# Financial Stability Report FIRST HALF 2007





BANCO CENTRAL DE CHILE

# Financial Stability Report \*/

FIRST HALF 2007



<sup>\*/</sup> This is a translation of a document written originally in Spanish. In case of discrepancy or difference in interpretation, the Spanish original prevails. Both versions are available at www.bcentral.cl.

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<sup>&</sup>lt;sup>1</sup>/ The statistical close of the Report was 15 May 2007, except table I.2, which covers the whole month of May.

# Preface

As established in its Basic Constitutional Act, the Central Bank of Chile "shall have as its porposes to look after the stability of the currency and the normal functioning of the internal and external payment systems." To carry out these tasks, the Central Bank of Chile is vested with diverse legal powers, such as extending emergency credit and determining regulations in matters affecting the financial system and international trade operations.

The Central Bank's focus in the area of financial stability is centered mainly on the proper functioning of the system and the Chilean economy's access to the international financial markets. The Central Bank's tracking of financial stability is complementary to that undertaken by the specialized supervisory entities; it serves as an independent element of analysis with respect to the supervisors' powers and functions in relation to the entities subject to their oversight.

The objective of the *Financial Stability Report* consists in providing information, on a half-yearly basis, to the Senate, the Government, and the general public regarding recent macroeconomic and financial events that could affect the financial stability of the Chilean economy, such as the evolution of the indebtedness of the main credit users, the performance of the capital market, and the ability of the financial system and the international financial position to adapt sufficiently to adverse economic situations. In addition, the *Report* presents the policies and measures that support the normal functioning of the internal and external payments system, with the object of promoting general knowledge and public debate with regard to the Bank's performance in fulfilling this function. The articles that appear in the final pages summarize recent research efforts by the Bank on topics related to financial stability.

The Board

# Summary

The global scenario continues to be favorable for the financial stability of the Chilean economy. Excellent conditions of international liquidity persist after many years, despite progress in the normalization of the monetary stimulus in the main economies. Long-term interest rates remain at their lowest levels in decades, while credit risk premiums are still low, similar to or even smaller than in the years preceding the Asian crisis of 1997. World economic growth has remained strong and more balanced than in the past few years; commodity prices have resumed significant growth and inflation pressures, within a context of reduced output gaps continue to worry the main economies around the world.

**Episodes of higher volatility in international financial markets have had no persistent effects on this favorable scenario**. Similarly to the experience of May-June 2006, the sudden adjustment of prices and the increase in stock market volatility in February-March of this year did not have a lasting effect on the valuation of the riskier financial assets. In fact, recently the impact of said episode on the main stock exchanges of the world has virtually disappeared. In addition, the last episode was focused essentially on stock markets, with lesser effects in other markets relevant to emerging economies, such as the sovereign bonds, foreign exchange and credit markets.

As pointed out in the last *Report*, this type of limited volatility events can be expected to happen again in the future. The fact that the global financial scenario has remained favorable for a long time does not imply that the most likely future scenario will not feature higher levels of volatility than it has since 2004. Historically, periods of low financial risk valuation and high liquidity such as the present one do not last forever, least so when they are accompanied by a gradual normalization of the global monetary stimulus. To the extent that financial volatility episodes continue to be bounded in their magnitude and duration, the Chilean economy should continue to enjoy significant degrees of financial stability.

One important risk for financial stability continues to come from global financial conditions deteriorating rapidly and abruptly. Actually, aside from specific, limited adjustments in particular markets, the main risk is that global financial conditions suffer an unexpected, intense and widespread decline affecting different regions and different classes of assets. Although this type of adjustment can be triggered by diverse elements (coming from the corporate or financial sector, geopolitical events or a crisis in some important emerging economy), the materialization of such a scenario requires a substantial change in the risk valuation by key market players.

There is some degree of uncertainty regarding how the global financial system might accommodate a significant reversal of the good present conditions. The major transformations that the financial system has undergone in recent years, because of, for example, strong growth in credit risk transfer securities and the increased relative importance of financial intermediaries such as the hedge funds, has probably resulted in improved market efficiency. However, the low reporting requirements on these intermediaries may hinder the capacity of some of the new quickly expanding securities may hinder the capacity of financial intermediaries in general to hedge from particularly tense scenarios. In general, developed markets have taken a cautious stand regarding these events.

Also, despite the good long-term prospects, concrete signs of cyclical weakness in the US are still present. Output expansion has moderated, primarily because of the big adjustment of the housing sector and the real estate market after the downfall of the *subprime*<sup>1</sup>/segment of mortgage clients. As long as this phenomenon remains contained in specific segments, the systemic implications will also remain bounded. In this sense, the aspects that must be monitored are the evolution of credit standards, the worsening of payment behavior of segments other than *subprime* ones, significant wealth effects associated to housing prices and potential declines in the equity of credit providers in developed economies. These elements might lead to further weakening of the American economy and motivate a financial scenario less favorable for the Chilean economy.

The occurrence of some of these risk scenarios would influence the cycle and the prices of financial assets in domestic markets. The valuation of financial assets in local financial markets is largely associated to global developments. In particular, a significant fraction of stock-returns variability in the Chilean stock market depends on aggregate macro-financial conditions, and only to a certain extent on portfolio decisions by individual agents. The change in stock valuations and in the interest rate structure since early in the year responds essentially to developments in the domestic and local cyclical conditions. In turn, the effects on financial prices and liquidity of the proposed increase in the limit on pension fund investments abroad will probably be small, considering both the gradual application of the initiative and the capacities of the Central Bank to ensure that the application is consistent with financial stability.

In general, the exposure of the financial system and of the Chilean economy to risk events depends on the degree of exposure and solvency of the main players in the system. On the credit risk side, corporate sector payment behavior is still good. Company results remain positive, beyond the effects of the copper price. Also, and as has been noted in previous *Reports*, companies have generally taken advantage of the favorable financial environment of recent years to strengthen their balance sheets. Normal leverage indicators have remained stable, while, with the prevailing foreign exchange system, the degree of exchange rate mismatch is smaller than it was before 1997.

<sup>&</sup>lt;sup>1</sup>/ This is the segment of debtors considered the riskiest for having defaulted in the past or having shown poor ability to meet financial obligations with expected income.

Financial system exposure to households continues on the rise, extending into new segments of clients whose payment behavior is less familiar. Consumer loans have seen reduced room for expansion in wellknown credit segments, as shown by their growth rates, growth dominated by an increase in the number of debtors rather than in the amounts owed, greater expenditures in provisions on the part of commercial banks, and some aggressive trace in institutions' business practices. On the other hand, mortgage loans, which imply smaller credit risk for the financial system, have kept their growing tendency, leaning on the development of new products.

In the recent context of fast growth in credit, and in order for access to credit by new segments to persist over time, it is important that both suppliers and demanders continue to take a prudent approach in risk evaluation. In comparison with the corporate segment, households' payment behavior is today more sensitive to changes in macro-financial conditions, particularly in the labor market. Credit suppliers, particularly providers of longer-term loans, must continue to be cautious when it comes to assessing their debtors' expected payment behavior not only in the current scenario but also in less favorable macroeconomic settings.

The financial system as a whole is in a good equity stand to face a potential deterioration of macro-financial conditions. The capital gaps that existed in the early 2000s have been used up to expand credit and, during the year 2006 so far, banking institutions have actively resorted to financing via subordinate bonds. Hence, there is currently less room to sustain the high credit growth rates of recent years, while demand for credit also shows some moderation. Thus, several banks have announced their intention to increase their capital base to be able to meet requirements associated with expanding their loans. Tension tests reveal that current levels of profits and equity permit the system at large to face episodes of sudden rises in interest rates and keep capitalization levels above the legal minimum.

The present policy framework in force in Chile allows maintaining normal access to foreign financing in periods of heavy turmoil. In particular, in the current conjuncture, significant external resources have accumulated, mitigating the possibility of misalignments in key relative prices, and surpluses in foreign accounts. On the other hand, within the floating exchange policy framework, agents' financial exposure (indebtedness and mismatches) to sudden changes in parities has decreased in comparison to expansionary periods in the past.

The same as in previous *Reports*, financial risk assessment and monitoring must continue to be handled with care. This warning applies to both financial institutions — whether banks or non-banking institutions — and their clients. The global financial scenario where the Chilean economy is inserted has latent risks, because only a very particular combination of structural changes at the global level could permit today's benign financial scenario to persist indefinitely into the future.

# I. Environment and financial risks

#### Figure I.1







Nov.01 Jul.02 Mar.03 Nov.03 Jul.04 Mar.05 Nov.05 Jul.06 Mar.07 Sources: IVA Indices and Central Bank of Chile.

This chapter reviews the recent conditions and developments in the international and domestic financial markets. It also describes and lays the foundation of the Central Bank of Chile's assessment of the main threats to financial stability that could originate in those markets.

# International environment

### Abundant international liquidity conditions persist

The international context continues to be favorable for financial stability. Long-term interest rates are still at historically low levels (figure I.1), as are the risk premiums of sovereign and corporate bonds in various regions of developed and emerging economies. International liquidity, measured as the ratio of domestic credit to GDP in developed economies, has also maintained historically high levels. Since the publication of the last *Report*, a sharp correction in emerging and advanced stock markets occurred last February and March. Once these turbulences passed, however, financial prices quickly returned to their former levels.

# Local financial markets

The evolution of local asset prices has been congruent with the evolution in the rest of the world. In the first half of this year, long-term interest rates hovered around their historic minimums, with an upward correction in the last month (figure I.2), similar to what happened with the main reference rates in international markets.

Stock prices on the local exchange have behaved similarly to those in other emerging economies (figure I.3), although they posted a better relative performance in the last half year. While exchanges in emerging countries have shown much higher returns than those in advanced countries, the impact of price correction periods also tends to be greater. During the episode in February and March this year, the Dow Jones fell 4.6% in the week of its sharpest adjustment, while the drop in Chile's exchange was 5.7% and that of the emerging markets index was 9.2%. Despite the extent of disparity in these drops, each of these markets recovered its pre-variation level in just over one month, a period that is significantly shorter than the recovery from the correction in May and June 2006.

The exchange rate recorded levels similar to those at the close of the last *Report*, with a volatility close to the minimums of the floating exchange rate



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Correction of financial risk valuation in international markets.
 Recession in the US with financial effects.
 Higher inflationary pressures in the world.
 Sharp correction of global imbalances.

Source: Central Bank of Chile.

### Figure I.5

Premium compression by sovereing risk (coefficient of variation) (1)



 Quotient between the standard deviation and the average risk premium in each period for: Brazil, Chile, Malaysia, Mexico, Indonesia, Russia, and Turkey.
 (2) Credit default swap spreads for sovereign bonds.
 (3) Emerging Market Bond Index.

Source: Authors' elaboration, based on data from Bloomberg.

period. The Chilean peso shows a higher correlation with currencies from emerging economies than with currencies from developed economies.

## **Financial risks**

The main external threat to financial stability identified in this *Report* continues to be a sharp correction in risk premiums for financial risk in general (figure I.4). Significant reversals in the perception and rating of financial risks could be caused by credit events in systemically important emerging economies, markets, or financial institutions; a sharp reversal in carry trade positions;<sup>1</sup>/ or a sharp correction of global current account imbalances. The conditions that could lead to these scenarios, and their main effects, are analyzed in greater detail below.

### Risk ratings are still at historically low levels

The low level and compression of sovereign risk premiums (figure I.5), the improved average risk rating of emerging economies, and other measures that reveal a low risk perception in the corporate sector and in equity markets, seem to reflect an environment of abundant liquidity and of greater "profit seeking" by international investors. Although the low risk premium could be a reflection of a continuous improvement of global macroeconomic fundamentals, the possibility that the valuation of financial assets has moved away from its fundamental values, due to a lax or incorrect assessment of the true financial risks involved, would increase the probability of a sharp correction.

The sharp correction registered in the international exchanges in February and March of this year and the increasing trend of volatility in international stock flows<sup>2</sup>/ indicate that the threat of new episodes of greater volatility in the prices of risky stocks is still plausible. The gradual normalization of monetary conditions suggests that these episodes will probably continue to be repeated, and the possibility of a sharper correction cannot be dismissed (figure I.6).

Another factor to consider is the high correlation between daily returns from exchanges in emerging and advanced economies,<sup>3</sup>/ which could facilitate the rapid propagation of a shock among very different markets.

# A correction could stem from the default of credit or currency markets or of systemically important financial intermediaries

The growing sophistication of financial instruments and markets may very well have contributed to establishing new mechanisms of transmission between the real and financial sectors. An additional factor is the significant

<sup>&</sup>lt;sup>1</sup>/ Corresponds to the arbitrage of the returns of short positions in low interest rate currencies and long positions in high interest rate currencies, incorporating exchange rate expectations.

<sup>&</sup>lt;sup>2</sup>/ A comparison of the level and volatility of prices and international capital flows shows that the turbulence in February and March was concentrated in equity markets. The debt, currency, monetary, and derivatives markets remained relatively stable.

<sup>&</sup>lt;sup>3</sup>/ The moving three-month correlation of daily returns of the Dow Jones and Morgan Stanley Composite Index (MSCI) Emerging Markets was around 30% in 2006, reached an average of 40% in the last quarter, and bordered on 55% last month.

Stock price volatility and the slope of the returns curve in the  $\ensuremath{\mathsf{US}}$ 





(1) Expected volatility of the stock market in the short term (30 days), implicit in the price of S&P500 index options.

 $\left(2\right)$  Three-month Treasury rate less the ten-year Treasury rate, lagged 18 months.

Sources: Bloomberg and Federal Reserve Board

#### Figure I.7

Probability density function of the oil price (\*) (percent, US\$/barrel)



Source: Authors' elaboration, based on data from Bloomberg.

increase in leveraged buy out (LBO) transactions in Europe and the US over the past year. The problems in the US housing market have had repercussions in the associated credit derivatives markets.<sup>4</sup>/ Since the last *Report*, a series of financial firms concentrated in the subprime mortgage segment have gone bankrupt, which has provoked concern about the extent to which this will affect financial markets.

Hedge funds seem to have played a significant role in the recent episodes of high volatility of asset prices and capital flows, as well as in the drop in long-term rates in March, due to their significant share in the increased demand for low-risk assets. Some analysts suggest that these funds could be increasing the correlation among returns from markets that originally were very distinct.

The scale and concentration of the carry trade in yen could also have macrofinancial repercussions. It is estimated that carry trade transactions in yen have reached their highest level since the Russian crisis.<sup>5</sup>/ Some international monetary and financial authorities have expressed concern about the risk of a sharp reversal in these transactions, similar to what happened in the Long Term Capital Management (LTCM) crisis in 1998. This possibility is still quite uncertain, however: yen positions broke down rapidly at the end of February, but the phenomenon reversed itself just as quickly and without major financial consequences.

# A significant hike in interest rates, or a sharp slowdown in the US economy, could also have an effect on financial risk ratings

Interest rate hikes could also be brought on by inflationary pressures, as a result of shrinking excess capacity in the world's major economies. To date, increases in oil prices have not provoked inflationary effects, as they have taken place in an environment of expanding world economic activity and moderate rises in interest rates. However, accumulated inflationary pressures or those generated by new oil price hikes could bring on unanticipated interest rate increases. Low excess capacity, the high degree of coordination among OPEC members, and geopolitical risks tend to bias oil price expectations upward (figure 1.7).

Over the last quarter, the perception of the US economy has worsened again among some economic agents.<sup>6</sup>/ Similarly, several real indicators suggest that the risk of a more acute slowdown is still latent. The growth rates of durable goods manufacturing and retail sales continued to drop in the last half year. Since January 2006, the time structure of interest rates has continued to show an almost null differential between long- and short-term rates, with the risk of a contraction in credit supply. Over the last half year, construction of new housing and new construction permits have trended downward (figure I.8), while some segments of the housing market have registered falling prices.

<sup>4/</sup> See Echeverría and Opazo (2007) in this Report.

<sup>&</sup>lt;sup>5</sup>/ The Commodities Futures Trading Commission indicated that historically high levels of yen short positions have been registered.

<sup>&</sup>lt;sup>6</sup>/ Consumers' prospects (Michigan University) showed falling confidence starting in March. In the same way, market operators (Federal Reserve of Philadelphia) estimate a greater expected probability of risk of recession than in the last *Report*.



Default rate on commercial bank mortgage debt (percent)



The contraction in the housing market could increase the probability and intensify the effects of a possible recession in the US This would be due to the wealth effects on consumers and to links with other sectors of the economy, particularly the financial sector, given that the real estate sector represents approximately 50% of the US financial sector's loans. The rise in mortgage delinquency (figure I.9), together with stricter standards for loan issuance (figure I.10), could both accentuate contraction in the real estate sector, thereby increasing the probability of a recession accompanied by a more severe credit contraction in the US financial system.

# In the event of crisis, emerging economies could also trigger a significant correction in the financial system

Emerging economies' fundamentals have continued to strengthen, on average, as a result of reductions in external debt, a greater accumulation of international reserves, improved fiscal balances, and larger current account surpluses. An abrupt change in the perception of these economies' risks, however, could unleash massive sales of their financial assets, contractions in the liquidity of their financial markets, and high price volatility, as occurred last February and March.

The Chinese economy is still under the threat of inflationary pressures, and the authorities are having difficulty slowing the boom in bank loans and investments and stemming their inflationary effects on financial asset prices. India is facing a similar scenario (table I.1), worsened by persistent fiscal deficits (around 4% of GDP) and a public debt that exceeds 80% of GDP. Hungary continues to accumulate a high fiscal deficit (8% of GDP over the last five years), whose counterpart has been a rising current account deficit (9% of GDP in 2006) that endangers the sustainability of its public and external debts (70 and 80% of GDP, respectively). In Turkey, political and economic tensions are on the rise, which is reflected in an expected annual inflation of close to 10%, a high current account deficit (8.5% of GDP), and public and external debt close to 66 and 55% of GDP, respectively.

Finally, the economies of the Baltic States (Estonia, Latvia, and Lithuania) have increased their current account imbalances as a result of heavy growth of consumption and domestic loans. Financing via external bank indebtedness has increased their external debt, which ranges from 55% of GDP for Lithuania to 103% of GDP for Latvia. Most domestic loan growth has been in the mortgage and consumer loan segments, denominated in foreign currency, in a context in which the loan market began to develop just a few years ago, meaning that both market participants and regulators face the challenges of adapting and gaining experience.

When comparing Chile with these more vulnerable systemically important emerging economies, it becomes evident that the structure of the Chilean economy's external sources of bank financing is much more similar to that of other Latin American countries (especially Brazil) than it is to other regions or groups of emerging economies (box I.1).

# The possibility of a sharp and disorderly correction of global imbalances persists, although to a lesser extent

Several factors suggest that the adjustment of global imbalances will be gradual and orderly. The most noteworthy are the slowing of the US economy, the solidification of a higher growth rate in the rest of the world

Index of financial conditions for loan issuance in the US (\*) (percent)



(e) Estimated for mortgages based on sectoral data.(\*) Net tightening index.

Sources: Federal Reserve Board and NBER.

than in the US, and the continued gradual adjustment of parities. This gradual adjustment requires the absence of abrupt changes in external financing flows to the US economy. All the above could be contributing to the gradual reversal seen in recent quarters (figure I.11).

#### Table I.1

Vulnerability in selected emerging economies

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	Macroeconomic vulnerabilities (1)									
Country	Growth of GDP	Current account/GDP	Fiscal deficit/GDP	External debt/GDP	Gross public debt/GDP					
			(percent)							
China	10.7	9.5	-1.4	12.7	38.2					
India	9.0	-1.4	-3.8	18.4	82.7					
Brazil	3.5	1.1	-2.4	18.1	71.1					
Russia	6.5	12.6	7.6	28.6	8.8					
Turkey	6.0	-8.5	-0.6	55.2	65.8					
Hungary	4.5	-9.1	-10.1	81.8	67.8					
Poland	4.9	-1.7	-4.5	42.3	48.9					
Lithuania	7.5	-12.2	-0.3	55.4	16.3					
Latvia	11.0	-14.0	-1.2	103.2	10.4					
Estonia	10.0	-10.5	1.9	85.7	4.6					

		Annual growth	Regulatory capital/	Past-due	Annual return						
	Price/Earnings	of bank	Risk-weighted	portfolio/	on bank						
Country	ratio	credit (2)	assets	Total loans	equity						
	(times)		(percent)								
China	21	16.0	n.a.	7.5	15.1						
India	23	18.3	12.4	3.3	12.7						
Brazil	13	27.9	17.4	4.4	24.5						
Russia	16	22.5	14.8	2.7	20.1						
Turkey	13	23.0	18.6	3.7	12.5						
Hungary	11	18.8	11.4	2.7	21.7						
Poland	13	11.3	13.6	6.6	21.3						
Lithuania	n.a.	51.4	9.5	1.1	16.0						
Latvia	n.a.	64.3	10.5	0.5	24.2						
Estonia	n.a.	33.4	13.2	0.2	19.4						

n.a.: Not available.

(1) Projection 2006.

(2) Most recent information available.

Sources: IMF (2007a), IMF (2007b), and IIF (2007).

However, the threat of a sharp correction of global current account imbalances cannot be completely dismissed. Several central banks have indicated their intention to modify the currency composition of their international reserves, and there have been rapid fluctuations in financial prices during recent episodes of financial turbulence and a high volatility in quarterly capital flows to the US economy.

### Based on the primary threats identified above, this Report considers two risk scenarios for the stress tests

While it is impossible to predict with any certainty the evolution of macroeconomic variables were any of these threats to materialize, the simulation scenarios used in this *Report* try to capture two diverse and extreme possibilities. The first scenario considers the case of a shock that has a significant but brief impact on financial and real variables. This scenario can be associated with a financial problem that has a heavy but transitory



Source: International Monetary Fund.

impact on real activity. In this case, the short-term rate would experience a major hike of 660 basis points over the period of one quarter. This effect would mostly disappear after a year and totally dissipate in the following two quarters. The currency would suffer a real depreciation and inflation would accelerate, while in the first year GDP would grow 4.6 percentage points less than in the base scenario. All effects would disappear toward the end of the second year.

The second scenario considers impacts that are less pronounced but of longer duration, in terms of both asset prices and real activity. This scenario can be associated with a cyclical contraction of world real activity. Short-term interest rates would rise by around 150 basis points in the first year and somewhat more in the second. In the first year, the impact on the exchange rate and inflation is close to a third of the impact in the first scenario, but its effects persist (gradually diminishing) for seven years. In the first year, real GDP grows 1.8 percentage points less than in the base scenario.

# Box 1.1: Similarity between the structure of Chile's external bank lenders and that of other emerging economies

Similarity in the structure of external lenders could be one of the numerous sources of international financial interdependence. This is not an issue of concern in itself, but rather the natural consequence of the growing integration of financial markets. However, an economy could potentially be affected by macrofinancial turbulences stemming from other economies solely based on the fact that they have common lenders.

In terms of external bank financing, several mechanisms can act simultaneously in this type of contagion. Losses in one economy could lead a bank to sell or reduce its assets in other economies or markets in order to restore its capital adequacy ratios. A global liquidation of positions could also occur if bank loans are reduced as a result of a drop in the value of the collateral implied in their operations (margin call). Finally, banks with a high exposure to countries in crisis might decide to diminish their level of risk exposure in general (flight to quality).

Several studies document this type of contagion. Van Rijckeghem and Weder (2001) find contagion in bank debt flows during the Mexican and Asian crises, but not in the Russian crisis. Hernández and Valdés (2001) find that financial competition was one of the channels of contagion in the crises in Thailand, Russia, and Brazil. Broner *et al.* (2005) also find evidence of contagion in emerging economies' stock returns.

One indicator of the potential degree of exposure to this type of contagion can be derived by applying the commercial interdependence index, proposed by Glick and Rose (1999), to the stocks of external bank debt. This provides an indicator of the similarity of the structure of external bank financing in two economies, which fluctuates between 0 (no similarity) and 1 (identical structure). Specifically, the ratio comparing countries i and j is calculated as follows:

$$I_{i,j,t} = \sum_{k=1}^{N} \left( \frac{C_{i,k,t} + C_{j,k,t}}{C_{i,t} + C_{j,t}} \right) \left( 1 - \frac{\left| C_{i,k,t} - C_{j,k,t} \right|}{C_{i,k,t} + C_{j,k,t}} \right)$$

where  $C_{i,k,t}$  = bank loans from lender *k* in country *i* in the period *t*. The omission of a subindex represents the sum over this variable.

Figure I.12 shows the similarity ratios between Chile and Brazil, China, and Turkey.

#### Figure I.12





In the context of empirical evidence of contagion, these indices suggest that in recent years, the potential risk of external bank financing contagion for Chile, associated with the similarity of the external bank lender structure, would be greater with respect to Brazil than to China or Turkey.

# II. Credit users

The possibility of default on credit commitments is one of the main risks on the balance sheets of the national financial intermediaries, as well as for the economy's external financing flows. In Chile, the banking system is exposed through its loans to households and nonfinancial firms and, to a lesser extent, through its investments in public debt securities. At the same time, the Consolidated Government and the corporate sector have a significant effect on the economy's external position. This chapter examines the financial position of credit users and evaluates the credit risk trend in the Chilean economy and its sensitivity to the risks described in chapter I.

In the last six months, credit users have not demonstrated significant changes in their financial situation and have thus maintained a favorable position for absorbing possible deteriorations in the economic and financial environment. In the framework of the fiscal rule, the net indebtedness of the Consolidated Government continues to fall, and its net lending position has solidified. Firms' payment capacity and solvency<sup>1</sup>/ have remained at adequate levels without major variations, in an economic context in which the mining sector has been the main beneficiary. Lastly, the rate of household indebtedness has slowed; its evolution now largely depends on an increase in the number of debtors, which reflects the incorporation of a group whose payment behavior is not well known. The above is consistent with the increase—however slight—in banks' loan-loss provisions over the last few months. As long as banks are able to correctly evaluate the risks of these new debtors, a deterioration in the latter's capacity to meet their obligations should not constitute a threat to the stability of the financial system.

### Figure II.1

Payment capacity and indebtedness of nonmining companies (1)



<sup>(1)</sup> Consolidated financial statements.

#### **Firms**

Loans to domestic nonfinancial firms are the main asset on banks' balance sheets (47%). Their greatest exposure is in nontradables sectors (81%), and the majority of these loans corresponds to large firms (64%).<sup>2</sup>/ The external debt of nonfinancial firms represents around 78% of the economy's external debt, and their capital and debt securities account for around 25% of the assets of domestic institutional investors.

In the last six months, the financial position of nonfinancial firms registered with the Superintendency of Securities and Insurance (SVS) continued to be solid, with some degree of strengthening in the margin. This can be explained by the continuation of a favorable economic scenario with low interest rates, sustained growth of internal consumption, and strong demand and good

<sup>(2)</sup> Financial debt / (Equity + minority interest).

<sup>(3)</sup> Interest coverage, calculated as (EBITDA / Financial expense), moving year. EBITDA = operating income + depreciation.

<sup>&</sup>lt;sup>1</sup>/ Based on information from companies registered with the SVS.

<sup>&</sup>lt;sup>2</sup>/ With a debt higher than 200,000 UE





(1) Calculated by converting the rating categories of current debt to a numerical scale between 0 and 20, and weighting by the amount of the debt.

(2) Figures as of March.

Source: Authors' elaboration, based on data from SVS.

#### Figure II.3



 GDP corresponds to the moving year ending in the first quarter of 2007.
 Corporate bonds (except Codelco), nonbank asset-backed securitized bonds, and commercial papers.

(3) Converted to pesos using the average dollar for the 2002-March 2007 period.

Sources: Authors' elaboration, based on data from SVS, SBIF and ACHEF.

Figure II.4



prices for some export commodities. The above has favored the generation of operational flows, especially in the mining sector, while the nonmining sector is still characterized by differences among sectors, explained in part by the high cost of energy, the evolution of the exchange rate, and other costs. Although the financial debt (banks and public debt) of nonmining companies has reached higher rates over the past six months, their main loan risk indicators have remained stable in the aggregate, thanks to the considerable generation of internal resources (figure II.1). Additionally, market expectations about the future evolution of earnings and default risk for nonfinancial firms registered with the SVS continue to be favorable, and are reflected in the minimum variation in corporate debt risk rating by risk rating agencies (figure II.2), and in optimistic projections by market analysts.

# Growth of debt was steady in the last half, with a greater contribution by local banks and external debt

Corporate debt continued to grow over the last half, reaching an annual real rate of 11.7% in March 2007. As of said date, the sector's total debt represented close to 80% of GDP,<sup>3</sup>/ or \$65.706 trillion. The local banking system, which is the sector's principal source of financing, maintained and even accentuated their contribution to the sector's growth (figure II.3). Commercial loans -which represent 75% of the banking sector's total financing-have posted a real annual growth rate of more than 12% for four consecutive quarters. If the growth of other bank loans (foreign trade loans, bank leasing, and factoring) is included, these rates exceed 15%. As previous Reports have emphasized, the growth of commercial loans encompasses both large firms (the majority of which are registered with the SVS) and small and medium-sized enterprises (real annual rates of 12.7 and 12.9%, respectively, in March 2007). In sectoral terms, the banking industry's high exposure to the commercial sector has continued (30.2%), but its exposure to construction, real estate, and infrastructure concessions (23.9%) has gradually increased and is currently the second largest component in the commercial loan portfolio.

Debt through bonds and other publicly offered corporate debt instruments also became more dynamic, growing at real annual rates of 11.6% in March 2007. While corporate bond issues had a real growth rate of 13.7% in 2006 (well above the 5.3% registered in 2005), the local bond market experienced explosive growth (92.3%) as a result of bond issues from banks and financial corporations registered with the SVS (figure II.4).

Finally, external debt (especially bank and commercial loans) has begun to recover its previous importance, growing at an average rate of 7.4% in dollars in the last half year, after registering negative growth rates from 2001 until March 2006.

### The sector's risk of debt default has remained low

The global economic environment has remained favorable for nonfinancial firms. In the case of firms registered with the SVS, operating flows remain positive and finance most of the investment flows (figure II.5). Investment in the consumer, electricity, and air transportation sectors has increased notably, while investment in the forestry sector remains high.

<sup>&</sup>lt;sup>3</sup>/ 76% if GDP is measured against the constant real exchange rate of December 1995.





Mar.03 Sept.03 Mar.04 Sept.04 Mar.05 Sept.05 Mar.06 Sept.06 Mar.07 (1) Consolidated financial statements.

(2) Excludes dividends paid.

Source: Authors' elaboration, based on data from SVS.

#### Table II.1

Financial indicators (\*)

Indicator	Dec.04	Dec.05	Sept.06	Dec.06	Mar.07					
Operating margin (p	ercent)									
Mining	40.5	42.2	54.4	54.9	54.7					
Other	12.7	12.0	11.7	11.7	11.7					
Asset yields (ROA, p	Asset yields (ROA, percent)									
Mining	21.9	28.4	44	47.9	45.1					
Other	3.8	3.3	3.8	3.8	3.4					
EBITDA/Financial exp	ense (time	s)								
Mining	21.1	28.4	41.0	38.7	36.3					
Other	3.2	5.0	5.1	5.1	5.2					
Financial debt/EBITD	A (times)									
Mining	0.8	0.6	0.4	0.4	0.4					
Other	3.2	3.1	3.0	3.1	3.2					
Financial debt/Equity (times)										
Mining	0.52	0.43	0.45	0.47	0.43					
Other	0.61	0.60	0.61	0.61	0.59					

(\*) Consolidated financial statements. Flow variables correspond to moving years ending in the respective quarters.

Source: Authors' elaboration, based on data from SVS.

The higher levels of debt in the period have not had a negative impact on these firms' main credit risk indicators. Aggregate indebtedness —the ratio of financial debt to equity— has diminished slightly, reaching 0.59 times in March 2007. This reduction is more pronounced in mining companies in the sample than in nonmining firms (table II.1). Interest coverage —the ratio of EBITDA to financial expenses— rose at the margin for nonmining companies (to 5.2 times in March 2007) and dropped for mining companies to 36.3 times, which nonetheless continues to be very high in historic terms.

The currency risk exposure of nonfinancial firms registered with the SVS continues to be contained. In recent years, there have been fewer mismatches due to an increase in dollar assets, a more intensive use of currency derivatives, and the substitution of external debt for local debt (figure II.6).

The mining sector's favorable financial situation is confirmed by new data that became available in 2006, which is shown in table II.2. These data cover mining companies that are subject to the specific mining tax or royalty, most of which are not registered with the SVS. As can be seen in the table, the debt and interest coverage indicators of these companies are even more solid than the indicators for the mining companies included in our analysis.<sup>4</sup>/ This is because most of these companies have scarce or null financial debt.

#### Table II.2

Financial indicators in the mining sector (1)									
Indicator	ROA (percent)	EBITDA/ Financial expense (times)	Financial debt/ EBITDA (times)	Financial debt/ Equity (times)	Total debt/ Equity (times)				
Mining sector (2) New companies (3)	47.9 64.2	38.7 95.6	0.40 0.10	0.47 0.13	0.88 0.49				

(1) As of December 2006 (most recent data available).

(2) Selected companies registered with the SVS. Excludes Codelco.

(3) Companies not registered with the SVS but which report their financial statements to comply with the stipulations in Law 20.026 (specific tax on the mining industry). Excludes companies whose accounting standards differ from current standards in Chile.

Source: Authors' elaboration, based on data from SVS.

Despite the above, two of these companies not registered with the SVS are among the largest debtors in the external sector, with a debt equivalent to 3.6% of the external debt of the whole corporate sector as of December. The local financial system registers almost no direct loans to this group, although there are leases with national banks. Finally, several of these companies habitually receive financing from their parent companies and/or subsidiaries from the same group.

# The analysis of sectoral- and individual-level vulnerability does not reveal cases that represent systemic threats

An analysis of individual-level vulnerability was carried out on firms with a potential risk of default, for which a group was chosen that had a financial debt ratio of over 1.5 times and an interest coverage ratio of less than two

<sup>&</sup>lt;sup>4</sup>/ Our analysis includes small and large copper mining companies, other mineral mining companies, specialized fertilizer mining companies, and members of the steel industry. It does not include Codelco.



(\*) Net position in dollars, adjusted for forwards, of firms registered with the SVS. Individual financial statements.

Sources: Authors' elaboration, based on data from SVS and Cowan, Hansen, and Herrera (2005).

#### Figure II.7

Concentration of financial debt by interest coverage and indebtedness (1)



 As of March 2007. The size of the circle represents the share of the firm's financial debt in the total debt of the sample.
 Includes the entire infrastructure concessions sector.

Source: Authors' elaboration, based on data from SVS.

times. In order for this group to represent a systemic risk, they must also represent a significant fraction of total financial debt and have no riskmitigation mechanisms.

In the last six months, the vulnerable group displayed an increase at the margin, and the fraction of financial debt in firms with an interest coverage of less than two times rose from 16% in September 2006 to 21.5% in March 2007. The percentage of firms with indebtedness higher than 1.5 times was 18.5% in March, with no significant variation since September 2006. This hike is mainly due to infrastructure concessionaires that have begun to amortize previously activated financial expenses. To a lesser extent, it was also due to the operational startup of urban transportation concessionaires;<sup>5</sup>/ these operations are long-term concessions, so they have high initial cash flow requirements, heavy leverage (principally long-term), and limited income. However, 68% of the total financial debt continues displaying indicators that are outside the area of vulnerability (figure II.7).

As in the last *Report*, our conclusion on the group of firms with less robust financial indicators and/or worse relative performance is that they do not represent an important risk of debt default. This conclusion is based on several factors, including the existence of debt collateral and considerations specific to their business, such as their competitive position, the natural variability of their income, and the stage of project maturity, among other factors. In the case of infrastructure concessions, another factor considered was that the majority of the concession contracts include mechanisms for mitigating demand risk.<sup>6</sup>/

# Firms are currently in a financial situation that allows them to confront financial stress scenarios

The risk scenarios presented in Chapter 1 —a sharp drop in the rating of risky assets, and significant cyclical global weakening— would lead to a weakening of macroeconomic variables, which would then have adverse effects on the capacity and solvency of nonfinancial firms. Particularly, scenarios that combine reduced GDP growth, a slump in the copper price, and higher interest rates would reduce the payment capacity of firms.

To estimate this impact, the sample was separated into the mining sector and the remaining sectors. We estimated the impact of the two stress scenarios on the interest coverage ratio, based on information up to December 2006. Even in the most extreme risk scenario (significant cyclical global weakening), the coverage indicator would fall moderately, in both the mining and the other sectors (figure II.8). In the mining sector, this indicator slipped from 40.7 times in December 2006 to 21.7 times in the course of a year (December 2007), and in the other sectors it fell from 5.1 times to 3.9 times in the same period. Among firms registered with the SVS Securities Registry, the sectors that would be most affected by a scenario of this nature are those associated with the nontradables sector: land transport, maritime transport, and infrastructure concessions. An increased interest rate is the variable that would most affect these sectors, since they receive a greater proportion of financing from the local financial system than the tradable goods sectors.

<sup>&</sup>lt;sup>5</sup>/ Associated with *Transantiago*.

<sup>&</sup>lt;sup>6</sup>/ See the Financial Stability Report from second half, 2006.

Interest coverage: historic versus stress scenarios (\*) (times)



(\*) Significant global cyclical weakening.

Source: Authors' elaboration, based on data from SVS.

#### Figure II.9

Local bank debt and payment capacity under alternative scenarios (\*)

(percent, times)



(\*) Percent of the sample's local bank debt according to the range of the interest coverage indicator.

Sources: Authors' elaboration, based on data from SVS, SBIF and Central Bank of Chile.

At-risk bank debt would rise from 9.9% of the sample's total debt in December 2006 to 15.5% after a year. The main sectors that possess atrisk debt —defined as debt in the hands of firms with an interest coverage indicator lower than one— are land transport and infrastructure concessions. In terms of domestic bonds and external debt, the proportion of corporate debt with an interest coverage indicator less than one rose from 11.6 to 17.8% for domestic bonds and from 3.4 to 8.0% for external debt (figure II.9).

These results are very similar to those obtained in the last *Report*. Although shocks negatively affect the loan payment capacity of this group of firms, and drive up the percentage of debt in the hands of firms with a low interest coverage ratio, none of these impacts is very significant. Most companies continue to have healthy coverage ratios. Additionally, at least some of the most affected firms hold debt collateral or other mechanisms that lessen the risk of default.

### Households

Loans to households represent around 25% of bank assets. Around 60% of the total corresponds to home mortgage loans and the rest to consumer loans and other credits tied to the use of credit cards and checking account overdrafts. Nonbank debt is around 30% of total household debt.

### The growth rate of household loans lessens

Although the growth rate of household debt has stayed above 15%, its recent evolution confirms a slight slowdown in the growth rate that has held since the second quarter 2006. Aggregate household debt grew by 16% in real annual terms in the first quarter 2007, which is the lowest growth rate registered in the last seven quarters. As of March 2007, total household debt was estimated at \$25.400 trillion, equivalent to 31.6% of GDP.

Loans issued by the nonbank sector recovered their momentum in the first half of 2007. Mortgage and consumer loans grew by 15 and 18%, respectively, in real terms (table II.3). These rates equal those posted by the banking sector for every type of household credit. The nonbank sector's increased activity was led by the private compensation funds (*cajas de compensación*) and was supported by an upward trend in loans issued by retailers.

### Table II.3

Household debt

(real annual change, percent)

	20	05				2006				2007
	I		11	III	IV	I	II	III	IV	I
<b>Mortgage</b> Bank Nonbank (1)		<b>15</b> 20 -9	<b>14</b> 18 -5	<b>13</b> 17 -5	14 16 0	15 17 6	16 17 10	<b>16</b> 16 14	<b>14</b> 14 11	<b>15</b> 15 15
<b>Consumer (2)</b> Bank Nonbank (3)		<b>19</b> 19 20	<b>17</b> 20 13	<b>21</b> 19 24	21 20 23	21 21 21	<b>20</b> 22 18	<b>20</b> 23 15	<b>19</b> 21 16	<b>18</b> 18 18
Total	I	17	15	17	17	18	18	17	16	16

(1) Includes securitized mortgage debt.

(2) Includes university debt and nonbank automobile debt.

(3) Includes retailers, private compensation funds, cooperatives, and insurance companies.

Sources: SBIF, SVS, SuSeSo, and Central Bank of Chile.



 $(\ensuremath{^{\star}})$  Six-month moving average. Amount and average debt at constant prices.

Sources: SBIF and Central Bank of Chile.

#### Figure II.11

Median price of house and apartment transactions (base index II.01 = 100)



#### Figure II.12

Indebtedness (DIR) and the financial burden (percent of disposable income)



Sources: Authors' elaboration, based on data from SBIF, SVS, SuSeSo and Central Bank of Chile.

The expansion of consumer bank debt continues to be dominated by an increase in the number of debtors, which grew 11.6% in April 2007. Average debt per debtor displayed less dynamic growth, reaching 6.1% in real annual terms in the same month, equivalent to \$2.8 million. This contrasts with average growth of 9.7% over the period 2004–06 (figure II.10).

For mortgage debt, the number of debtors grew by 6.3% in April 2007, down from rates near 8% at the end of 2005. Bank mortgage debt per debtor, which reached \$15.5 million in the same period, also lost momentum, growing by 8.1% in real annual terms.

Debtors with high levels of debt continue to lead growth in bank consumer loans. The share of loans of more than 400 UF, which are concentrated in approximately 9% of all debtors, rose from 45% of total consumer loans in August 2006 to 47.5% in April 2007. For mortgage loans, 5% of debtors holds 28% of this debt (debtors who have borrowed more than 3,000 UF).

Housing prices, measured by the median house and apartment transaction recorded in the most representative neighborhoods of the Santiago Metropolitan Region, renewed their growth trend in the third quarter of 2006. Specifically, the prices of houses and apartments grew by 7 and 6%, respectively, in real annual terms<sup>7</sup>/ (figure II.11). This development could be one of the factors that is sustaining the growth of mortgage debt, given the strong and prolonged effect housing prices tend to have on mortgage loans.

### Financial burden grows alongside debt

Household debt continues growing faster than disposable income, which can be seen in the steady rise in the debt-to-income ratio (DIR) since these statistics have been available. In particular, total DIR rose to 59.9% in March 2007, while long-term DIR reached 51.8% in the same month<sup>8</sup>/ (figure II.12).

The strong growth in household debt has led to a significant increase in the financial burden as a percentage of disposable income. The total debt-service-to-income ratio reached 19.5% in March 2007, while the ratio of long-term debt service to income was 10.2%. The evolution of the interest rates and maturities of different kinds of loans has contributed to an increase in the financial burden of debt maturing in over one year (figure II.13).

However, a disaggregation by type of credit reveals opposing effects. Mortgage loans, mainly composed of nonendorsable mortgage loans, have stable interest rates and a longer average maturity, which was 19 years in early 2007. This interest rate and maturity evolution partially compensated for the effect of increased mortgage debt on the financial burden.

In the case of bank consumer loans, the maturity of loans at more than one year has moderately increased, reaching an average of 43 months in March 2007. The interest rates of bank loans rose at the margin, while the interest rates of nonbank loans rose significantly. Short-term consumer loans, which constitute

<sup>7/</sup> For more information about this indicator, see Cox and Parrado (2005).

<sup>&</sup>lt;sup>8</sup>/ The historical calculation of the debt-to-income ratio (DIR) and the debt-service-to-income ratio was revised based on the continual updating of the national accounts data, which include measures of disposable income.

Decomposition of the growth in the financial burden at over one year

(real annual change, percent)



Mar.03 Sept.03 Mar.04 Sept.04 Mar.05 Sept.05 Mar.06 Sept.06 Mar.07 Sources: Authors' elaboration, based on data from SBIF, SVS, SuSeSo and Central Bank of Chile.

#### Figure II.14

Composition of consumer debt at less than one year (billions of pesos)



Sources: Authors' elaboration, based on data from SBIF, SVS, SuSeSo and Central Bank of Chile.

#### Figure II.15

Consumer confidence index



 1.02
 III.02
 1.03
 II.04
 III.05
 III.05
 I.06
 III.06
 1.07

 Sources: Adimark, University of Chile, and Central Bank of Chile.

half the total financial burden, have had rising interest rates in the past year, but the effect of the change in their composition (from nonbank to bank loans) has prevented an even greater increase in the financial burden (figure II.14).

#### The financial vulnerability of households has increased at the margin

Consumer confidence fell off considerably in the first quarter of 2007, despite the benign economic growth and employment conditions (figure II.15). Similarly, according to the Survey of Economic Perception and Expectations of the University of Chile, the proportion of households who report a "difficult" debt situation was higher than the previous quarter and exceeded 20%. According to the most recent bank loan survey carried out by the Central Bank of Chile in March 2007, the bank sector perceives a slowdown in demand for both consumer and mortgage loans. Also, commercial banks report a slight increase in the flexibility of consumer credit supply as a result of greater competition among bank and nonbank institutions.

The flows of new mortgage loans display a persistent drop in the share of variable- or mixed-rate loans, down to 16% in April 2007 (figure II.16). This indicates that most new mortgage debtors are less exposed to the risk of interest rate hikes.

Credit risk indicators confirm the changing trend that has been observed since the second quarter of 2006. Particularly, consumer loan-loss provisions have continued their upward trend, reaching 5.3% as of March 2007, while mortgage provisions stayed at 0.47%. This could partially be reflecting the bank sector's uncertainty about a greater household credit risk, particularly in relation to consumer loans (figure II.17).

In a context of robust macroeconomic conditions, the above evidence suggests that the credit cycle is going through a process of gradual maturation, which is in line with what has been stated in earlier *Reports*. Both the exposure and financial fragility of households have risen through increased indebtedness, although the risk of a significant deterioration of the households' ability to service their debt is limited. This is conditional on the macroeconomic environment remaining dynamic. Nevertheless, sustained growth of debt can be a source of financial stress for some households. Financial institutions must therefore continue to carefully evaluate their standards for granting loans, and households must evaluate their capacity to sustainably generate income when taking on financial commitments.

## Consolidated Government<sup>9</sup>/

The public sector's degree of financial soundness affects the asset quality of financial intermediaries, the confidence of national and foreign investors, and the availability and cost of financing for other agents in the economy. In the case of Chile, the exposure of national and international investors to public debt, which includes the Central Government and the Central Bank, is low and the Consolidated Government sector has even become a net creditor.

<sup>&</sup>lt;sup>9</sup>/ The consolidated figures for the Central Government and the Central Bank eliminate entries that represent liabilities (assets) for the Central Government and assets (liabilities) for the Central Bank. These entries are fiscal promissory notes with the Central Bank, fiscal deposits in the Central Bank, and Central Bank securities held by the Central Government.



#### Figure II.17

Household credit risk (1) (percent)



Mar.95 Sept.96 Mar.98 Sept.99 Mar.01 Sept.02 Mar.04 Sept.05 Mar.07

Measured through the banking system's risk indicators.
 Percent of total loans of consumer banks.
 Percent of total mortgage loans of the system.

Source: SBIF.

#### Figure II.18

Consolidated public debt (percent of GDP)



# The strength of public finances continues supporting the Chilean economy's financial stability

This year, the Consolidated Government will continue solidifying its position as a net creditor. In the framework of the fiscal rule—which defines fiscal spending as a function of the Central Government's permanent income—gross and net Chilean public debt has continued to decrease as a result of extraordinary earnings from copper. The Consolidated Government's gross and net debt thus fell from 24.3 and 2.5% of GDP in December 2005 to 19.6 and –6.1% in December 2006, respectively (figure II.18).

# The Central Government reduced its exposure to liquidity and interest rate risk

Liquidity risk has not changed significantly with respect to earlier evaluations. Most of the Central Government's current debt is contracted at medium and long terms, thus keeping the exposure to liquidity risk low. Moreover, as of December 2006, only 33.3% of its debt was variable rate, which translates into lower interest rate risk.

Apart from short-term instruments issued for liquidity management, the Consolidated Government's liabilities with a maturity of less than a year will not be difficult to finance since they represent a small percentage of the total (less than 10% as of December 2006<sup>10</sup>/). As of the same date, the Consolidated Government's short-term liabilities in foreign currency were nearly US\$5.8 billion, equivalent to 21% of the Central Bank's total international reserves and of the General Treasury's assets held abroad (excluding foreign currency deposits in the national financial system).

The Central Government has continued with its policy of issuing internal debt bonds. For this year, it plans to issue bonds in the domestic market worth US\$700 million, of which 54% (UF 11 million) will be 20-year indexed bonds (BTU) and close to 46% (\$170 billion) will be 10-year bonds in pesos (BTP) issued for the first time by the General Treasury of the Republic. At the end of May, the total balance of 10- and 20-year BTU bonds issued since the first issuance in 2003 was UF 63.2 million (equivalent to US\$2.2 billion), while the BTP balance was \$51 billion (equivalent to US\$96 million). By issuing internal debt despite the surplus expected for this year, the Central Government is decreasing its need to liquidate dollars on the local market.

Chile's long-term financial liabilities hold an A+ rating or better in local currency and an A (or the equivalent) in foreign currency, according to the three international risk rating agencies.

The Consolidated Government's accumulation of assets, mainly abroad, has led to continued growth of the net foreign currency lending position, which is sensitive to exchange rate fluctuations. As of December 2006, the Central Bank and the Central Government had a net global and foreign currency lending position of 9.6 and 3.5% of GDP, respectively (figures II.19 and II.20).

Within the framework of the Law on Fiscal Responsibility, the Pension Reserve Fund was formalized on 28 December 2006, with an initial contribution of

<sup>&</sup>lt;sup>10</sup>/ Latest information available.

Net positions of the Consolidated Government (\*) (percent of GDP)



(\*) A positive number implies a net asset position; a negative number represents a net liability position.

Source: Central Bank of Chile, based on data from the Finance Ministry.

#### Figure II.20

Net positions of the Central Government (\*) (percent of GDP) In foreign currency In pesos 10 Total 0 -10 -20 -30 -40 93 95 97 99 01 03 05 91 89

 $(\ensuremath{^{\ast}})$  A positive number implies a net asset position; a negative number represents a net liability position.

Source: Central Bank of Chile, based on data from the Finance Ministry.

Figure II.21

Total balance of the Central Government (percent of GDP)



Source: Finance Ministry

US\$604 million. The Economic and Social Stabilization Fund was created on 6 March 2007, with an initial contribution of US\$6 billion. These resources were invested by the Central Bank of Chile in its capacity of Fiscal Agent. Additionally, the General Treasury has other investments as part of its assets. The General Treasury's total resources in foreign currency, including previous funds, were US\$12.162 billion in March 2007. In contrast, total assets in pesos amounted to an equivalent of US\$2.071 billion. The investment strategies for funds managed by the Central Bank are determined by the Finance Ministry. Their average duration is approximately 2.1 years, and they are composed of dollars (50%), euros (40%), and yen (10%).

# In the near future, the Central Government should continue strengthening its position as net creditor

The implementation of the Budget Law should lead to new reductions in net public debt in 2007. These reductions should be even greater than what was predicted in the last *Report* since this year's expected copper price has risen and now exceeds the price used for the Budget Law (figure II.21).

The Central Bank will also continue to reduce its debt as a proportion of GDP, in both gross and net terms. This is a consequence of the slow reduction of its deficit, based on several factors: the decrease in Central Bank assets and liabilities, the progress of capitalization, a fall in the country risk premium, and the favorable interest rates in recent years, which have reduced the differential between debt costs and asset earnings.

In the framework of the 2006 Law on Fiscal Responsibility, last December the Government made its first capital contribution to the Central Bank for the amount of US\$605.9 million. In 2007, the contribution is expected to be a maximum of US\$730 million. Since the capitalization is again expected to be in dollars, the Central Bank's net position in foreign currency and international reserves will grow, *ceteris paribus*.<sup>11</sup>/

 $<sup>^{11}\!/</sup>$  The final outcome for reserves depends on movements in the Central Bank's assets and liabilities in foreign currencies.

# Box II.1: Representativeness of firms registered with the Superintendency of Securities and Insurance

The best source of corporate accounting information in Chile is the database of firms registered with the Superintendency of Securities and Insurance (SVS) (henceforth "SVS firms"). Following current legislation, corporations that publicly offer stocks or debt instruments must be registered and must file certain information. The same is true for companies with more than 500 shareholders and those in which at least 10% of their subscribed capital is in the hands of a minimum of 100 people. There are also cases of specific registry requirement<sup>12</sup>/ or voluntary registration. These firms must provide information on a quarterly basis, and they must be audited once a year.

From the perspective of financial stability, however, what matters most is how representative this group is with respect to all companies with financial debt. This group holds most of the external liabilities of all national firms and 100% of the bonds, but only 27% of local bank debt. It is therefore important to assess just how representative SVS firms are of the other 73% (table II.4).

### Table II.4

Composition of financial debt (percent of total)

	SVS	Other
Local bank debt	27	73
External bank debt	63	3/
Bonds	100	0

Source: Authors' elaboration, based on data from SBIF and Central Bank of Chile.

One way to estimate the representativeness of SVS firms is to use the National Annual Industrial Survey (ENIA). This survey covers all manufacturing firms with at least ten employees. This box uses the 2004 ENIA survey, with a universe of 4,700 firms divided into three groups: firms registered with the SVS, large manufacturing firms, and small and medium-sized manufacturing enterprises (SMEs). The latter two groups are not registered with the SVS.<sup>13</sup>/

The first row of table II.5 shows that, of the entire ENIA universe, SVS firms account for 18% of commercial debt with local banks, while 69% of this debt corresponds to large firms not registered with the SVS.

#### Table II.5

Selected indicators

	svs	Large firms	SMEs		
Local commercial debt	(percent of total	debt)			
	17.5	69.4	13.0		
Sales	(percent of total	sales)			
	22.2	69.5	8.4		
Financial debt/sales	(times)				
	56.6	19.1	24.6		
Bank debt	(percent of total	liabilities of each	group)		
Bank debt in pesos	11.8	43.8	77.3		
Local bank debt in foreign currency	8.8	33.5	16.6		
External debt	47.8	22.7	6.0		
Bonds	32.0	-	-		
Coverage 1 (1)					
Percentile 50	12.6	6.3	3.9		
Percentile 25	2.2	0.5	-1.6		
Coverage 2 (2)					
Percentile 50	8.4	8.5	7.4		
Percentile 25	2.6	0.9	-1.7		
Total debt in dollars	(percent of total	liabilities of each	group)		
	56.6	56.2	22.7		
Currency mismatch	(percent of expo	rts of each group	)		
Percentile 50	30	10	0		
Percentile 75	100	60	10		
Overdue debt	(percent of total overdue debt)				
	18.1	8.4	73.4		
	(percent of total	liabilities of each	group)		
	0.4	0.0	2.0		

(1) Operating income / Financial expense.

(2) Operating income / Debt multiplied by the average interest rate.

Source: Authors' elaboration, based on data from SBIF and ENIA 2004.

The rest of table II.5 describes four aspects of the financial situation of ENIA firms: the level and composition of their financial debt, the liquidity situation for each category of firms, their foreign currency exposure, and finally their payment behavior in 2004.

The table reveals that the degree of financial indebtedness (with respect to sales) for SVS firms is substantially higher

<sup>&</sup>lt;sup>12</sup>/ An example of these are the corporate requirements specified in *Plan Transantiago's* bidding rules.

<sup>&</sup>lt;sup>13</sup>/Large firms are defined as having sales greater than or equal to UF 100,000; and SMEs have sales less than UF 100,000.

than for SMEs and large firms. This may reflect the lack of information about the use of other financing sources like leasing and suppliers by unregistered ENIA firms. With respect to financial debt, SVS firms differ from the rest in terms of both their greater use of bonds (32%) and their external debt. The main differences between large firms and SMEs are that large firms use a greater degree of both foreign currency debt with local banks and external debt.

SVS firms have the highest interest coverage ratios, followed by large firms. This can be seen in the two types of coverage reported in the table: coverage 1, which measures the ratio of financial expenses reported in ENIA to operational income, and coverage 2, which assumes a flat interest rate of 6% for all debt in order to calculate the ratio of interests to operating margin. Considering that the difference between the two measurements is financial expenses, it is possible to conclude that the better interest rates secured by SVS firms partly explain their better coverage. Also, given that financial expenses include not only financial debt but all kinds of debt, it is possible that indebtedness with other debtors occurs under less favorable conditions. Indebtedness in dollars, as a fraction of liabilities, is similar for SVS and large firms and considerably lower for SMEs. The similarity between SVS and large firms disappears, however, when the mismatches are measured using debt in dollars net of exchange derivatives over exports (see Cowan *et al.*, 2007, in this same *Report*). The lower hedging by SVS firms and their greater use of external debt is probably due to the fact that they have greater access to international financial markets (with lower financing costs) than large firms and SMEs average.

Finally, the table shows overdue debt in ENIA for 2004. Two percent of total SME debt is overdue, while SVS and large firms have practically no delinquent liabilities. It is notable that 73% of total overdue debt is held by SMEs.

The results of these comparisons suggest that, in general, the data from SVS firms are not representative of the whole manufacturing sector. Rather, large firms are the most relevant for monitoring the sector, considering that they hold the largest percentage of local bank debt. SVS firms are representative of external debt and bonds, although large firms have foreign currency debt in a similar proportion to that of SVS firms.

# **III. Assessment of systemic risks**

This chapter assesses systemic risks to the financial system and international financial integration, in light of the national and international macrofinancial threats and microfinancial vulnerabilities described in the previous chapters.

### Nonbank financial sector

This section analyzes the investment decisions of nonbank financial institutions and their potential impact on the financial markets, as well as the financing conditions of credit users and banks.

The volume of assets administered by institutional investors has steadily grown, reaching \$73 trillion as of March 2007, equivalent to US\$136 billion and 92% of GDP. This growth has been led by mutual funds, which displayed a real annual change of 27% as of March 2007, followed by pension funds, which grew 17%. Assets administered by life insurance companies saw real annual growth of 7% in the same period.

Investment of these resources has been concentrated in private bonds and national variable-income instruments. Foreign instruments also experienced a significant increase in their share in the aggregate portfolio of the nonbank financial institutions, constituting 24.5% of total assets at the end of the first quarter of 2007 (table III.1). This share increase has basically been associated with a sharp increase in the valuation of these assets.

#### Table III.1

Investment portfolio of the nonbank financial institutions (percent, billions of March 2007 pesos)

	2002	2003	2004	2005	2006		2007
Instruments	Dec.	Dec.	Dec.	Dec.	Jun.	Dec.	Mar. (p)
State	25.9	22.1	17.4	14.9	13.4	11.7	10.2
Time deposits	22.3	16.8	20.4	21.7	23.5	21.0	21.7
Bank bonds	3.0	2.6	2.4	3.3	3.6	4.5	4.7
Mortgages bills	12.5	10.8	8.7	6.4	6.2	5.7	5.5
Endorsable mortgage loans	2.3	2.2	1.9	2.0	2.1	2.0	1.9
Corporate bonds and promissory notes	10.8	12.8	13.0	12.9	12.5	12.4	12.2
National stocks	7.3	10.9	11.9	12.0	11.3	13.5	13.8
Investment abroad	11.8	16.7	19.0	21.8	22.8	24.5	24.5
Real estate	1.5	1.6	1.6	1.6	1.6	1.6	1.6
Other	2.5	3.5	3.6	3.3	2.9	3.2	4.0
Total	42,474	48,223	54,674	58,777	62,227	70,157	73,074
(p) Provisional figures.							

Sources: SAFP and SVS.

Net investment in debt instruments by the nonbank financial institutions

(quarterly flow in billions of March 2007 pesos)



Sources: SAFP and SVS.

#### Figure III.2

Mutual fund assets, by type of fund (percent of total assets)



#### Figure III.3

Insurance premiums, by type (annual growth, percent)



Dec.01 Sept.02 Jun.03 Mar.04 Dec.04 Sept.05 Jun.06 Mar.07 Source: SVS.

### Net investment in local instruments is on the rise

During the second half of 2006, net flows aimed at bank and corporate bonds doubled the purchases made during the same period in 2005, and this same trend has continued in the first three months of 2007 (figure III.1). This movement has been dominated by investment by pension funds in bank bonds, which consequently reduced their investment in time deposits.

The share of investment in local assets in the nonbank financial institutions' aggregate portfolio rose to 13.8% of total assets as of March 2007. The greater flow of resources toward national variable-income instruments can be explained by a sustained growth in wages, which has increased the flow of resources from pension fund contributors and savings alternatives like mutual funds. It can also be explained by decisions to transfer affiliates to funds that are more intensive in variable-income instruments. Despite the size of the portfolio administered by pension funds in the local variable-income market, its impact on stock prices is not significant (Silva, 2007).

#### Net assets of mutual funds with upward tendency

As a result of the flattening of the interest rate curve in recent months, the increased net assets of mutual funds have tended to be concentrated in short-term fixed-income funds. As of March 2007, these funds represented 47% of the industry's total net assets, amply surpassing longer-term fixed-income mutual funds, which held steady at around 20% (figure III.2). Despite the favorable evolution in the amount of administered resources, mutual funds are characterized by persistent volatility, especially fixed-income funds (Figueroa and Luna, 2007).

Stock mutual funds have recovered since September 2006, following a year of stagnation. They received a greater injection of resources, with the help of good performances by the local stock exchange and international markets. Greater financial deepening has allowed for the development of new investment vehicles, like structured mutual funds, which represent 4% of the industry's total net assets (\$421 billion).

#### Solvency of the life insurance companies

Low long-term interest rates continue depressing life annuity sales. As of March 2007, they posted a real drop of 16% with respect to March 2006 (figure III.3). The evolution of rates offered for life annuities has been similar to that of long-term market rates, while at the same time real returns from life insurance company investments are around 8%. Despite the volatility of investment returns, average asset returns rose to 26% in March 2007.

Nevertheless, the life insurance market continues to evolve favorably, which is reflected in an acceptable risk rating for the industry. Similarly, the asset adequacy test carried out in December 2006 did not produce major differences compared to the test results in June 2006, and this shows that the reinvestment rate calculated for companies is lower than current market interest rates (figure III.4).







Growth of bank assets





Source: Authors' elaboration, based on data from SBIF.

#### Figure III.6

Return on equity and exposure to consumer loans (1) (percent)



(1) As of December 2006.

(2) Earnings / Base capital.

(3) Percent of consumer loans in total loans.

Source: Authors' elaboration, based on data from SBIF.

### **Banking sector**

This section analyzes the financial strength of the local banking system, which is directly related to its degree of exposure to credit, market, and liquidity risk and to its capacity to absorb shocks.

#### Exposure to credit risk continues to rise

Despite a slight slowdown in the early months of 2007, consumer loans are still growing faster than all other bank loan segments, and their average share of total loans has risen to 13%. The growth of household financing has been particularly important in the three largest private banks, which represent 54% of this segment. Bank financing provided to small and medium-sized enterprises has also displayed increased activity, particularly for microenterprises, which experienced a real annual change of 19% as of March 2007.

The above figures generally reflect the industry's recent strategy, designed to prioritize credit growth in segments that offer greater relative margins (figure III.5). Also, the financial instruments portfolio has dropped by US\$1.9 billion over the last two years, which has driven up the relative share of loans in the system's balance sheet.

### The macrofinancial environment contributes to the system's profitability

Given the current macrofinancial environment, the greater exposure to consumer loans has not necessarily led to significant increases in portfolio expenses, which has contributed to sustaining the profitability levels exhibited by the banking industry. Over the past two years, return on equity has managed to stay above 18% systemwide, and it is over 25% in banks with a stronger presence in the retail sector (figure III.6). As a result, the change in composition toward relatively riskier assets has strengthened income from interest and commissions, thus compensating for greater loan-loss provisions.

Additionally, over the past year operational support expenses have stabilized at an historic minimum of around 2% of assets, making it possible for operational efficiency, which is measured as the quotient of profits and operating income, to continue contributing to return on equity, although to a lesser extent than in previous years (figure III.7). Continued improvement in operational efficiency is a current challenge for the banking industry, so in the absence of a more intensive use of technologies, the strategy of expansion into retail segments will necessarily be accompanied by an increase in operational support expenses.<sup>1</sup>/

### Consumer portfolio provisions have maintained their upward trend

While debtor payment behavior has recently been robust, an increase in loanloss provisions has been detected, mainly in the consumer loan segment. Bank debtor delinquency, measured through the nonperforming loan ratio, has been

<sup>&</sup>lt;sup>1</sup>/ This is reflected in the significant growth in the number of both bank branches and bank employees in 2006, which were up 7% and 9%, respectively, in annual terms.



Figure III.8



stable since the beginning of 2006 at historically low levels of around 0.8%, while the stock of provisions has shown a slight change in trend since the beginning of the year, and is currently situated at 1.5% of total loans.

The major increase has been in provisions for the consumer credit portfolio, which can partly be explained by the growth of credit in lower income segments. In fact, as of last March, the provisions ratio carried out by consumer divisions, whose target is the lowest income segment, was 6.5% of the portfolio, versus 4.3% on a systemwide level (figure III.8).

### Corporate sector risk remains stable

Corporate sector credit risk indicators have been relatively stable since mid-2006. As of March, they showed a delinquency ratio of 1% and a provisions ratio of 1.1%. This is explained mainly by this sector's solvency (chapter II) and also by the degree of sectoral diversification of the system's loans, despite the real estate sector's greater relative share. Financing for real estate firms, concessioners, and infrastructure firms has continued to grow strongly, reaching an exposure of more than 14% of all banking industry financing for the corporate segment.

### The asset base is strengthened

The system's capital adequacy ratio has been experiencing a slight reduction since the end of 2005, and it is currently hovering around 13% of risk-weighted assets (moving year). While leverage was the main cause of the drop in the capital adequacy ratio in 2006, over the past few months the drop has basically been due to a sharper increase in risk-weighted assets (figure III.9).

While the excess capital accumulated in 2002 and 2003 has slowly been decreasing as the result of a heavy expansion of bank credit backed by greater financial leverage, the system's capital adequacy ratio has remained high, and all the institutions have a ratio above 10% of risk-weighted assets.<sup>2</sup>/

At the same time, banks have increased the issuance of subordinated bonds, making use of the gap between the actual level of these instruments and the maximum allowed in regulatory capital measures; this is particularly the case in large banks (figure III.10). The share of these banks' subordinated bonds rose from 42% of base capital in December 2005 to 48% in December 2006, close to the regulated maximum of 50%.

For 2007, several capital increase initiatives are expected to materialize, as some banks have already announced. This will make it possible to sustain a level of credit growth similar to what has been registered in recent periods. For the first half of 2007, it is estimated that the average asset base increase for the three major private banks will reach approximately 14% of its current level.

### The liquidity position has remained stable

As in economies with relatively developed financial markets, one of the main sources of financing for the local banking system is the collection of time

<sup>&</sup>lt;sup>2</sup>/ Banks whose minimum capital requirement is equal to or above 10% as of March 2007 have an average weighted capital adequacy ratio of 12.4% (moving year).



(\*) Effective equity/Risk-weighted assets.

Source: Authors' elaboration, based on data from SBIF.

#### Figure III.10

Subordinated bonds and the capital adequacy ratio (1) (percent)



(2) The size of the cicle represents the share of each bank in the system's risk-weighted assets.

Source: Authors' elaboration, based on data from SBIF.

deposits made by the public (individuals, investors, and firms). In the case of Chile, and notwithstanding the relative importance of pension fund deposits for banks' collection of funds, the recent announcements of a gradual expansion of investment abroad limits for these institutional investors should not provoke significant alterations in the system's liquidity position, particularly considering that banking institutions should have adequate asset and liability management policies that take into account liquidity management, among other aspects. Moerover, banks normally have instruments among their assets that are easily liquidated. As of March 2007, the total system's financial instruments portfolio was worth approximately US\$14.4 billion, which represents 86.5% of total pension fund time deposits.

### Stress tests

Stress tests are used to evaluate the impact on bank balance sheets of the materialization of the risk scenarios described in chapter 1. This section particularly analyzes the impact of these scenarios on credit and market risks (interest rates and the exchange rate).<sup>3</sup>/

The impact on bank credit risk is measured by the change in annual loanloss provisions over loans.<sup>4</sup>/ Table III.2 shows this indicator for the different groups of local banks as of December 2006, compared with the indicator that would exist under different risk scenarios.<sup>5</sup>/ Losses due to credit risk are more significant in scenario 1, primarily for consumer banks.<sup>6</sup>/

#### Table III.2

Credit risk under different risk scenarios

(loan-loss provisions as a percent of loans)

		Multibanks (1)	Consumer banks (2)	Treasury banks (3)	Medium-sized banks (4)	System
Distribution 1989-2006 (5)	Median Maximum Standard deviation	1.5 3.2 0.7	7.1 23.2 5.1	0.7 1.8 0.5	1.3 2.8 0.6	1.4 2.7 0.5
Decemb	per 2006	1.0	5.0	0.1	0.8	1.0
Base	scenario	1.2	6.3	0.2	0.9	1.2
Risk sce	nario 1	1.6	8.2	0.3	1.2	1.6
Risk sce	nario 2	1.4	7.1	0.3	1.0	1.4

(1) Banks with a market share of over 10%.

(2) Banks whose consumer loans are more than 50% of their total loans.

(3) Banks whose primary activity is treasury operations.

(4) Encompasses all banks not included in the above categories.

(5) Includes only banks in operation as of December 2006, with the exception of consumer banks.

Source: Authors' elaboration, based on data from SBIF.

 $^{6}\!\!/$  The consumer banking sector currently posts profitability levels of over 20% of capital, which will eventually facilitate its recapitalization in the case of losses.

<sup>&</sup>lt;sup>3</sup>/ This does not include other risks that banking institutions traditionally face, like liquidity risk or the counterparty risk of derivatives transactions.

<sup>&</sup>lt;sup>†</sup>/ Loan-loss provisions reported for the risk scenarios are projected to two years, because credit risk materializes with a lag based on the economic cycle's maturity, with the greatest deterioration recorded in this period.

<sup>&</sup>lt;sup>5</sup>/ The heterogeneity in the indicator shown in table III.2 reflects the differences among banks in terms of loan composition, portfolio risk quality, and provisions policies.

Impact of different risk scenarios over return on equity (1) (earnings over base capital)



(1) Figures are weighted by the base capital of each institution as of December 2006.

(2) The minimum (maximum) corresponds to the value immediately below (above) the 25th (75th) percentile.

Source: Authors' elaboration, based on data from SBIF

#### Figure III.12

Impact of different risk scenarios on the capital adequacy ratio (1)



(1) The figures are weighted by the base capital of each institution as of December 2006.

(2) The maximum corresponds to the value immediately above the 75th percentile.

Source: Authors' elaboration, based on data from SBIF.

Market risk includes the impact of changes in interest rates and in the exchange rate on earnings. In the first scenario, the system's median loss is only 0.6%, although some treasury banks could register losses of up to 7% of their base capital due to the valuation of their financial instruments in the face of interest rate changes. Losses associated with interest rate risk from repricing liabilities are significant, and in most cases they are greater than valuation losses. For some banks, increases in the interest rate structure generate losses of up to 12% of base capital.

The impact of a depreciation of the peso as a consequence of the materialization of risk scenarios is still contained, as in previous *Reports*. In the first scenario, losses derived from depreciation average 1.1% of the system's base capital, but while some banks register profits of 4%, others register losses of almost 5%.

Figure III.11 shows the distribution of capital returns under the two risk scenarios. The figure illustrates the greater severity of scenario 1, in which nearly 27% of banks could post losses, reducing the system's average profitability by 8 percentage points. Under scenario 1, 79% of these losses are caused by credit risk, while 21% come from market risks. This indicates that the principal source of risk that banking institutions face is the materialization of losses due to credit risk.

Despite the losses estimated under the stress scenarios, the system's capital adequacy ratio is only marginally reduced compared to the situation in December 2006, and none of the banks has a ratio under the minimum requirement of 8%, even in the most severe scenario (figure III.12).

# **External financing**

The international financial markets are an important source of financing for domestic firms and, to a lesser extent, for banks and the Government. A sharp and significant deterioration in market access conditions could generate financial and/or balance-of-payments stress. This section examines the recent evolution and outlook of the Chilean economy's external financing, as well as the risks that could affect its continuity.

# The Chilean economy continues to strengthen its external financial position

In a favorable international macrofinancial environment, the liability position of the economy's net international investment position dropped by almost 40% in nominal terms (from US\$32 billion at year-end 2005 to US\$20 billion at year-end 2006) and by half as a percentage of GDP<sup>7</sup>/ (from 25% to 13% in the same period). This change can be explained by a significant and sustained increase in external assets held by the General Government and the corporate sector over the past year (figure III.13).

Foreign direct investment (FDI) continues to dominate external liabilities, and investment in stocks dominates the economy's external assets (figure III.14). The asset position in foreign debt instruments has increased

<sup>&</sup>lt;sup>7</sup>/ GDP at a real constant exchange rate (base index: December 2005 =100).
## Figure III.13

Net international investment position, by institutional sector





(e) Estimated on the basis of financial account flows.

Source: Central Bank of Chile.

Figure III.14



Source: Central Bank of Chile.

Figure III.15

Foreign direct investment (FDI) flows in Chile



significantly, which, in conjunction with a decrease in liability positions, caused the net liability position of the economy's debt to decrease by one half in 2006, to 9% of GDP (using the real constant exchange rate).

# The reinvestment of FDI earnings is high, and not exclusive to the mining sector

In 2006, FDI flows to Chile reached US\$8 billion (around 5% of GDP), the highest nominal rate since 1999 (12% of GDP).<sup>8</sup>/ Reinvestment of earnings now represents 93% of these flows, versus only 3% in 1999.<sup>9</sup>/

While the increase in the share of earnings reinvestment flows coincides with an increase in copper prices starting in 2002, the mining sector represents less than 50% of this reinvestment (figure III.15). In terms of the use of reinvestment, an analysis of a group of mining companies that represent 80% of the sector's reinvestment of earnings as of December 2006 shows that a low percentage was used for physical investments in new projects, while the rest was used to finance commercial loans (debts receivable), the accumulation of short-term financial assets, and payment of long-term debt. It is therefore safe to assume that a reversal in FDI due to a lower copper price would not necessarily create a risk for the economy's external financing.

# External debt grew faster than in previous years, but it is still low compared to other countries with a similar risk rating

In 2006, external debt grew by 7%, compared with 3% in 2005 and 1% in 2004. However, an important part of this growth corresponds to loans between suppliers (nonfinancial debt) associated with the expansion of imports.

Most of the external debt stock is subject to fixed interest rates (58% net of swap) and contractually is still long term (82%). However, 34% of total external debt corresponds to liabilities with a residual maturity of under 12 months.

Chile's external debt represents a smaller percentage of GDP (31%) than other economies with a similar risk rating. Also, nearly 80% of the total stock corresponds to the private sector, and this share has remained quite stable over the past ten years. The major change in composition in this period has been a decrease in the relative importance of debt held by foreign-owned firms with their parent companies (from almost 50% in 2005 to 43% in March 2007).

Firms account for 78% of the economy's external debt, and the biggest proportion of this is financial debt held by nontradeables firms<sup>10</sup>/

<sup>&</sup>lt;sup>8</sup>/ For the purpose of comparison, flows of new external debt undertaken in 2006 reached US\$3.2 billion (2% of GDP).

<sup>&</sup>lt;sup>9</sup>/ While gross capital contributions continue to be significant (more than 50% of net FDI and 3% of GDP), so does capital repatriation (outflow) (30% of FDI and 2% of GDP).

<sup>&</sup>lt;sup>10</sup>/ Close to a third of this debt is held by the electricity sector, whose income is indexed to the exchange rate according to the tariff structure. An additional quarter is held by firms whose income is indexed to the dollar and/or that are adequately hedged with currency derivatives (telecommunications).

#### Figure III.16



(1) GDP at a constant real exchange rate (base index Dec. 2005 = 100).
(2) Financial debt excludes trade loans and loans tied to FDI.

Source: Central Bank of Chile.

# Figure III.17

Availability of net external financial liquidity



(1) GDP at a constant real exchange rate (base index Dec. 2005 = 100). External liquidity includes short-term loans, cash and deposits, and portfolio investment. It does not include positions in derivative instruments.
(2) Estimated on the basis of financial account flows.

 (3) Banks and institutions (pension funds, mutual funds, and insurance companies).

Source: Central Bank of Chile.

(figure III.16). However, the external debt of firms as a percentage of total indebtedness is close to 30%, a share that has been falling over time. More than two-thirds of companies that operate in the currency derivatives market hold net asset positions. Also, most of these companies are from the nontradeables sector.

The banking sector's external debt is low (13% of the economy's external debt and 4% of the sector's total financing in 2006), which by regulation is hedged for currency risk. It is also highly concentrated: the three main debtor banks hold more than two-thirds of the sector's total.

# The economy's aggregate liquidity and solvency indicators remain solid

The ratios of external debt to GDP (31%) and external debt to exports (78%) have been steadily falling since 2002 (table III.3). The economy also maintains a positive current account balance, which was close to 5% of GDP in the first quarter of 2007. Although official international reserves fell last March,<sup>11</sup>/ unrestricted reserves have remained stable. At the same time, the availability of the economy's external liquidity has been following an upward trend, led by a greater accumulation of General Government assets thanks to high copper prices and to prudent fiscal management (figure III.17).

# Table III.3

External liquidity and solvency indicators (percent)

	Average 01-05	Dec.04	Dec.05	Dec.06	Mar.07 (e)
Solvency					
External debt/GDP	52	46	38	33	31
Current account balance/GDP	-0.3	1.7	1.1	3.6	4.8
External debt/Exports	176	135	111	82	78
External debt service/Exports	32	31	22	24	15
Liquidity					
STRED/External debt (1)	30	32	32	36	34
STRED/Official international reserves	80	87	85	89	105
STRED/Unrestricted international reserves (2)	99	116	146	132	134
Other					
Current fixed-rate external debt (net of swaps)/ External debt	58	61	56	58	58

(1) STRED: Short-term residual external debt.

(2) Unrestricted international reserves: official reserves minus short-term commitments in foreign currency (maturing BCX, BCD, swaps), fiscal deposits in the Central Bank, and others.
(e) Estimates.

Source: Central Bank of Chile.

# The economy's exposure to changes in external financing costs continues to be moderate

At the sectoral level, the Consolidated Government displays a particularly loose liquidity position, with liquid assets that exceed the entire economy's

<sup>&</sup>lt;sup>11</sup>/ To US\$15.39 billion, although in April they rose to US\$17.529 billion. In March 2007 the Government created two funds—the Pension Reserve Fund and the Social and Economic Stabilization Fund—which were established through deposits and are administered by the Central Bank of Chile in its capacity as Fiscal Agent. These funds are administered separately and are not considered international reserves; this explains the sharp drop in official reserves in the first quarter, due to the withdrawal of deposits for creating the funds.

## Figure III.18

External sectoral liquidity (1) (US\$ billion)



 Corresponds to commitments in which the counterparty is a nonresident. Includes short-term loans, cash and deposits, and portfolio investment. Does not include positions in derivative instruments.
People and firms exclude the liquid assets of institutions.

Source: Central Bank of Chile.

residual short-term liabilities (figure III.17). The liquid external assets of the corporate and personal sectors were nearly twice their short-term residual external commitments over the past three years. In the case of the banking sector, average liquid external assets were equivalent to close to 60% of short-term residual commitments in the same period, and this share is following an upward trend (figure III.18).

Lastly, for each 100 basis point increase in interest rates of credit risk premiums, the interest service on external debt would rise by an estimated US\$300 million after one year. This is the same figure that was reported in the previous *Report*, since both the maturity composition and the rate structure of external debt have remained stable.

# The Chilean economy is in a robust position for absorbing this type of disturbance

Events like those seen in May and June 2006 and February and March 2007 introduce a greater volatility into international capital markets. However, the economy's external solvency and liquidity, the composition and structure of its external financing, the strength of its fundamentals, and its monetary, fiscal, and exchange rate policy framework put it in a robust position for absorbing this type of disturbance.

# **IV. Financial regulations and infrastructure**

This chapter reviews recent initiatives in the area of the financial regulatory framework and prudential regulation, both in Chile and abroad, as well as aspects relating to the functioning and development of the payment systems and the infrastructure that supports the operation of the financial markets.

# Financial framework and prudential regulation

# Regulatory framework dictated by the Central Bank of Chile

Regulatory framework on deposit taking, financial intermediation, and other operations (January 2007)

In January, the Central Bank of Chile replaced the regulatory framework on deposit taking and financial intermediation, covered in chapter III.B.1 of its *Compendium of Financial Regulations*, to which banking companies in Chile are subject.

The new regulations, which are the result of a joint review carried out with the Superintendency of Banks and Financial Institutions (SBIF) and which were presented to the industry and the general public for comments on the Bank's website in October 2006, take into account the advances made by the economy and the local financial system in the last several years, as well as the international best practices and recommendations in these areas. The new framework thus incorporates new deposit instruments and promotes the adoption of international best practices, recommendations, and standards.

The main changes consist in modernizing the standards on the interest rates and currencies in which time deposits can be contracted; increasing the flexibility of standards on the advance payment of deposits and shortterm intermediation; ratifying the minimum terms for transacting sales with a resale agreement; and replacing the regulations on "short sales" for standards oriented to regulating security loan transactions (securities lending).

In addition, structured notes have been incorporated as time deposit instruments. This type of instrument offers the holder not only an interest rate, but also additional options for gains and losses conditional on the evolution of some of the currencies, interest rates, or other underlying assets or variables described in chapter III.D.1 of the *Compendium of Financial Regulations*  Another important element that the new regulations introduce is the obligation for banks to implement policies, procedures, and systems to appropriately manage and control risk in sales transactions with resale agreements and in securities lending. Also, the documentation for this type of transaction should make reference to or be based on a master agreement written and updated in accordance with international best practices and recommendations in these areas.

This new regulation went into effect on 2 April 2007, so that banking companies would have a trial period to adapt their policies, procedures, and risk management and control systems.

# Regulations issued by other supervisory organizations in the country

# New investment alternatives for mutual funds (SVS, December 2006)

The Superintendency of Securities and Insurance (SVS) updated the conditions and requirements for investments made by mutual funds in securities issued by foreign entities and in derivative instruments, thus expanding the investment alternatives for these institutions.

Noteworthy modifications to the regulations include the authorization to invest in commodities and/or foreign commodity securities, structured notes, and index securities (stocks, debt, and commodities). They also allow for investment in derivatives contracts whose underlying assets are commodities, and increases the flexibility of investment in index derivatives.

# "Chile Invests" plan (Finance Ministry, March 2007)

In March, the Government announced a series of measures and complementary legislative bills designed to strengthen economic growth, including a third capital market reform.

The capital market reform will include a ratification of the 4% income tax rates applicable to all foreign credit-issuing institutions, improvements to the regulations governing security resale contracts, and an expansion of the securities market law's provisions on collateral to apply to financial collateral arrangements between institutions.

With the purpose of contributing to the development of Chile's financial market, legal and regulatory changes will be proposed to facilitate the use of the Chilean peso in international financial transactions. A connection between our markets and global settlement and custody systems will be promoted, and a legislative bill will be sent to Congress to improve the tax framework for derivative transactions in Chile.

# Capital Market II (Finance Ministry, May 2007)

In May, Congress approved the second Capital Market Reform (MKII), which includes a set of initiatives designed to promote the development of the risk capital industry, reduce transaction costs for collateralized financing transactions, improve the corporate administration regimes, and perfect the oversight mechanisms of the Superintendencies. It also introduces a series of modernizations to several legal texts, like the General Banking Law, Decree Law 3.500 governing pension funds, and the insurance company law, with the purpose of updating these texts to reflect the most recent developments in the capital market.

For the General Banking Law, changes were introduced to the provisions on technical reserves and the definition of demand deposits. Specifically, paid-in capital and reserves were replaced with effective net assets; this implies an expansion of the limit on the basis of which institutions must constitute their technical reserves (box IV.1). It also allows technical reserves to be invested in instruments issued by the Central Bank of Chile or the General Treasury of the Republic, at any maturity. In terms of the definition of demand deposits or liabilities, the new legal framework considers these to include only deposits whose payment may be required unconditionally. Also, improvements were made to the legal framework for banking transactions with derivative products, which must observe the regulations and limitations established by the Central Bank of Chile.

# Modernization of the securities clearing and settlement system (Finance Ministry, May 2007)

The Finance Ministry made a proposal to modernize the clearing and settlement systems for financial instruments. This proposal essentially recommends that a regulatory framework be created to operate clearing houses and central counterparties (annex IV.1).

The main objective is to facilitate the convergence of the capital market with international standards in the area. For this, it aims to strengthen the efficiency of securities clearing and settlement systems by incorporating mechanisms to appropriately manage and mitigate risks to which they are exposed. It plans to strengthen the existing judicial framework, considering, among other legal modifications, the incorporation of the concepts novation, irrevocability, and finality. It also proposes to incorporate securities lending transactions as a mechanism to facilitate the settlement process.

# Documents of interest published by international organizations

# "Introduction to Applied Stress Testing." Working paper WP/07/59. IMF, March 2007

Stress tests are a valuable tool for evaluating the risks facing banks and other financial institutions, since they make it possible to quantify the impact of extreme but plausible shocks on their profitability and solvency.

The purpose of this paper is to contribute to a better understanding of this tool by illustrating its strengths and weaknesses using a series of examples applied to the banking system and, to a lesser extent, to other financial institutions. It explains how to evaluate credit, exchange rate, interest rate, liquidity, and contagion risks. It also illustrates how to design stress scenarios and interpret the obtained results. The paper includes an Excel file with stress test exercises as supporting material.

The paper describes the relationship between stress tests and other analytical tools, like financial soundness indicators (FSI), and early warning systems

used by supervisors. It also includes a survey of best practices by central banks and the IMF when carrying out this type of tests.

# "New developments in clearing and settlement arrangements for OTC derivatives." Committee on Payment and Settlement Systems. BIS, March 2007

This document analyzes current arrangements and practices for risk management and administration in over-the-counter (OTC) derivatives markets and evaluates the potential risks to be mitigated by greater use of, and enhancements to, market infrastructure in recent years. The report focuses on six important issues for analysis in this market: (1) the risks created by delays in documenting and confirming transactions; (2) the implications of the rapidly expanding use of collateral to mitigate counterparty credit risks; (3) the potential for expanding the use of central counterparty (CCP) clearing to reduce counterparty risks; (4) the implications of OTC derivatives prime brokerage; (5) the risks associated with unauthorized novations of contracts; and (6) The potential for significant market disruptions from the closeout of OTC derivatives operations following the default of a large market participant. Of these six aspects, the paper concludes that it is necessary to make greater progress on and reinforce points (1) and (5).

The paper also highlights several issues that will gradually assume greater importance: (i) open access to essential trade and post-trade services with the aim of achieving convenient and efficient connectivity with other systems, and (ii) central banks and supervisors will need to consider whether certain existing standards for securities clearing and settlement systems like CCPs should be applied to providers of clearing and settlement services for OTC derivatives.

# The payments system and financial infrastructure

The payments system is an essential component of financial infrastructure. Its safe and efficient functioning is fundamental for the good performance of the economy, the effectiveness of monetary policy, and financial stability.

Monitoring the payments systems contributes to the resilience of the financial system. The considerable increase in operations processed through these systems and the greater international concern for and interest in financial stability have highlighted the importance of the monitoring function and have contributed to better specifying this concept.

The Central Bank of Chile has the responsibility of overseeing the normal functioning of the payments systems. It therefore has the authority to regulate and supervise different aspects of the systems. It also acts as a broker and user of these services and as a proponent of the reform and modernization of the financial infrastructure.

# Large-value payment systems

The large-value payment systems are made up of the Real-Time Gross Settlements (RTGS) System and the Large-Value Payment Clearing House (*Cámara de Compensación de Pagos de Alto Valor*, or CCAV).<sup>1</sup>/ Both systems process interbank operations, through client accounts, and delivery versus payment (DVP) operations.<sup>2</sup>/

The RTGS is a payment system that operates in real time and processes gross transactions. It offers an intraday liquidity facility to provide financing to its participants, and it operates daily by purchasing financial instruments with a resale agreement. The CCAV system operates using multilateral settlements and has mechanisms to mitigate credit and liquidity risk, which include the establishment of bilateral and multilateral limits and cash collateral that participants must provide at the beginning of daily operations. These mechanisms make it possible to ensure the availability of resources at the time of settlement, in case a participant with a higher debtor balance does not have sufficient resources for settlement.<sup>3</sup>/

The number of operations settled in the large-value payment systems, and their amounts, have become more stable. In March 2007, an average of 3,656 operations were settled daily; of these, more than 75% were processed in the CCAV. The increased use of this system is explained, in part, by the lower liquidity requirements for the functioning of this type of system. With regard to the amount of operations settled, it was around \$6.4 trillion a day (equivalent to \$1.741 billion per payment). Of this amount, \$3.6 trillion were processed in the RTGS, while \$2.8 trillion were processed in the CCAV (figure IV.1).

Of the total payments processed by large-value payment systems as of March 2007, 44% were operations via client accounts, 39% were interbank operations, 13% were DVP operations, and the remaining 4% were Central Bank of Chile operations, which mainly consisted of buying and selling debt securities, payment of coupons at maturity, and requests for a permanent deposit facility. With regard to the evolution of the number of payments settled in large-value payment systems, there has been a significant increase in operations through client accounts, which can be explained, in part, by measures taken by the Central Bank of Chile to settle all large-value operations in these new payment systems. DVP operations have remained stable in recent months. The average number of daily payments associated with this type of operation is around 460, with an average of \$1 billion per payment (figure IV.2).

# **Retail payment systems**

The retail payment systems —used by individuals and/or firms to make payments and money transfers— process a large number of transactions with lower relative unit value, normally tied to the buying and selling of goods and services. Considering how useful retail payment systems are for the general public, they should be practical, trustworthy, and efficient.

## Figure IV.1



Payments settled in the large-value payments systems (\*)

Sources: Combanc and Central Bank of Chile.

# Figure IV.2

Types of payments settled in the large-value payments systems (\*)

(number of operations)



(\*) Monthly daily average.

Sources: Combanc and Central Bank of Chile

<sup>&</sup>lt;sup>1</sup>/ The RTGS system is managed and operated by the Central Bank of Chile; the CCAV system is managed and operated by *ComBanc S.A.* 

<sup>&</sup>lt;sup>2</sup>/ This procedure makes it possible to synchronize the transfer of securities in the DCV with the closeout of payments in the Central Bank of Chile or the CCAV.

<sup>&</sup>lt;sup>3</sup>/ This condition, known as the Lamfalussy Principle, has been included by CPSS in its recommendations for large-value payments systems (Basic Principle V).



Source: Authors' elaboration, based on data from SBIF.

#### Figure IV.4

Use of retail payment methods

(billions of pesos)



Source: Authors' elaboration, based on data from SBIF.

Payments are made using a variety of instruments, including checks, credit and debit cards, automatic teller machine transactions, and the Internet. All of these mechanisms are continually being developed, thanks to technological innovations and competition among the many providers operating in the market. Table IV.1 presents statistics on the relative importance of each instrument, including automatic teller cash withdrawals from checking accounts.

## Table IV.1

Evolution of the main retail payment methods (value in billions of pesos for each year)

	2000	2001	2002	2003	2004	2005	2006
	(billions of pesos for each year)						
Checks	518,574	545,627	568,040	512,007	503,038	462,985	339,126
Automatic teller machines	4,969	5,795	6,710	7,058	7,673	8,633	8,838
Credit cards (1)	861	951	1,013	1,205	1,418	1,829	2,173
Debit cards	31	175	319	597	804	942	1,261
Internet transactions	n.a	n.a	n.a	n.a	n.a	n.a	n.a
	(thousands of transactions)						
Checks	305,122	293,173	285,108	291,932	284,286	276,589	257,540
Automatic teller machines	161,576	184,980	210,930	221,464	233,617	246,115	238,633
Credit cards (1)	37,536	39,751	40,346	43,903	47,964	55,560	59,754
Debit cards	1,972	11,490	20,459	34,058	42,645	52,157	66,975
Internet transactions	7,969	22,400	23,184	34,065	46,556	56,991	88,183

n.a: Not available.

(1) Includes only bank credit cards.

(2) Annualized figures on the basis of transactions carried out in June and December .

Source: SBIF

The most commonly used payment means in Chile is the check, which accounts for 36% of all transactions (figure IV.3). However, its relative importance, in both the number and value of transactions, has fallen systematically in recent years, and has been substituted by a growing use of electronic payment means (figure IV.4).<sup>4</sup>/ In the past year, the number of Internet fund transfers grew significantly (55%), surpassing transactions using credit and debit cards. There has also been a sustained increase in the use of debit cards, in terms of both the number and amount of transactions.

<sup>&</sup>lt;sup>4</sup>/ The information on credit cards includes only those issued by banks. According to statistics recently published by the Superintendency of Banks and Financial Institutions (SBIF), transaction amounts associated with nonbank-issued credit cards in the last quarter of 2006 were more than double those of bank-issued cards.

# Box IV.1: Capital Market II effects on the constitution of technical reserves

Current regulations call for a mechanism for constituting a special reserve requirement, known as technical reserve, which stipulates that demand liabilities held by financial institutions over two-and-a-half times their paid-in capital plus reserves must be 100% backed by liquid resources. The purpose of this regulation is to secure adequate safeguards by banks for resources that are explicitly guaranteed by the Central Bank, which is the case for all demand liabilities that the financial system holds with the public.

The Capital Market Reform II (MKII), already enacted, includes a series of modifications to this regulation. First, the basis for calculating the constitution of technical reserves has been modified, from two and a half times an institution's base capital to two and a half times its real net assets, whose value is always higher than the former. Second, the following are no longer considered demand liabilities: debt that must be legally paid off in a period of less than 30 days, and time deposits that are ten days or less from maturity. It also broadens the instruments considered eligible for constituting technical reserves to include notes issued by the Central Bank or the General Treasury of the Republic at any maturity, as long as they are valued at market price (previously, it was only possible to use instruments with residual maturities of 90 days or less).

Between January 2004 and December 2005, the average amount held by the financial system in technical reserves was approximately US\$4 billion. In this same period, the average total balances of demand deposits (net of exchange) reached US\$15.3 billion, and average capital was US\$9.9 billion. The difference between real net assets and capital in this period for the system was US\$2.2 billion, on average, while affected term liabilities (that is, with a maturity of less than ten days) reached US\$4.1 billion. Given these amounts, the effect of the MKII modifications, in practice, will be to reduce the total amount of technical reserves to be constituted by banking institutions.

There is no doubt that this modification will affect financial institutions' portfolio decisions, by reducing their demand for instruments currently used to constitute technical reserves. These instruments include short-term notes issued by the Central Bank to manage liquidity. To facilitate short-term monetary management, the legal stipulations include a six-month transition period so that the technical reserve reduction can be implemented gradually.

# Annex: Central Counterparties (CCP)

# I. Introduction

Securities settlement systems are fundamental components of the financial market infrastructure. Over recent years, the volume of traded securities has increased significantly, encouraged by initiatives that tend to homogenize trading processes, the implementation of new transaction platforms, and a growing integration of global markets. At the same time, infrastructure has been developed that contributes to sustaining a higher degree of market activity.

Central banks and other market supervisors have an interest in the correct functioning of securities settlement systems. Any weakness in their design or flaws in their operations could affect the functioning of financial markets. Also, for clearing transactions, securities settlement systems generally use payment systems operated by central banks.

Securities trading involves several stages or functions with the participation of various entities. The process includes the negotiation of the security; confirmation of the terms of negotiation; the calculation of each party's obligation in terms of both securities and cash, which is known as clearing or settlement; and the definitive transfer of securities and funds to close out the obligations. The custody of security certificates is generally handled by securities depository entities.

An important source of risk in securities trading transactions is the possibility that one of the parties does meet its obligations (credit risk) or that it settles its obligations later than expected (liquidity risk). To mitigate these risks, market participants and several international organizations have recommended introducing central counterparties (CCP) into securities settlement systems. This annex presents the main characteristics of CCP and explains their role in securities settlement systems. It also describes international principles and recommendations for adequately designing and managing the risks of these entities.

# **II. Central Counterparties**

The central counterparty is an entity that intermediates between the market participants once a securities transaction has taken place, acting as in the sole buyer for all sales transactions and the sole seller for all purchase transactions. Thus, the bilateral contracts between the parties are replaced at the moment of their confirmation with new liabilities with the CCP.

Traditionally, CCPs have been used in derivatives markets and securities exchanges, but in recent years they have begun to provide services in the over-the-counter (OTC) market. To the extent that the markets become more competitive and more complex, the function carried out by these entities becomes increasingly relevant.

The way CCPs are organized depends on several factors, including the specific characteristics of the securities settlement system and the judicial framework of the respective country. At the same time, a number of factors are especially important for the adequate functioning of the CCPs and their effective contribution to the security and efficiency of financial markets: the available systems for managing and controlling credit and liquidity systems; the framework on nondiscriminatory and objective access to the services offered; and an effective corporate governance that appropriately balances the interests of the different parties involved in the transaction.

# III. Risk management in the CCPs

The CCPs are exposed to a set of risks that must be managed effectively. These include credit or counterparty risk, liquidity risk, legal risks, replacement risk, and operating risk. A well-designed CCP, with effective risk management and administration systems, is capable of reducing these risks significantly.

A CCP should orient its credit risk management mainly toward mitigating the effects of noncompliance by system participants. In line with this objective, certain requirements are normally established for the participants, related to the fulfillment of minimum capital requirements, credit ratings, limits on uncovered positions, and the setting of margins.

In case of noncompliance, a CCP's operating procedures should clearly establish the manner in which collateral and other available resources are used to ensure the settlement of the operations on the stipulated dates. In addition, the CCPs maintain their own resources to sustain unforeseen losses in extreme market conditions.

Another mechanism used to face delays in the delivery of securities is securities lending transactions.<sup>5</sup>/ This mechanism involves automatic, standardized procedures through which participants can have access to securities on loan, which must be returned in a predetermined period. In the standardized schemes, the securities depository entities define the portfolio of securities available for this type of transaction, establishing the terms of the loan. Moreover, some systems give the option of automatically renewing the transaction.<sup>6</sup>/

# **IV. Benefits of the CCPs**

Markets that feature a CCP benefit especially from the reduction of the risks inherent in the clearing and settlement processes.<sup>7</sup>/ Furthermore, the use of multilateral settlement mechanisms implies that participants face lower exposure, freeing up their resources to finance a larger number of transactions.

Another benefit associated with CCP operations is the reduction of the costs and time involved in the postnegotiation processes and securities settlement. At the same time, schemes that feature a CCP generate economies of scale, through the use of multilateral networks and standardized processes.

# V. Recommendations for a well-designed, smoothly functioning CCP

In March 2004, the CPSS and the Technical Committee of the International Organization of Securities Commissions published a document containing recommendations or principles for an appropriate management and administration of the risks facing a CCP.<sup>8</sup>/ These principles are summarized below.

# Recommendation 1: Legal risk

A CCP should have a well-founded, transparent, and enforceable legal framework for each aspect of its activities.

# **Recommendation 2: Participation requirements**

A CCP should require participants to have sufficient financial resources and a robust operational capacity. The participation requirements should be objective and publicly disclosed and should permit open access.

# Recommendation 3: Measurement and management of credit exposures

A CCP should measure its risk exposure to its participants at least once a day. A CCP should use margin requirements,

other risk control mechanisms, or a combination of both to limit its exposure to potential losses from defaults by its participants in normal market conditions.

## **Recommendation 4: Margin requirements**

If a CCP relies on margin requirements to limit its credit exposure to participants, those requirements should be sufficient to cover potential default in normal market conditions. The models and parameters used in settling margin requirements should be risk-based and reviewed regularly.

# **Recommendation 5: Financial resources**

A CCP should maintain sufficient financial resources to withstand, at a minimum, a default by the participant to which it has the largest exposure.

# **Recommendation 6: Default procedures**

A CCP should ensure that timely actions can be taken to contain losses and liquidity pressures, maintaining the operational continuity in case the default of one of the participants spreads to others.

# Recommendation 7: Custody and investment risks

A CCP should hold assets in a manner that minimizes the risk of loss or delay in its access to them. Assets invested by a CCP should be held in instruments with minimal credit, market, and liquidity risks.

# **Recommendation 8: Operational risk**

A CCP should identify sources of operational risk and minimize them through the development of appropriate systems, controls, and procedures. Systems should be reliable and secure. Business continuity plans should allow for the timely recovery of operations and the fulfillment of a CCP's obligations.

# **Recommendation 9: Cash settlements**

A CCP should employ cash settlement arrangements that eliminate or strictly limit its settlement bank risks.

# **Recommendation 10: Physical deliveries**

A CCP should clearly state its obligations with respect to physical deliveries, as well as identify and manage any risks from these obligations.

## Recommendation 11: Risks in links between CCPs

CCPs that establish either cross-border or domestic links to clear trades should evaluate the potential sources of risks that could arise and ensure that these risks are managed prudently on an ongoing basis.

<sup>5/</sup> CPSS, BIS (1999).

 $<sup>^{6}\!\!/</sup>$  These mechanisms are most often used with stock securities and not

with debt securities, given their greater heterogeneity.

<sup>&</sup>lt;sup>7</sup>/ Ripatti (2004).

<sup>&</sup>lt;sup>8</sup>/ CPSS, BIS (2004).

# Recommendation 12: Efficiency

CCPs should be cost-effective without sacrificing the safety of participants.

# **Recommendation 13: Governance**

Governance arrangements for a CCP should be clear and transparent to fulfill public interest requirements and support the objectives of owners and participants.

# **Recommendation 14: Transparency**

A CCP should provide market participants with sufficient information for them to identify and accurately evaluate the risks and costs associated with using its services.

# Recommendation 15: Regulation and oversight

A CCP should be subject to transparent and effective regulation and oversight.

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# **Abbreviations**

ACHEF:	Chilean Association of Factoring Companies
ACOP:	Real Estate Agents Association
BCD:	Central Bank bonds expressed in dollars
BCS:	Santiago stock exchange
BCX:	Central Bank bonds in dollars
BIS:	Bank for International Settlements
BTU:	Treasury bonds expressed in an inflation-indexed unit of account (unidades de fomento, UF)
BTP:	Treasury bonds expressed in pesos
CPSS:	Committee on Payment and Settlement Systems
DCV:	Central securities deposit
EBITDA:	Earnings before interest, taxes, depreciation, and amortization
GDP:	Gross domestic product
IMF:	International Monetary Fund
INP:	Institute of Social Security Standardization
NBER:	National Bureau of Economic Research
OPEC:	Organization of Petroleum Exporting Countries
NIR:	Net international reserves
RTGS:	Real Time Gross Settlements
SAFP:	Superintendency of Pension Funds Administrators
SBIF:	Superintendency of Banks and Financial Institutions
SuSeSo:	Superintendency of Social Security
SVS:	Superintendency of Securities and Insurance
S&P:	Standard & Poor's
US:	United States of America
VIX:	Chicago Board Options Exchange Volatility Index

# Evolution and effects of currency mismatches: 1995–2004\*/

# I. Introduction

The rise in exchange rate volatility that accompanied the flotation of the peso in 1999 has made it increasingly important to know the degree and impact of currency mismatches on firms in the nonfinancial sector. From a financial stability viewpoint, it is particularly interesting to understand how such currency mismatches—in periods of unexpected currency depreciation—affect companies' payment behavior and the likelihood of their closing or bankruptcy.

This article focuses on exposure to unexpected depreciation stemming from liability positions in dollars. The emphasis on dollar-denominated debt is due to the complexity that a mismatch in this direction imposes on macroeconomic management. In the face of an external phenomenon like the events of 1998 in Chile, uncovered dollar-denominated debt saps the power of monetary policy, since the expansive effect of a rate drop and the accompanying currency depreciation are curtailed by the contractive effects of short positions in dollars.

Several studies have sought to characterize the mismatches arising from dollar-denominated debt and understand its effects on large firms (and in many cases listed) in Chile.<sup>1</sup>/ The studies find that these currency mismatches affect real variables like investment and production, but they have been small in large nonfinancial firms over the last decade. Moreover, existing evidence indicates that mismatches diminished after the floating of the exchange rate.

Given data limitations, progress has been slow in understanding the mismatches of firms that do not provide information to the SVS, especially smaller companies. This hampers a full understanding of this phenomenon, since these companies can be expected to behave differently for several reasons. On one hand, smaller companies are probably more reluctant to be mismatched, because they are in the hands of a limited number of owners with little asset diversification, who are interested in minimizing the volatility of the company's cash flow (or balance sheet). Furthermore, these firms' access to credit is more precarious, making it difficult for them to absorb transitory fluctuations in their cash flows and/or equity. On the other hand, the hedging options available to small Authors: Kevin Cowan, Alejandro Micco, and Álvaro Yáñez\*\*/

and medium-size companies are arguably limited, in particular the use of currency forwards. This is due partly to the fixed costs associated with the use of these instruments and partly to the restrictions on small firms' debt capacity, which prevent them having access to credit lines and therefore to commit credibly to cover possible contract losses.

The *Financial Stability Report* of the First Half 2006 portrayed the currency mismatch of firms covered by the Annual Industrial National Survey (ENIA) for 2004.<sup>2</sup>/ This work extends those results along two dimensions.<sup>3</sup>/ First, it describes the evolution of foreign currency debt, currency derivatives, and trade liberalization for the 1995–2004 period. It thus supports the analysis of changes in the levels and distribution of mismatches, in particular before and after the float. Second, it empirically quantifies the consequences of those mismatches, in particular the effects of mismatches on the payment behavior and the exit (closing) of firms, with an emphasis on possible differences among firms of different sizes.

<sup>\*/</sup> The opinions expressed herein are of the exclusive responsibility of the authors and do not necessarily represent those of the Finance Ministry of Chile, the Superintendency of Banks and Financial Institutions (SBIF), the Central Bank of Chile, or its Board. We appreciate the work of Alvaro García in assembling the business panel of the Annual National Industrial Survey (ENIA). We also appreciate comments by Luis Opazo, Nicole Winkler, Rodrigo Cifuentes, and all those who attended the joint workshop of the Financial Policy Division of the Central Bank of Chile and the SBIF. Finally, we are grateful for the valuable collaboration of Marisol López, Alvaro Nash, and Paulina Rodríguez in assembling and interpreting the data used in this study.

<sup>\*\*/</sup> Central Bank of Chile, Finance Ministry of Chile, and Superintendency of Banks and Financial Institutions, respectively.

<sup>&</sup>lt;sup>1</sup>/ All the studies use a partial sample of the firms that report to the Uniform Codified Statistical Form (FECUs) of the Superintendency of Securities and Insurance (SVS). See Benavente *et al.* (2002); Bleakley and Cowan (2001); Fuentes (2003); Cowan *et al.* (2005).

<sup>2/</sup> Cowan, Micco, and Yáñez (2006).

<sup>&</sup>lt;sup>3</sup>/The database used has four limitations. First, it only covers the manufacturing sector. Second, it does not contain information on the currency composition of the firms' financial assets. Third, information is only available on bank, bond, or overseas debts; there are no data on domestic debt with nonfinancial companies. Fourth, the financial data include all the activities conducted by the firms, whereas ENIA data only consider manufacturing activities. Nevertheless, we feel that the benefits gained from the breadth of coverage compensate for the shortcomings.

# II. Data and assumptions

The main source of information used in this article is the 1995–2004 ENIA manufacturing survey, which annually covers nearly 4,700 industrial companies with ten or more workers. In addition to data on sales and inputs, the survey reports on the subsector to which the firm belongs, as well as on direct exports. The ENIA data (grouped by firm) is complemented by information on debt with the domestic banking sector in pesos and in dollars, debt payment behavior (SBIF), external debt, currency derivatives positions (Central Bank of Chile), and bonds and debentures (SVS). It is assumed that all external debt is denominated in foreign currency.

The measurement of asset (or earnings) sensitivity to the exchange rate assumes that export prices in pesos are more sensitive to the exchange rate than local market prices. On the other hand, it is reasonable to assume that domestic price sensitivity to the exchange rate (pass-through) depends on the degree of sectoral openness. To consider this dimension, we constructed a measure of the openness of each ENIA subsector (two digits of the Standard International Industrial Classification, revision 3) using data from the 1996 input-output matrix. Specifically, the degree of openness corresponds to the ratio of the sum of imports and exports to total supply for each sector.

We made a series of changes to the individual database. First, all values were converted to 2004 constant pesos. Second (and contrary to Cowan, Micco, and Yáñez, 2006), public firms and copper-sector firms with manufacturing plants were excluded from the sample. Third, firms were divided into two categories based on sales in thousands of inflation-indexed units of account (*unidades de fomento*, UF): small + medium (SME), with sales of (0,100] UFs; and large + mega (LME), with sales of  $(100,\infty]$  UFs. Finally, observations with extreme values in the main variables were eliminated from the regression analysis.<sup>4</sup>/

# III. Sample description

The full sample consists of approximately 4,700 firms per year. Of these, nearly three-quarters are SMEs. LMEs account for around 90% of sales in both 1995 and 2004, although they represent only 25% of the firms. On the other hand, the SMEs constitute 34% of total employment (for more details, see Cowan, Micco, and Yáñez 2006).

Figure 1 summarizes the financial position of the companies at both extremes of the sample. The financing they obtain from the financial sector is broken down into four components: domestic bank loans in pesos, domestic bank loans in dollars, external loans, and domestic bonds. Small and mediumsized companies (SMEs) are separated from large and mega companies (LMEs), and the debt is standardized by the group's total sales.





Source: Authors' calculations, based on data from SBIF, SVS, and Central Bank of Chile.

LMEs show higher levels of average indebtedness in dollars in both periods, partly due to more dollar-denominated debt with local banks, but mainly because of a greater use of foreign debt. Domestic bonds, in turn, are a source of financing exclusively for larger companies, in both 1995 and 2004. During both periods, the level of total financial debt over sales is slightly higher for LMEs than for SMEs.

SMEs' access to the banking system has remained relatively constant over time. For all years covered by the sample, their bank debt approaches 25% of sales, while nearly 75% of the firms in the sample carry some type of bank debt (current or expired).<sup>5</sup>/

The use of currency derivatives exhibits important changes in the period covered. Figure 2 shows the net (buy–sell) and gross (buy+sell) notional positions of currency derivatives scaled by sales. A positive net value corresponds to a buy position. LME gross positions have increased steadily since the beginning of the sample, reaching 4% of sales toward the end of the period. For SMEs, however, the use of derivatives is a recent phenomenon. Finally, the LMEs shifted from a liability to an asset position in 1998–99.

<sup>&</sup>lt;sup>4</sup>/ A Z-score was constructed, and observations with |z| > 4 were eliminated. <sup>5</sup>/ Current debt as of 31 December is considered.

## Figure 2

Use of currency derivatives in ENIA firms (share of sales)



Source: Authors' calculations, based on data from SBIF, SVS, and Central Bank of Chile.

# IV. Currency exposure: firm-level analysis

This section discusses the distribution of dollar-denominated debt and the net derivatives positions of the firms in the sample.

The main result of this section is that the dollar-denominated debt distribution among firms was very similar pre- and post-float. Unlike in other countries in the region, dollardenominated debt has been low in Chile in the last ten years. Moreover, the reduced level of dollar-denominated debt that exists on the market is concentrated in large firms that export or operate in open sectors of the economy.

Figure 3 separates the sample's firms in the post-float period along two dimensions: size and openness (exports > 0). It then reports the median, 75th percentile, and 90th percentile of the dollar-denominated debt over sales for each of the four resulting groups by size and openness. The same pattern is observed in each of the cuts of the distribution: LMEs have more dollar-denominated debt than SMEs, and exporters have more dollar-denominated debt than nonexporters. The same pattern surfaces for pre-float debt (1995–98), although with slightly higher levels of dollar-denominated debt. This confirms that firms matched the elasticity of their revenues with their financial expenses even before the exchange rate flotation (figure 4).

These results are confirmed in multivariate regressions that also include the exports-to-sales ratio and sectoral openness (table 1). The first column shows that, even before 1999, firms with higher exports over sales (continuous variable) and those that operated in more open sectors had a larger total debt in foreign currency. The estimated coefficient for the exports dummy (discrete variable) suggests that the simple fact of exporting means a greater use of dollar-denominated debt. This result may reflect several factors: changes in the perception of currency risk once the firm exports; the fact that exporting firms are better managed and, therefore, handle currency risk less; or that exporting firms may have easier access to dollar loans. The estimated coefficients for the size dummies indicate that the largest firms use significantly more dollar-denominated debt than small firms, even when we control for the openness measures. In additional regressions, we rule out that these differences may be due to a greater total leverage by LMEs or to differences in the use of foreign debt.

#### Figure 3

Post-float distribution of debt in foreign currency (\*)



(\*) 2000-04 period.

Source: Authors' calculations, based on data from SBIF, SVS, and Central Bank of Chile.

#### Figure 4

Pre-float distribution of debt in foreign currency (\*) (share of sales)



<sup>(\*) 1995-98</sup> period.

Source: Authors' calculations, based on data from SBIF, SVS, and Central Bank of Chile.

The second column of the table repeats this estimate for the 2001–04 period, with qualitatively similar results. The coefficients in bold in column B are statistically different from those of column A. In this case, sectoral openness has a larger post-float impact.

#### Table 1

Dependent variable Dollar debt/Sales Derivatives [A] 1995-97 [B] 2001-04 [C] SMEs [D] LMEs Sales Exports and sales 0.357 0.405 0.421 0.303 -0.014 [0.068]\*\*\* [0.179]\*\*\* [0.223]\* [0.007] 0.129 0.245 Dummy (exports >0) 0.141 0.034 0.002 [0.031]\*\*\* [0.018]\* [0.001]\* 0.215 0.319 Sectoral openness 0.632 0.661

Determinants of dollar debt and notional positions of currency derivatives

	[0.055]***	[0.121]***	[0.103]***	[0.080]***	[0.001]
Medium	0.349	0.415			
	[0.043]***	[0.046]***			
Large	0.513	0.706			
	[0.052]***	[0.077]***			
Mega	0.541	0.801			
	[0.056]***	[0.092]***			
Total debt/Sales					
Dollar debt/Sales					0.003
					[0.001]***
In (sales)			0.281	0.03	
			[0.029]***	[0.010]***	
No. observations	17,568	16,285	27,662	6,191	16,212
Estimate	Intreg	Intreg	Intreg	Intreg	MICO
		5	5		1

\* Significant at 10%, \*\* significant at 5% and \*\*\* significant at 1%.

Source: Authors' elaboration, based on data from SBIF, SVS and Central Bank of Chile.

The correlation among dollar indebtedness, openness, and exports observed in the full sample is replicated in the two samples that disaggregate firms by size (columns C and D). In both SMEs and LMEs, the firms with more dollar-denominated debt are those that export more and operate in more open sectors. The numbers in bold indicate that sectoral openness and the export dummy have a bigger impact on the ratio of dollar-denominated debt to sales for SMEs than for LMEs. This may be due to the fact that SMEs have less access to the currency derivatives market, which is why they must match their real exposure (exports and sectoral openness) with the composition of their liabilities.

The last column reports the results of a regression in which the dependent variable is the net currency derivatives position over sales. Data are not reported before 1999 or for SMEs because there are practically no derivatives in either case. As was found for 2004, the firms with the largest short positions in dollars are large firms with dollar-denominated debt, but few exports.

# V. Evolution of currency exposure

In this section we document the evolution of loans in foreign currency, net of currency derivatives, and a summary measure of currency mismatches for groups of firms of different sizes in the 1995–2004 period. In general terms, we confirm the results that have been obtained for FECU firms: the dollarization of debt falls after the Asian crisis, while mismatches have been falling throughout the sample. Cowan *et al.* (2005) document that dollar-denominated debt (gross and net of derivatives) in FECU firms starts falling in 1999. These authors argue that part of this drop was a reaction to the larger-than-expected variation in the real exchange rate after the float. A recent study by Kamil (2006) confirms this fact with data on listed firms for six Latin American countries.<sup>6</sup>/ There is no evidence as to whether this pattern is replicated in smaller firms.<sup>7</sup>/

Figure 5 shows the evolution of dollar-denominated debt net of derivatives for SMEs and LMEs. This ratio of net debt over sales can be considered a first approximation of the mismatch on the firms' balance sheets. To minimize the influence of extreme observations, we report the median and the 75th and 90th percentiles of each group of firms. The SME median and 75th percentile are not included in the figure because they are zero every year.

#### Figure 5



(\*) Measured as uncovered debt in foreign currency.

Source: Authors' calculations, based on data from SBIF, SVS, and Central Bank of Chile.

A similar pattern is observed for both groups and for the different cuts of the distribution: the level of dollar-denominated debt over sales was lower post-float than in 1995–98, although the exact breakpoint depends on the percentile and the group. These trends are robust to controlling for changes in the exports-to-sales ratio, exits of companies from the sample, and the mechanical effects of valuation stemming from movements in the exchange rate.

<sup>6/</sup> Cowan (2001) obtains similar results for a smaller sample of countries.

<sup>&</sup>lt;sup>7</sup>/ The fact that the dollarization of total bank loans falls with the variation in the real exchange rate in emerging economies (Ize and Levy-Yeyati, 2005) does not guarantee a drop among SMEs, since most commercial credit is concentrated in larger firms.

## Figure 6

Currency mismatches (\*) (times exports)



Source: Authors' calculations, based on data from SBIF, SVS, and Central Bank of Chile.

Figure 6 presents the results for a second mismatch measure: namely, the ratio of dollar-denominated debt (net of derivatives) over exports. As illustrated in the figure, this mismatch measure falls systematically for the three percentiles and in both groups of firms. In the case of the 90th percentile, this drop is very significant, going from ten times sales to less than two for LMEs and from seven times to three for SMEs. It is also interesting to note the similarity in the mismatch levels between both groups of firms, indicating that a good part of the differences in dollar-denominated debt over sales in SMEs and LMEs is due to the differences in both groups' propensity to export.

# VI. Effects of mismatches

In this section, we analyze the impact of currency mismatches on firms' payment behavior, measured as (dollar-denominated debt - exports) over sales.8/ We begin with a brief description of the average development of different payment measures: overdue debt over total bank debt, number of firms with bad debt, exits of firms from the ENIA sample, and bankruptcies declared by firms with the Superintendency of Bankruptcies. Figure 8 reports the payment behavior based on data from the SBIF, as usual disaggregating SMEs and LMEs. The overdue portfolio and the share of firms with default debt are considerably higher for SMEs than for LMEs. This coincides with the survival biases generated by the process of the firms' entry, exit, and growth. Many SMEs simply are not profitable; they stop paying their debts and eventually close down or go bankrupt. Those that do survive this process grow and "graduate" to the LME group. Also, one would expect a higher level of indebtedness in the initial growth phase to finance the development of the project.

As for the time line, SMEs experience a sustained overdue portfolio growth, with slight accelerations in 1998 and 2003. In contrast, the fraction of SMEs with default debt starts to

rise only in 2001, possibly on the tail of the earlier increases in overdue portfolios. For LMEs, both nonpayment measures follow a plateau pattern, with rises at the beginning of the sample and a later recovery (figure 7).

## Figure 7



Source: Authors' calculations, based on data from SBIF, SVS, and Central Bank of Chile.

In line with payment behavior, SMEs show a higher exit rate out of the ENIA database than LMEs. That is not the case with declared bankruptcies—which are mainly by LMEs—because the fixed legal costs of applying for bankruptcy from a creditor company do not make this alternative feasible for smaller companies. Exits by both SMEs and LMEs rise around 1998 and 1999, after which they drop. Bankruptcies, on the other hand, seem to lag behind the exits of firms, peaking in 2002 (figure 8).

## Figure 8

Exit from the ENIA sample and bankruptcy (share of firms each year) SME exit LME bankruptcy LME exit SME bankruptcy 0.008 0 14 0.007 0.12 0.006 0.10 0.005 0.08 0.004 0.06 0.003 0.04 0.002 0.02 0.001 2002 2003 1996 1997 1998 1999 2000 2001

Source: Authors' calculations, based on data from SBIF, SVS, and Central Bank of Chile.

<sup>&</sup>lt;sup>8</sup>/ This measure implicitly uses a debt duration of one year.

Our main objective in this section is to determine whether currency mismatches affect payment behavior, exit, or bankruptcy of firms in the periods following an unexpected depreciation. To this end, we estimate the following equations:

$$Y_{i,t+k} = \alpha \exp_{i,t-1} \Delta e_t + \beta \exp_{i,t-1} + \delta(t) + X_{i,t} \beta + \gamma Y_{i,t-1} + \varepsilon_{it}$$
$$Z_{i,t+k} = f \left[ \alpha \exp_{i,t-1} \Delta e_t + \beta \exp_{i,t-1} + \delta(t) + X_{i,t} \beta \right] + \varepsilon_{it}$$

where  $Y_{i,t+k}$  is the ratio of overdue debt for the period of depreciation, k=0, or the following period k=1,  $Z_{i,t+k}$  is a dummy to indicate that the firm has default debt, if it has zero sales in the ENIA, or if it files for bankruptcy; and f[.] is a probit function. The independent variables are  $(\exp_{i,t-1})$ , the currency mismatch in t-1, the interaction of this mismatch with variations in the peso-UF exchange rate  $(\exp_{i,t-1} \Delta e_t)$ , year dummies  $\delta(t)$ , and other control variables that include the interaction between sectoral openness and  $\Delta e_t$  and a lag of the dependent variable for the case of the overdue portfolio. The linear specifications are estimated with Micco with robust errors clustered by year. The nonlinear estimate is probit, with the same error structure.

Table 2 reports overdue portfolio estimates. Each cell corresponds to a regression, and only the estimated value for coefficient  $\alpha$  is reported. The first rows show that, for the full sample, there is a currency mismatch effect on the overdue portfolio only in SMEs in *t* + 1, that is, the year following the depreciation. Rows 3 and 4 only include the post-float period, and during that time we find no significant effects for any interaction.

# Table 2

Effects of currency mismatches

	Dependent variable: Dollar debt/Sales					
	LMEs		SMEs	Sample		
	t	t+1	t	t+1		
Exp	0.011	-0.035	0.013	0.211	1995-2004	
x var% RER	[0.010]	[0.041]	[0.015]	[0.094]*		
Exp	0.011	-0.011	0.028	0.188	2000-2004	
x var% RER	[0.005]	[0.024]	[0.024]	[0.117]		
Exp	0.003	-0.002	0.013	0.034	2000-2004	
x dummy 2001	[0.000]***	[0.002]	[0.000]***	[0.001]***		

\* Significant at 10%, \*\* significant at 5% and \*\*\* significant at 1%.

Source: Authors' elaboration, based on data from SBIF, SVS and Central Bank of Chile.

The main concern regarding liability positions in foreign currencies is the effect of sharp, unexpected depreciations. The 2001 period provides a good example of this type of phenomenon, since the considerable currency depreciation stemmed from financial causes and thus was unexpected (Tokman and Tapia, 2003). Moreover, contrary to the other major depreciation in the sample (1999), the 2001 episode does not coincide with domestic rate increases, changes in the exchange rate regime, or sharp drops in external demand. Additionally, since the depreciation happened within the current policy framework, it is more informative about the potential effects of future currency mismatches.

The last two rows of the table focus only on this episode, in that they show the results of estimating the base specification, but replacing  $\Delta e_t$  with a dummy for 2001. The estimated coefficients indicate that the mismatches had a significant impact on the overdue portfolio of LMEs with exchange rate exposure in 2001 and on SMEs in 2001 and 2002.

To measure these coefficients, we considered the difference between the impact of depreciation on a SME with 0% mismatch and on one with a mismatch of 2 (which corresponds to the 75th percentile of the distribution). In accordance with the estimated coefficient, the overdue debt of the firm with the higher mismatch rose 2.6% more than the firm without a mismatch. This difference is substantial considering that the average increase in the overdue portfolio between 2000 and 2001 was 0.4%. The same exercise for LMEs is 0.6%, which compares to an average increase in the LME overdue portfolio of 0.1%.

Table 3 only reports results for exits and bankruptcies, since no significant coefficient was obtained for default debt. The results generally coincide with those obtained for overdue portfolios. If we focus on 2001, we can see a higher probability of bankruptcies and exits in 2001 and 2002 in LMEs and SMEs that had greater exchange rate exposure in 2000.

Effects of curre	ency mismatche
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	Dependent variable: Exit of firms from the ENIA sample				
	t	t+1	Sample		
Exp	0.284	-0.416	1995-04		
x var% RER	[0.181]	[0.515]			
Exp	1.315	0.715	2000-04		
x var% RER	[0.258]***	[1.102]			
Exp	0.121	0.129	2000-04		
x (dummy 2001)	[0.013]***	[0.020]***			
	Dependent variable	: Bankruptcy			
Exp	0.594	1.14	1995-04		
x var% TCR	[1.608]	[0.754]			
Exp	0.302	0.899	2000-04		
x var% TCR	[0.185]	[0.878]			
Exp	0.06	0.034	2000-04		
x I (dummy 2001)	[0.001]***	[0.001]***			

\* Significant at 10%, \*\* significant at 5% and \*\*\* significant at 1%.

Source: Authors' elaboration, based on data from SBIF, SVS and Central Bank of Chile.

# **VII.** Conclusions

This study characterizes the evolution of the foreign currency debt of a sample of more than 4,500 Chilean manufacturing firms in the 1995–2004 period.

First, the study confirms the existing results for large companies: the foreign currency debt of Chilean companies is low and has been falling since the late 1990s.

Second, the study finds that for both the 2000–04 and 1995–98 periods, this debt is concentrated in firms that export and belong to sectors open to foreign trade. This currency "match" is observed in both LMEs and SMEs. This suggests that in firms with dollar-denominated debt, the depreciation-related increase in the value (in pesos) of their liabilities will be accompanied by a rise in the peso value of their revenues. Moreover, the fact that the dollar-denominated debt is concentrated in larger firms implies that the effects of potential residual mismatches will have a lesser impact on payment behavior or production decisions.

Third, this study confirms that currency mismatch is an important variable to monitor—in particular for SMEs—since in periods of unexpected depreciation, currency mismatches affect payment behavior, bankruptcies, and decisions regarding company closures.

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# Prominent features of development in the credit derivatives market\*/

# I. Introduction

The credit derivatives market has grown rapidly in recent years. This is reflected in estimates that the notional value of its stock exceeded US20 trillion in 2006. This growth is expected to continue in the medium term (figure 1)<sup>1</sup>/.





Source: British Bankers' Association (2006)

At the same time, the complexity of how these instruments are structured has increased significantly. For example, the most recent innovations include derivatives structured on the basis of derivatives or indices of derivatives. This allows an asset to be used several times to create new instruments, which complicates the accurate measuring of the potential effects of credit derivatives on financial stability.

In addition, credit derivatives are traded in over-the-counter (OTC) markets, which are made up of networks of operators working outside an organized market. Consequently, the details of the transactions are not public, so statistics are generated on the basis of surveys and reports, which are voluntary, have variable and incomplete coverage, and are subject to double accounting. This makes it difficult to achieve a level of understanding and monitoring that is consistent with the current degree of development of these instruments.

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For these and other reasons, a wide-ranging international debate has arisen over the possible risks associated with the development of credit derivatives markets. Some of the primary concerns have to do with how these instruments affect the length and volatility of credit cycles, whether they contribute to reducing the risk of a systemic financial crisis, and whether they contribute to market resilience.

In this context, the objective of the article is to describe the functioning of the credit derivatives market and some of the implications for financial stability. We begin by describing conceptually the efficiency gains and potential costs associated with the functioning of this market. We then describe the main stylized facts of its structure and performance. Finally, we review the main proposals by supervisors and regulators in the rest of the world and present some conclusions.

# II. Credit derivatives: definitions and concepts

The use of credit derivative instruments is one of several forms of credit risk management (diagram). While the development of the credit derivatives market has received a lot of attention recently, the transfer of credit risk is not a new phenomenon. Syndicated bank loans, as well as securitization, began in the United States in the 1970s, and secondary markets for bank loans followed in the 1980s. Bank guarantees and credit insurance have an even longer history.

A credit derivative is understood to include any financial instrument that allows the transfer or management of credit risk separately from other types of risk associated with an underlying or reference asset. These instruments include credit default

<sup>\*/</sup>The opinions expressed in this article are the exclusive responsibility of the authors and do not necessarily represent the opinions of the Central Bank of Chile or its Board. We thank Rodrigo Cifuentes, Kevin Cowan, Karol Fernández, Pablo García, José Manuel Garrido, Nancy Silva, and an anonymous referee for comments.

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 $<sup>^1\!/</sup>$  The credit derivatives market is still small compared with the currency and interest rate derivatives markets, which totaled US\$38 trillion and US\$262 trillion, respectively (BIS, 2006) .

swaps (CDS), CDS index products, synthetic collateralized debt obligations (CDO), credit spread instruments, credit linked notes, and swaptions, among others.







Source: RiksBank (2006).

CDSs are the most commonly used instruments in this market. In very general terms, a CDS is a bilateral OTC financial contract, in which one of the parties (the protection buyer) pays a periodic premium, normally expressed in annual basis points over the notional value covered, in exchange for a contingent payment by the other party (the protection seller) once the reference entity experiences a credit event. This premium only covers the credit risk associated with the underlying asset and possibly the counterparty risk of contract settlement. The holder of the asset retains the financial risks associated with other factors, such as interest rates, currency, or liquidity.

The second most common, in terms of market share, are CDS index products, which are standardized, freely tradable instruments that are composed of CDS reference entities for which the most important criterion for inclusion in the index is liquidity. CDS indices are thus very liquid instruments that are traded at very low bid-ask spreads.

The third most common instruments are synthetic CDOs, which are contracts that transfer the credit risk of a portfolio of underlying assets composed of other derivatives, such as CDSs and CDOs. Other credit risk transfer instruments are much less important in the market.

In principle, the proper functioning of the credit derivatives market has many benefits for its participants. By separating the asset from its credit risk, credit derivatives facilitate the management of one of the most important financial risks.<sup>2</sup>/ For risk buyers, this separation has the advantage of allowing them to invest in certain risks with a much lower capital requirement. Risk sellers benefit from lower costs and exposure, in addition to being able to keep the underlying assets on their balance sheets. In terms of financial market supervision and regulation, another benefit is that these instruments generate more precise and timely information on the market perceptions of credit risk.

The potential costs associated with the functioning of this market depend on whether the instruments are correctly valued.<sup>3</sup>/ This is directly related to the magnitude of possible market distortions and failures, mainly as a result of the existence of information asymmetries among the participants. These distortions generally stem from the existence of moral hazard problems, adverse selection, agency problems, myopia, or limited rationality on the part of the participants, as well as strategic interaction between sellers and buyers operating in fairly concentrated markets.

In sum, while the development of credit derivatives markets offers potential benefits, it also implies potentially high costs, both at the level of individual participants and at the systemic level in the case of important financial disturbances.

# III. Structure and performance of the credit derivatives market

# III.1 Market structure

Banks, which worldwide hold a net buyer position for credit risk protection, are the most important agents in the market, with a share of around 50% (table 1). In addition, current contracts —both buy and sell— are highly concentrated in a few institutions. For example, the five largest banks in the United States held almost 100% of credit derivatives contracts at year-end 2006, while J.P. Morgan Chase Bank N.A. alone held 52% of these contracts.<sup>4</sup>/ The Herfindahl-Hirschmann market concentration index reached 3,359 in December 2006, which is considerably higher than the breakpoint at which regulatory concern is raised on the presumption of behavior affecting competition (1,800 and over).<sup>5</sup>/

Hedge funds are the second most active participants, with a market share of around 30%, compared with a share of around 4% in 2000. According to the IMF (2006) and other reports, hedge funds have played a special role in developing the credit derivatives market and represent an important share of market

 $<sup>^2\!/</sup>$  See Allen and Gale (1994) for a conceptual description of the role of financial innovation in the diversification of risks.

<sup>&</sup>lt;sup>3</sup>/ A detailed analysis of this point can be found in Basel Committee on Banking Supervision, Joint Forum (2005).

<sup>&</sup>lt;sup>4</sup>/ The Office of the Comptroller of the Currency (2007).

 $<sup>^5\!/</sup>$  In currency derivatives markets, this index is in the range of 500 to 600, according to BIS.

turnover. For example, these funds represent between 20% and 30% of the transactions of some intermediaries, and in some cases this share rises to 50%-60%.<sup>6</sup>/

#### Table 1

Credit derivatives market, by type of agent (\*) (percent of total)

Agent	(a) Protection buyer	(b) Protection seller	(a)-(b) Net demand
Banks	1	1	
Investment	39	35	4
Credit	20	9	11
Hedge funds	28	32	-4
Insurance companies	6	17	-11
Pension funds	2	4	-2
Corporations	2	1	1
Mutual funds	2	3	-1
Other	1	1	0
Total	100	100	

(\*) Year 2006.

Source: British Bankers' Association.

In third place are the insurance companies. While they have a smaller market share, they stand out as the main net protection sellers in the market.

With regard to the types of instruments, CDSs are the most commonly used, with a market share of approximately 33% (table 2). In addition to dynamic growth in both their adoption and their uses, CDSs serve as the basis for structuring numerous synthetic instruments and derivatives indices (ABX, CDX, iTraxx, etc.). At the same time, the class of derivatives indices has increased its share substantially, from 9% in 2003 to 30% in 2006.<sup>7</sup>/ The greater liquidity in this market has turned indices into an effective, low cost financial investment instrument for credit risk management.

#### Table 2

Credit derivatives market, by type of instrument (percent of total)

Туре	2000	2002	2004	2006
Individual CDS	38	45	51	33
Aggregate indices	n.d.	n.d.	9	30
Synthetic CDO	n.d.	n.d.	16	16
Credit linked notes	10	8	6	3
Credit spread options	5	5	2	1
Equity linked credit	n.d.	n.d.	1	0
Swaptions	n.d.	n.d.	1	1
Other	47	42	14	16
Total	100	100	100	100

Source: British Bankers' Association.

The quality of the underlying assets, in turn, exhibits a gradual trend toward the increased use of riskier assets. The share of CDSs whose underlying assets have an investment grade rating fell from 65% to 59% in the 2004–06 period, while the share of assets with a BB–B rating rose from 13% to 23% (British Bankers' Association, 2006).

# III.2 Market performance

### **Credit derivatives prices**

A central aspect of the assessment of the potential costs and benefits associated with this market is whether the credit derivatives prices adequately reflect credit risk. In general, a credit derivative's spread depends on the expected credit risk and the agents' valuation of that risk. The available evidence suggests that global factors, especially the low valuation of credit risk, have a dominant role in determining spreads, while idiosyncratic factors play a much smaller role.<sup>8</sup>/

At the same time, there is a strong correlation between the spreads of corporate indices and the VIX (figure 2), with daily values close to 0.9. This correlation has weakened only during the periods of financial turbulence experienced in May–June 2006 and February 2007. This suggests that the spread is being determined primarily by changes in the willingness to accept more financial risk in the markets, rather than by changes in the perception of credit risk.

#### Figure 2



(1) Appetite for risk measured through the VIX index.

(2) CDX corresponds to the spread of the DJ CDX.NA.HY B on the run at 5 years. (3) iTraxx corresponds to Main Index of Europe on the run at 5 years.

Sources: JPMorgan and Bloomberg.

#### 6/ Fitch Ratings (2006).

 $^{\prime\prime}$  The indices are basically made up of CDSs. For example, the ABX is an index of mortgage CDSs in the US, the CDX is composed of corporate CDSs in the US, and the iTraxx is the equivalent for corporate CDSs in Europe and Asia.

<sup>8</sup>/ Empirical studies find that even when controlling for idiosyncratic factors and other variables, an important part of the behavior of CDS prices is not explained (Blanco *et al.*, 2003; Collin-Dufrense *et al.*, 2001). Collin-Dufrense *et al.* suggest that a large part of the unexplained variation could be determined by macro-global factors. Another relevant issue is the reaction of the spreads to contemporaneous credit events and news. The corporate credit risk derivatives market exhibits a close contemporaneous relationship between the CDX spread and the penalty on corporate loans in the US commercial banking system (figure 3) and not necessarily with expected credit events.<sup>9</sup>/

## Figure 3

Corporate credit events and derivatives valuation (1) (percent, basis points)



Creat events measured through the debt penalty for firms in the US banking system.
CDX corresponds to the spread of the DJ CDX.NA.HY BB on the run at 5 years.
The default rate is measured through the debt penalty percent for firms in the US banking system.

Sources: JPMorgan and Bloomberg.

The mortgage derivatives market illustrates a more extreme case. The ABX index spread rose sharply in February 2007, which was related to the relatively recent news on the US mortgage market.<sup>10</sup>/ However, the increase in default rates and the problems in the real estate sector have been present since mid-2006 (figure 4).

#### Figure 4



 Credit events measured through the mortgage default rate in the subprime segment and in the commercial banking system in the US.

(2) ABX corresponds to the spread of the ABX.HE index with a risk rating of BBB-.

Sources: J.P. Morgan and Federal Reserve Board.

Finally, there are no data for assessing whether the expected returns on credit derivatives effectively take into account factors like counterparty, liquidity, and operating risk, among others. Evidence indicates, however, that operating risk has fallen significantly in recent periods. According to the Federal Reserve Bank of New York, as of September 2006 the largest firms in the sector had reduced the number of outstanding credit derivative confirmations by 70% and those outstanding more than 30 days by 85%, among other advances.<sup>11</sup>/

In sum, the evidence suggests that the valuation of credit derivatives seems to be fairly influenced by global and contemporaneous factors. In this sense, the behavior of credit derivatives prices appears to be very similar to that of more standard financial instruments, and their performance could be due largely to the unusually high demand for financial assets and investment instruments.

# **Risk transfer**

The evidence does not allow the identification of the effective credit risk transfers realized through the credit derivatives market. This is due not only to the opacity of the market, but also to its relatively recent development, in a context of high global liquidity and extraordinarily favorable economic conditions.

However, the high concentration of transactions among only a few agents suggests that the diversification of credit risk has occurred solely for a small number of agents, especially banks, rather than at the aggregate level.<sup>12</sup>/

What is surprising is the low level of understanding that the users of credit derivatives themselves have of the degree of risk transfer involved in their operations. For example, Deloitte & Touche indicates that only 41% of those surveyed use valueat-risk (VaR) models to evaluate credit derivatives, and less than half carry out stress tests for these purposes.<sup>13</sup>/ There are several notable cases of alleged errors in the interpretation

<sup>9/</sup> This indicator is very similar to the default rate for this segment.

<sup>&</sup>lt;sup>10</sup>/Specifically, HSBC's adjustment to loan-loss provisions and the latest reports on default in the sector (Fed and Mortgage Bankers' Association).

<sup>&</sup>lt;sup>11</sup>/ Other noteworthy trends include the end of the practice of earmarking transactions without obtaining the prior consent of the parties; the doubling of the share of transactions confirmed electronically, to 80% of the total volume of transactions; and the forging of a protocol on settlement in the case of a credit event. Federal Reserve Bank of New York (2006).

<sup>&</sup>lt;sup>12</sup>/This concentration, of both the supply and demand for credit risk protection, is a stylized fact that has been systematically observed in recent years (Minton *et al.*, 2005).

<sup>&</sup>lt;sup>13</sup>/ Financial Times (2007).

and use of derivatives, including the Procter & Gamble and Orange County losses.  $^{\rm 14}\!/$ 

Moreover, some surveys and studies indicate that among several motives for carrying out these transactions, the transfer of credit risk plays a minor role. For example, FitchRatings (2006) finds that the share of banks for which financial investment was the dominant motivation for their operations increased from 77% to 89%, while those whose main objective was credit risk coverage fell from 80% to 40%.<sup>15</sup>/ Similarly, a survey by the British Banker's Association (2006) reports that the main use of credit derivatives is financial investment.

In a more academic line, Franke and Krahnen (2005) conclude for the case of CDOs that risk transfer is limited in the European banking system, and, in practice, only the risk associated with very low probability events is transferred. Other studies find that the use of instruments that group and segment risks is offset by an increase in the users' vulnerability in the face of macroeconomic fluctuations, which increases systemic risk.<sup>16</sup>/

In sum, the available evidence suggests that credit derivatives are being employed mainly for uses other than credit risk coverage. This evidence, in part, would be consistent with the fact that derivatives prices are strongly tied to global factors. At the same time, there is no conclusive evidence that their use effectively reduces systemic risk.

# IV. The view of supervisors and regulators in an international perspective

With some differences in emphasis, supervisors and regulators at the international level have taken a cautious stance toward the development of credit derivatives markets in recent years.<sup>17</sup>/ In general, regulators in the United States (the Federal Reserve) and the United Kingdom (the Bank of England and the Financial Services Authority) share a position that rests primarily on the role of market discipliner.<sup>18</sup>/ The regulators in other European central banks have been more cautious, tending to emphasize the need to regulate the practices and procedures of the markets and agents involved. This greater caution may be influenced by the greater size of the credit derivatives market relative to the underlying assets in Europe compared with the US, as well as by the greater integration of derivatives activities in the balance sheets of European banks.<sup>19</sup>/ Finally, the Bank of Japan has made an even sharper assessment regarding the potential vulnerabilities that the development of these markets has introduced into the financial system.20/

The regulators' main concern is the opacity of the market, and the impossibility for both regulators and investors to identify the transfers and final concentrations of credit risk in domestic financial systems and in the international system. Additionally, a large share of the activity that determines prices in credit derivative markets is concentrated in a fairly limited number of agents, mainly banks. This is a concern because of the liquidity problems that could be generated in the case of insolvency or market exit of one of these large operators.

Some analysts have suggested that the strong growth of the share of hedge funds could effectively contribute to absorbing and diversifying financial disturbances in a normal environment. However, the possibility of systemically important financial shocks poses a serious risk that the strong participation of these agents in the credit derivatives markets could contribute to amplifying and transmitting these shocks much more globally, by involving agents, sectors, and markets that would not have been so exposed in the past.

Another area of concern is the inaccurate valuation of the true risks involved. This concern is based on the generalized compression in risk premiums that has been seen in the vast majority of markets in recent years. Some suspect that since credit derivatives have become investment instruments, they may be excessively determined by the great financial liquidity and high demand for financial instruments seen today. Thus, the interdependencies and risk transfer generated by these markets have not been tested across the entire spectrum of general conditions in the financial markets and the credit cycle.

The highly complex characteristics and conditions of credit derivatives also present challenges for participants and supervisors. This raises the real possibility of an incomplete understanding of their true properties, characteristics, and implications for liquidity and solvency on the part of the agents that use them. In particular, the most important issue for managing credit risk through these markets and instruments has to do with the correct assessment of the behavior of the correlations of insolvency across different agents and sectors, both regulated and unregulated.<sup>21</sup>/

<sup>&</sup>lt;sup>14</sup>/ The estimated losses from an apparent misuse of derivatives in the Orange County and Procter & Gamble cases are US\$2 billion and US\$157 million, respectively. In Orange County, the losses stemmed from structured note transactions, whereas the Procter & Gamble case involved the use of currency derivatives and led to an extensive legal dispute with Bankers Trust (McCarthy, 2000).

<sup>&</sup>lt;sup>15</sup>/ The sum of the main motivations declared by the surveyed banks for operating with credit derivatives does not equal 100%, but there could have been more than one main motivation.

<sup>&</sup>lt;sup>16</sup>/ Krahnen and Wilde (2006) find that the issuance of credit derivatives increases the correlation between each bank's stock price and prices on the stock market. Hansen and Krahnen (2007) find similar results at the individual bank level.

<sup>&</sup>lt;sup>17</sup>/ Basel Committee on Banking Supervision, Joint Forum (2005).

<sup>18/</sup> Greenspan (2005); Geithner (2006).

<sup>&</sup>lt;sup>19</sup>/ European Central Bank (2006).

<sup>&</sup>lt;sup>20</sup>/ Hirano (2005).

<sup>&</sup>lt;sup>21</sup>/ Basel Committee on Banking Supervision, Joint Forum (2005).

# V. Conclusions

The scarce information on the effects of the development of credit derivatives markets on the stability of the financial system is an issue of particular concern, especially given the rapid growth of transactions and current positions of key agents in regulated sectors, the high market concentration, the growing complexity of the instruments, and the virtual absence of information on transactions at the agent level.

In this sense, the working agenda of regulators, ratings agencies, investors, and issuers should be to consider how derivatives transactions attenuate or introduce greater exposure to events of a systemic nature, what are the characteristics and properties of these instruments, to what extent they allow a real transfer of credit risk, or whether they are being used as yet another financial investment instrument.

Finally, international experience reveals important operational challenges in this market. A particularly noteworthy problem is the delay in registry and settlement of transactions that the US derivatives industry has faced for several years. Only recently have substantial improvements been recorded in this area.

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# Characterization of fixed-income mutual funds in a scenario of inflation surprises\*/

Authors: Luis Figueroa\*\*/ and Leonardo Luna\*\*\*/

# I. Introduction

The mutual fund industry in Chile has experienced accelerated growth in recent years, making it a significant actor to be taken into account in financial market analysis.<sup>1</sup>/ The reasons for the expansion are many, including per capita income growth, regulatory changes in the pension savings industry,<sup>2</sup>/ new financial products, stock exchange boom, business liquidity and other economic-cycle-related factors.

An important characteristic of this industry is intense asset turnover, especially during episodes of surprise inflation.<sup>3</sup>/ This high volatility is explained in part by the characteristics of mutual fund participants, who are well-informed agents that can demand the liquidation of their instruments from one day to the next.

This volatility is important for two reasons. First, mutual funds are an important actor in the fixed-income market, which raises the issue of whether this asset turnover could affect interest rate volatility. Second, mutual funds have a large bank deposit component, accumulating 16% of the system's total deposits and in some banks exceeding 50% of their deposits. The high volatility of mutual fund assets could thus be a source of risk in the management of the banking system's liquidity.

The present article characterizes the mutual fund industry from the perspective of financial stability. In particular, we analyze the money market and fixed-income funds, which together represent 75% of the assets managed by this industry.

Section two provides a brief overview of the industry and the main empirical regularities of the behavior of the money market and fixed-income mutual funds. Short- and long-term mutual fund asset turnover during episodes of surprise inflation is investigated in section three. Section four analyzes interest rate behavior in these periods, and the final section presents the conclusions.

# II. Empirical regularities of the money market and fixed-income mutual fund industry

Since the so-called Corfo-Inverlink case, which temporarily affected short-term mutual funds, the industry has grown at average rates of over 20% a year. What is surprising when examining fund type or class is the evolution not only of fixed-income mutual funds, whose assets doubled in three years, but also of stock mutual funds and other recently developed categories, including mutual funds with a guaranteed yield and mutual funds specializing in qualified investors (figure 1).<sup>4</sup>/

Mutual fund use as an investment vehicle is not new in developed countries,<sup>5</sup>/ where the assets under management exceed 50% of GDP. Examples include Australia (102%), the United States (67%), and France (65%). In Chile, the volume of this industry's resources represented 12% of GDP at the end of 2006.

<sup>\*/</sup> The opinions expressed are the exclusive responsibility of the authors and do not necessarily represent those of the Central Bank of Chile or its Board, nor the Superintendency of Pension Fund Administrators. We appreciate comments from Pablo García, Kevin Cowan, Rodrigo Cifuentes, Beltrán de Ramón, Claudia Sotz, and an anonymous referee, as well as the participants of internal seminars from the Division of Financial Policy and Financial Operations of the Central Bank of Chile.

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<sup>\*\*\*/</sup> Central Bank of Chile.

<sup>&</sup>lt;sup>1</sup>/ The growth rate of mutual fund assets from 2000 to 2006 was nearly twice the growth rate of life insurance and pension fund companies, respectively, reaching an average annual rate of 24% for the period. Their share in the non-banking financial institution portfolio went from 8% to 14% in the same period.

 $<sup>^2\!/</sup>$  Voluntary pension savings have played an important role in the mutual fund industry since 2003.

 $<sup>^3\!/</sup>$  These movements also occur because of changes in relative prices, flight to quality effects, and seasonal factors.

<sup>&</sup>lt;sup>4</sup>/ Hernández and Parro (2004) list the mutual fund industry as an important factor in capital market development in Chile.

 $<sup>^{5\</sup>prime}$  Ong and Sy (2004) present mutual fund asset figures for several countries.

# Figure 1



#### Source: SVS.

Regarding the segments of this industry, Chilean regulations recognize eight fund types, with the first three categories assigned to funds specializing in money market and fixed-income market instruments. Among those are short-term, or type 1, mutual funds (MF1), whose portfolio duration does not exceed 90 days; medium-term, or type 2, mutual funds (MF2), with maturities of 90 days to a year; and long-term, or type 3, funds (MF3), with maturities of over one year.

As of December 2006, MF1s held more than 48% of total assets managed by the mutual fund industry, with an average annual growth rate of 40% in the last twelve months. A significant portion of the contributors corresponds to companies looking to capitalize their cash surpluses for short periods. In fact, most of the FM1s permit redemptions at one day, thereby granting the possibility to invest funds for shorter periods than in the banking system.<sup>6</sup>/ This type of fund's greater facility for providing liquidity generates high volatility in their assets. A large part of MF1 asset variation is explained by the seasonal characteristics of the cash needs of companies. Thus, the pattern of daily changes observed during the month responds partly to supplier payments, salaries, and labor law obligations (figure 2).

On a weekly basis, strong negative variations are seen on Mondays and positive variations on Thursdays and Fridays as a result of companies' decisions to capitalize their cash over the weekend. This also happens in medium- and longterm mutual funds, but at much lower levels (figure 3). This weekly seasonality is also motivated by the more stable interest rates offered by mutual funds. In contrast, reverse repos offer lower rates closer to the weekend, due to the effective dates when banking institutions and brokerages actually receive the money.<sup>7</sup>/

# Figure 2

Daily seasonality of the FM1 (\*) (percent, median change in five days)



Source: Authors' elaboration, based on data from SVS.

#### Figure 3

Weekly seasonality of the FM1 and FM3 (percent, median change in one day)



(\*) For the 2002-06 period.

Source: Authors' elaboration, based on data from SVS.

An aspect of interest in the configuration of the fixed-income industry is the low level of resources concentrated in MF2s. Their participation in the mutual fund industry as a whole fell from 10% at the beginning of 2002 (post-nominalization) to 5% by the end of 2006; they currently represent only 7% of fixed-income mutual funds. The recurrent explanation in the market for this phenomenon is that the yield curve shows little difference in profits between short and long periods, for which

<sup>&</sup>lt;sup>6</sup>/ The minimum period for deposits in pesos for banks is 30 days. Overnight repurchase operations can also be undertaken.

<sup>&</sup>lt;sup>7</sup>/ The implementation of the real-time gross settlement (RTGS) system is conducive to the elimination of this type of phenomenon.

the predominant variable is the denomination of the currency in which the investment is made—that is, nominal (short term) versus indexed (long term). We therefore focus our analysis on short-term MF1s and long-term MF3s.

MF3s are used as a longer-term investment vehicle. Because the portfolios of these funds contain a larger component of inflationindexed instruments, they are also subject to the impact of the differentials between expected and actual inflation trends. Although the weekly seasonal element of MF3s is not as dominant as in short-term funds (figure 3), they do experience harsh asset variations as a result of massive investor reaction to short-term profit fluctuations in periods of surprise inflation. In this context, an inflation surprise is defined as significant differences between actual and expected inflation.<sup>8</sup>/ The degree of significance is obtained by considering events that are one standard deviation above and below in the distribution of differences.

After nominalization in 2001 the share of peso instruments increases in all the funds, while UF-denominated instruments nearly disappear in MF1s. By late 2006, FM1s only held 6% of their assets in indexed instruments, representing a total of US\$500 million, while MF3s held US\$1.700 billion (48% of their portfolios) in these instruments. Thus, MF1s are generally considered to be short-term peso-denominated funds. In contrast, MF3s represent longer-term instruments in UF<sup>9</sup> (figure 4).

#### Figure 4

Fixed-income mutual fund assets (US\$ million)



Source: SVS

The events of October 2004 and 2005 are clear examples of the strong variations or the sensitivity that MF3s can experience.<sup>10</sup>/ In 2004 higher short-term deposit rates and negative inflation in December detonated an 11% drop in MF3 assets during October, November, and December. The same situation occurred in 2005, when rising long-term interest rates triggered a fierce exodus of investors and a 41% contraction in MF3 assets (figure 5).

#### Figure 5

Actual inflation, surprise inflation, and the impact on FM3 assets (US\$ million, percent)



Although the causality between rates and mutual fund asset turnover is a question in these episodes, it raises the issue of what fundamental variables move investors of these fixed-income funds. If it is true that investors speculate with the level of inflation, then it would be of interest to see to what extent MF1s and MF3s have some degree of substitution and how the turnover in these funds could affect the volatility of indexed rates.

# III. Impact of inflation surprises on mutual funds

To study the impact of inflation surprises on short- and longterm mutual fund assets, we analyzed 55 events between January 2002 and September 2006. Given the definition of surprise inflation in the previous section, 27% of the cases analyzed correspond to inflation surprises, with seven of them being positive and eight negative.

In the case of short-term mutual funds, a detail should be added about their valuation to capture the potential effects of asset change. Unlike the rest of the mutual funds, whose share price is determined on the basis of market prices, MF1 share value is calculated at the historical cost on which interest is earned during the month.<sup>11</sup>/ The method used to value the

<sup>&</sup>lt;sup>8</sup>/ We use the Central Bank of Chile survey on one-month-ahead expectations as a measure of expected inflation.

<sup>&</sup>lt;sup>9</sup>/ As a reference, one day of transactions on the Stock Exchange equals approximately US\$850 million in financial intermediation, US\$400 million in fixed-income instruments, and US\$200 million in the money market.

<sup>&</sup>lt;sup>10</sup>/ Central Bank (2006) provides a table with greater detail of the events described.

<sup>&</sup>lt;sup>11</sup>/ Historical cost is the original cost of purchase plus the interest accrued at the moment of valuation (IRR valuation of purchase).

shares implies that even when market prices change, MF1 shares could react to these changes with a lag.<sup>12</sup>/ This is an important characteristic that reduces risk and the volatility of returns and makes it an attractive investment instrument for many participants. However, this form of valuation also grants, in theory, the possibility for "UF arbitrage" to investors faced with an inflation surprise.<sup>13</sup>/ The evidence presented in this article rebuts said "UF arbitrage."<sup>14</sup>/

We used aggregate MF1 and MF3 assets over time to empirically analyze mutual fund behavior in periods of surprise inflation, and we calculated the median of the accumulated percentage change for the days preceding and following the inflation publication date.<sup>15</sup>/ These changes were then separated into surprise inflation events that were positive, negative, and null events for the 2002–06 period.

The empirical evidence shows that the median change in accumulated MF1 assets diminishes on each day following a positive inflation surprise. The opposite happens in response to negative surprise events. The results are the same if, instead of using assets, the change in number of shares is calculated to eliminate the price effect of the valuation change<sup>16</sup>/ (figure 6).

#### Figure 6



Source: Authors' elaboration, based on data from SVS. Acquisition cost of the instruments.

A more detailed look seems to indicate that, in the event of negative inflation surprise, MF1s increase two days after the event, but MF1 assets then return to their pre-surprise level. Even more importantly, MF1s react to negative inflation surprises with a certain lag, since the change on the first day is almost null. This could be evidence that MF1s may have a role in reinforcing interest rate movements, but they do not cause of the initial push. This effect is more apparent in the series adjusted for price effects, where the only relevant change occurs on the second day. What happens in the case of positive surprises is different: after a steep fall the first day, the asset level continues to drop on subsequent days.<sup>17</sup>/

The signs of the variations are consistent with the fact that MF1s are fundamentally nominal funds. Although they incorporate some UF-denominated instruments, these are not a determining factor in periods of surprise inflation, as would be suggested by the "UF arbitrage" hypothesis.

When we repeated the previous exercise for MF3s, the results were consistent with the larger share of inflation-indexed instruments in these funds. Looking at the change in the number of shares, we see a very different behavior for the days following the day on which the variation in the CPI is revealed, whether the surprise is negative or positive.<sup>18</sup>/ The number of MF3 shares increases following positive surprises due to greater demand for adjustable-rate instruments, and it diminishes in negative surprises. The behavior is almost null in response to null surprises (figure 7).

# Figure 7

Change in number of FM3 shares in relation to CPI publication (median accumulated percent change) (\*)



(\*) Relative to the day of CPI publication. Series is seasonally adjusted for the 2002-06 period.

Source: Authors' elaboration, based on data from SVS.

<sup>16</sup>/Specifically, we carried out the same exercise, this time calculating the asset series by keeping the share value constant for the ten days preceding and following the inflation publication date.

<sup>17</sup>/ If the same exercise is performed considering the changes with respect to the day prior to the publication of the CPI, we find a different behavior in the asset changes. The change in assets is positive for all types of surprises considered.

<sup>18</sup>/ The results are similar if asset changes are considered and if the calculations are made with respect to the day prior to the CPI publication date.

 $<sup>^{12}\!/</sup>$  Mutual funds can adjust their share value when it is misaligned with market prices.

<sup>&</sup>lt;sup>13</sup>/ CPI variations are known on the first days of every month, but MF1 shares incorporate the change in UF value on the tenth day. Theoretically, it would be possible to enter or exit the funds in the days that pass between the inflation surprise and this adjustment, thereby taking advantage of the lag time.

<sup>&</sup>lt;sup>14</sup>/ This type of posting also would allow for the possibility of arbitrage in the face of unanticipated movements in the monetary policy rate. This is not analyzed in this article.

<sup>&</sup>lt;sup>15</sup>/ The asset series was seasonally adjusted econometrically for possible intraweekly and monthly effects indicated in section 1. It was also adjusted for holidays. Finally, a dummy variable was used to exclude the period of the Corfo-Inverlink case.

Article

Two points should be highlighted. First, the number of shares increases with a lag in response to negative events. As in the case of MF1s, this would seem to show that mutual funds act with a lag, at least in response to negative surprises. Although this fact could certainly increase rate volatility in the days following the surprise, it is less probable that mutual funds would cause an overreaction on the day the CPI is announced. Second, the fact that MF3s react days after positive inflation events could, at the margin, create greater volatility in longer-term adjustable rates.

# IV. Impact of inflation surprises on interest rates

This section examines interest rate behavior for different maturities and instruments around CPI publication date.

In this respect, it is important to clarify that the direct result of a Fisher equation<sup>19</sup>/ between real and nominal rates implies that on the short-term market, where nominal rates are fixed, any change in expected inflation produces a change of the same magnitude and the opposite sign in real rates. In this section, then, we are not trying to determine whether real rates react to changes in inflation, but whether there is evidence of an "overreaction." This overreaction could materialize in larger changes than expected or in changes subsequent to the inflation surprise.

To analyze this point, we take the median rate variation relative to an average of the five days previous to the publication of inflation data. We use average interest rates for 30- to 90-day deposits and 90- to 360-day deposits, as well as prime deposit rates at the same maturities and the rates of BCU-2s and BCU-5s (Central Bank UF-denominated bonds).

In all cases, the rate continues to rise systematically on the days following the publication of the CPI when there is a negative surprise. Moreover, the rate starts to change days before the publication of the CPI. On the other hand, while 90-day prime rates present a clear distinction between negative and positive surprises (figure 8), this distinction is not so clear for 360-day prime rates.

In this case, inflation surprises are studied on a monthly basis, which explains why significant movements in short rates can be expected. However, if we assume that long-term expected inflation is fixed and that all inflation surprises are transitory, we would expect the effect of inflation surprises on longer rates to be quite moderate or null. In fact, an inflation surprise of 30 basis points during one or two semesters, in the short part of the curve, would generate changes of between three and six basis points in the BCU-5 rate.<sup>20</sup>/ On the other hand, because the securities at real rates cannot pay negative rates, one would expect a priori a greater interest rate reaction to negative

surprises than to positive. We find a behavior consistent with the above on analyzing BCU-2 and BCU-5 rates, except for the fact that two days after the publication of the CPI, the median change in BCU-5 rates increases by 8 basis points for negative surprises (figure 9).

# Figure 8

Change in deposit rates in relation to the day of CPI publication (1) (percent, median) (2)



(1) 30- to 90-day indexed prime deposit rates.

(2) Calculated relative to the average rate of the five days before CPI publication.

Source: Authors' elaboration, based on data from Central Bank of Chile.

### Figure 9

Change in BCU-5 rates in relation to the day of CPI publication (percent, median) (\*)



(\*) Calculated relative to the average rate of the five days before CPI publication.

Source: Authors' elaboration, based on data from Central Bank of Chile.

<sup>&</sup>lt;sup>19</sup>/In its simplest form, the Fisher equation shows that the nominal interest rate equals the real interest rate plus the expected interest rate:  $r_{y} = r_{y} + \Delta p$ .

<sup>&</sup>lt;sup>20</sup>/ This change considers residual benchmark securities in the secondary market and depends on whether one assumes that there is or is not substitution with nominal securities at similar maturities.

Although the sign of the rate change is consistent with what we would expect a priori, it is surprising that on average rates react with a lag to surprises and that the positive surprise effect is so low.<sup>21</sup>/ This lag in rates would seem to coincide with the lags observed in MF1s and MF3s during negative surprises; however, this coincidence does not imply that there is a direct relationship.

# V. Conclusions

This document seeks to explain mutual fund behavior and some of the implications for financial stability. The behavior of mutual fund assets around periods of surprise inflation is consistent with the fact that MF1s are mainly a portfolio of peso-based short-term instruments, while MF3s are a portfolio of longer-term indexed instruments.

The high volatility of mutual fund assets, in particular fixed-income funds, could have some effect on interest rates. The reaction of their portfolios is consistent with the above mentioned in periods of surprise inflation. Entries into MF1s and exits from MF3s occur in response to negative inflation surprises. The opposite happens during positive surprises.

Interest rate behavior is consistent with mutual fund asset turnover, although rates begin to react prior to CPI announcements. In this sense, a greater understanding of the effects of institutional

investors on rate volatility would require studying the rest of the market agents: banks, insurance companies, and pension funds. This work represents a step toward this understanding.

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<sup>21</sup>/ While rates have no upper limit when they rise, they do have boundaries when they fall. Nominal rates cannot be negative, which conditions the minimum level that real rates can reach in periods of positive surprise. This could partly explain why greater changes are observed in negative surprise periods. Also, the median of negative surprises was greater than that of positive surprises in the period analyzed.
# Impact of pension fund transactions on the local stock market \*/

### I. Introduction

The potential impact of institutional investors on financial markets, especially in emerging economies, is a topic that has generated growing interest in Chile, as well as in academic and economic policy circles around the world.<sup>1</sup>/

In the case of Chile, it is particularly important to understand the financial market effect of pension funds, given the size of the funds. Pension fund assets equal 62% of GDP, and the flow of available resources for investment nears US\$300 million a month, which makes up a significant portion of the amounts traded on financial markets domestically.

This article investigates the effect of pension fund transactions on local stock returns. To this end, I employ a reduced model of aggregate market returns, incorporating variables related to pension fund participation in the market. To solve potential problems of endogeneity in pension fund transactions, the model takes advantage of portfolio variations caused by regulatory restrictions that prevent the pension funds from increasing their investments abroad. The article also evaluates the possibility of stock prices having strayed from their fundamentals during periods when restrictions on pension fund investments abroad have become active.

The main result is that, at a monthly frequency, the pension funds' net stock purchases have shown no positive effect on market returns. Nor is there evidence of a "misalignment" of stock prices with their fundamentals during periods when regulatory limits have forced the pension funds to invest in local instruments.

# II. Evolution of investment limits

Historically, the pension funds invested their resources in government debt instruments, private bonds and domestic stocks. By the late 1990s, however, local stocks were gradually replaced by foreign instruments, which matched their share in the aggregate pension fund portfolio in 2000 (12% of assets).<sup>2</sup>/ Since then, growth in foreign investment has widely surpassed

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growth in domestic stock investment, and only since 2003 have stock investments recovered, reaching 17% of total pension fund assets in December 2006 (figure 1).

#### Figure 1





The main objective of the pension fund system is to insure and maximize retirement-age taxpayers' pensions. This is reflected in the large number of restrictions under which the system began and the multiple safeguards against putting these resources at excessive risk. Among these safeguards, the most important have been investment limits by instrument type and

<sup>\*/</sup> The opinions expressed in this document are the exclusive responsibility of the author and do not necessarily represent those of the Central Bank of Chile or its Board. I appreciate the comments by Luis Figueroa, Pablo García, Kevin Cowan and an anonymous referee, as well as participants at the internal seminar of the Financial Policy Division of the Central Bank of Chile and the joint workshop with the Superintendency of Pension Fund Administrators. \*\*/ Central Bank of Chile.

<sup>&</sup>lt;sup>1</sup>/ Gompers and Metrick (2001), Bohl and Brzeszczynski (2005), Pritsker (2005), and *Global Financial Stability Review*, IMF, April 2007.

<sup>&</sup>lt;sup>2</sup>/ The loss of importance of local stocks in this period was partly due to a price effect, stemming from the Asian and Russian financial crises, and then to stock sales that the pension funds had to carry out as a result of takeover bids by foreign companies, mainly in the electricity sector.

issuer, which have gradually evolved. Thus, variable-income investments (between 10% and 30% of assets) were allowed in 1985, four years after the system was created, and foreign fixed-income investments of up to 3% were authorized in 1992. Restrictions have evolved as the administration of these resources has matured and benefits have been reaped from diversifying products and investments in different markets.

Up to 1997, foreign investment amounts were not very relevant and far from the established limits (figure 2). However, as the pension funds have expanded their positions in this type of investment, the margin has become increasingly tighter, even given progressive hikes in the limits.<sup>3</sup>/Rising foreign investments have concentrated on variable-income instruments, especially since September 2002, when the sublimit on foreign variable income investments was removed. This investment is linked to investments in local stocks, since both are subject to an overall variable-income limit, which has become increasingly restrictive since the creation of multifunds (figure 3).<sup>4</sup>/

#### Figure 2





#### Figure 3

Variable-income investment and limits (percent of assets)



# III. Relationship between pension fund transactions and market return

The pension funds have made monthly net stock purchases of \$20 billion, on average. The main stock sales were carried out in the 1998–99 period, while the largest purchases took place in 2003–04. The high volatility of monthly purchases is reflected in their share in the stock market (figure 4). Although pension fund transactions have historically represented between 20% and 30% of the total number of shares traded, this relative share was only 9% in 2004–06, well below than the historical average of 21%. A similar trend can be seen in connection with market assets, with a drop in the pension funds' stock investment share, which has hovered around 8% since mid-2003.

#### Figure 4

Pension fund share in the stock market (percent)



Sources: SAFP and BCS.

Stock returns also present major variations during the period. Figure 5 shows the local stock index returns and pension fund transactions. Three episodes can be distinguished. In period I, there were no restrictive investment limits for pension funds (1996–99 and 2002–03). In period II, there were restrictions on investing in foreign instruments, but with room to invest in local stocks (that is, there was a gap between the maximum allowed investment and current investment in local stocks), since aggregate variable income was not yet restricted (2000–01).

<sup>&</sup>lt;sup>3</sup>/Foreign investment surpluses occurring in 2006 are backed by a norm issued by the regulatory agency, which does not penalize surpluses stemming from investment yields, up to a maximum of 5% of the fund's value.

<sup>&</sup>lt;sup>4</sup>/ The investment limits in variable-income instruments and in national stocks are established for each fund type (fund A: 80% and 60%, respectively; fund B: 60% and 50%; fund C: 40% and 30%; fund D: 20% and 15%; and fund E: 0% in both cases). Therefore, transfers of affiliates to funds with a higher variableincome share automatically broaden the consolidated limit of the funds.

Finally, in period III, both foreign investment and total variable income were subject to active limits (2004–06).<sup>5</sup>/ Pressure on share prices from the activation of limits on foreign investments for pension funds should be strongest in period II.

#### Figure 5

Stock returns and pension fund transactions (\*) (percent, billions of pesos)



Sources: SAFP and BCS.

Nevertheless, the figure does not demonstrate a strong positive relationship between pension fund purchases and stock returns, which is corroborated by the negative correlation coefficient calculated for each period (table 1).

#### Table 1

Correlation between pension fund transactions and stock returns (percent)

	Period			
Variables	I	II	ш	Total
Net stock purchases (NSP) NSP/Market amount traded NSP/Stock market equity	-0.060 -0.127 -0.108	-0.135 -0.356 -0.162	0.100 -0.017 0.017	-0.031 -0.139 -0.104
Sources: SAFP and BCS				

# **IV. Estimation and results**

#### **Estimation model**

This article uses a monthly aggregate market return that includes internal and external macroeconomic variables. The equation to be estimated is of the following type:

$$R_{IPSA} = \beta_0 + \beta_1 R_{S \& P} + \beta_2 CAP_{30-90} + \beta_3 FIN\_EXT + \beta_4 \Delta TCN$$

$$+ \beta_5 FP + \beta_6 FP^* D_{II} + D_{II} + D_{III} + \varepsilon,$$
(1)

where the dependent variable  $(R_{IPSA})$  corresponds to the monthly returns of the Selective Stock Price Index (IPSA), adjusted for

dividends and other capital variations. The IPSA contains the 40 companies with the greatest market presence and represents 70% of aggregate market assets. Foreign influence on the Chilean stock market is measured by the monthly return of the Standard & Poor's 500 Index ( $R_{S\&P}$ ). The short-term domestic interest rate (CAP<sub>30-90</sub>) reflects internal financing conditions. Included as well is the spread of the group of emerging market bond funds (EMBI) plus the ten-year US government bond rate, as a reflection of foreign financing conditions. The monthly return of the observed exchange rate ( $\Delta$ TCN) affects the gains of the tradables (positive) and non-tradables (negative) sectors; a negative impact is expected, considering the greater weight of the non-tradables sector in the IPSA. Finally, a measure of pension fund (PF) stock transactions was included. There are two reasons for which pension fund transactions are correlated with stock returns. The first is portfolio effects: with imperfect substitute assets, changes in the pension fund portfolio generate changes in the relative returns of the assets. This is the mechanism estimated in this article. The second reason is that pension funds anticipate changes in returns and adjust their portfolios on the basis of this information.<sup>6</sup>/ To differentiate these two effects, this article assumes that net stock purchases by pension funds occurring when foreign investment limits are active are not correlated with the return expectations of the pension fund administrators (AFPs).

To implement the above, I included an interaction between net purchases (PF) and a dummy variable ( $D_{II}$ ) that equals 1 if it corresponds to period II, described previously. The effect of pension fund transactions on stock returns is measured by the sum of the parameters PF and PF\*D<sub>II</sub>.

Since information on effective transactions is not available, net pension fund purchases were estimated as the difference between the number of shares held in period t and the number of shares held in the period t–1, multiplied by the share price in period t–1.<sup>7</sup>/ The valuation effect on the change in investment is partially isolated by weighting these two values by the price in the previous period.<sup>8</sup>/ Three alternative measures are used to normalize pension fund transactions: (i) the coefficient between net purchases and the total value of the pension funds in the immediately previous period is estimated; (ii) net

<sup>&</sup>lt;sup>5</sup>/ An active limit is defined as occurring when effective investment is equal to or higher than 90% of the established maximum limit.

 $<sup>^6\</sup>prime$  To the extent that pension funds make their investment decisions on the basis of the market index outlook, pension fund transactions would present a correlation with the error term ( $\epsilon$ ) and the associated parameter, creating a positive bias.

<sup>&</sup>lt;sup>7</sup>/ Net purchases refer to the difference between stock purchases and sales in a given period.

<sup>&</sup>lt;sup>8</sup>/ This measure could underestimate the number of real transactions, since calculations at the level of the pension fund system exclude operations carried out between AFPs or between the funds of a single administrator.

purchases are calculated as a percentage of the market assets of the stock market, and (iii) net purchases are also calculated as a percentage of the monthly stock transactions in the stock market. These last measures are estimated on the basis of a long-term trend.

The following table shows the descriptive statistics of all the variables. The average monthly return of the IPSA is 0.75%, somewhat lower than the return in pesos of the foreign S&P index. The price indices (IPSA, S&P, and exchange rate) have a unit root, but their returns are stationary, the same as for interest rates.

#### Table 2

Description of the variables

Variables	No. observations	Average	Standard deviation	Minimum	Maximum
IPSA return	142	0.75	5.77	-35.46	14.27
S&P return	142	0.75	4.24	-15.76	9.23
Domestic interest rate	142	7.55	4.59	1.68	22.32
External financing	142	11.72	3.53	6.41	23.70
Exchange rate variation	142	0.19	2.40	-5.73	6.39
Net stock purchases (NSP)	142	17.85	38.54	-69.10	215.40
NSP/Fund (-1)	142	0.08	0.21	-0.51	0.78
NSP/Stock market equity	142	0.04	0.10	-0.23	0.44
NSP/Market amount traded	142	5.12	12.33	-29.26	49.46

Sources: SAFP, BCS and BCCh.

#### **Results: impact of pension fund transactions**

Table 3 shows the results of estimating equation (1) for different specifications of pension fund transactions. All estimates incorporate two dummy variables in the intercept:  $D_{II}$ , as defined above, and  $D_{98}$ , which equals 1 in August 1998, given the sharp fall of the IPSA (–35%).<sup>9</sup>/ In general, the results confirm the sign and significance of the parameter that accompanies the foreign stock index: a 1% change in the foreign stock market return implies a 0.5% increase in the local stock market. Likewise, interest rates and the exchange rate have a negative and significant impact, while the cost of external financing is positive. As a whole, explanatory macrofinancial variables represent 37% of the variability of IPSA returns. All considered, contemporaneous pension fund transactions do not generate a positive impact, even when taking into account periods with restrictions against investing overseas.<sup>10</sup>/

The previous estimate uses pension fund limits on foreign investment to identify the effect of pension fund transactions on stock returns. An alternative way to approach this issue is to evaluate whether, in the periods when foreign limits are active, there is a structural break in the determinants of the returns. To test this hypothesis, structural break tests (Chow test) were applied for period II, period III, and periods II and III combined, as defined above. The results do not reject the null hypothesis of no structural break.

#### Table 3

Impact of pension fund transactions on stock returns (\*) (parameters and Newey-West HAC *t* statistics in parentheses)

	Dependent variable: Monthly IPSA return			
Explanatory variables	Net stock purchases (NSP)	NSP/ Fund (–1)	NSP/Stock market equity	NSP/Market amount traded
S&P return	0.545	0.542	0.543	0.543
	[5.863]***	[5.83]***	[5.84]***	[5.834]***
Domestic interest rate	-0.275	-0.285	-0.283	-0.283
	[-2.215]**	[-2.368]**	[-2.336]**	[-2.348]**
External financing	0.191	0.229	0.215	0.222
	[1.504]	[1.77]*	[1.659]*	[1.715]*
Exchange rate variation	-0.325	-0.334	-0.332	-0.333
	[-2.094]**	[-2.183]**	[-2.165]**	[-2.173]**
Pension funds (PF)	-0.006	-2.22	-4.125	-0.036
	[-0.539]	[-1.366]	[-1.113]	[-1.231]
PF*D <sub>II</sub>	-0.004	-0.038	-0.163	-0.001
	[-0.306]	[-0.014]	[-0.031]	[-0.021]
N° observations	142	142	142	142
R <sup>2</sup> aj.	0.446	0.450	0.448	0.449
DW	2.075	2.078	2.077	2.077

\* Significant at 10%, \*\* significant at 5% and \*\*\* significant at 1%.

 $(^{*})$  Åll estimations include the constant, the dummy for August 1998, and the DII dummy, although they are not reported.

Source: Author's elaboration.

Another identification strategy to measure the effect of net pension fund purchases on stock returns is to use instrumental variables. The following were used as instruments of pension fund transactions: the lags of the transactions themselves, the lags of other independent variables, and a combination of foreign investment limits and aggregate variable-income restrictions that simulates period II described in figure 5-that is, the product between the change in the foreign limit and the value of pension funds that are restricted against investing overseas in t-1, as long as there is a gap between maximum allowed investment and current investment in aggregate variable-income investments. The results of the second stage are shown in the first column of table 4. The interacted parameter of net purchases becomes positive, but is not significant, while the rest of the parameters (not reported) maintain their levels.

It is possible that only the highest volume transactions have an effect on returns. To test this hypothesis, the equation was estimated incorporating the square of pension fund transactions; however, the results show that this new variable is not significant (table 4).

<sup>9/</sup> Estimates were also carried out excluding 1998, with similar results.

<sup>&</sup>lt;sup>10</sup>/ Estimates were made including the lags of pension fund transactions to capture possible delays in their impact on market returns, but none of the estimates were different from zero.

One could also argue that only stock purchase transactions are exogenous to stock returns during the periods of active foreign limits. The last column of table 4 thus reports the results of estimating the model again, this time including pension fund buy and sell transactions separately, with both normalized by total stock market transactions.<sup>11</sup>/ Again, I found no positive, significant effect of purchases on returns.

#### Table 4

Alternative specifications (1)

(parameters and Newey-West HAC t statistics in parentheses)

	Dependent variable: Monthly IPSA return				
Explanatory variables	Instrumental variables (2)	Quadratic estimation	Asymmetric effect (2)		
Pension funds (FP)	-0.104 [-1.212]	-0.015 [-0.253]			
PF*D	0.146				
PF*PF		-0.001 [-0.505]			
PF purchases			-0.033 [-1.025]		
PF purchases*D <sub>II</sub>			0.044 [0.476]		
PF sales			-0.041 [-0.741]		
PF sales*D <sub>II</sub>			-0.096 [-0.860]		
Change in foreign limit					
N° observations R²aj. DW	142 0.433 2.025	142 0.453 2.079	142 0.443 2.091		

(1) All estimations include the microfinancial variables presented in table 3, as well as the constant, the dummy for August 1998, and the  $D_{\mu}$  dummy, although they are not reported. (2) Includes the  $D_{\mu}$  dummy (not reported).

Source: Author's elaboration.

The above results hold even when considering alternative measures of the stock index and including other explanatory variables.<sup>12</sup>/

#### **Complementary information**

An alternative way to verify whether stock prices respond to net pension fund purchases is to see if prices moved away from their fundamentals in periods when pension funds were "forced" to invest in Chile because of the limits. One way of doing this is to compare price-earnings (P/E) ratios among countries in 2006, when foreign limits were active. Figure 6 presents the price-earnings ratios for a group of 41 developed and emerging countries, including Chile. As the figure shows, market valuation in Chile, at 20.7, is higher than the simple average of the countries considered (18.3), although the degree of variability among countries is significant.

#### Figure 6

# Price-earnings ratio

(times as of December 2006)



(1) Includes the following countries, in ascending order based on the P/E ratio: Norway, Portugal, Spain, Germany, Italy, Singapore, France, Hong Kong, Sweden, Australia, Canada, Ireland, United States, United Kingdom, Switzerland, Finland, Denmark, Japan, and New Zealand.
(2) Includes the following countries, in ascending order based on the P/E ratio: Venezuela, Thailand, Hungary, Brazil, Colombia, South Korea, Russia, Lithuania, the Philippines, Poland, Mexico, Malaysia, Greece, Turkey, Indonesia, Czech Republic, India, Estonia, China, Peru, and Latvia.

Source: Bloomberg.

Diverse factors particular to each economy have a potential impact on market asset valuation. The value of a market asset (P) can be expressed as the present value of expected dividends (D), appropriately discounted at rate R. That is,

$$P_t = E_t \left[ \sum_{i=1}^{\infty} \left( \frac{1}{1 + R_{t+i}} \right)^t D_{t+i} \right].$$

This expression can be simplified in the very simple case of the standard model for a constant dividend growth rate. Assume that dividends are a fraction,  $\alpha$ , of earnings; that earnings, in turn, are a constant fraction of GDP, which grows at a constant rate, *g*; and that the discount rate is equal to the risk-free interest rate, r, plus a risk premium,  $\rho$ . The price-earnings ratio will then be defined by

$$\frac{P}{U} = \frac{\alpha(1+g)}{r+\rho-g}$$

<sup>&</sup>lt;sup>11</sup>/ The international literature indicates that the buy and sell orders of institutional investors have an asymmetric effect on prices (Chiyachantana, *et al.*, 2004).

<sup>&</sup>lt;sup>12</sup>/ Regressions using the IGPA return, the price-earnings ratio, and the market-book ratio as dependent variables maintain the null significance of the parameter associated with pension fund transactions, unlike the results of Walker and Lefort (2002). Variables related to the evolution of economic activity and commodities prices were also included.

This implies that the price-earnings ratio will depend positively on the economy's growth rate and negatively on the riskfree interest rate and the risk premium. When relating the price-earnings ratio to a number of macrofinancial variables of the economies included in the sample for 2006, there is a statistically and economically significant relationship with GDP growth and the inflation rate, with the following coefficients:

$$R_{P/U} = \frac{15.42 + 1.09 \text{ PIB} - 0.86\pi}{_{[6.28]^{***}}},$$

where t statistics are reported in parenthesis. This relationship holds even when controlling for direct country risk indicators, such as the Moody's rating and the EMBI spread, as well as for local financial variables like long- and short-term interest rates and the share of the pension funds in the economy. <sup>13</sup>/ For the case of Chile, the estimated market valuation, at 18.2, is somewhat lower than the actual one, but the degree of dispersion among countries indicates that, for Chile, this difference is not significant (figure 7). This dispersion holds for both developed and emerging countries.

#### Figure 7



Source: Bloomberg

In conclusion, based on a simple review, there is no evidence for arguing that, on the Chilean market today, the market asset valuation has strayed from the macrofinancial variables that determine it.<sup>14</sup>/

Should there be an overvaluation of local stocks, it should be lower in stocks with ADRs, because when these securities are acquired by investors who do not have investment restrictions on their portfolios, they present a greater degree of price arbitrage. If this is true, the relationship between the IPSA and the index of stocks with ADRs (ADRian) should be increasing, especially in periods with a higher number of restricted investors.

An analysis of the historic relationship among the indices in the 1995–2006 period reveals a growing trend. However, this phenomenon did not become more pronounced during the period in which pension fund influence was the greatest (period II), since the rise experienced up to the end of 2000 was almost completely reverted over the course of the following 18 months (figure 8). Also, mean tests between periods do not reject the equality of the slopes.

#### Figure 8

Relationship between stock market indices: IPSA/ADRian (times)



Source: Bloomberg

# V. Conclusions

A monthly stock return model provides no evidence that pension fund stock transactions affect aggregate market return in Chile.

A possible explanation is that Chile's growing integration with international financial markets reduces the effect of pension funds—however large they may be in relation to GDP—on local stock market prices.

Another explanation is that said transactions either have shortterm effects that dissipate in the monthly data or have an impact on individual stock prices that is diluted in aggregate data. Both topics should be addressed in future research.

<sup>&</sup>lt;sup>13</sup>/ The effect of the interest rate is weakened in cross-country studies, while being significant in time series models (Sialm, 2005).

 $<sup>^{14}\!/</sup>$  Similar results are found when comparing the market-book ratio among countries.

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