 2001 of exchanges that trade agricultural products available on the MATBA. Even though the MATBA is the most important agricultural exchange in Latin America, its trading volume reached only 0.24 percent of the total traded by the exchanges under consideration. The top three agricultural exchanges in 2001 were the CBOT (74.3 percent), Tokyo Grain Exchange (14.6 percent), and Kansas City Board of Exchange Trade (4.35 percent). These figures are not very different from those in 2000, in which the same former exchanges were among the top three with corresponding shares of 76.2, 12.4, and 3.5 percent, respectively, and the MATBA had a slightly higher share of 0.29 percent.

Panel (b) of Table 5 shows the evolution of the trading volume (number of contracts) on the MATBA from 1993 to 2001. For this time period, futures on wheat, corn and soybean were the most actively traded, with corresponding average shares of 25, 20.3, and 17 percent. The greatest annual decrease in volume took place in 2001, with a 20 percent drop with respect to 2000. In general, lower trading was observed throughout 2001, and December had no trading at all, as a consequence of the late Argentinean crisis.

Rofex was founded in November 1909 as the General Exchange of National Commodities of Rosario of Santa Fe (*Mercado General de Productos Nacionales del Rosario de Santa Fe*). In the decade of the 1920's, sizeable amounts of linen, corn and wheat were traded. At the time, Argentina was the main producer and exporter of linen in the world, and the second producer of corn after the United States. In addition, its share in the international trade of wheat was 25 percent. However, government interventions and lingering inflation dampened trading in the following years. Between the late 1930's and the late 1980's, Rofex was utilized by the government as a regulatory agency, and for official grain purchases. At the beginning of the 1990's, the government allowed the negotiation of grain futures contracts denominated in US dollars. The latest and most attractive products are Rosafe Soybean Index (RSI) futures and options contracts, which are cashed settled against the spot price of soybean at Rosario.

The contracts actively traded are futures and options on sunflower, sorghum, wheat, corn, RSI, and the Argentine Live Cattle Index. Other contracts available at Rosafe are financial products, such as Argentine T-note options on futures, Argentine T-note futures, and options and futures on short, medium and long-maturity bonds (global bonds). Panel (c) of Table 5 shows the share of these different products in total trading for the time period 1993-2001. As we see, the most actively traded contracts were futures and options on the RSI, with corresponding shares of 68.2 and 21.4 percent of total volume. Futures and options on wheat and corn by contrast lagged behind with an aggregate share of only 8.7 percent.

Panels (a) and (b) of Table 5 illustrate that Rofex is a relatively small exchange. Indeed, the total volume traded on MATBA in the period 1993-2001 amounted to 143.6 million tons, whereas the volume on Rofex only reached 16.1 million in the same time period. On the other hand, when compared with other exchanges that traded derivatives on agricultural commodities worldwide in 2001, Rofex's share only amounted to 0.08 percent.

2.1.3 Mexico

In 1994 the Mexican Stock Exchange (*Bolsa Mexicana de Valores*, BMV) and the Mexican Central Securities Depository (*S.D. Indeval*) committed to create The Mexican Exchange of Derivatives (MexDer). Funding was provided by BMV, and *Indeval* helped creating a clearing house, denominated Asigna. MexDer and Asigna began transactions in December 1998. The contracts currently traded at MexDer are futures on the exchange rate (US dollar against Mexican peso), the stock index of the Mexican Stock Exchange (IPC), the 28-day interbank interest rate of equilibrium (TIIE 28), Certificates of the Treasury Mexican Confederation (CETES), three-year government bonds (M3), and individual stocks. Table 6 (a) gives a detailed description of these contracts.

[Table 6 about here]

In May 2001 a significant step towards increasing liquidity at MexDer was taken by introducing market makers (e.g. BBVA *Bancomer, Banco Santander Mexicano, Banco Nacional de Mexico*). So far they are only applicable to futures on TIIE 28, the most actively traded contracts at MexDer, as Table 6(b) shows. The goals of market makers are to provide, among other things, a minimum monthly volume and to offer prices to create liquidity (see Sanchez-Arriola, 2001). The existence of market markets might explain why the daily average financial volume increased from US$1,155 million in August-December 2000 to US$11,867 million in January-August 2001. In fact, the average daily volume jumped from US$1,733 million in April 2001 to US$13,548 million in May 2001, and kept growing thereafter.

Table 6(c) shows that MexDer is still relatively small as compared with the Mexican Stock Exchange. For instance, in 2001 estimates of the financial volumes over GDP are 33.4 percent for MexDer, and 727.4 percent for BMV. However, MexDer continues to grow. In particular, in January 2002 the number of contracts traded reached 33 percent of all contracts traded in 2001.

2.1.4 Brazil

In October 1917, exporters, businessmen, and commodity producers founded the Sao Paulo Commodities Exchange (BMSP). This was the first Brazilian institution to offer forward transactions. As time went by, BMSP established a rich tradition in the trade of agricultural commodities, especially coffee, live cattle, and cotton. In July of 1985, the Mercantile & Futures Exchange (BM&F) was founded. Trading sessions commenced at the end of January 1986, and within a short time it became one of the world's major futures exchanges.

In May 1991, BMSP and BM&F merged, giving rise to the Brazilian Mercantile & Futures Exchange (*Bolsa de Mercadorias & Futuros*), which kept the name BM&F. In June 1997, another merger took place, this time with the Brazilian Futures Exchange (BBF) of Rio de Janeiro, which was founded in 1983. The purpose of this merger was to strengthen the domestic commodity market and consolidate BM&F as the major derivatives trading center in Mercosur.

In January 2000, BM&F joined the GLOBEX Alliance, made up by the Chicago Mercantile Exchange, the Euronext NV (Paris), the Singapore Exchange-Derivatives Trading, MEFF-The Spanish Financial Futures and Options Exchange (Madrid), and the Montreal Exchange. Through the Global Trading System (GTS), the participants in each one of the allied markets have 24-hour access to the products offered by the other exchanges. Clearing operations are conducted by each individual exchange.

Table 7 shows some of the derivatives available at BM&F. Financial volumes are sizeable in absolute terms and relative to Brazilian GDP. In 2001 the daily financial volume reached approximately US$16,550 million, that is, sixty times the daily production of Chile in 1999 (source: United Nations).[11] At the same time, in 2001 the financial volume of BM&F over GDP reached 639.51 percent, which is about thirty seven times that of the Sao Paulo Stock Exchange (BOVESPA).

[Table 7 about here]

BOVESPA, the major stock trading center in Latin America, was founded in August 1890. Up to the mid sixties, BOVESPA and other Brazilian exchanges were official entities linked to the finance departments of state governments, and brokers were appointed by government authorities. After the enactment of the Securities Act in 1965, the Brazilian financial system and capital market underwent a series of reforms which provided the institutional character the Brazilian stock exchanges still have today. The Brazilian exchanges became non-profit self-regulating institutions, with administrative and financial autonomy. The traditional individual government securities broker was replaced by brokerage firm, companies established as joint stock companies or private limited liability companies. The Sao Paulo Stock Exchange is a self-regulating entity that operates under the supervision of the Brazilian Securities and Exchange Commission (CVM).

The most actively traded contracts on BOVESPA are listed company stocks, stock options, rights and stock dividends, subscription warrants and fund quotas. BOVESPA also trades depository receipts of stocks issued by companies from Mercosur member countries. Table 7(b) shows the total annual financial volume for 1999-2001, classified by financial instrument. The figures show that the cash market (cash sales and purchases of stocks listed on BOVESPA) accounted for over 80 percent of total trading from 1999 to 2001. Options and forwards, the next two most actively traded contracts, had shares of 8.8 and 4.5 percent, respectively, in 2001.

2.2 Derivatives Trading at OTC Markets and Exchanges around the World

Notional amounts—a measure of market size—involved in derivative contracts are sizeable. According to information gathered by the Bank of International Settlements (BIS), at the end of June 2001 the notional amount of outstanding positions reached US$99.7 trillion in OTC markets, and US$19.5 trillion on exchanges Among OTC transactions, positions on interest rates contracts represented 76 percent of the notional amount

[11] And, it is equivalent to 1.7 percent of the aggregate daily volume on the main exchanges in the United States (NYSE, CME, NYME, CBOE, IMM, and NYFE) in 1995 (source: Martinez Abascal, 1999).

outstanding, whereas those on foreign exchange and other contracts (equity, commodities, credit and other derivatives) amounted to 20.5 and 3.4 percent, respectively. Interest rate contracts also predominated on exchanges, reaching 89.9 percent of the notional amount outstanding. Currency and equity index contracts represented, by contrast, small percentages of the notional amount outstanding (9.8 and 0.34 percent, respectively). Meanwhile, turnover—a measure of market activity—reached US$1,342 billion in OTC markets and US$2,209 billions on exchanges at the end of June 2001.

[Table 8 about here]

Table 8 shows data on contracts entered into for different categories of exchange-traded derivatives in the United States for both 1998 and 1999 (source: The Futures Industry Institute, Factbook 2000). In 1998 trading volume of futures reached 48.7 percent, whereas options on securities and options on futures reached 51.3 percent altogether. In 1999 futures trading slightly went down (43.4 percent), making more room for options (56.6 percent). As a whole, the number of contracts traded in 1999 rose by 6.55 percent with respect to 1998. The most actively traded contracts, as a share of all contracts, were futures on interest rates (27.02 percent in 1998, and 21.87 percent in 1999), options on futures on interest rates (8.3 percent in 1998, and 6.5 percent in 1999), and options on individuals securities (31.5 percent in 1998, and 40.4 percent in 1999).

[Table 9 about here]

Data on exchange-traded derivatives outside the US in 1998 and 1999 is shown in Table 9 (source: The Futures Industry Institute, Factbook 2000). As we see, futures contracts predominated in both years (69.7 percent in 1998, and 59.8 percent in 1999), and total volume increased 13.42 percent between 1998 and 1999. The most actively traded contracts were futures on interest rates (42.1 percent in 1998, and 33.4 percent in 1999), and options on equity indices and individual equities (25.4 percent in 1998, and 36 percent in 1999). It is worth noticing that, according Tables 8 and 9, almost half derivatives contracts initiated on exchanges around the world took place in the US (47.48 and 45.92 percent in 1998 and 1999, respectively).

The Bank of International Settlements (BIS) collects data of OTC and traditional foreign exchange markets around the world in its triennial 'Central Bank Survey of Foreign Exchange and Derivatives Market Activity'. The geographical coverage was expanded from 25 countries in 1995 to 43 countries in 1998, and to 48 in 2001. The data focuses on transactions of the spot, outright forwards and foreign exchange swaps (involving two currencies) in traditional foreign exchange markets, foreign exchange derivatives (foreign exchange forwards and swaps, currency swaps and currency options/warrants, among others), and interest rates derivatives (Forward Rate Agreements (FRAs), swaps, and options/warrants, among others).

Table 10 shows figures of global turnover in traditional foreign exchange and OTC derivatives markets.[12] In the former, the predominance of foreign exchange swaps has increased over time, with a share exceeding 50 percent in 2001. At the same time, foreign exchange market activity sharply declined between 1998 and 2001, which appears to be a consequence of the introduction of the euro, the growing share of electronic broking in the spot interbank market, and consolidation in the banking industry. The sharpest decline took place in the spot market, going from US$568 billion in April 1998 to US$387 billion in April 2001. In OTC derivatives markets, the total turnover increased by 6.1 percent between 2001 and 1998, but foreign exchange instruments lost ground to interest rate instruments. The expansion in the interest rate segment might be explained by lower liquidity of long-term US government bonds, and an expanding activity in euro-denominated interest rate swaps. Finally, the turnover of exchange-traded derivatives on currency and interest instruments amounted to over 1.5 times that of OTC markets in 2001, a sharp increase with respect to 1998. Interest rates derivatives predominated, a pattern already detected in Tables 8 and 9.

[**Table 10 about here**]

The value of open positions or notional amount outstanding gives a better idea of the size of OTC markets (Table 11). Due to their longer maturity, global positions on OTC interest rates derivatives accounted for over 65 percent of all open positions at the end-March 1995, and the end-June 1998 and 2001. The most actively traded contracts, among all categories, were swaps on interest rates, with a 57.4 percent share of all open positions at the end-June 2001 (equivalent to US$57,220 billion). The predominance of interest rates derivatives among open positions on exchanges is also evident (89.9 percent at end-June 2001). It is interesting to notice that, although turnover on exchanges continues to be greater than that in OTC markets, total open positions in OTC markets quadrupled those on exchanges at end-June 2001.

[**Table 11 about here**]

Finally, Table 12 shows figures of daily turnover in OTC markets by continent, for April 1998 and 2001. The two major OTC markets worldwide were London (England) and New York (United States), with shares of 39.6 and 17.9 percent, respectively in April 2001. In both years, Europe concentrated over 70 percent of the worldwide OTC-turnover. In order to account for the fact that countries differ in the size of their economies, we constructed an indicator of daily turnover over (average) daily production in US dollars. According to it, the most active OTC markets were those in Singapore, United Kingdom, and Hong Kong.

Among Latin American countries, Mexico showed the most active trading of OTC derivatives in April 2001, with a daily average turnover of US$4.6 billion. Out of this amount, US$4.2 billion were on foreign exchange derivatives (Mexican peso against US

[12] Turnover was defined as the absolute gross value of all deals concluded (but not closed) during the month, and was measured in terms of the notional or nominal amount of the contracts. No distinction was made between short and long positions. For example, a purchase of US$5 million against the Japanese yen and a sale of US$7 million against the Japanese yen would amount to a gross turnover of US$12 million.

dollar), and the remaining US$0.4 billion on interest rates derivatives. The second and the third most active OTC markets in 2001 were Brazil and Chile, with corresponding daily turnovers of US$2.1 billion and US$0.6 billion. (When accounting for economy size, Chile had the greatest OTC market as of April 2001).

[Table 12 about here]

III A Closer Look at the Derivatives Market in Chile

In this section, we study in more detail the evolution of the derivatives market in Chile in the most recent years. As was mentioned in the Introduction, the derivatives regularly traded in Chile are US$/Chilean peso and US$/UF forwards. These types of contracts were introduced in the domestic market in 1992 and 1994, respectively.

3.1 Exchange Rate Derivatives

When derivatives were introduced in the early 1990's their market turnover only ranged between 10 and 20 percent of the total amount traded in the spot exchange rate market. However, as Table 13 shows, in the past few years market activity has jumped to over 50 percent of the spot market. Transactions in forwards contracts are carried out by two different ways: trading and position. Trading focuses mostly on speculative transactions, whereas position involves hedging market risk. The market for forwards is driven by the needs of exporters and importers, and consists primarily of commercial banks and investment-bankers engaged in money-market investments. Medium and small-size firms do not generally enter into derivatives contracts because of stringent guarantees. The minimum amount per contract is US$1 million. However, it is possible to take a position for US$50,000 or less through bank branches.

[Table 13 about here]

Maturities of US$/Chilean peso forwards range from 1 to 7 days, 8 to 30 days, 31 to 42 days, and more than 42 days. The forward prices for long and short positions are calculated from the spot exchange rate and the interest rates for borrowing and lending in Chilean pesos and US dollars:[13]

$$\text{Bid} = \text{Bid spot exchange rate} * \left(\frac{1 + \text{lending rate in pesos} * \text{maturity}/30}{1 + \text{borrowing rate in US\$} * \text{maturity}/360} \right) \quad (1)$$

$$\text{Ask} = \text{Ask spot exchange rate} * \left(\frac{1 + \text{borrowing rate in pesos} * \text{maturity}/30}{1 + \text{lending rate in US\$} * \text{maturity}/360} \right) \quad (2)$$

The maturities of US$/UF forwards range from 1 to 90 days, 91 to 180 days, and 181 to 360 days. The forward price (rate) is quoted as a premium (either positive or

[13] Short interest rates in pesos are always quoted on a monthly basis, whereas interest rates in US dollars are quoted on an annual basis.

negative) over the percent variation of the UF. Specifically, if the currency purchased on a future date is the US dollar, the forward rate (annual basis) would be calculated as follows. The forward price (UF per US$) is given by:

$$\text{Fwd price} = \frac{\text{Ask spot exchange rate}}{\text{UF value}} \left(\frac{1 + \text{borrowing rate in UF} * \text{maturity}/30}{1 + \text{lending rate in US\$} * \text{maturity}/360} \right) \quad (3)$$

The forward rate solves the equation: [14]

$$\text{Fwd price} = \left(1 + \frac{\text{Fwd rate} * \text{maturity}}{360} \right) * \frac{\text{Observed exchange rate}}{\text{UF}},$$

which is equivalently to:

$$\text{Fwd rate} = \left(\frac{\text{Fwd price}}{\text{Observed exchange rate}/\text{UF}} - 1 \right) * \frac{360}{\text{maturity}} \quad (4)$$

In order to make the above computation clear, let us consider the following example. As of December 2001, the (average) ask spot exchange rate and the observed market exchange rate were 660.5 Ch$/US$ and 656.2 Ch$/US$, respectively. If we consider a contract with maturity of 90 days, the (average) borrowing rate in UF and the lending rate in US dollars would be 6.21 and 2.06 percent, respectively. The average value of the UF in December 2001 was Ch$16,262.01. Substituting these figures in equation (3) yields a forward price of 0.0401 UF per US$. That is to say, if the amount purchased at maturity was US$100,000, the total amount due would be UF 4,103.5 or, approximately Ch$ 66.7 million. From equation (4), this is equivalent to saying that the forward rate would be 6.77 percent plus UF.

Figure 3 shows the evolution of the aggregate turnover of US$/Chilean peso and US$/UF forward contracts for the time period January 1998-December 2001. It is evident that the trading volume of US$/Chilean peso forwards was much greater than that of US$/UF forwards. As mentioned in Section 2.1.1, Chile's declining inflation rate has made the simultaneous hedging of currency and inflation risk no longer as urgent. On the other hand, the shorter maturity of US$/Chilean peso forwards (between 7 and 42 days) may be more suitable to hedge currency risk than inflation-linked contracts, especially to importers and exporters. The forwards market activity shows a seasonal behavior, in which turnover peaks generally take place around those months in which international trade is more active, namely, March, April, September and October.

[Figure 3 about here]

[14] The observed market exchange rate is the average value of the exchange rate for purchases and sales made by banks and money exchanges with third parties over the previous working day.

Figures 4 and 5 show the turnover of US$/Chilean peso and US$/UF forward contracts disaggregate by maturity. Among US$/Chilean peso forwards, the most actively traded contracts in the time period January 1998-December 2001 were those whose maturity is less than or equal to 7 days, and between 8 and 30 days. In particular, the latter dominated turnover approximately from June 1999 onwards. In the case of US$/UF forwards, the most actively traded contracts were those whose maturity is less than or equal to 90 days, and between 91 and 180 days. It is interesting to notice that contracts with maturity less than or equal to 90 days became the most actively traded around June 1999. As explained below, this fact appears to be a consequence of the change in the exchange rate policy of the Central Bank of Chile.

[Figures 4 and 5 about here]

From August 1984 to September 1999, the exchange rate policy in Chile consisted of a floating band, whose center was the so-called reference exchange rate (*dolar acuerdo*). The value of the reference exchange rate was recalculated daily according to the fluctuations in the parities of a currency reference basket—comprised by the US dollar, the Japanese yen, and the Deutsche mark, and adjusted by the difference between domestic and foreign inflation. Even though the dirty float lasted for 15 years, the level and the rule for adjusting the reference exchange rate, as well as the width of the floating band, experienced many changes over time. The floating band was finally eliminated on September 21, 1999.[15] The exchange rate essentially floated between September 1999 and July 2001. However, as a consequence of the Argentinean crisis, from July 2001 onwards the Central Bank of Chile has either actively traded in the exchange rate spot market or has issued US dollar-denominated bonds (PRD) to smooth out fluctuations in the spot rate.

It was the common belief that the volatility of the nominal exchange would dramatically increase after eliminating the floating band. During the dirty float, the Central Bank of Chile engaged in active trading in the exchange rate market whenever the spot rate either approached the bottom or the upper bound of the band. Therefore, the claim was that such policy provided an implicit exchange rate insurance to all economic agents. In order to investigate the validity of this conjecture, we constructed volatility estimates and tested whether volatility actually increased during the free float period (September 1999-July 2001).

Figure 6 shows three different estimates of the daily volatility of the 'real' exchange rate (S_t) for the time period January 1993-September 2001. This series is obtained by deflating the nominal exchange rate by a proxy of daily inflation (UF). The exponentially weighted moving average (EWMA) estimator is given by:

$$\sigma_{ewma} = \sqrt{\sum_{t=1}^{T} \frac{\lambda^{t-1}}{\sum_{j=1}^{T} \lambda^{j-1}} (S_t - \overline{S})^2} \qquad (5)$$

[15] For a complete analysis of the evolution of the nominal exchange rate during the dirty float, see Lefort and Walker (1999).

where λ is obtained by minimizing the (daily) root mean squared prediction error ($RMSE_v$):

$$RMSE_v = \sqrt{\frac{1}{T}\sum_{t=1}^{T}(S_{t+1} - \hat{S}_{t+1|t}(\lambda))^2} \quad (6)$$

(see, for example, Harvey, 1989).

The one-day real exchange rate forecast, given the data available at time t (that is, one day earlier), is given by:[16]

$$\hat{S}_{t+1|t} = \lambda \hat{S}_{t|t-1} + (1-\lambda)S_t \quad (7)$$

with the initial condition $\hat{S}_{2|1} = S_1$.

The equally weighted (EW) estimate of the volatility is calculated from equation (5) by setting λ=1. That is to say,

$$\sigma_{ew} = \sqrt{\frac{1}{T}\sum_{t=1}^{T}(S_t - \overline{S})^2} \quad (8)$$

Finally, the naï ve estimate is calculated as the absolute value of the daily change in the real exchange rate:

$$\sigma_{naïve} = |S_t - S_{t-1}| \quad (9)$$

[Figure 6 about here]

In order to address the question on how volatility changed after elimination the floating band, we divided the sample into two groups of a two-year length each. The time period pre-change goes from May 1997 to May 1999, whereas the post-period covers June 1999 to June 2001. The floating band was dropped in September 1999, so the second time period is essentially free from any intervention from the Central Bank to stabilize the nominal exchange rate.

Tables 14 (a) through (c) show descriptive statistics of the three volatility estimates for the pre and post free float period. In all cases, increases in mean and standard deviation of volatility are observed in the post free float period. In addition, the frequency of higher volatility episodes is higher. Table (d) shows further evidence of a structural break in the probability distribution of volatility. A Kolmogorov-Smirnov test rejects the null

[16] In order to estimate the optimal λ, we carried out a grid search over the interval [0.01, 0.99], with a step of 0.01. By using the data from the whole sample period, we found an estimate of λ equal to 0.51. The volatility series was constructed from equation (5) by taking T=20 (the average number of working days in a month), and plugging in the estimate of λ. $\overline{S}$ is the sample mean of the 20 observations taken each time.

hypothesis of equal cumulative distribution functions (pointwise) for the pre and post free float. In addition, a Welch two sample t-test suggests that the mean of volatility actually increased over June 1999-July 2001. The Wilcoxon/Mann-Whitney and Barlett tests in turn suggest that higher moments of volatility also changed after dropping the floating band.

[Table 14 about here]

However, the change in volatility was not sharp enough to dramatically alter the aggregate trading volume of forwards contracts, as Figure 4 shows. What is interesting is that the composition of the forwards contracts has changed. Currently the most actively traded contracts are those whose maturity ranges between 8 and 30 days, in the case of US$/Chilean peso forwards, and whose maturity is less than or equal to 90 days, in the case of US$/UF forwards.

For US$/Chilean peso forwards, whose maturity is between 8 and 30 days, we observe an upward trend in their turnover since the end of 1998. However, its predominance became evident only since approximately June 1999. Prior to June 1999, 91-180 day contracts represented a high share of the total turnover of US$/UF forwards. However, they later lost ground to shorter maturity contracts. An explanation to these phenomena might be the following. Even though the exchange rate has not exhibited a sharp increase in its volatility, eliminating the floating band has led to higher currency risk. Indeed, as the exchange rate insurance provided by the floating band was not longer available, economic agents found that a better way to hedge currency risk was by entering into shorter maturity contracts.

In previous sections, we have argued that regulatory constraints faced by pension funds (AFP), and low market liquidity might be two factors that have slowed down the development of derivatives markets in Chile. Panels (a) and (b) of Figure 7 show estimates of market liquidity on a monthly and daily basis, respectively. Panel (a), in particular, shows that the average of liquidity—which is defined as the difference between actual and required bank reserves—in any given month has been relative low for the period February 1994-May 2002. Indeed, the average for the whole time period was only US$12.9 millions, and higher liquidity has been observed only from 2000 onwards. Panel (b) shows liquidity on a daily basis from January 2001 to May 2002, where each data point is a 30-day moving average. These figures show more clearly how fluctuating is liquidity, and how this may get sharply negative in some time periods. This certainly have shrunk transactions on domestic stock exchanges, and also in OTC markets.

[Figure 7 about here]

But what about the future perspectives of derivatives markets in Chile? As previously mentioned, a package of amendments to the Law of Capital Markets was passed by the Chilean Congress in November 2001. The main innovations can be summarized as follows. First, short-selling of frequently traded stocks and bonds will be exempted from the capital gains tax (15 percent). This will also apply to the sale of bonds traded in a stock exchange. Second, capital gains tax will be eliminated on the sale of frequently traded stocks, which were purchased after April 19, 2001.Third, an emerging stock exchange will

be created in order to provide an alternative source of funding for mid-sized companies. Capital gains of stocks traded on this exchange will be exempted from the capital gains tax for three years. Fourth, multiple Pension Funds (AFP) will be available. AFP will now not only offer one single fund but five different alternative investment portfolios to their affiliates, according to their tastes for risk and return.[17] Fifth, there will be more investments choices for savings in excess of the mandatory 10 percent of monthly gross income, which is currently managed by pension funds. Voluntary savings will be managed not only by pension funds, as has been until now, but by mutual funds, investment funds, banks, and life insurance companies.

In principle, the elimination of the capital gains on short-selling of stocks, the creation of an emerging stock exchange, and the multi-fund AFP might have the greatest impact on the Chilean derivatives market by providing additional liquidity to the spot markets, and by offering new financial instruments. In particular, the existence of multi-fund AFP might reduce the flock effect referred to in Section 2.1.1. However, we will have to wait for the next few years to see the effect of the amendments. Meanwhile, the OTC market of currency forwards continues to be the most active.

IV Conclusions

Derivatives began to be actively traded between the mid-1970's and the mid-1980's on and outside exchanges in most industrialized countries. According to information gathered by The Bank of International Settlements, at the end of April 2001 the value of OTC positions outstanding was over US$99 trillion, while the value of positions outstanding in organized exchanges was approximately US$20 trillion. In Latin America the largest derivatives exchanges are located in Argentina (MATBA, ROFEX), Brazil (BM&F, BOVESPA), and Mexico (MexDer). In addition, OTC markets exist in Chile and Peru.

The contracts regularly traded in Chile are US$/Chilean peso and US$/*Unidad de Fomento* (UF) forwards. Other types of derivatives, such as individual stock options and stock indices options have been barely traded. The causes appear to be low market liquidity and regulatory constraints faced by institutional investors. However, recent amendments to the Law of Capital Markets—which involve the creation of an exchange for emerging firms, and the existence of multi-fund AFPs, among others—might boost the derivatives market. Meanwhile, foreign exchange rate derivatives continue to be the most actively traded.

In our analysis, we examined the effect of the elimination of the floating band of the US dollar against the Chilean peso in 1999 on forwards turnover. The figures showed us that, at least until December 2001, the exchange rate had not been significantly more volatile. And, therefore, the forwards market has not become noticeably more active. However, economic agents have now switched to shorter-maturity contracts as the exchange rate insurance provided by the floating band is no longer available.

[17] In particular, there will be three age brackets (less than 40, 41-55 and over 55 years old), and a default fund for each bracket. Riskier portfolios will be made available only to younger affiliates in order to reduce excessive market risk as their retirement approaches.

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Table 1 Chilean Regulation for the Trading of Derivatives

	Forwards	**Futures**	**Options**
Definition	Agreement to buy or sell an asset at a certain future time for a certain price	Similar to forwards, but exchange-traded and subject to additional constraints	Contract gives the right to buy or sell an asset at a certain future time for a certain price.
Underlying asset	Foreign exchange, commodities, and interest rates	IPSA[1], US dollar, foreign interest rates	Endesa and CTC-A stocks. Options are the American type.
Contract size	Agreed by the two counterparts	-IPSA: 2.000 x IPSA in pesos -US$: UF per US$ 10,000 -Interest rates: US$ 1 million [2]	100-stock package. Reference price: average defined by the exchange.
Delivery date	Agreed by the two counterparts	-IPSA: The day before the last work day of every month -US$: Third Wednesday of January, March, May, July, September, and November. -Foreign Interest rates: Third Wednesday of March, June, September, and December [2]	Third Tuesday of February, April, June, August, October, and of December.
Initial margin	None	-IPSA: Approximately 25% of the contract size (in pesos) -US dollar: A fixed amount in pesos, equivalent to a certain % of the contract size -Foreign interest rates: US$600 per contract [2]	Writer: 20% of the market value of the stocks involved in the contract, plus 100% of the current option value. Buyer: none.
Warranty	Agreed by the two counterparts	The corresponding exchange clearinghouse	The Santiago Stock Exchange clearinghouse
Liquidity	Very low	Generally high	Generally high
Price quote	Not applicable	-IPSA and US$: Santiago Stock Exchange -Foreign interest rates: Chicago Mercantile Exchange	Santiago Stock Exchange
Regulation applicable	Compendium of Financial Regulations, and Compendium of Foreign Exchange Regulations	-IPSA and US$: Law of the Capital Market, and regulations of the Santiago Stock Exchange and of the Superintendence of Securities and Insurance - Foreign interest rates: Compendium of Foreign Exchange Regulations	Law of the Capital Market, and regulations of the Santiago Stock Exchange and of the Superintendence of Securities and Insurance

Source: Central Bank of Chile (1994), and Santiago Stock Exchange (1999) [1] IPSA is a stock index, which measures the price variation of the 40 stocks most actively traded on the Santiago Stock Exchange. [2] Chicago Mercantile Exchange

Table 2 Derivatives Trading on the Santiago Stock Exchange: 1990-2000

(Figures in thousand US dollars of December 2000)

			Traded Assets					
Time period	**Stocks**	**I.I.F**	**I.R.F**	**Metals**	**Futures**	**C.F.I.**	**Options**	**Total**
Decade 1960	29,208.7	0.0	1,805.5	2,042.7	0.0	0.0	0.0	33,056.9
Decade 1970	67,342.1	49,263.6	21,916.7	6,534.4	0.0	0.0	0.0	145,056.8
Decade 1980	463,516.4	5,000,321.2	5,290,426.7	17,534.2	0.0	0.0	0.0	10,771,798.6
Decade 1990	4,723,486.8	65,691,662.9	46,988,564.7	14,590,545.8	602,181.7	55,797.7	445.4	132,652,684.9
Decade 2000	5,882,781.6	126,536,927.8	42,527,412.0	46,103,278.7	0.0	32,210.4	0.0	221,082,610.6
Year	**Stocks**	**I.I.F**	**I.R.F**	**Metals**	**Futures**	**C.F.I.**	**Options**	**Total**
1990	1,005,475.4	6,952,874.7	18,328,212.9	332,532.1	9,048.1	0.0	0.0	26,628,143.3
1991	2,305,535.2	11,225,776.8	14,829,065.1	4,444,048.2	27,830.2	6,551.1	0.0	32,838,806.7
1992	2,254,963.7	18,266,751.8	24,839,673.5	3,883,646.9	16,481.5	25,581.0	0.0	49,287,098.4
1993	3,037,499.3	30,510,929.3	28,350,584.4	4,277,098.5	7,432.1	27,544.5	0.0	66,211,088.2
1994	5,324,445.5	33,485,494.4	47,062,740.8	5,058,723.7	75.3	72,970.7	406.1	91,004,856.4
1995	9,800,121.2	53,184,056.7	71,914,005.2	9,764,654.2	0.0	285,162.9	39.2	144,948,039.4
1996	7,301,071.5	95,934,447.7	68,225,750.2	10,753,998.4	0.0	67,352.9	0.0	182,282,620.6
1997	6,140,360.1	116,967,083.9	73,212,728.4	17,367,692.5	0.0	63,342.4	0.0	213,751,207.4
1998	3,814,188.1	167,952,348.6	78,310,946.8	42,913,713.6	0.0	8,466.1	0.1	292,999,663.3
1999	6,251,208.3	122,436,864.6	44,811,939.2	47,109,349.9	0.0	1,005.1	0.0	220,610,367.1
2000	5,882,781.6	126,536,927.8	42,527,412.0	46,103,278.7	0.0	32,210.4	0.0	221,082,610.6
Average 90-00	**4,828,877**	**71,223,051**	**46,583,005**	**17,455,340**	**5,533**	**53,653**	**40**	**140,149,500**
Percentage	**3.45%**	**50.82%**	**33.24%**	**12.45%**	**0.00%**	**0.04%**	**0.00%**	**100.00%**
Ave 90-00/GDP	**8.78%**	**129.47%**	**84.68%**	**31.73%**	**0.01%**	**0.10%**	**0.00%**	**254.76%**

Source: Santiago Stock Exchange and the Central Bank of Chile. IIF: fixed-income instruments whose maturity is less than a year; IRF: fixed income instruments, such as mortgage securities, Treasury and Central Bank bonds, commercial banks and firms bonds; Metals: gold and coined silver, and US dollars; CFI: shares of investment funds. Ave. 90-00/GDP is calculated as the 1990-2000 average for each category over the 1990-2000 average Chilean GDP (all figures in US dollars of 2000).

Table 3 Evolution of Investments made by Chilean Pension Funds by Sector and Financial Instruments
(Figures are percentages of total assets)

	Dec-98	**Dec-99**	**Dec-00**		**Dec-01**	
			Type 1 Fund	Type 2 Fund	Type 1 Fund	Type 2 Fund
Public Sector	**40.96**	**34.59**	**35.73**	**68.37**	**35.00**	**61.99**
Central Bank of Chile Bonds	37.53	31.01	31.90	37.45	29.95	51.65
Chilean Treasury Bills	0.01	0.00	0.00	---	0.00	---
Bonds of Recognition	3.43	3.58	3.83	30.92	5.04	10.35
Domestic Financial Sector	**32.05**	**33.70**	**35.62**	**30.54**	**33.08**	**33.97**
Mortgage securities	16.60	15.10	14.36	14.96	12.91	13.00
Bank deposits	13.64	16.11	18.73	15.53	17.54	20.11
Financial institutions bonds	1.45	2.02	2.03	0.05	2.05	0.86
Financial institutions stocks	0.38	0.52	0.51	---	0.65	---
Forwards	–0.025	–0.043	0.006	---	–0.072	---
Domestic Firms	**21.17**	**18.26**	**17.57**	**1.06**	**18.50**	**4.05**
Stocks	14.53	11.89	11.11	---	9.96	---
Bonds	3.77	3.79	4.04	1.06	6.16	4.05
Investment Funds Shares	2.88	2.58	2.43	---	2.39	---
Foreign Sector	**5.73**	**13.42**	**10.89**	**---**	**13.36**	**---**
Mutual funds shares and stocks	3.93	8.91	8.86	---	8.65	---
International investment funds shares	0.19	0.19	0.24	---	0.22	---
Debt notes	1.50	4.15	1.67	---	4.37	---
Forwards	---	-0.0005	---	---	0.0002	---
Others	0.10	0.16	0.11	---	0.11	---
Current assets	**0.09**	**0.03**	**0.19**	**0.03**	**0.06**	**-0.01**
Total assets in millions of US$	**31,146.89**	**33,978.44**	**35,937.21**	**8.48**	**34,705.09**	**28.91**

Source: Superintendence of Pension Funds (SAFP). Pension funds are divided into Type 1 and Type 2. Type 2 pension funds only invest in fixed-income securities.

Table 4 Transactions in Foreign Interest Rates Derivatives by Chilean Commercial Banks and Non-financial Firms [1, 2, 3]

(Figures in millions of US dollars, base =December 2000)

(a) Notional Amount Outstanding [4]

Date	Fixed rate		Floating Rate							
	Banks	Firms	Banks	Firms	Total banks	% of total assets	Total firms	% of market capitalization	Total banks and firms	% Change
Dec 1996	0	1,194	158	0	158	1.8%	1,194	2.1%	**1,352**	--
Dec 1997	253	2,798	112	0	366	2.9%	2,798	4.6%	**3,163**	234%
Dec 1998	304	4,523	110	0	414	4.2%	4,523	10.1%	**4,937**	156%
Dec 1999	285	3,697	192	837	477	3.1%	4,534	7.0%	**5,011**	102%
Dec 2000	422	3,705	501	800	923	4.5%	4,505	7.4%	**5,428**	108%
Dec 2001	1,815	4,855	414	1,149	2,229	8.7%	6,004	9.5%	**8,232**	152%

(b) Notional Amount Subscribed (Turnover)

Date	Banks		Firms		Total banks and firms	Annual change	Total banks and firms/Santiago Stock Exchange financial volume
	Total	Share	Total	Share			
Dec 1996	108	10%	988	90%	1,096	--	6.6%
Dec 1997	732	23%	2,401	77%	3,133	190.9%	16.3%
Dec 1998	362	10%	3,142	90%	3,504	13.6%	13.5%
Dec 1999	354	19%	1,514	81%	1,868	-45.3%	9.8%
Dec 2000	156	26%	445	74%	601	-66.8%	3.3%
Dec 2001	223	37%	388	63%	611	3.3%	3.1%

Source: Author's elaboration based upon information from the Central Bank of Chile, the Santiago Stock Exchange. [1]Transactions in derivatives on foreign interest rates carried out by Chilean firms with foreign counterparts under Chapter VI of CNCI. [2]The underlying asset is classified into fixed and floating rate [3]Provisional figures. [4]End-of-month figures

Table 5 Derivatives Markets in Argentina

(a) 2001 World Ranking of Options and Futures on Agricultural Products (figures in tons)

Exchange	Wheat	Corn	Soybean	Sunflower seed	Total Exchange	Share Exchange
CBOT	1,158,791,883	2,742,467,485	2,174,488,669		**6,075,748,037**	74.265%
Tokyo Grain Exchange		1,039,390,900	153,065,850		**1,192,456,750**	14.576%
Kansas City Board of Trade	353,848,265				**353,848,265**	4.325%
Fukuoka Futures Exchange		201,696,800	48,014,970		**249,711,770**	3.052%
Minneapolis Grain Exchange	135,681,513				**135,681,513**	1.658%
South African Futures Exch.	1,199,600	64,144,300		1,262,450	**66,606,350**	0.814%
Kansai Agricultural Com. Exc.			43,111,110		**43,111,110**	0.527%
MATBA	6,520,800	4,457,900	7,630,000	1,020,400	**19,629,100**	0.240%
MidAmerica Commodity Exch.	1,434,159	3,102,966	7,737,309		**12,274,434**	0.150%
LIFFE	10,836,900				**10,836,900**	0.132%
Rofex	961,100	116,350	5,046,550		**6,124,000**	0.075%
Matif / Euronext París	2,857,950	2,883,200			**5,741,150**	0.070%
Budapest Commodity Exch.	1,739,000	1,573,300	3,900	110,100	**3,379,800**	0.041%
Winnipeg Commodity Exch.	3,228,300				**3,228,300**	0.039%
Central Japan Comm. Exch.			2,496,900		**2,496,900**	0.031%
Sydney Futures Exchange	202,500				**202,500**	0.002%
BM&F		123,876	2,241		**126,117**	0.002%
Total product	**1,677,301,970**	**4,059,957,077**	**2,441,597,499**	**2,392,950**	**8,181,202,996**	100%

Source: Mercado a Termino (MATBA). The ranking only considers those products traded on MATBA, namely, wheat, corn, soybean, and sunflower seed.

(b) Trading Volume (in tons) at MATBA in 1993-2001 by product and contract type

	Wheat		Corn		Sunflower seed		Soybean		Total Annual
	Futures	Options	Futures	Options	Futures	Options	Futures	Options	
1993	2,455,800	436,800	2,053,600	232,000	772,600	89,300	984,600	106,900	7,131,600
1994	1,963,100	490,600	1,818,300	392,200	865,600	181,400	885,300	153,900	6,750,400
1995	2,084,000	1,354,400	1,634,300	1,130,200	977,000	391,900	837,900	191,100	8,600,800
1996	4,847,300	2,429,000	2,780,100	1,655,500	1,172,700	751,500	936,800	563,800	15,136,700
1997	4,949,200	2,449,000	4,368,900	2,067,900	1,863,400	980,500	2,604,500	990,500	20,273,900
1998	4,855,800	2,056,700	4,248,600	1,504,500	2,354,000	995,700	2,906,900	1,092,000	20,014,200
1999	5,427,100	2,693,000	3,947,500	978,900	3,394,000	610,200	4,388,200	1,773,600	23,212,500
2000	5,229,300	1,823,900	4,667,200	899,300	2,690,750	180,700	5,367,200	2,747,500	23,605,850
2001	4,108,000	1,894,800	3,588,900	800,500	1,176,700	276,800	5,462,300	1,547,300	18,855,300
Total 93-01	**35,919,600**	**15,628,200**	**29,107,400**	**9,661,000**	**15,266,750**	**4,458,000**	**24,373,700**	**9,166,600**	**143,581,250**
Share 93-01	**25.02%**	**10.88%**	**20.27%**	**6.73%**	**10.63%**	**3.10%**	**16.98%**	**6.38%**	**100.00%**

Source: MATBA

Table 5 (continued)

c) Trading Volume (in contracts) on Mercado a Termino de Rosario (Rofex), Argentina, 1993-2001

	***Rosafe* Soybean Index (RSI)**		**Wheat**		**Corn**		**Other**	**Total Rofex**	
Year	**Futures**	**Options**	**Futures**	**Options**	**Futures**	**Options**	**(futures/options)**	**No.Contracts**	**Tons**
1993	1,297	0	168	0	85	0	754	2,304	63,925
1994	4,109	0	129	0	131	0	61	4,430	117,250
1995	7,109	0	961	0	1,370	0	606	10,046	315,375
1996	6,249	4,919	2,004	1,353	1,045	1,134	707	17,411	580,175
1997	26,463	3,256	2,336	1,061	1,841	624	151	35,732	1,039,850
1998	49,790	9,442	4,017	1,038	2,726	515	698	68,226	1,913,600
1999	69,938	22,994	4,440	353	862	32	2,994	101,613	2,635,280
2000	98,132	32,347	5,814	1,633	650	4	1,517	140,097	3,685,170
2001	142,039	54,118	8,956	6,108	218	0	3,172	214,611	5,792,675
Total 93-01	**405,126**	**127,076**	**28,825**	**11,546**	**8,928**	**2,309**	**10,660**	**594,470**	**16,143,300**
Share 93-01	**68.15%**	**21.38%**	**4.85%**	**1.94%**	**1.50%**	**0.39%**	**1.79%**		

Source: Author´s elaboration based upon information from Rofex and MATBA. The category "Other" includes sorghum, sunflower seed, INA (Argentinean feeder cattle index), IMR (Rosafe corn index), and BGC (Short-term global bonds).

Table 6 The Mexican Market of Derivatives (MexDer)

(a) Futures Contracts available at MexDer

	Exchange rate	Stock index	Fixed-income (*)	Fixed-income	Stocks
Contract type	US dollar DEUA	Stock Index of the Mexican Stock Exchange IPC	28-day interbank interest rate of equilibrium (TIIE) TE28	91-day certificates of the Treasury Confederation (CETES) CE91	CMX, FEMD, GCAA, GFBO, TMXL
Contract size	US$10,000	Mx$10.00 times the value of IPC	Mx$ 100,000	10,000 Cetes (=Mx $100,000)	1,000 stocks
Delivery date	Monthly cycles up to 3 years	Quarterly cycles: March, June, September, December up to 1 year	Monthly cycles: up to 30 and 6 months	Monthly cycles: up to 30 and 6 months	Quarterly cycles: March, June, September, December

Source: MexDer. (*) MexDer also offers futures on 3-year bonds of development of the Federal Government (M3). Individual stocks include *Cementos Mexicanos* (CMX), *Fomento Económico Mexicano*, S.A. de C.V. (FEMD), *Grupo Carso*, S.A. de C.V. (GCAA), *Grupo Financiero* BBVA Bancomer, S.A. de C.V. (GFBO), and *Teléfonos de México*, S.A. de C.V. (TMXL).

(b) Daily Averages for January-August 2001

Underlying asset	Volume (No. of contracts)	Share volume	Financial volume (millions US$)	Share financial volume
DEUA	922	1.79%	10.0	1.79%
IPC	136	0.26%	1.0	0.17%
CE91	0	0.00%	0.0	0.00%
TE28	50,521	97.93%	550.7	98.03%
CMX	12	0.02%	0.1	0.01%
FEMD	0	0.00%	0.0	0.00%
GCAA	0	0.00%	0.0	0.00%
GFBO	0	0.00%	0.0	0.00%
TLMX	0	0.00%	0.0	0.00%
Total	**51,591**	**100%**	**561.7**	**100%**

(c) Size of MEXDER relative to the Mexican Stock Exchange

Mexican Stock Exchange (daily averages in millions US$)					
Year	**Stock market**	**Fixed income**	**Capital market**	**Money market**	**Total**
1998	122	4	137	5,074	5,336
1999	139	2	154	8,770	9,064
2000	165	2	169	16,330	16,666

Financial Volume over GDP in 2001 (*)	
Mexican Stock Exchange	**MEXDER**
727.4%	33.4%

Source (b) and (c): MexDer, and the World Bank. (*): Estimates.

Table 7 Brazilian Derivatives Markets

(a) BM&F

Floor Trading	2000 Financial volume (millions US$)	2000 Share of total trading	2001 Financial volume (millions US$)	2001 Share of total trading
Gold spot (250g)	217.1	0.01%	79.2	0.00%
Total Gold	**340.8**	**0.01%**	**110.2**	**0.00%**
Bovespa Index futures	188,525.4	4.95%	91,494.8	2.21%
Total Bovespa stock index	**188,610.6**	**4.95%**	**91,831.4**	**2.22%**
Interbank Deposits (ID) futures	1,896,412.5	49.80%	1,761,528.0	42.58%
ID x US Dollar spread futures	230,638.9	6.06%	61,814.7	1.49%
ID forward with reset	167,885.0	4.41%	228,494.4	5.52%
Total Interest rates	**2,303,059.7**	**60.47%**	**2,051,950.6**	**49.60%**
US dollar futures	1,007,840.1	26.46%	885,639.7	21.41%
Total Foreign currencies	**1,012,123.0**	**26.58%**	**893,183.4**	**21.59%**
C-Bond futures	73.7	0.00%	115.4	0.00%
EI-Bond futures	72.8	0.00%	15.3	0.00%
Total Sovereign debt instruments	**146.5**	**0.00%**	**130.8**	**0.00%**
Live cattle futures	1,102.3	0.03%	360.7	0.01%
Arabica coffee futures	3,933.9	0.10%	2,757.1	0.07%
Anhydrous fuel alcohol futures	550.0	0.01%	382.1	0.01%
Total Agricultural products	**5,792.8**	**0.15%**	**3,673.7**	**0.09%**
Total floor trading	**3,510,073.4**	**92.17%**	**3,833,496.9**	**92.65%**
Total electronic system (GTS)	**23,516.7**	**0.62%**	**411,811.7**	**9.95%**
Total OTC market	**274,695.2**	**7.21%**	**131,043.1**	**3.17%**
Total all markets	**3,808,285.3**	**100%**	**4,137,406.4**	**100%**

Source: Author' elaboration based upon information from the Mercado do Futuros o Mercadorias (BMF). Only all those derivatives contracts with greatest shares within each category are shown in the table. Although total figures include all traded categories .

(b) BOVESPA

Total Annual Financial Volume: 1999-2001 (millions US$)						
Market	**1999**		**2000**		**2001**	
Cash (*)	70,635.0	82.6%	85,555.8	84.1%	54,196.1	83.2%
Forward	1,057.9	1.2%	3,979.2	3.9%	2,829.2	4.4%
Options	8,992.3	10.5%	7,080.9	7.0%	5,742.1	8.8%
Futures	0.0	0.0%	0.0	0.0%	0.4	0.00%
Others	4,814.4	5.6%	5,113.9	5.0%	2,339.4	3.6%
Total	**85,499.8**	**100%**	**101,729.8**	**100%**	**65,107.3**	**100%**

(c) Relative Size of BM&F and BOVESPA in 2000

Exchange	Financial volume (mill US$)	Share of GDP
BOVESPA	101,729.8	17.1%
BMF	3,808,285	639.5%

Source (b) and (c): BOVESPA and the World Bank. (*)cash purchase or sale of a given number of shares, at a price set on trading floor sessions.

Table 8 Derivatives traded on US Exchanges: 1998 and 1999

Category	Trading Volume January-December 1998 (Number of Contracts)	Trading Volume January-December 1999 (Number of Contracts)
Total Futures	503,201,445 (48.70%)	477,919,308 (43.41%)
Total Options on Futures	127,485,961 (12.34%)	115,000,090 (10.45%)
Total Options on Securities	402,514,207 (38.96%)	507,942,023 (46.14%)
Total	**1,033,201,613** (100%)	**1,100,861,421** (100%)
Futures		
Interest Rate	279,208,766 (55.49%)	240,735,657 (50.37%)
Agricultural Commodities	73,323,714 (14.57%)	72,996,432 (15.27%)
Energy Products	63,810,735 (12.68%)	75,145,313 (15.72%)
Foreign Currency/Index	27,019,174 (5.37%)	23,658,363 (4.95%)
Equity Indices	42,366,918 (8.42%)	46,742,765 (9.78%)
Precious Metals	13,823,949 (2.75%)	14,445,203 (3.02%)
Non-Precious Metals	2,483,610 (0.49%)	2,880,940 (0.60%)
Other	1,164,579 (0.23%)	1,304,635 (0.27%)
Total	**503,201,445** (100%)	**477,919,308** (100%)
Options on Futures		
Interest Rate	85,803,111 (67.3%)	71,984,229 (62.59%)
Agricultural Commodities	17,498,211 (13.73%)	18,370,703 (15.97%)
Energy Products	12,076,289 (9.47%)	13,409,464 (11.66%)
Foreign Currency/Index	3,580,003 (2.81%)	1,970,358 (1.71%)
Equity Indices	5,562,819 (4.36%)	5,513,900 (4.79%)
Precious Metals	2,777,759 (2.18%)	3,552,925 (3.09%)
Non-Precious Metals	153,332 (0.12%)	161,499 (0.14%)
Other	34,437 (0.03%)	37,012 (0.03%)
Total	**127,485,961** (100%)	**115,000,090** (100%)
Options on Securities		
Interest Rate	76,760 (0.02%)	42,556 (0.01%)
Foreign Currency/Index	1,826,950 (0.45%)	826,092 (0.16%)
Equity Indices	74,830,347 (18.59%)	62,308,151 (12.27%)
Individual Equities	325,780,150 (80.94%)	444,765,224 (87.56%)
Total	**402,514,207** (100%)	**507,942,023** (100%)

Source: The Futures Industry Institute (FII) 2000 Fact Book. The exchanges include the American Mercantile Exchange (AMEX), the Chicago Board Options Exchange (CBOE), the Cantor Exchange, the Chicago Board of Trade (CBOT), the Chicago Mercantile Exchange (CME), the Kansas City Board of Trade (KCBOT), the Mid-America Commodity Exchange (MIDAM), the Minneapolis Grain Exchange (MGE), the New York Board of Trade (NYBOT), the New York Mercantile Exchange (NYMEX), the Pacific Stock Exchange (PSE), the Philadelphia Board of Trade (PBOT), and the Philadelphia Stock Exchange (PHLX).

Table 9 Derivatives traded on Exchanges Outside the United States: 1998 and 1999

Category	Trading Volume January-December 1998 (Number of Contracts)	Trading Volume January-December 1999 (Number of Contracts)
Total Futures	796,107,856 (69.65%))	775,569,595 (59.82%)
Total Options	344,862,103 (30.17%)	520,827,726 (40.18%)
Total	**1,142,969,959** (100%)	**1,296,397,321** (100%)
Futures		
Interest Rate	480,674,849 (60.23%)	433,272,299 (55.87%)
Agricultural Commodities	45,940,264 (5.76%)	44,894,404 (5.79%)
Energy Products	19,027,449 (2.38%)	22,459,229 (2.90%)
Foreign Currency/Index	27,506,873 (3.45%)	12,983,365 (1.67%)
Equity Indices	135,686,202 (17.00%)	160,748,693 (20.73%)
Precious Metals	33,433,989 (4.19%)	36,244,464 (4.67%)
Non-Precious Metals	55,196,171 (6.92%)	63,626,218 (8.20%)
Individual Equities	618,464 (0.08%)	1,324,838 (0.17%)
Other	23,595 (0.00%)	16,085 (0.00%)
Total	**798,107,856** (100%)	**775,569,595** (100%)
Options		
Interest Rate	43,923,880 (12.74%)	46,182,796 (8.87%)
Agricultural Commodities	927,724 (0.27%)	957,378 (0.18%)
Energy Products	442,522 (0.13%)	449,160 (0.09%)
Foreign Currency/Index	6,629,831 (1.92%)	1,666,708 (0.32%)
Equity Indices	114,515,222 (33.21%)	245,740,148 (47.18%)
Precious Metals	199,468 (0.06%)	365,915 (0.07%)
Non-Precious Metals	2,515,409 (0.73%)	4,034,548 (0.77%)
Individual Equities	175,643,697 (50.93%)	221,430,211 (42.52%)
Other	1,350 (0.00%)	862 (0.00%)
Total	**344,862,103** (100%)	**520,827,726** (100%)

Source: The Futures Industry Institute (FII) 2000 Fact Book. The data comprises exchanges in Europe (Austria, Denmark, Finland, France, Hungary, Italy, Norway, The Netherlands, The United Kingdom, Spain, Sweden, and Switzerland), Asia (China, Hong-Kong, Korea, Malaysia, Japan, Singapore, and Taiwan), Africa (South Africa), North America (Canada), South America (Argentina and Brazil), Oceania (Australia and New Zealand).

Table 10 Global Market Turnover in Traditional Foreign Exchange Markets and OTC derivatives markets
(Daily averages in April, in billions of US dollars)

	Traditional Foreign Exchange Markets					
Instrument	**1995**		**1998**		**2001**	
	Turnover	**% Share**	**Turnover**	**% Share**	**Turnover**	**% Share**
▪ Spot transactions	494	41.5%	568	38.1%	387	32.0%
▪ Forwards	97	8.2%	128	8.6%	131	10.8%
▪ Foreign exchange swaps	546	45.9%	734	49.3%	656	54.2%
Total foreign exchange market[1]	**1,190**	**100%**	**1,490**	**100%**	**1,210**	**100%**
	OTC derivatives markets					
Instrument	**1995**		**1998**		**2001**	
Foreign exchange instruments	**Turnover**	**% Share**	**Turnover**	**% Share**	**Turnover**	**% Share**
▪ Forwards and foreign exchange swaps	643	73.1%	862	69.7%	786	56.7%
▪ Currency swaps	4	0.5%	10	0.8%	7	0.5%
▪ Options	41	4.7%	87	7.0%	60	4.3%
▪ Other	1	0.1%	0	0.0%	0	0.0%
Total	**689**	**78.3%**	**959**	**77.5%**	**853**	**61.5%**
Interest rate instruments						
▪ FRAs	66	7.5%	74	5.8%	129	9.3%
▪ Swaps	63	7.2%	155	12.3%	331	23.9%
▪ Options	21	2.4%	36	2.8%	29	2.1%
▪ Other	2	0.2%	0	0.0%	0	0.0%
Total	**152**	**17.3%**	**265**	**20.9%**	**489**	**35.3%**
Total OTC derivatives[1]	**880**	**100%**	**1,265**	**100%**	**1,342**	**100%**
	Exchange-traded derivatives					
Instrument	**1995**		**1998**		**2001**	
	Turnover	**% Share**	**Turnover**	**% Share**	**Turnover**	**% Share**
▪ Currency instruments	17	1.4%	12	0.9%	9	0.4%
▪ Interest rate instruments	1,205	98.6%	1,360	99.1%	2,200	99.6%
Total Exchanged-traded derivatives	**1,222**	**100%**	**1,170**	**100%**	**2,209**	**100%**

Source: Bank for International Settlements (BIS), Triennial Central Bank Survey of Foreign Exchange and derivatives Market Activity in 1998 and 2001. The geographical coverage comprises 26 countries in 1995, 43 in 1998, and 48 in 2001. Turnover, which is a measure of market activity, was defined as the absolute gross value of all deals concluded (but not closed) during the month, and was measured in terms of the notional or nominal amount of the contracts. No distinction was made between sales and purchases. The figures were adjusted by local and cross-border double-counting. [1]: Including estimates for gaps in reporting.

Table 11 Global Positions in OTC Derivatives by Type of Contract
(In billions of US dollars)

	OTC traded derivatives					
	End-March 95		End-June 98		End-June 01	
Contract type	**Notional**	**% Share**	**Notional**	**% Share**	**Notional**	**% Share**
Foreign exchange	**13,096**	**32.23%**	**22,055**	**30.57%**	**20,434**	**20.50%**
Forwards and foreign exchange swaps	8,699	21.41%	14,658	20.32%	13,275	13.32%
Currency swaps	1,957	4.82%	2,324	3.22%	4,302	4.32%
Options	2,379	5.85%	5,040	6.99%	2,824	2.83%
Other	61	0.15%	33	0.05%	33	0.03%
Interest rate	**26,644**	**65.57%**	**48,124**	**66.71%**	**75,813**	**76.07%**
FRAs	4,597	11.31%	6,602	9.15%	7,678	7.70%
Swaps	18,283	44.99%	32,942	45.66%	57,220	57.42%
Options	3,548	8.73%	8,528	11.82%	10,913	10.95%
Other	216	0.53%	52	0.07%	2	0.00%
Other (equity, commodity, credit)[1]	**897**	**2.21%**	**1,964**	**2.72%**	**3,412**	**3.42%**
Total OTC-traded derivatives	**40,637**	**100%**	**72,143**	**100%**	**99,659**	**100%**
	Exchange-traded derivatives					
	End-March 95		End-June 98		End-June 01	
Contract type	**Notional**	**% Share**	**Notional**	**% Share**	**Notional**	**% Share**
Currency contracts	119	1.15%	103	0.72%	66	0.34%
Interest rates contracts	9,722	94.30%	13,107	91.93%	17,493	89.87%
Equity index contracts	469	4.55%	1,047	7.34%	1,905	9.79%
Total Exchange-traded derivatives	**10,310**	**100%**	**14,257**	**100%**	**19,464**	**100%**

Source: BIS, Triennial Central Bank Survey of Foreign Exchange and derivatives Market Activity in 1998 and 2001. Nominal or notional amount outstanding provides a measure of market size, and it was defined as the absolute gross nominal or notional value of all deals concluded and still open. [1]: Includes forwards, swaps, and options.

Table 12 OTC Derivatives Market Activity around the World
(Average daily turnover in billions of US dollars)

Continent	Total	%Share	Total	%Share	Foreign Exchange[4]		Interest Rates[5]		Total /daily GDP[6]	
	Apr-98	Apr-98	Apr-01	Apr-01	Apr-98	Apr-01	Apr-98	Apr-01	Apr-98	Apr-01
America	**330.6**	**23.48%**	**335.4**	**21.12%**	**265.6**	**209.2**	**65**	**126.2**	**7.33**	**6.82**
Argentina	0.1	0.01%	-	-	0.1	-	-	-	0.09	-
Brazil	-	-	2.1	0.13%	-	1.9	-	0.3	-	0.88
Canada	33.6	2.39%	43.3	2.73%	27.2	33.4	6.4	9.9	13.32	16.76
Chile	0.5	0.04%	0.6	0.04%	0.5	0.6	-	-	1.85	2.29
Mexico	2.6	0.18%	4.6	0.29%	2.4	4.2	0.2	0.4	1.32	2.25
Peru	-	-	0.04	0.00%	-	0.04	-	-	-	0.17
United States	293.8	20.86%	284.7	17.93%	235.4	169.1	58.4	115.7	8.03	7.60
Asia [1]	**276.3**	**19.62%**	**267.1**	**16.82%**	**236.2**	**244.8**	**39.8**	**22.3**	**11.62**	**10.96**
Hong Kong	51.4	3.65%	52.0	3.28%	48.9	49.4	2.4	2.6	80.20	79.26
Japan	123.3	8.76%	131.7	8.29%	91.7	115.9	31.6	15.8	7.23	7.54
Malaysia	0.8	0.06%	0.9	0.06%	0.8	0.9	0	0.0	2.51	2.83
Saudi Arabia	1.4	0.10%	1.0	0.06%	1.1	0.9	0.2	0.1	2.40	1.65
Singapore	90.7	6.44%	69.5	4.37%	85.4	66.3	5.3	3.2	256.15	191.49
Taiwan	1.6	0.11%	1.8	0.11%	1.5	1.7	0.1	0.1	n.a	n.a
Thailand	2.2	0.16%	1.3	0.08%	2.2	1.3	-	0.0	4.43	2.60
Europe [2]	**1,034.5**	**73.47%**	**1,193.0**	**75.11%**	**800**	**676.1**	**234.7**	**516.9**	**28.27**	**31.82**
Belgium	24.9	1.77%	21.8	1.38%	20.1	7.8	4.9	14.1	25.59	21.92
Denmark	25.9	1.84%	25.3	1.59%	21.7	19.5	4.2	5.8	37.86	36.13
France	98.5	7.00%	106.0	6.68%	57.9	40.9	40.6	65.1	17.48	18.37
Germany	86.7	6.16%	159.2	10.03%	57.6	65.2	29.1	94.0	10.51	18.85
Italy	21.2	1.51%	36.1	2.27%	17.1	12.4	4.1	23.7	4.64	7.71
Netherlands	31	2.20%	49.4	3.11%	27.5	25.2	3.5	24.2	19.99	31.11
Spain	16.6	1.18%	25.9	1.63%	13.7	5.5	2.9	20.5	7.13	10.87
Sweden	14.8	1.05%	22.3	1.40%	11.2	19.1	3.6	3.2	15.91	23.38
Switzerland	63	4.47%	62.6	3.94%	57.2	53.0	5.9	9.6	62.45	60.54
United Kingdom	591.2	41.99%	628.1	39.55%	468.3	390.3	122.9	237.8	104.54	108.42
Africa/Oceania[3]	**43.0**	**3.05%**	**60.04**	**3.78**	**39.0**	**51.77**	**4.0**	**10.7**	**18.27**	**23.38**

Source: Author's elaboration based upon information provided by the BIS, Triennial Central Bank Survey of Foreign Exchange and derivatives Market Activity in 1998 and 2001, and the United Nations. The figures were adjusted by local double-counting. The estimated coverage of derivatives markets in individual countries ranged between 73 and 100%.[1] Included in the computations but not shown: Bahrain, India, Indonesia, Philippines, South Korea; [2] Included in the computations but not shown: Austria, Czech Republic, Finland, Greece, Hungary, Ireland, Luxembourg, Norway, Poland, Portugal, Russia, Slovenia, and Slovakia; [3] Includes South Africa, Australia, and New Zealand; [4] Forwards, swaps, and options. [5] Single-currency contracts only; [6] Total/daily GDP is the ratio of total turnover of the month of April over an estimate of daily economic activity, namely, annual GDP (in current dollars) divided by the number of working days in a year (approximately 250). The ratio gives an idea of how active is the OTC market with respect to the size of each economy.

Table 13 Domestic Transactions in the Foreign Exchange Rate Market
(millions of US dollars per working day)

	July 2000	October 2000	January 2001	April 2001
Total (net)[1]	**1,603**	**1,962**	**2,125**	**2,329**
By instrument				
Spot	1,058	1,321	1,565	1,694
Forwards and swaps[2]	545	941	560	635
By currency	1,578	1,934	2,080	2,283
Chilean peso against:				
US dollar	1,578	1,934	2,080	2,283
DM, Japanese Yen	--	--	--	--
Non-local currency:	25	28	45	46
DM/US dollar, Yen/US dollar, others				

Source: Central Bank of Chile. [1]: Adjusted for inter-bank double counting. [2] Derivatives are OTC instruments

Table 14 Statistics by Classification of Volatility Estimates: Pre and Post Change of Nominal Exchange Rate Policy

(a) Exponentially Weighted Moving Average

Interval (Ch$)	Mean		Max		Min		Std dev		Percent	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
[0, 5)	1.595	2.361	4.920	4.990	0.100	0.220	1.207	1.215	91.57	88.39
[5, 10)	5.879	6.768	8.390	9.980	5.010	5.020	0.821	1.270	7.68	10.49
[10, 15)	11.278	11.373	12.420	12.110	10.400	10.480	0.855	0.634	0.75	1.12
All	1.996	2.924	12.420	12.110	0.100	0.220	1.828	2.028	100	100

(b) Equally Weighted Moving Average

Interval (Ch$)	Mean		Max		Min		Std dev		Percent	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
[0, 2)	0.909	1.464	1.990	1.990	0.160	0.690	0.516	0.319	61.99	44.0
[2, 4)	2.770	2.736	3.990	3.990	2.010	2.000	0.546	0.520	32.96	44.38
[4, 6)	4.512	4.836	5.900	5.940	4.000	4.020	0.615	0.639	3.37	9.18
[6, 8)	6.366	6.812	6.550	7.670	6.060	6.070	0.181	0.587	1.69	2.43
All	1.736	2.468	6.550	7.670	0.160	0.690	1.294	1.289	100	100

(c) Naive

Interval (Ch$)	Mean		Max		Min		Std dev		Percent	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
[0, 2)	0.552	0.733	1.990	1.960	0.000	0.000	0.504	0.513	91.95	88.76
[2, 4)	2.469	2.618	3.480	3.820	2.010	2.000	0.377	0.534	6.93	10.49
[4, 6)	4.638	5.125	5.370	5.810	4.110	4.440	0.545	0.969	0.75	0.37
[6, 8)	6.510	7.480	6.510	7.480	6.510	7.480	--	--	0.19	0.19
[8, 10)	9.540	8.320	9.540	8.320	9.540	8.320	--	--	0.19	0.19
All	0.743	0.974	9.540	8.320	0.000	0.000	0.898	0.919	100	100

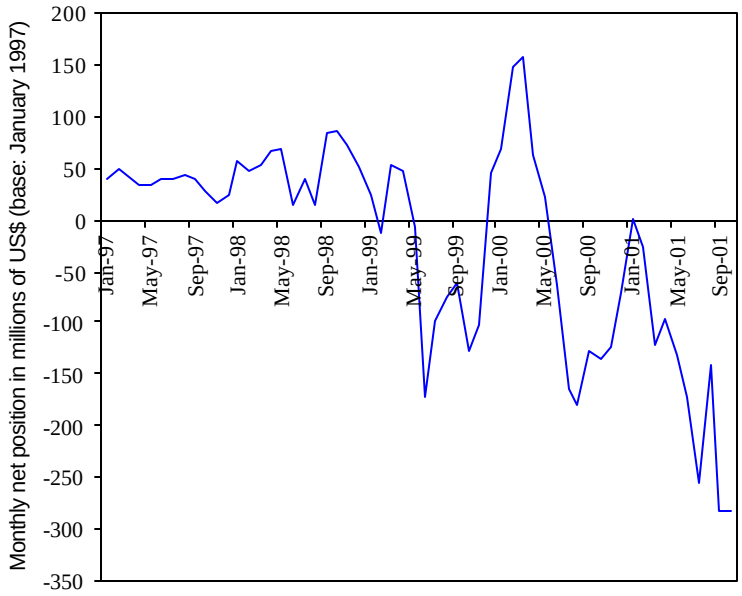
(d) Comparison of Pre and Post Distributions

Test	Exp. weighted	Equally weighted	Naive
Kolmogororv-Smirnov [(1)]	0.273	0.380	0.210
	(0.000)	(0.000)	(0.000)
Welch Two-Sample t-Test[(2)]	7.854	9.257	4.151
	(0.000)	(0.000)	(0.000)
Wilcoxon/Mann-Whitney[(3)]	9.488	10.080	6.165
	(0.000)	(0.000)	(0.000)
Bartlett[(4)]	5.689	0.007	0.291
	(0.017)	(0.931)	(0.589)

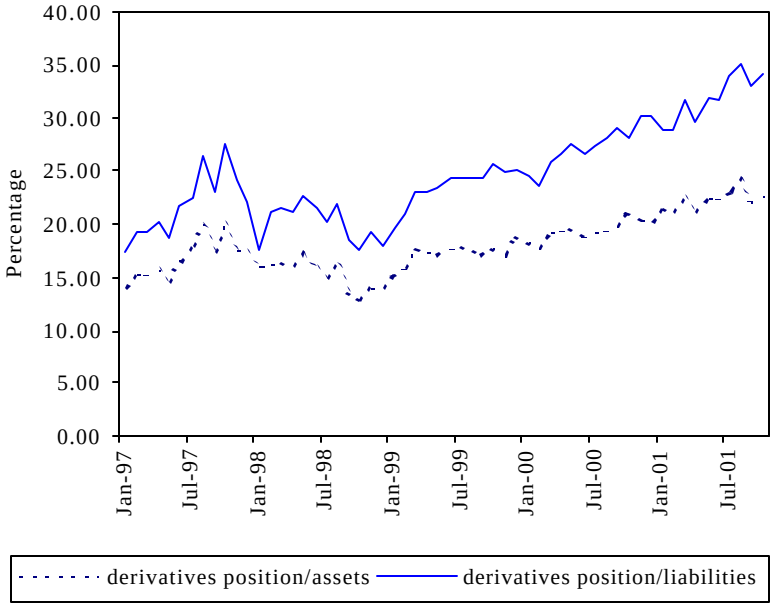
Notes: p-values between parenthesis. (1) The two-sample Kolmogorov-Smirnov goodness of fit test is used to test whether two sets of observations could reasonably have come from the same distribution. Under the alternative hypothesis the cumulative distribution function (cdf) of x (post) does not equal the cdf of y (pre) for at least one sample point. (2) Under the Welch modified two-sample t-test the null hypothesis is that the population mean for x less that for y is zero. The alternative hypothesis is that the difference of means for x and y is greater than zero. (3) The Wilcoxon rank sum test is used to test whether two sets of observations come from the same distribution. The alternative hypothesis is that the observations come from distributions with identical shape but different locations. Unlike the two-sampled t-test, this test does not assume that the observations come from normal distributions. This test is equivalent to the Mann-Whitney test. (4) The Bartlett test compares the logarithm of the weighted average variance with the weighted sum of the logarithms of the variances. Under the joint null hypothesis the subgroup variances are equal.

Figure 1 Derivative Positions of Chilean Commercial Banks: January 1997-October 2001

(a) Monthly net position

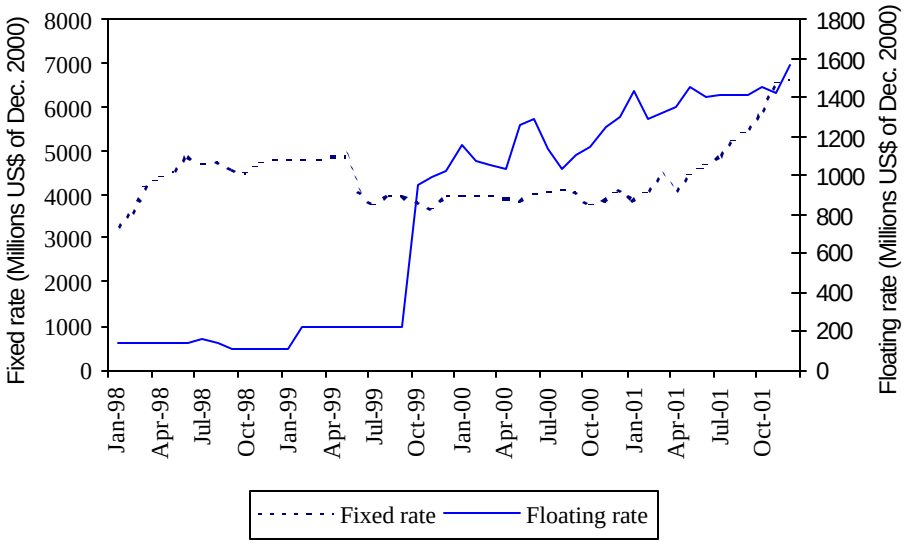


(b) Derivative positions as shares of assets and liabilities



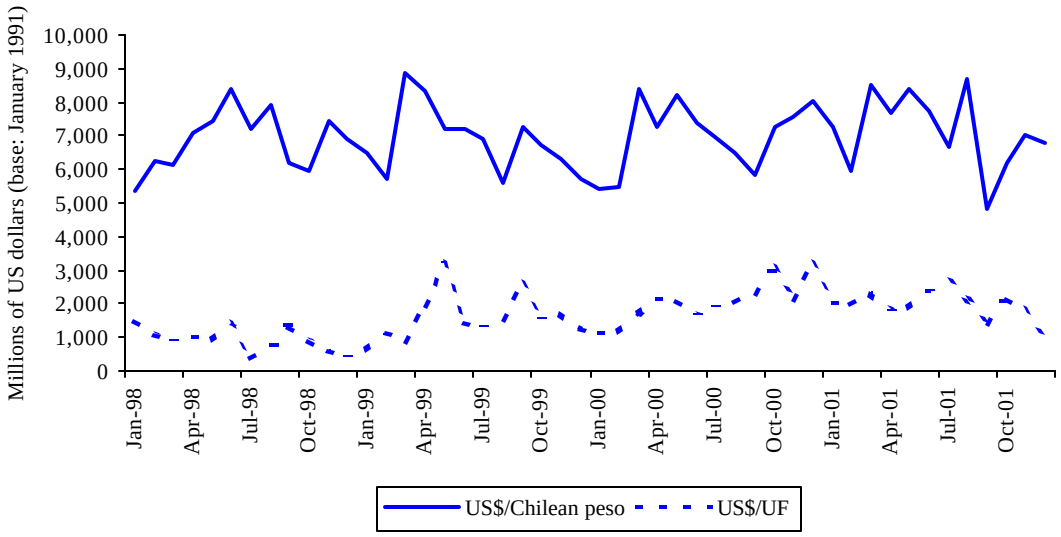
Source: Author's elaboration based upon information in monthly bulletins of the Superintendence of Banks and Financial Institutions. The net position is defined as the difference between long and short positions on derivatives.

Figure 2 Notional Amount Outstanding in Derivatives on Fixed and Floating Interest Rates held by Banks and Firms operating in Chile



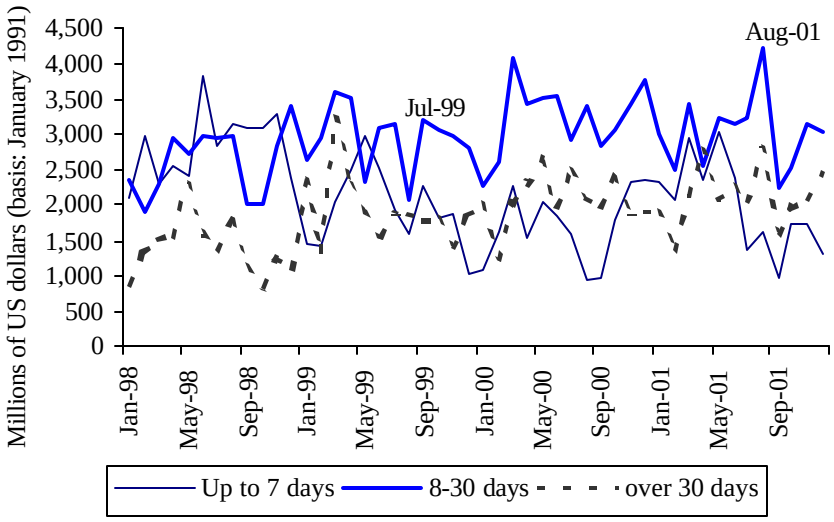
Source: Author's elaboration based upon information provided by the Central Bank of Chile.

Figure 3 Monthly Turnover of Currency Forwards subscribed in the Chilean Formal Exchange Rate Market: January 1998-December 2001



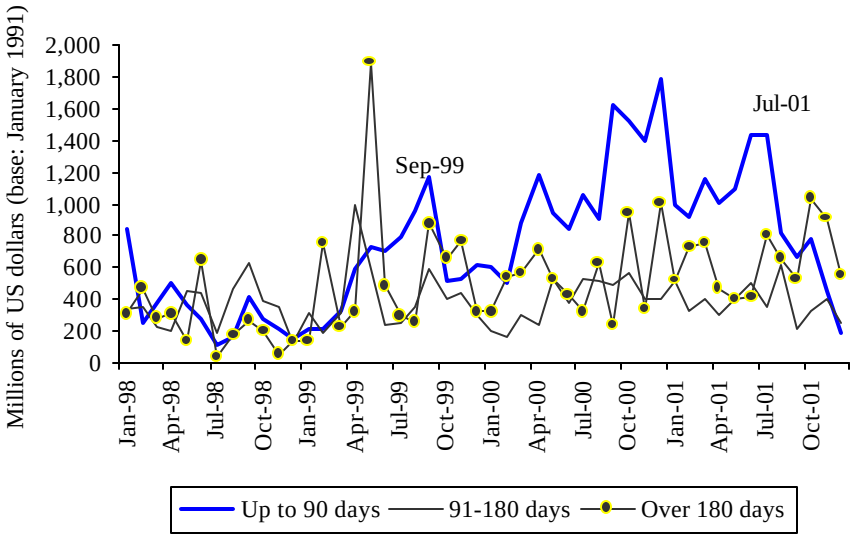
Source: Based upon information provided by the Central Bank of Chile. Figures were deflated by the percent variation in the US Consumer Price Index (CPI)

Figure 4 Monthly Turnover of US dollar/Chilean peso Forwards subscribed in the Chilean Formal Exchange Rate Market: January 1998-December 2001



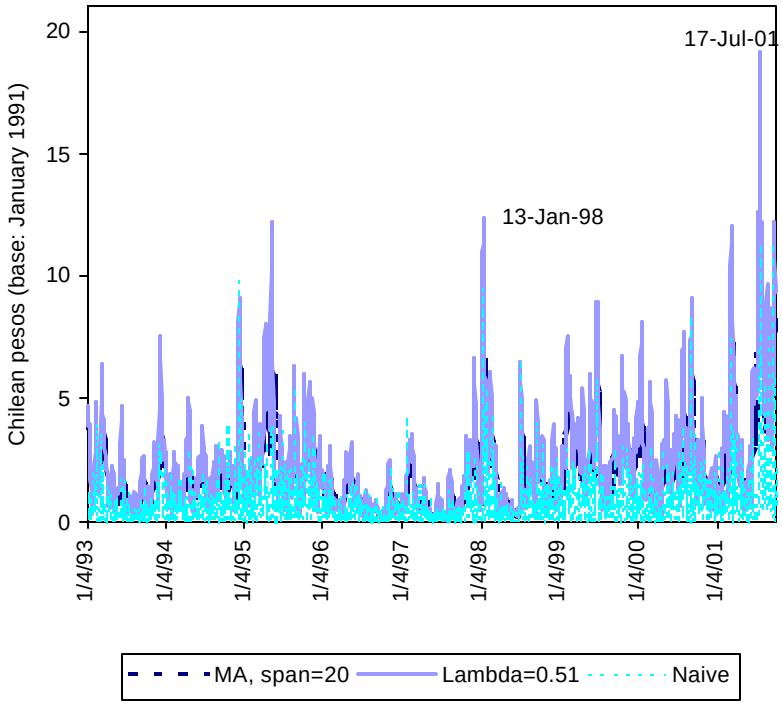
Source: Based upon information provided by the Central Bank of Chile. Figures were deflated by the percent variation in the US Consumer Price Index (CPI).

Figure 5 Monthly Turnover of US dollar/UF Forwards subscribed in the Chilean Formal Exchange Rate Market: January 1998-December 2001



Source: Based upon information provided by the Central Bank of Chile. Figures were deflated by the percent variation in the US Consumer Price Index (CPI).

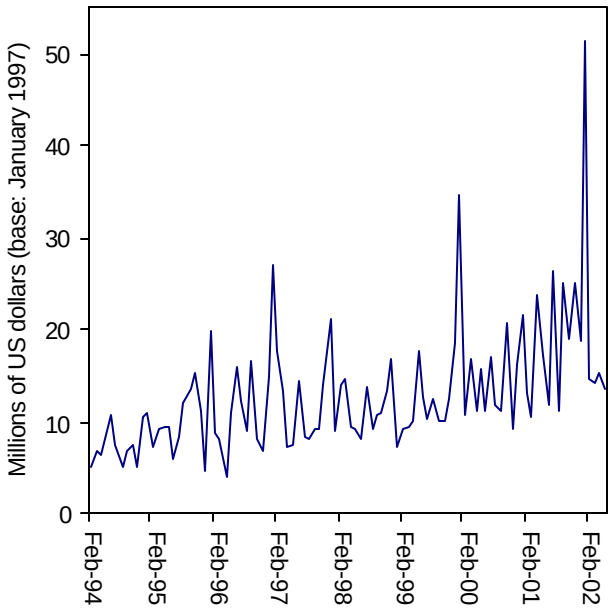
Figure 6 Estimates of Nominal Exchange Rate Volatility: January 1993-September 2001



Source: Based upon on daily data of the observed market exchange rate, provided by the Central Bank of Chile. The observed exchange rate series was deflated by the daily percent variation of the *Unidad de Fomento* (base=1, September 1, 1991).

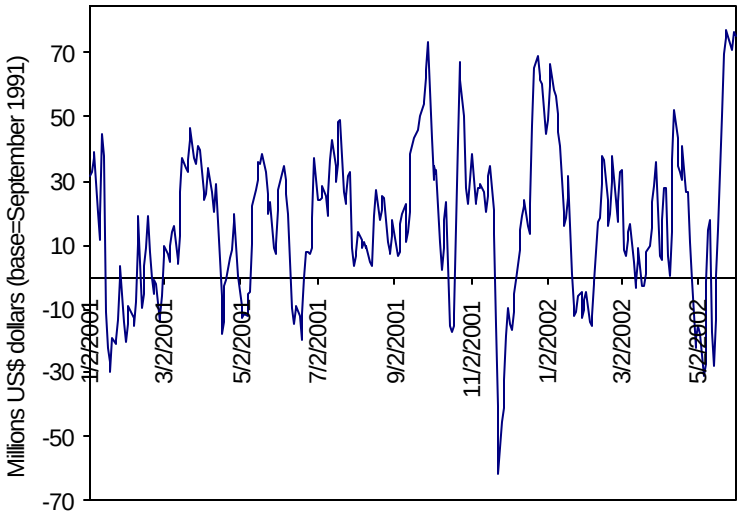
Figure 7 Liquidity of the Chilean Financial System

(a) Monthly averages: February 1994-May 2002



Source: Author's elaboration based upon information collected by the Central Bank of Chile. Liquidity is defined as the difference between actual and required banks reserves. The figures are monthly averages, and have been adjusted by inflation.

(b) Daily Liquidity: January 2001-May 2002



Source: Author's elaboration based upon information collected by the Central Bank. Liquidity is defined as the difference between actual and required banks reserves. The figures are daily, and each data point represents a moving average of liquidity on the preceding 30 days. Figures have been adjusted by the daily variation of the *Unidad de Fomento* (UF).