Financial Stability Report

FIRST HALF 2008

BANCO CENTRAL
DE CHILE

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*/ This is a translation of a document originally written 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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[*] The statistical closing date of this *Report* was 23 May 2008.

Foreword

As established in its Basic Constitutional Act, the Central Bank of Chile must “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, on 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 adequately 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 objective 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 world's main financial centers continue to show a high level of fragility, similar to that at the time of the last *Report*. This fragility is manifested in a weakened capital position of important financial intermediaries, together with uncertainty about the value of their assets. This uncertainty has implied a fall in the normal level of activity in various financial markets, especially the liquidity markets in which the financial intermediaries obtain short-term financing. This situation should be resolved to the extent that these intermediaries complete the process of recognizing losses and raising the necessary capital to strengthen their balance sheets. The banks' weakened capital position has consequences not only for their ability to give credit, but also for their ability to face additional deteriorations in the quality of their other assets.

The most immediate cause of the current turbulence is the credit deterioration of securitized assets —especially in subprime mortgages in the U.S.— which began to occur with the maturing of a period of intense credit growth. This period was characterized by low risk premiums in the international financial markets, which in turn resulted from an environment of low interest rates and abundant global liquidity. In this context, the possibility of a credit deterioration in other asset classes cannot be discounted. This situation explains the loss of confidence in the asset value of an important group of banks and financial institutions in the markets of the most advanced economies.

Combined with the increased demand for liquidity stemming from the closure of securitization and short-term debt markets, this loss of confidence has been reflected in the unusual behavior of the markets and interbank interest rates. This has motivated the world's main central banks to provide liquidity through various avenues. Nevertheless, interbank liquidity premiums have not shown signs of falling significantly or permanently over time, which is indicative of continuing uncertainty. At the same time, the Bear Stearns episode and the degree of involvement therein by the U.S. fiscal and monetary authorities had an impact in reversing a fall in the valuation of assets in several markets. This intervention seemed to have acted a signal on the U.S. authorities' willingness to intervene to avoid a systemic crisis.

In brief, large financial intermediaries have suffered significant losses in this crisis, generating fear of a global credit crunch. A deterioration in the ability to supply credit or a reduced willingness to do so, reinforced by the prospects for macroeconomic deterioration, is the main threat to financial stability identified in this *Report*.

A deterioration in international economic activity is the second threat identified in this *Report*. The drop in world growth projections, together with recession scenarios, could increase the materialization of credit risk in Chile, as firms face a reduction in the demand for their products which weakens their ability to generate flows to service their financial commitments.

In the period covered in this *Report*, the advanced economies have witnessed a significant and generalized increase in actual and expected inflation. Consequently, the risk of significant hikes in the riskfree rates in these economies, as a result of this acceleration of inflation, is the third threat identified in this *Report*. Such hikes could translate into higher external financing costs for the Chilean economy and could increase the risk of a global credit crunch.

Locally, the international situation has had varying effects on the prices of different financial assets. Both the international value of the Chilean peso and the stock price indices have followed world trends. The local currency suffered a strong appreciation relative to the U.S. dollar in the first quarter of the year, at times in which a similar adjustment occurred relative to a range of other currencies. This correction is related to the necessary adjustment of the U.S. external accounts, which was highlighted as a threat in previous *Reports*. Stock prices, in turn, have followed a pattern similar to that of the emerging economy indices, with a high degree of volatility and a strong correlation with stock indices for the advanced economies.

Local interest rates —both long and short term— have been more strongly affected by internal events than by external factors. While short-term deposit rates in the banking system recorded a small rise in both their level and their volatility, the increase is a small fraction of that observed in developed financial markets. This is largely explained by the almost zero impact of subprime credit problems on the solvency of the Chilean banking system. The higher level of local short rates is instead associated with a scenario of higher inflation and, to a lesser extent, with international liquidity pressures. Long rates, in turn, reflect the portfolio adjustment toward indexed instruments in the face of greater inflation uncertainty, which caused a drop in the yields demanded on these instruments. Yields registered a hike, with some degree of overreaction, in the face of the announcement of greater debt issues by both the Central Bank (to sterilize reserve accumulation) and the Central Government.

While Chilean firms do not show signs of significant negative trends in either their access to external financing or their financial risk indicators, an important share of firms have had to make adjustments in the face of higher energy prices. The business sector's debt financing continued to grow at real rates around 10%, with a higher external debt and a somewhat lower growth of bonds. The operating margins of nonmining firms that report to the Superintendency of Securities and Insurance (SVS) showed some deterioration in March 2008 for the first time in several years. While these financial indicators are far from indicating situations of important financial risk, the stress tests carried out on these firms reveal a greater sensitivity to this sector's payment capacity relative to the results of a similar test in the last *Report*.

The direct exposure of the business sector to the main threat identified in this *Report* is limited. In particular, residual short-term external bank financing coming due is US$3.557 billion, or 8.6% of their total external debt, while the amount of bonds maturing in the present year does not represent a particularly large magnitude.

The growth rate of household debt continues to fall. Bank consumer loans is the main component behind this drop. These lower growth rates reflect both a less favorable macroeconomic scenario and the fact that there is less space to grow in the most traditional segments. Therefore, the supply from both bank and nonbank issuers tends to be oriented to new segments, especially lower income segments. The access to credit for new clients implies that the debtors must learn to realistically determine their payment capacity. The suppliers, in turn, must invest in getting to know the behavior of their new clients, as a basis for carrying out an adequate risk management. This process must be approached prudently by both the debtors and the loan suppliers, especially in the face of risk scenarios like those emphasized in this *Report*.

In addition to the abovementioned developments in household credit, and in line with a less favorable macroeconomic scenario, local banks present lower growth rates in their business loans and more restrictive future conditions, as indicated by the Central Bank's Survey of Bank Credit. The more restrictive conditions apply to all sectors, but especially to the sectors that are most dependent on domestic demand, such as agriculture and livestock and also construction.

Banks continue to face the challenge of using alternative financing sources to cover a possible change in pension fund portfolios toward increased investment abroad. Relative to the last *Report*, the volume of funds that could leave has grown: although the foreign investment limit on pension funds has risen, the funds have not made full use of the greater funds available for foreign investing. However, the banking system has obtained longer-term financing abroad and has increased its holdings of liquid assets, thereby improving its liquidity position. These movements go in the right direction given the new financing risk scenario that the banks face. Nevertheless, this *Report* highlights the possibility of a contraction in the supply of credit in the main financial centers, which implies that local banks should manage their foreign liquidity positions very carefully and adopt the necessary actions to ensure fluidity in their access to external markets.

Compared with the last *Report*, the banks present a somewhat tighter capital position and a greater sensitivity in the stress tests. This last result, however, is heterogeneous and mainly applies to banks with a larger share of their assets in segments that are more sensitive to the cycle, as is the case of consumer loans. Nevertheless, some banks have already increased their capital and announced additional increases for the rest of the year.

In this scenario of greater financial turbulence, it is noteworthy that both banks and firms have increased their foreign debt, which indicates that access to external financing has not been shut off. The economy's foreign risk premium increased slightly in this period. At the same time, the accumulation of assets abroad continues, particularly as a result of investment decisions by the Government and the institutional investors. Despite the continuing access to external financing (as of the close of this *Report*), the possibility of a more severe tightening of international liquidity cannot be discounted, in line with the events analyzed in this *Report*. This risk scenario motivated the Central Bank's decision to accumulate US$8.000 billion in additional reserves over the course of the year.

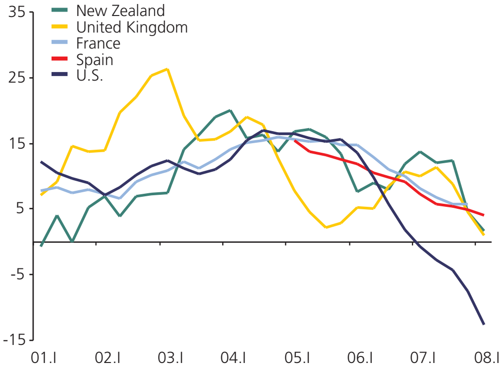
In sum, the current macroeconomic policy scheme, the framework of prudential regulation, the equity position of the banking system, and the levels of solvency presented by the Chilean economy should contribute significantly to facilitating a gradual adjustment to tighter global financial conditions. This resilience will be supported by the process of international liquidity accumulation initiated by the Central Bank. As detailed in the last *Report*, a greater deterioration in external financial conditions would have a negative impact on the Chilean economy, as would a world recession. Nevertheless, the analysis presented in this *Report* suggests that the Chilean financial system should be prepared to face a more restrictive external environment, without becoming an additional source of risk or volatility.

I. Financial environment and risks

Figure I.1

Home prices in advanced economies

(annual change, percent)



Source: Bloomberg.

This chapter reviews the recent conditions and developments in the international economy. It also describes and lays the foundation of the Central Bank of Chile's assessment of the main risk factors for national financial stability.

International financial environment

In the last six months, the international financial environment has been marked by a deepening of the financial crisis originating in the U.S. real estate market. The effects of this crisis have expanded into markets and financial institutions that were originally very distant from the U.S. residential mortgage market. This has occurred in a period of economic slowdown for the U.S. economy, and the probability that something similar could happen in the euro area —and thus in other economies— is rising. At the same time, inflation risks have increased around the world. In addition to complicating the implementation of monetary policy, this has generated high volatility in the price of assets that offer greater relative protection against this risk.

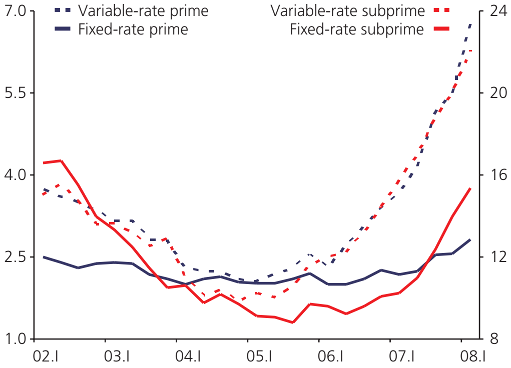
Since the last *Report*, the main events that have taken place in the international financial markets have been the new recognition of losses on the part of important financial institutions and the determined intervention by the U.S. Federal Reserve (the Fed) to support the sale of Bear Stearns, with the goal of avoiding a bankruptcy that would have severe systemic consequences.

The U.S. financial and real estate crisis continues to deepen

Figure I.2

Default on residential mortgages in the U.S.

(percent of total loans in each category)



Source: Bloomberg.

The mortgage crisis has continued to build as a result of sharper drops in home prices, which have resulted in higher residential mortgage default rates and new loss recognition by the big financial institutions involved. In March, used home sales and home prices fell 19% and 14% annually, respectively[1]/. This reflects the severe reduction in activity in the U.S. real estate market in the past year (figure I.1). The subprime mortgage default rate in the U.S. has continued to grow at a fast pace, registering around 19% as of March 2008. This segment represents 15% of total outstanding mortgage loans, and it is made up primarily of variable-rate mortgages. Moreover, although the default rates of lower-risk segments (prime and alt-A) are four or five times lower, their payment behavior has worsened (figure I.2).

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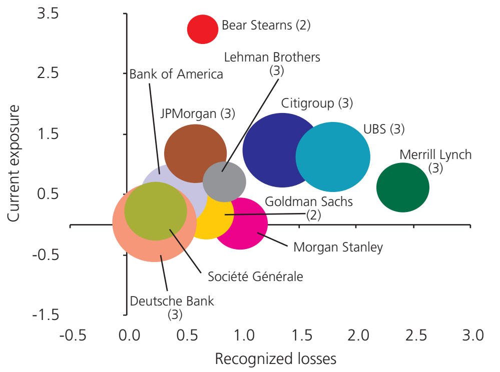
[1]/ According to several analyses, these price drops are the main explanation of the increase in mortgage default. See Doms, Furlong, and Krainer (2007).

Figure I.3

Exposure to and loss from subprime mortgage assets (1)
(percent of total assets)

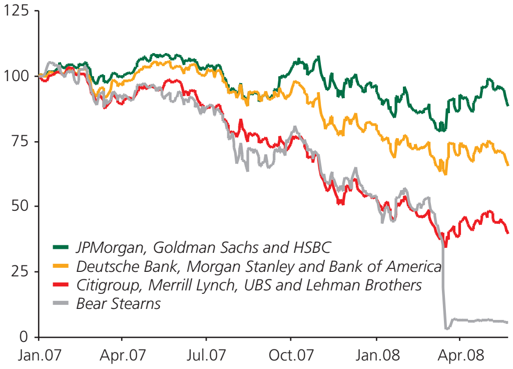


(1) The size of each circle represents the bank's total assets as of December 2007. The unnumbered circles include actual losses as of the same date.
(2) Include estimated losses as of March 2008.
(3) Include actual losses as of March 2008.

Source: Central Bank calculations, based on data from press releases and financial system reports.

Figure I.4

Financial institutions' stock prices (*)
(index 02 Jan. 07 = 100)



(*) Grouped by similarity in the evolution of their stock prices.

Source: Central Bank calculations, based on data from Bloomberg.

In addition to generating losses in institutions that specialize in providing or securitizing mortgages, the subprime crisis continues to affect commercial and investment banks in the U.S. and Europe whose balance sheets include derivative and securitized assets and instruments backed by residential mortgages in the U.S. The valuation of these assets has also been affected by the tightening of liquidity in these markets. In addition, the downgrading of bond risk ratings has contributed to these losses by reducing the valuation of the insured assets.

As of the statistical closing date of this *Report*, the losses incurred by commercial and investment banks on structured instruments and loans in the last year were over US$380 billion, which represents more than 2% of assets for some of these institutions, or 20% of equity (figures I.3 and I.4). These have been only partially offset by capital increases, which reached over US$260 billion as of the same date. This is reflected in core capital, which has fallen significantly for some international banks (table I.1).

Table I.1

Losses, capital increases and capital adequacy of international banks (1)

	Losses from writedowns and loans (2)	**Capital increases (2)**	**Core capital ratio as of March 2007 (3)**	**Core capital ratio as of March 2008 (3)**
	(US$ billion)		(percent)	
Citigroup	42.9	44.1	8.3	7.7
UBS	38.2	28.8	11.7	6.9
HSBC	19.5	2.0	9.3 (4)	9.3 (5)
Bank of America	14.8	19.7	8.6	7.5
JPMorgan Chase	9.8	7.8	8.5	8.3
Washington Mutual Bank	9.1	10.0	7.8	8.1
Deutsche Bank	7.7	3.2	8.7	9.2
Wachovia Bank	7.0	10.5	7.4	7.5
Bayerische Landesbank	6.8	0	7.7	7.3
Société Générale	6.3	10.3	7.5	7.9
ING Bank	6.1	3.2	7.7	8.3
Barclays	5.2	9.7	7.3	7.6 (5)
Dresdner Bank	3.4	0	10.7	9.2
Wells Fargo	3.3	2.5	8.7	7.9
ABN AMRO	2.5	0	8.4	10.6 (5)
Banco Santander	n.a.	n.a.	7.6	7.5

n.a.: Not available.
(1) The banks included in this table represent more than 63% of the external debt of the Chilean banking system and around 11% of the external debt of the economy as of December 2007.
(2) Values accumulated from the third quarter of 2007 to the close of this *Report*. Except for Barclays, HSBC, and JPMorgan Chase, which include losses and/or contributions from previous periods.
(3) Core capital (or capital adequacy) ratio corresponds to the sum of equity capital plus reserves, divided by risk-weighted assets.
(4) Figure for the second quarter of 2007.
(5) Figure for the fourth quarter of 2007.

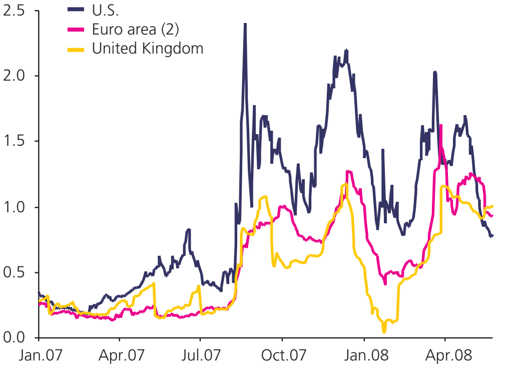
Sources: FitchRatings, Bloomberg and financial reports of the respective institutions.

Additionally, the perception of credit and counterparty risk in the interbank markets of some of the advanced economies remains high, as evidenced in the high spreads between the Libor and the rates on credit-risk-free assets. Short-term spreads, which have fallen from the peaks reached at the end of last year, are currently situated between 80 and 90 basis points in the

Figure I.5

Three-month interest rate spread (1)

(percent)



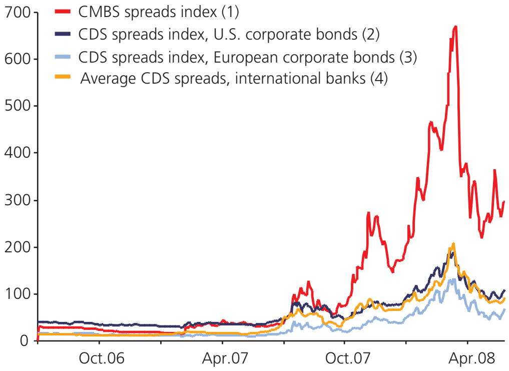
(1) Three-month Libor versus three-month Treasury bond rate.
(2) Germany's three-month Treasury bond rate is used for the euro area.

Source: Bloomberg.

Figure I.6

Measures of risk perception in the mortgage, banking and corporate sectors

(basis points)



(1) CMBS = Commercial mortgage-backed securities. Index with investment grade and in the U.S.
(2) CDX compound index, with investment grade.
(3) iTraxx compound index, with investment grade.
(4) CDS = Credit default swaps. Five-year CDS from Goldman Sachs, JPMorgan, Citigroup, Lehman Brothers, Merrill Lynch, Bank of America, HSBC, Deutsche Bank, Santander and BBVA.

Sources: Bloomberg and JPMorgan.

U.S. and the euro area, respectively (figure I.5). The persistence of liquidity problems that these spreads signal has obligated monetary authorities in the U.S., the U.K., and the euro area to supply extraordinary amounts of liquidity through their usual mechanisms and, in the former two cases, to establish special mechanisms, such as the swap of liquid assets on their balance sheets for illiquid assets on the balance sheets of the banks (box I.1). It is expected that these special liquidity provisions will continue as long as uncertainty remains at current levels.

Several large investment banks, hedge funds, structured investment vehicles (SIV), and other conduits have experienced financing problems stemming from the withdrawal of investors in the face of uncertainty about the quality and value of the assets on their balance sheets. This business model, based on the roll-over of short-term liabilities to finance long-term assets, exposed Bear Stearns to a sudden drop in investors' confidence and willingness to loan against the firm's asset collateral, and led to its sale to J.P. Morgan Chase in March, with the support of the Fed and the U.S. Treasury. This event reduced the perception of the probability of a crisis stemming from bank runs or liquidity problems, but uncertainty about asset quality persists (figure I.6).

In this context, the financial intermediaries in the advanced regions are in a process of deleveraging, which is reversing the excessive credit growth of the period prior to the crisis. This deleveraging is being carried out in three ways: first, replenishing and increasing capital, as evidenced by the capital injections negotiated with sovereign investment funds at the end of last year and beginning of 2008, followed by the recent sale of stock shares and new issues in financial markets; second, downsizing and restructuring their balance sheets, including liquidating assets and risky business areas; and finally, reducing their willingness to take risks and lending, as confirmed by surveys on bank lending standards in the U.S., the euro area, and the U.K. In addition, these institutions will face a more difficult environment for financing their loans, as the markets of securitized assets are expected to continue to be very tight until at least 2009 (table I.2).

Table I.2

ABS and CDO issues (*)

(US$ billion)

	2006				2007				2008
	I	II	III	IV	I	II	III	IV	I
Total ABSs	68.7	67.6	63.7	59.0	58.1	48.5	21.8	17.9	15.4
Car loans	6.3	5.2	9.0	8.2	4.2	7.8	4.7	4.8	3.5
Credit cards	6.7	5.3	6.1	4.1	8.1	7.5	7.6	6.9	9.0
Residential mortgages	50.4	50.3	43.7	41.9	38.2	30.1	6.0	3.2	0.1
Student loans	5.3	6.8	4.7	4.4	1.8	3.1	3.5	3.1	2.7
Total CDOs	108.0	125.0	138.6	180.1	186.5	175.9	93.1	47.5	11.7

(*) ABS = Asset-backed securities, CDO = Collateralized debt obligations. ABS issues correspond only to the U.S.

Sources: JPMorgan and the Securities Industry and Financial Markets Association.

External threats to financial stability

Credit tightening in international markets

Various bank surveys show that credit continues to tighten in the advanced economies for a wide range of credit users (table I.3). This is likely the result of the deterioration in the lending capacity of the banks that have been most strongly affected by the subprime crisis, combined with a generalized reduction in the willingness to grant credit and take risks.

Table I.3

Indicators of real activity, expectations, and financial conditions in advanced economies

	2007				2008
	I	II	III	IV	I
GDP (annualized rate)					
U.S.	1.5	1.9	2.8	2.5	2.5
Euro area	3.2	2.5	2.7	2.2	2.2
United Kingdom	3.0	3.2	3.1	2.8	2.5
Consumer confidence index (1)					
U.S.	92.2	86.9	85.7	77.5	72.9
Euro area	-5.4	-2.6	-3.9	-7.7	-11.9
United Kingdom	-6.2	-4.2	-2.5	-3.8	-8.6
Household financial conditions index					
U.S. (2)	5.5	6.8	10.4	24.8	33.8
Euro area (2)	-6.0	-1.0	5.0	16.0	26.0
United Kingdom (3)	n.a.	-2.9	0.1	-31.2	-30.7
Financial conditions index for medium-sized and large firms					
U.S.(2)	0.0	-3.7	7.5	19.2	32.2
Euro area (2)	-4.0	-3.0	31.0	41.0	49.0
United Kingdom (3)	n.a.	1.8	-20.2	-51.8	-37.3

n.a.: Not available.
(1) Higher or more positive indicates more confidence.
(2) Higher or more positive indicates less favorable conditions.
(3) Higher or more positive indicates more favorable conditions.

Sources: Federal Reserve, European Central Bank, Bank of England, Michigan University and Thomson Datastream.

The primary factors contributing to the banks' reduced capacity to finance their loans in the last six months have been the following: (a) reductions in equity, due to accumulated losses, (b) financing difficulties, in the face of the impossibility of financing illiquid long-term assets by rolling over short-term liabilities; and (c) a shortage of regulatory capital, to the extent that banks have increased the risky assets on their balance sheets, —mainly by absorbing and backing SIVs and leveraged buy outs (LBOs).

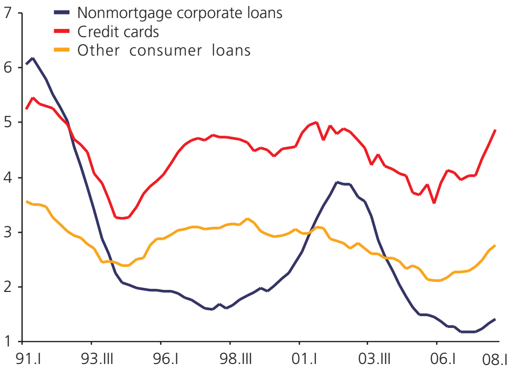
In addition to the above factors, banks are expected to be less willing to grant new loans and more cautious in their risk evaluations, as they anticipate the effects of the contraction of the real cycle and the credit tightening at the international level on the payment behavior of their debtors in other segments of their loan portfolio.

At the same time, the residential mortgage loan portfolio in the U.S. and other advanced economies could deteriorate further. This would be the

Figure I.7

Default rates on corporate and consumer loans in the U.S. (*)

(percent of total loans in each category)



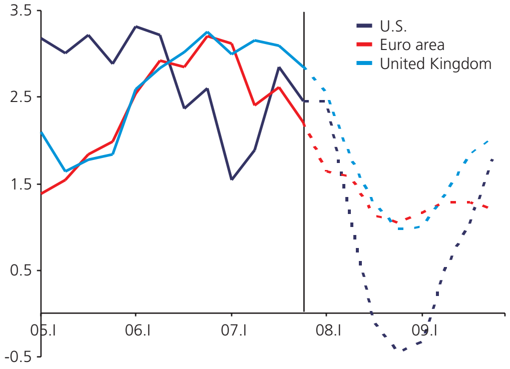
(*) Corporate loans exclude agricultural loans.

Source: Federal Reserve.

Figure I.8

Growth projections for advanced economies

(annualized rates, percent)

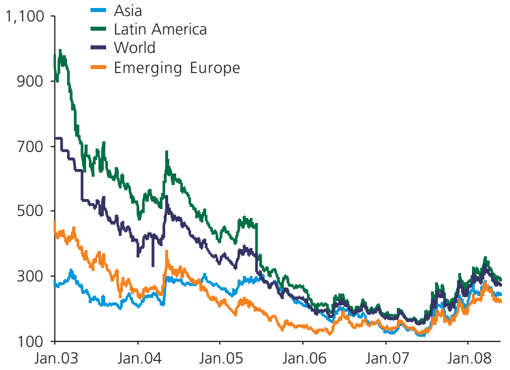


Source: Central Bank calculations, based on data from Bloomberg, investment banks and the IMF.

Figure I.9

Regional EMBI

(basis points)



Source: Bloomberg.

result of further drops in home prices, the expected fall in employment and income, and, in the U.S., the upward adjustment of the (initially low) interest rates on a share of these loans. An increase in default on commercial mortgages is also expected, especially in the housing construction sector. While the default rate for this segment remains at low levels in the U.S., it has quintupled in the last year to reach 4.6% of this loan portfolio. Several other advanced economies, including the United Kingdom, Spain, France, and New Zealand, are beginning to observe a similar trend in the prices of residential and commercial properties and the default rate on commercial mortgages. The default rate on consumer loans —credit cards, car loans, and student loans— could also register an increase, rising above the low levels that have been maintained to date. Finally, various asset prices incorporate expectations of an increase in corporate credit risk —not only in the U.S., but also in Europe— in the coming months, reversing the historically low levels of the present period (figure I.7).

Against this backdrop, the main concern for national financial stability is the growing possibility of a deeper and more prolonged global credit crunch than has been seen thus far, especially in the banking industry.

Global slowdown

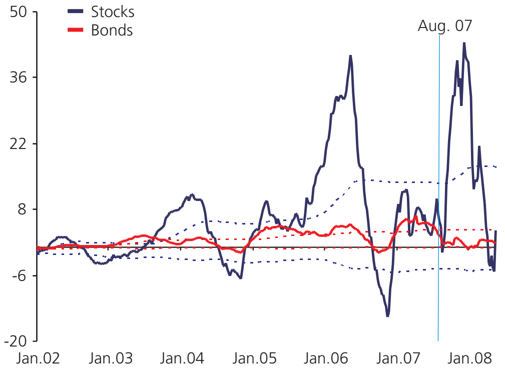
Several indicators suggest that the U.S. economy is either already in a recession or decidedly headed to one, which would have a negative effect on Europe and the emerging economies. U.S. output growth in the first quarter of this year was mainly due to the buildup of inventories, since consumption and investment stalled. Moreover, drops in employment and several indicators of economic activity in recent months —such as construction and manufacturing, as well as the index of confidence in the economy— increased the possibility of a strong slowdown (figure I.8). Indicators of Europe's activity still do not show clear signs of moving in this direction, but the appreciation of the euro, together with the effects that a recession in the U.S. would have on the world economy, increase the risk of a significant slowdown in Europe in the coming quarters. This viewpoint is consistent with the latest growth projections from the European Commission, which estimates rates around 2.0% and 1.8% for this year and the next one in the European Union, and 1.7% and 1.5%, respectively, in the euro area.

Thus far, the emerging economies have been resilient to the slowdown in the advanced economies, but they will probably also be affected. On average, the emerging economies' sovereign risk premiums are higher than they were a year ago, although they have fallen steadily since February (figure I.9). Capital stock flows have fallen from the euphoric levels of late 2007, but they still indicate a net capital inflow, while debt flows have remained relatively stable during the year as a result of lower borrowing requirements in these economies (figure I.10). Asia's lower dependence on U.S. demand for its exports has contributed to the fact that the Asian countries, especially China, have not shown signs of a significant economic slowdown (figure I.11). The OPEC countries will continue to be dynamic, as far as oil prices remain extraordinarily high. However, the Baltic countries and Eastern Europe are vulnerable given the prospect of a tightening of conditions for access to external financing. Their vulnerabilities include the overheating of their economies, the high degree of their households indebtedness in foreign

Figure I.10

Capital inflows to emerging economies (*)

(US$ billion)



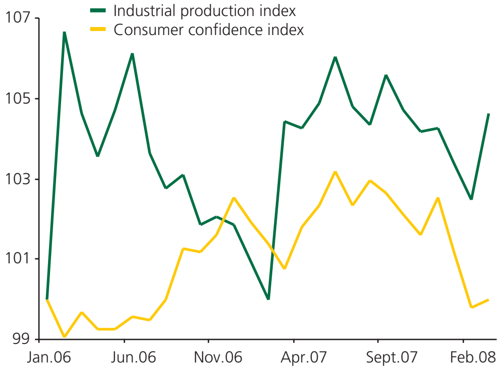
(*) The dotted lines represent confidence intervals of more or less than one standard deviation.

Source: Emerging Portfolio Fund Research.

Figure I.11

Indices of the Chinese economy

(index Jan. 06 = 100)

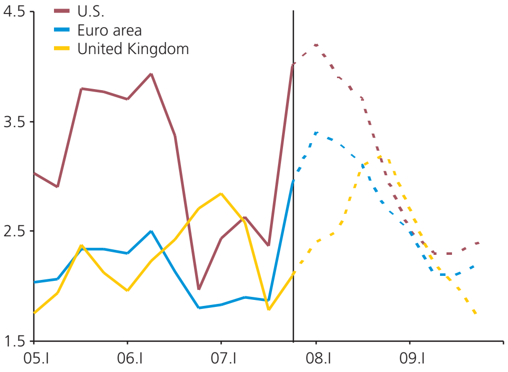


Source: Thomson Datastream.

Figure I.12

Inflation projections for advanced economies

(average annual change in local currency, percent)



Source: Central Bank calculations, based on data from Bloomberg, JPMorgan and Consensus Forecast.

currency, their current account deficits, and the high levels of their external indebtedness. A crisis in any of these economies or regions could accentuate the turbulence in the international financial markets.

Acceleration of world inflation

The period covered in this *Report* has seen a significant and generalized increase in actual and expected inflation in advanced and emerging economies (figure I.12). Price increases for a series of commodities, including some foods and oil, have been an important factor in this hike. At the close of this *Report*, the price of oil reached US$132 a barrel, accruing a 37% hike since January of this year (figure I.13).

A number of explanations have been proposed for this rise in the price of commodities, from real factors associated with the growth of demand and problems in supply, to financial factors such as low real dollar interest rates and the search for assets that offer protection against inflation.

The recent increases in expected inflation make it more likely that central banks in the main financial centers will adopt a more contractionary monetary policy. Moreover, if the inflation outlook worsens substantially, the possibility of significant hikes in policy rates cannot be discarded. Thus, in the weeks prior to the close of this *Report*, expectations of an increase in policy rates have risen in the U.S., the euro area, and the United Kingdom, despite stable liquidity conditions in interbank markets and substantial reductions in home prices in several of these economies.

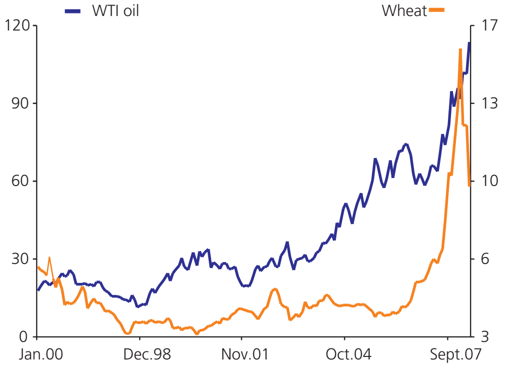
Implications for financial stability in Chile

The materialization of the identified threats could imply a tightening of the availability and access conditions —including cost— of external financing for the Chilean economy. On one hand, local credit users could be affected by a reduced willingness to lend on the part of international financial intermediaries, as a result of their precarious equity position. On the other, access conditions could also be affected by an increase in risk-free interest rates, induced by the anti-inflationary reaction of the main central banks. These risks are illustrated in figure I.14, which synthesizes the external threats to national financial stability and the changes that have occurred since the last *Report*.

A world recession would have a negative impact on the demand for Chilean exports, which would translate into a drop in both the volume of exports and export prices. The current macroeconomic scenario includes a series of possible scenarios in which such a recession could occur. The first is a deep recession in the U.S., stemming from the subprime crisis and its repercussions. A fall in the U.S. activity level alone constitutes an important risk for world activity. Finally, the oil price hike could have both direct and indirect contractionary effects. The latter could be generated by potential increases in monetary policy rates, induced by higher inflation.

Figure I.13

International oil and wheat prices (*)
(US$/barrel, US$/metric ton)

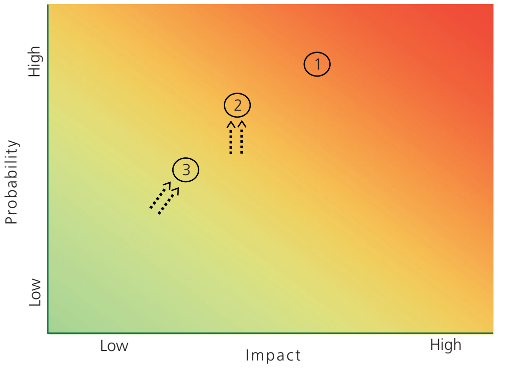


(*) Monthly averages.

Source: Bloomberg.

Figure I.14

Probability-impact matrix of external threats to domestic financial stability



(1) Credit crunch in international financial markets.
(2) Global slowdown.
(3) Acceleration in international inflation.

Source: Central Bank of Chile.

The strength of Chile's policy framework and of the Chilean external and fiscal accounts largely minimizes the potential damages that these events could trigger. The Central Bank of Chile's recent decision to increase international reserves is aimed precisely at further insuring the economy against such a scenario of greater international liquidity risk. The Central Bank will continue to monitor and evaluate the implications of these threats and risk factors for national financial stability.

Based on the relevant risk factors for the Chilean economy, this Report considers two scenarios for the stress tests carried out on different entities

To facilitate comparison over time, the stress scenarios are the same as in previous *Reports*. These consider two extremely adverse macroeconomic contexts. The first assesses the case of a shock that has a significant, but short-lived impact on real and financial variables. In this case, there is an increase in the short-term rate of 660 basis points in one quarter; the currency suffers a real depreciation and inflation accelerates, while GDP grows 4.6 percentage points less than in the baseline scenario in the first year. All these effects disappear toward the end of the second year.

The second scenario considers a less pronounced, but longer-lived impact. Short-term interest rates rise around 150 basis points in the first year. The impact on the exchange rate and inflation is about a third of the impact in the first scenario, but its effects last for several years, falling gradually. Real output grows 1.8 percentage points less than in the baseline scenario in the first year. Both scenarios assume that monetary policy behaves consistently with the Central Bank's objectives.

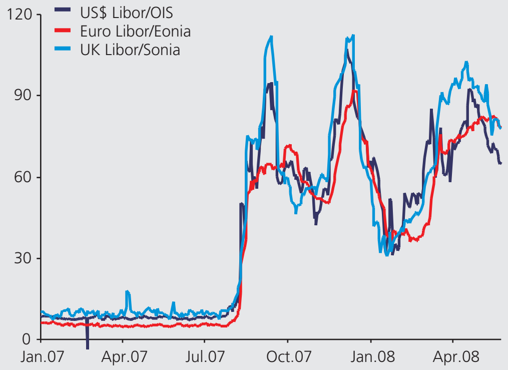
Box I.1: Recent central bank interventions in advanced economies

Since August 2007, the money markets of several advanced economies have experienced important disturbances and liquidity shortages. Increasing uncertainty regarding both their counterparties' exposure to assets backed by subprime mortgages and their own liquidity needs caused banks to reduce their supply of liquidity to other banks. This is reflected in the sharp fluctuations in the spread between the Libor and overnight swap rates (OIS, Eonia, and Sonia) (figure I.15)[2]/.

Figure I.15

Three-month interest rate spread in the interbank market (1) (2)

(basis points)



(1) Three-month Libor versus three-month overnight swap rates in the same currency.
(2) OIS = U.S. dollar Overnight Index Swap. Eonia = Euro Overnight Index Average. Sonia = Sterling Overnight Index Average.

Source: Bloomberg.

The central banks of the U.S., the euro area, and the U.K. responded differently to the liquidity crunch in their respective interbank markets (table I.4).

Table I.4

Central banks' reactions

	Federal Reserve	European Central Bank	Bank of England
Reductions in the policy rate	x		x
Extraordinary liquidity injections	x	x	x
Relaxation of discount window collateral	x		x
Three-month liquidity supply	x	x	x
Six-month liquidity supply		x	
Lender of last resort	x		x
Financial instrument swaps	x		x

Sources: Federal Reserve, European Central Bank and Bank of England.

The European Central Bank (ECB) addressed the crisis by permitting a wide range of collateral for carrying out normal operations, including securities backed by investment-grade corporate debt, and qualifying an extensive list of financial entities for participation. Unlike the Fed and the Bank of England, the ECB has not changed its monetary policy rate, or the way it runs its open-market operations, or the way it provides emergency credit. At the same time, it has extended the terms in its financing structure, concentrating on the six-month money market segment. These operations have been neutralized with repos or the sale of other assets, so the ECB's balance sheet has not grown.

In contrast to the ECB, the Fed has expanded its intervention options. Originally, both its open-market operations and the discount window were overnight or very short term (two weeks or less). These facilities were only open to some depository institutions, such that brokers and investment banks, which were experiencing most of the liquidity problems, were excluded from using them. In addition, although the Fed accepted a wide range of collateral for its discount window operations, the surcharge was high (100 basis points over the policy rate). This cost, together with the stigma attached to a financial institution that was forced to use this window, inhibited its use.

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[2]/ The Libor, which is an offered rate, is generally higher than the rate on overnight deposit swaps (which is the rate that is ultimately transacted). Also, the Libor incorporates a term liquidity premium, which has increased significantly during the turbulence owing to the lack of confidence among banks.

Thus the Fed has become the most active central bank in terms of expanding existing liquidity mechanisms and creating new ones. It aggressively lowered the policy rate (by 325 basis points from August 2007 to the close of this *Report*) and the discount window surcharge (75 basis points since August 2007). It introduced the Term Auction Facility (TAF) last December, expanding it from US$40 billion at introduction to US$150 billion in May. Every two weeks, the TAF auctions funds at 28 days to depository institutions that meet solvency criteria and are eligible for the Fed's primary credit program (usually overnight). The TAF effectively replicates the discount window, but without the associated reputational cost and with rates set by the market. In March, the Fed also introduced the Term Securities Lending Facility (TSLF) and the Primary Dealer Credit Facility (PDCF). The TSLF, which is currently over US$140 billion, provides Treasury bonds to primary dealers, who post less liquid assets as collateral. This facility effectively increases the liquidity in the repo markets, not only for Treasury bonds but also for mortgage-backed bonds. The PDCF, which stands at US$17 billion, allows primary dealers to obtain liquidity from the Fed through the discount window, authorizing a broader spectrum of collateral, at the same rate and a longer maturity (120 business days, versus 90 calendar days), than is available to depository institutions through the discount window. In August, the Fed also implemented dollar swap operations with the ECB and the Swiss National Bank to alleviate the dollar liquidity pressures in these economies. The amounts of these operations were progressively increased to US$50 billion and US$12 billion as of May.

Together, these special operations exceeded US$380 billion, or 44% of the Fed's total assets. While the bulk of these operations continue to be very short term (15 days or less), the Fed has also injected financing at more than 15 days, currently at about US$51 billion. Another effect of these operations has been to reduce the share of Treasury bonds in the assets on the Fed's balance sheet, while increasing the share of other securities such as residential mortgage-backed securities (RMBS) and commercial mortgage-backed securities (CMBS).

Finally, the Fed became the lender of last resort on rescuing Bear Stearns and supporting the purchase of the company by J.P. Morgan Chase.

At the beginning of the crisis, the Bank of England had the greatest restrictions on the range of acceptable collateral for its open market operations. In its first interventions last September, it provided liquidity through four special auctions at three months; these auctions were not very successful, however, due to the associated reputational cost. In March, the Bank of England broadened the spectrum of acceptable collateral for its normal operations at three months, but the list of securities was still much more restrictive than for its special auctions. In April of this year, it introduced the Special Liquidity Scheme, which is a swap —for up to three years— of U.K. Treasury bonds for less liquid instruments. It is estimated that the outstanding amount of these operations could reach US$100 billion. The Bank of England has also lowered its policy rate by 75 basis points since December 2007. Finally, it became the lender of last resort on rescuing the Northern Rock mortgage bank.

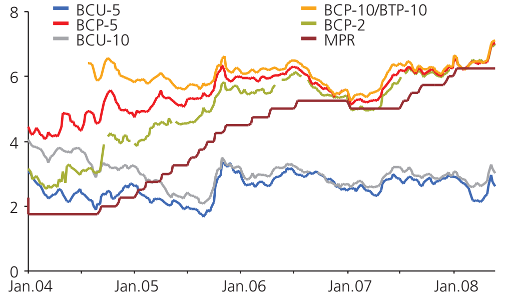
As a result, the Bank of England has increased the total amount of loans to financial institutions by more than 40% since August, and the share of its financing at three or more months has grown from 31% to 74%.

II. Domestic financial markets

Figure II.1

MPR and rates on state instruments

(weekly average, percent)

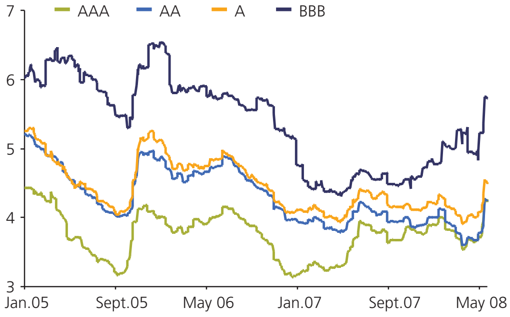


Source: Central Bank of Chile.

Figure II.2

Rates on corporate instruments

(percent)

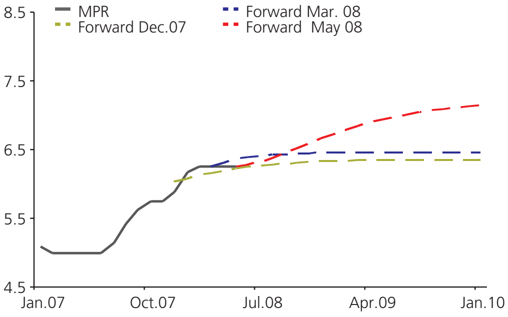


Source: LVA Indices.

Figure II.3

MPR and forward curves

(percent)



Source: Central Bank of Chile.

This chapter analyzes the main domestic financial markets, taking into account their recent evolution in terms of activity, yields, and volatility.

The events in international environment affect the currency and stock markets, while the fixed-income market reflects local developments

Events in international markets have had an impact on some of the national financial markets. The depreciation of the U.S. dollar, stemming from the adjustment of the U.S. external imbalance and the drop in U.S. monetary policy rate, has affected the local currency, as well as the currencies of other economies. The trend in the local stock market has been similar to that of the emerging economies' market stock indices, with high volatility and a strong correlation with stock indices in the advanced economies. The evolution of the fixed-income market, in turn, has been determined mainly by local events.

Higher inflation has increased the demand for inflation-indexed instruments

External factors, including the increase in commodity prices, and isolated domestic factors, associated with the impact of the drought on the prices of certain agricultural products, have contributed to an increase in inflation levels and uncertainty. This has generated a rise in investor preference for instruments that hedge inflation risk. In the first quarter of 2008, institutional investors such as the pension funds, life insurance companies, and mutual funds made net purchases of bonds totaling $400 billion. This amount, which is mostly denominated in UFs, is almost equal to the sum of purchases in the previous four quarters.

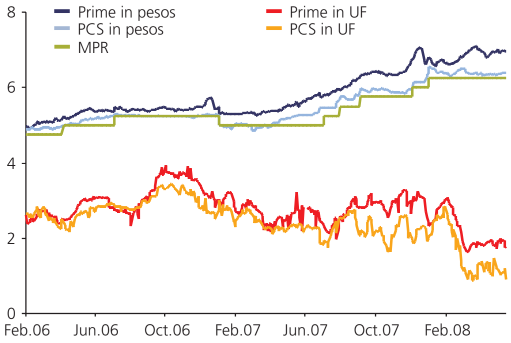
This situation explains the reduction in interest rates on indexed debt instruments in the first three months of the year. In this period, UF-denominated Central Bank notes at 5 and 10 years fell 70 and 30 basis points, respectively (figure II.1). The greater demand for UF-denominated securities extended to corporate bonds: the rates on these instruments with a risk rating between AAA and A fell between January and March (figure II.2).

While lower interest rates could give local issuers an incentive to issue debt, this effect has not been as strong in the corporate sector. In the first four months of 2008, corporate bond issues, mostly denominated in UFs, were $388 billion, which is 40% lower in real terms than issues in the first four months of 2007 (chapter III). Local banks, in turn, issued senior and subordinate bonds for the equivalent of $420 billion between January and April 2008.

Figure II.4

Prime deposit rates and "promedio cámara" swap rate (PCS) (*)

(percent)



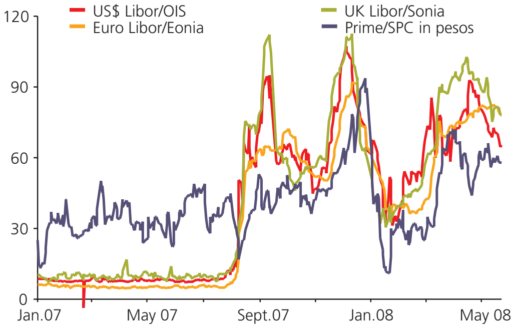
(*) Peso rates at 90 days and UF rates at one year.

Source: Central Bank of Chile.

Figure II.5

Three-month interest rate spread (1) (2)

(basis points)



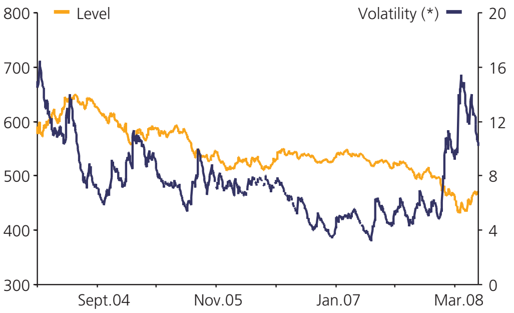
(1) Three-month Libor versus three-month overnight swap rates in the same currency.
(2) OIS = U.S. dollar Overnight Index Swap. Eonia = Euro Overnight Index Average. Sonia = Sterling Overnight Index Average.

Sources: Bloomberg and Central Bank of Chile.

Figure II.6

Level and volatility of the exchange rate

(Ch$/US$, percent)



(*) Calculed as a moving window of the change in maximum and minimum prices each day, exponentially weighted by a 0.94 factor.

Source: Central Bank calculations, based on data from Bloomberg and Central Bank of Chile.

On 10 April, the Central Bank announced its program for reinforcing the international liquidity position by hoarding US$8 billion in reserves, to be carried out between 14 April and 12 December 2008 (box II.1). At the same time, the Bank updated its calendar of monetary operations, open market operations, and its debt program as a way of sterilizing the liquidity effects associated with the reserve accumulation (box II.2). The updating of the debt plan for the period from May to August, announced on 7 May, considers an increase in the supply of Central Bank bonds of US$3 billion, made up of 75% UF-denominated debt instruments and 25% peso-denominated instruments. In addition, the new plan contemplates the issue of a new benchmark: the two-year UF-denominated bond (BCU-2).

Following the Central Bank's announcement and an announcement by the Finance Ministry regarding new bond issues, long-term rates increased sharply, which is partly explained by the initial response of market agents to the supply shock. Nevertheless, as of the closing date of this *Report*, the rates on indexed state papers (BCU-5 and BCU-10) have returned to the levels seen at the beginning of the year, closing at 2.6% and 3.0% in May 2008. The rates on corporate instruments, in turn, also adjusted upward following the announcement of the debt calendars.

Nominal rates have remained in line with recent trends in the MPR

The trend for nominal rates on long-term state instruments has tracked the evolution of the monetary policy rate (MPR), reaching average levels of 6.5% in April 2008. These rates then rose 60 basis points in May in response to greater inflation expectations, whereas the MPR stayed at 6.25% through the close of this *Report*. However, MPR forward curves indicate that the market anticipates new increases in this rate, —up to two adjustments of 25 basis points each in the next twelve months (figure II.3)[1]/.

Peso liquidity remains stable, despite the increase in peso financing rates

The nominal rates on time deposits that banks offer their prime customers —mostly institutional investors— continue to follow an upward trend[2]/. Following a 100-basis-point increase in December 2007, the 90-day nominal prime rate recorded strong shifts in the first few months of 2008, reaching 7% in May of this year[3]/. Prime rates quoted in UFs fell 130 basis points in the same period (figure II.4). On the margin, these shifts in the banks' cost of financing are explained by expectations of an increase in the monetary policy rate —as indicated by the "*promedio cámara*" interest rate swap— and by the increase in the inflation premium.

Nominal prime rates have increased more than nominal swap rates, such that the spread between the two has risen from an average of 30 basis points in the first half of 2007 to 60 basis points in May 2008 (figure II.5). This spread is correlated with liquidity premiums in the advanced economies' banking systems, which is consistent with the Chilean financial system's integration in international markets. However, the increase in the local spread is less

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[1]/ After the statistical closing date of this *Report*, the Central Bank Board raised the policy rate to 6.75% in its monetary policy meeting on 10 June.

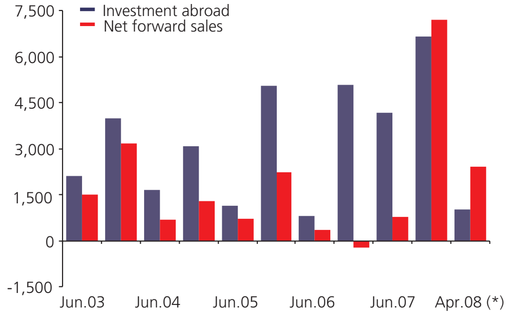
[2]/ The average deposit rates for non-prime customers also followed an upward trend.

[3]/ Longer-term nominal rates recorded a similar movement. The correlation between 90-, 180-, and 360-day rates is over 94%.

Figure II.7

Pension fund hedging

(half-yearly absolute change, US$ million)



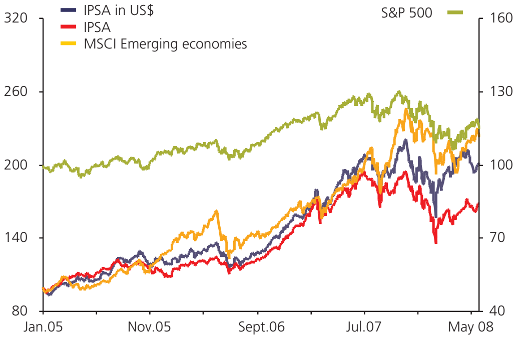
(*) Change between December 2007 and April 2008.

Source: SAFP.

Figure II.8

Stock indices

(index Jan. 05 = 100)

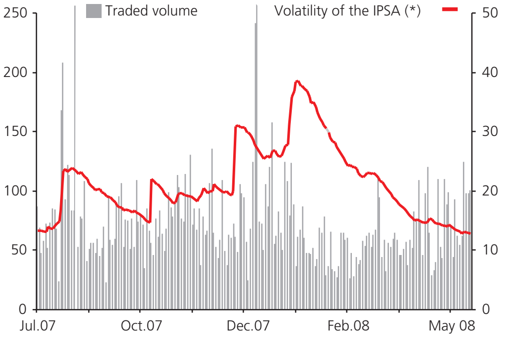


Source: Bloomberg.

Figure II.9

Local stock market

(Ch$ billion, percent)



(*) Calculed as a moving window of the change in maximum and minimum prices each day, exponentially weighted by a 0.94 factor.

Source: Central Bank calculations, based on data from data from the Santiago Stock Exchange and Central Bank of Chile.

significant than that observed in these economies (chapter I), indicating that the transmission of external liquidity conditions has been limited.

Exchange rate volatility has fallen…

The volatility and level of the peso-dollar exchange rate have swung sharply in recent months. In the first quarter, exchange rate volatility reached a maximum of 15.4% a year, far higher than the historical average of 8%. The exchange rate level fell from 496 pesos to the dollar to a minimum of 431 pesos to the dollar, which amounts to a drop of 15% (figure II.6)[4]/. As mentioned earlier, both effects were generated, in part, by the global depreciation of the dollar, the favorable terms of trade seen recently, and, to a lesser extent, the expanding interest rate differential between Chile and the U.S. (box II.3). In recent weeks, however, exchange rate volatility has fallen to 10%, while the level was 472 pesos to the dollar at the close of this *Report*.

…and the increased activity in the forward foreign exchange market continues

Activity in the currency derivatives market has also risen since the last quarter of 2007. The pension funds have been using hedge derivatives more extensively through the sale of dollar futures, acquiring a net sales position of US$22.6 billion in the month of April 2008. Between August 2007 and April 2008, the amounts involved in these operations exceeded US$8.6 billion. The majority of the transactions were concentrated in August 2007, when the pension funds strongly increased their foreign investment positions following the increase in their foreign investment limits. During the period covered in this *Report*, the pension funds increased their dollar futures sales to rates above their spot dollar purchases, used for their investments abroad (figure II.7). Other non-institutional and non-resident investors have made net purchases of dollar futures, generating a net buyer position of US$17.6 billion as of April (box IV.1).

The stock market tracks international market trends

The higher volatility of the international markets was also felt in the local stock market. In January 2008, the principal national stock market index, the IPSA, fell below 2,500 points, its lowest value since December 2006. Since that date, it has regained an upward trend, and it exceeded 3,000 points at the close of this *Report*. The local stock market, like other stock markets in the region, reacted to the sharp drops in the U.S. stock markets, upon the announcement of weak macroeconomic results, and discouraging news in the financial sector. In January 2008, the S&P 500 index registered its worst performance since October 2002, while the MSCI Emerging Markets index fell 12.7% in the same month (figure II.8).

These international trends contributed to the increased volatility of the IPSA, which exceeded 40%, the highest volatility of the last two years. The amount of stocks traded fell moderately, but maintained an average of $50 billion a day (figure II.9). Finally, the IPSA's drop has affected its price-to-earnings ratio, which fell from 24 times in October 2007 to 20 times in April 2008.

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[4]/ The volatility measure is based on intraday exchange rates. For details, see "Volatility measures for financial markets," included in this *Report*.

Box II.1: **Hoarding of international reserves in the current macrofinancial scenario**

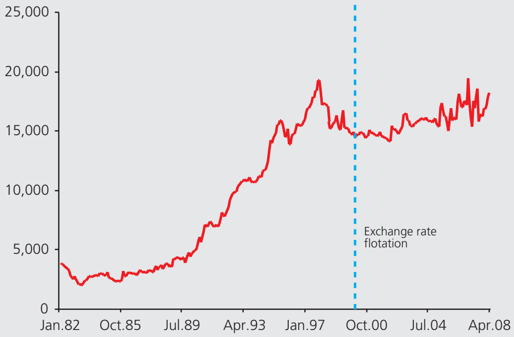
International reserves are liquid foreign currency assets held by the Central Bank of Chile. They constitute an instrument that supports monetary and exchange rate policy in fulfilling the objective of monitoring monetary stability and the normal functioning of internal and external payments. Within the framework of the floating exchange rate policy regimen in place in Chile since September 1999, the objective of international reserve management is to efficiently provide secure access to international liquidity, which protects the Central Bank's financial equity worth.

The level of the Central Bank of Chile's international reserves has been widely discussed in the economic field, especially since the Asian crisis of late 1997. In the 1990s, the Chilean economy significantly improved its monetary, political, and fiscal fundamentals, and it accumulated international reserves (figure II.10). This increase in the reserve level is largely explained by Central Bank interventions, with the goal of accommodating the considerable capital inflows of the period in the context of a band-based exchange rate policy.

Figure II.10

Chile's international reserves

(US$ million)



Source: Central Bank of Chile.

Since 2000, and following the implementation of a floating exchange rate regime, the stock of international reserves has undergone variations that have kept the reserve level relatively stable, despite greater financial and commercial integration[5].

International evidence shows that countries that are financially integrated in international markets are exposed to reversals in financial flows caused by liquidity shocks to their capital accounts. When the economy suffers a liquidity shock that makes it impossible to meet its short-term foreign currency liabilities, this phenomenon could trigger very adverse scenarios such as bankruptcies among firms exposed to exchange risk and, ultimately, within the financial system. The first- and second-generation perspectives on the causes of crises consider the inadequate management of the economy and/or lack of credibility as main causes. More recent perspectives have in common the idea that crises can be viewed as the result of a shock that is amplified[6]. The story is similar, however: currency depreciation ends up having an effect on output by affecting agents' access to credit. The departure of asset prices from their fundamentals, as well as international investors' margin calls, can also lead to sharp adjustments on the part of investors and to possible contagion.

Under the current international macrofinancial scenario, there is the possibility that the U.S. subprime crisis could be transmitted to emerging economies, causing liquidity problems and significant asset price adjustments. In addition, the future evolution of policy rates is not yet clear in developed economies that have recorded surprise increases in inflation stemming from the increase in oil and food prices, among other factors. The materialization of the events described above could be associated with significant adjustments in the capital inflows into Chile, together with deterioration in the terms of trade.

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[5] On 5 November 2003, the Central Bank Board offered the option of gradually exchanging debt securities expressed in dollars and payable in pesos that were due between 1 December 2003 and 1 December 2004, for equivalent non-renewable securities payable in dollars. As a result of this policy, the Central Bank reduced its international reserves between 2003 and 2005.

[6] Krugman (1999) and Chang and Velasco (1999) present models that support this mechanism.

Table II.1

International reserve adequacy indicators
(times)

	IR/GDP (1)	IR/M2	IR/Imp.	Guidotti index (2)	Liabilities index (3)
Country/Group	**December 2003**				
Brazil	0.09	0.38	0.96	2.0	0.27
Colombia	0.14	0.46	0.78	3.0	0.48
Israel	0.23	0.22	0.72	-	0.32
Malaysia	0.40	0.41	0.54	5.1	0.50
Mexico	0.09	0.20	0.33	6.4	0.37
Peru	0.16	0.18	0.99	3.9	0.38
Thailand	0.29	0.26	0.54	3.8	0.84
Emerging economies (4)	0.23	0.63	0.76	5.0	-
Chile	0.21	0.42	0.91	2.21	0.78
Country/Group	**December 2005**				
Brazil	0.06	0.25	0.69	2.2	0.21
Colombia	0.12	0.37	0.70	2.4	0.62
Israel	0.21	0.22	0.60	-	0.26
Malaysia	0.51	0.46	0.61	5.7	0.62
Mexico	0.10	0.20	0.32	11.3	0.33
Peru	0.17	0.16	0.94	4.3	0.44
Thailand	0.29	0.27	0.43	3.2	1.20
Emerging economies (4)	0.25	0.70	0.75	5.7	-
Chile	0.14	0.27	0.53	2.39	0.61
Country/Group	**December 2007**				
Brazil	0.14	0.50	1.42	7.9	0.26
Colombia	0.12	0.33	0.80	3.1	0.62
Israel	0.18	2.18	0.57	-	0.25
Malaysia	0.44	0.37	0.63	5.7	0.61
Mexico	0.10	0.19	0.32	19.3	0.29
Peru	0.15	0.13	0.94	6.1	0.49
Thailand	0.27	0.25	0.51	4.6	1.28
Emerging economies (4)	0.25	0.63	0.91	4.9	-
Chile	0.10	0.18	0.37	1.51	0.51
Country/Group	**December 2008 (f)**				
Chile (5)	0.15	0.23	0.44	2.07	0.75

(f) Forecast based on the reserve accumulation program, applied to the stock in February 2008.
(1) International reserves are reported by the IMF. For Chile, the information is published by the Central Bank of Chile.
(2) Corresponds to the ratio of international reserves to short-term external debt.
(3) Corresponds to the ratio of international reserves to (gross short-term liabilities + current account deficit).
(4) The group of emerging economies is made up of the 31 countries thus categorized by JPMorgan Chase.
(5) Chile's 2008 GDP is taken from the IMF projections in the *World Economic Outlook*, April 2008. International reserves for 2008 equal the sum of the stock at the end of 2007 plus US$8 billion.

Sources: International Monetary Fund, World Bank and Central Bank of Chile.

The application of the international liquidity accumulation program announced by the Central Bank on 10 April will increase the international reserve level on the order of 50% relative to the stock in February 2008. An analysis of international reserve adequacy indicators for a broad group of emerging economies shows that Chile registered an important decline between 2003 and 2005 (table II.1). As a result, Chile's indicators are lower than those seen in other Latin American economies[7]/.

In 2003, Chile's indicators were in line with other emerging economies. The reserves-to-output ratio, for example, was 0.21, and the situation was similar for reserves to M2, reserves to imports, the Guidotti index, and the liabilities index. These indicators later fell, in contrast to trends in a set of emerging economies. The projected accumulation for the present year reverses this trend, so as to come on line with the historical trends of economies similar to Chile and to respond to the current financial and macroeconomic environment[8]/.

A cost-benefit analysis of holding international reserves requires assumptions that capture the main elements mentioned above. In general, the level of international reserves to be held should maximize the net benefits of holding reserves and incorporate all the economy's external assets and liabilities. A simplified version of the above approach involves minimizing the probability of the occurrence of a crisis given the associated economic costs, combined with minimizing the cost of holding international reserves[9]/.

The probability of the occurrence of a crisis thus has to be taken into account when measuring the marginal costs of a US$8 billion increase in international reserves. This probability is very difficult to quantify and is subject to constant changes, in line with the evolution of the international environment and the cyclical position of the economy. Disregarding second-order effects and considering a relatively limited crisis probability of 3.3% for Chile (as estimated for 2004 by García and Soto, 2004), and taking the current country risk premium as an approximation of the financial opportunity costs of greater international reserves,[10]/ the expected additional cost per year of the higher reserves is situated around US$140 million. The benefits, in turn, must take into account that the empirical evidence estimates that the cost of a financial crisis carries an accumulated loss of 7% of GDP, which corresponds to approximately US$10 billion[11]/. Consequently, the reserve accumulation would only have to cause a 1.3% reduction in the probability of the occurrence of a crisis for the expected marginal costs to equal the expected marginal benefits. Finally, to the extent that the probability of a crisis increases, the benefit of holding a higher level of reserves also rises.

---

[7]/ International reserves to GDP is the most widely used measure of the reserves' capacity to accommodate the cost of an eventual crisis, measuring the latter over the economy's output in a given year. The ratio of international reserves to M2 appears in the literature on early warning indicators after the Mexican crisis; the literature suggests that this ratio could be a good crisis predictor, where higher levels would be inversely correlated with the probability of the occurrence of such an event (Kaminsky, Lizondo, and Reinhart, 1997, among others). The ratio of reserves to imports has been used as an adequacy indicator based on the view that trade is the main component on the balance of payments and that openness and external vulnerability are understood mainly as trade shocks (De Beaufort Winjhols and Kaptein, 2001). The Guidotti index, in turn, recognizes that the recent crises in emerging economies has to do with capital flows and liquidity, in line with theoretical contributions that support such a perspective and where the ratio of reserves to external short-term debt is tied to the probability of the occurrence of a crisis (Bussière and Mulder, 1996; Rodrik and Velasco, 1999; among others). Finally, the last ratio incorporates a greater variety of liabilities and also the need to finance a possible trade deficit.

[8]/ The level of these ratios is even lower if we consider Chile's international reserves net of short-term liabilities; —an exercise that is difficult to carry out for other economies, given the lack of data.

[9]/ See Jeanne and Rancière (2006) and García and Soto (2004) for details.

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[10]/ This assumes that the reserves are invested exclusively in U.S. Treasury bonds with a similar maturity to the external debt held by the government of each country, and that the cost of financing is given by the cost of this debt.

[11]/ IMF (1998) differentiates between a speculative crisis, a financial crash, and a bank crisis, with costs of 7.6%, 10.7%, and 14.0% of GDP, respectively.

Box II.2: **The Central Bank of Chile's liquidity management tools**

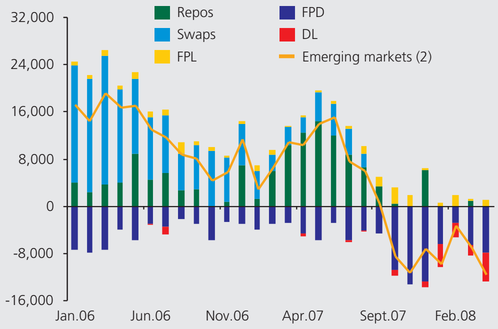
The main operational component of the Central Bank's monetary policy is the set of transactions it carries out to keep the overnight interbank interest rate close to the MPR. The rest of the system's rates are determined by the market. To keep the interbank rate situated at the desired level, the Bank uses a range of instruments to affect liquidity in the system.

In addition, the Bank forecasts the system's liquidity needs and establishes a liquidity adjustment scheme in the monthly monetary schedule. This schedule announces periodic auctions of Central Bank discountable promissory notes (*Pagarés Descontables del Banco Central*, PDBC) and schedules open-market operations through which instruments for injecting or withdrawing liquidity are bought or sold.

Gráfico II.11

Monetary operations

(Ch$ billion)



Source: Central Bank of Chile.

The Bank also has the authority to carry out discretionary open-market operations to address unexpected changes in the liquidity level. The financial terms and conditions of these operations are established by the Bank and announced in advance to achieve the desired effect, in accordance with stipulations in the *Compendium of Financial Regulations*(*Compendio de Normas Financieras*, CNF). There are also standing overnight liquidity and depository facilities, which provide banks with complementary tools for liquidity management. These discretionary operations are used to fine-tune liquidity, and they can be contractionary or expansionary.

In recent practice, the Central Bank has mainly used the following tools:

- Debt certificates' purchase operations with a resale agreement (repos): the eligible instruments are debt securities from the Central Bank and other entities approved by the Bank[12]. The usual terms are 1, 7, and 14 days.

- Currency swaps: buy-sell foreign currency operations establishing a simultaneous purchase/sale in the future for the same amount. The usual terms are 7 and 14 days.

- Liquidity deposits (DL): the discretionary reception, on the part of the Central Bank, of deposits furnished by banks. They currently pay the MPR, and the usual terms are 1 and 7 days.

- Standing liquidity facility (*Facilidad permanente de liquidez*, FPL): used to mitigate a transitory liquidity shortage. The Central Bank effects a purchase with a resale agreement using instruments authorized in the *Compendium of Financial Regulations*. The current interest rate charged is the MPR plus 25 basis points. There are no quantitative limits, other than the availability of the petitioner's collateral. As the name suggests, the availability of this facility is ongoing.

- Standing depository facility (*Facilidad permanente de depósito*, FPD): allows banks to reduce transitory excess liquidity. The Central Bank receives deposits in national currency furnished by the banks, which yield the MPR less 25 basis points. The availability of this facility is continuous.

From January 2006 to date, the net amount of monetary operations shifted from injecting to withdrawing liquidity (figure II.11). This stems from the gradual increase of liquidity in the financial system from June 2007 onward, in part due to the abolition of the technical reserve[13].

In terms of composition, swap operations ceased, repo operations were reduced, and liquidity deposit operations increased. These changes are consistent with the higher levels of liquidity seen in this market.

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[12] The instruments submitted as collateral for these monetary operations and standing facilities are subject to a percentage discount depending on their type.

[13] See box IV.1, *Financial Stability Report*, first half 2007.

Box II.3: **Capital flows: risk and return**

This box assesses the incentive generated by the differential between domestic and foreign interest rates for investors that take on debt abroad to invest in fixed-income instruments in Chile. The box also discusses the evolution of portfolio flows into the country in recent years.

The ex-ante return for an investor that contracts debt abroad and invests in Chile without using hedging instruments is

$$R_{ex\text{-}ante} = i_t - i^*_t + D_t$$

where i_t is the local nominal rate, i^*_t is the rate in dollars, and D_t the expected depreciation of the exchange rate in t. Given risk-neutral investors and no taxes or reserve requirements, the ex-ante return should be zero. If not, a capital inflow would be expected, which appreciates the exchange rate until reaching zero.

Figure II.12 shows the evolution of the domestic and foreign rate differential[14]/. The average interest rate differential between 1994 and September 1999 (when the Central Bank abandoned the exchange rate band) was 8.5%. Between September 2001 (start of the nominal monetary policy) and May 2008, the average differential was 1.3%[15]/.

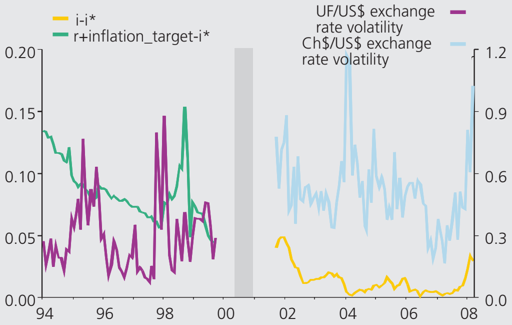
If investors are not risk neutral, then the estimation must take into account not only the expected return, but also its volatility, which is equivalent to the expected volatility of a depreciation[16]/. This expected volatility is approximated using the standard deviation of the daily yields[17]/.

Figure II.12 shows these volatilities. In the pre-1999 period, there was both a higher average interest rate differential and lower volatility compared with the post-2001 period.

Figure II.12

Yield and volatility for a foreign investor (*)

(times)



(*) Dollar versus UF and peso. Annualized yield for the interest rate spread and standard deviation of the monthly daily return for the exchange rate volatility.

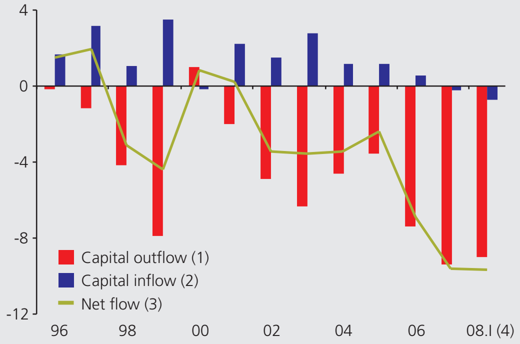
Source: Central Bank of Chile.

Figure II.13 graphs the capital inflows and outflows. The figure shows that inflows have followed a downward trend in the last few years, whereas outflows have increased. Consequently, net capital outflows have registered an important rise since 2000.

Figure II.13

Portfolio investment flows

(percent of GDP)



(1) Asset portfolio investment.
(2) Liability portfolio investment.
(3) Capital outflow minus capital inflow.
(4) Annual accumulated flow as of February 2008.

Source: Central Bank of Chile.

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[14]/ For the average bank deposit rate in pesos/UF at 90 days to one year, we used domestic nominal/inflation-indexed interest rates. For the external rate, we used the banks' average deposit rate in dollars at the same maturity.

[15]/ For the peso rate in the period before 1999, we used the UF rate plus the inflation target.

[16]/ For the period prior to the floating of the exchange rate (September 1999), we used UF-denominated returns and the UF-dollar exchange rate. For the period after nominalization (August 2001), we use nominal yields and the peso-dollar exchange rate.

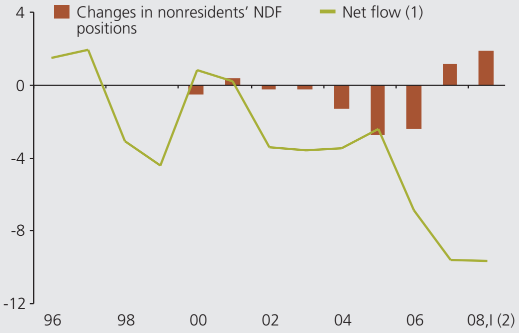
[17]/ See the article, "Volatility measures for financial markets," in this *Report*.

A considerable share of capital inflows and outflows are hedged through forward operations, so as to eliminate the currency risk for the investor. Forward operations are also used as a mechanism for speculation, depending on whether their price is higher or lower than the expected exchange rate. Whatever the case, these operations represent another way of changing the Foreign-currency asset or liability position of the Chilean economy. Figure II.14 presents the net capital inflows and changes in nonresidents' forward positions[18]/. The changes in the level of hedging are of a lower magnitude than the investment flows.

Figure II.14

Net portfolio investment flow and changes in nonresidents' NDF positions

(percent of GDP)



(1) Capital outflow minus capital inflow.
(2) Annual accumulated flow as of February 2008.

Source: Central Bank of Chile.

In sum, the rate differential has been lower in recent years than in the period before 1998, while volatility and risk have been higher. Consequently, the inflow of speculative capital has become less attractive. This appears to be corroborated by the data, which show a capital outflow even when currency hedging operations are taken into account.

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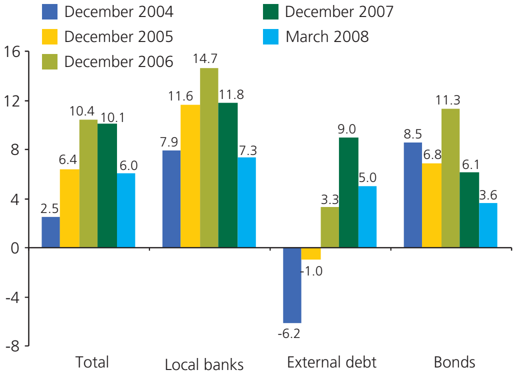
[18]/ A negative (positive) value indicates a decrease (increase) in the stock of dollar forwards bought by nonresidents.

III. Credit users

Figure III.1

Breakdown of financing sources

(real annual growth, percent)

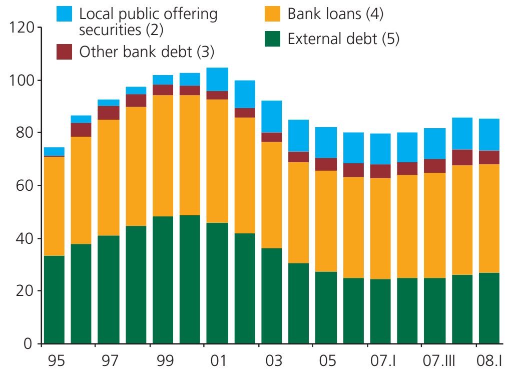


Source: Central Bank calculations, based on data from the SVS, SBIF, ACHEF and Central Bank of Chile.

Figure III.2

Total debt

(percent of GDP) (1)



(1) First quarter 2008 GDP corresponds to the moving year ending in that quarter.
(2) Corporate bonds (except Codelco), nonbank asset-backed securitized bonds and commercial paper.
(3) Factoring and leasing.
(4) Commercial and foreign trade loans.
(5) Includes loans associated with FDI. Converted to pesos using the average exchange rate for the period January 2002 to March 2008.

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

This chapter examines the financial situation of credit users and evaluates the credit risk trend in the Chilean economy and its sensitivity to the risks presented in chapter I.

Firms

Loans to domestic non-financial firms are the main asset on banks' balance sheets (49.2%). Their greatest exposure is in nontradable sectors (83.7%), and the majority of these loans correspond to large firms (66.3%)[1]. The external debt of non-financial firms represents 73.4% of the economy's external debt, and their equity and debt securities account for 23.5% of the assets of domestic institutional investors.

The aggregate financing of the corporate sector has continued to grow, increasing slightly in size relative to GDP

In 2007, total financing through debt recorded a real annual growth rate of 10.1%. This expansion is similar to growth in 2006, and it exceeds that of earlier years (figure III.1). The numbers for the first quarter of this year, however, indicate a moderate slowdown. Total debt thus represented 87% of GDP in March 2008 (figure III.2). The preferred source of debt continues to be the local banking system: loans grew 11.8% in real annual terms last year and have continued to grow this year, albeit it at a slightly lower rate. External debt maintained its share of corporate sector financing, in contrast with the reductions seen in previous years: growth accelerated in 2007, bringing external debt to 5% in March 2008.

Given this background, and considering the risk of a possible international credit crunch mentioned in chapter I, we analyzed the short-term corporate debt that is likely to need refinancing. As of December 2007, residual short-term bank debt represented 8.6% of the total external debt of firms, at US$3.557 billion. It is estimated that not more than 45% of this amount is held by non-mining sectors that are considered most sensitive to energy prices (US$1.6 billion)[2].

Bond issues were lower in 2007 than in 2006 (figure III.3). The data as of April 2008 also show lower issues vis-à-vis the same period in 2007, but listings of new bond issues were relatively more dynamic, especially in that last month.

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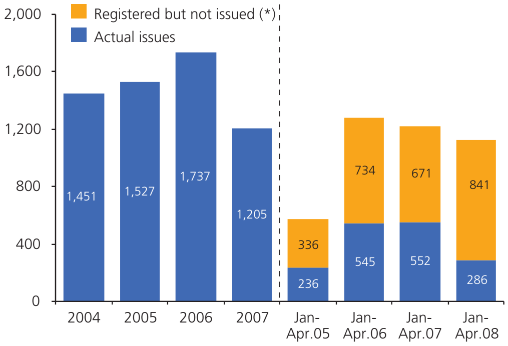
[1] With debt exceeding UF200,000.

[2] The methodology used to define the group of firms that are sensitive to energy costs is described in table III.1.

Figure III.3

Corporate bond issues

(billions of March 2008 pesos)



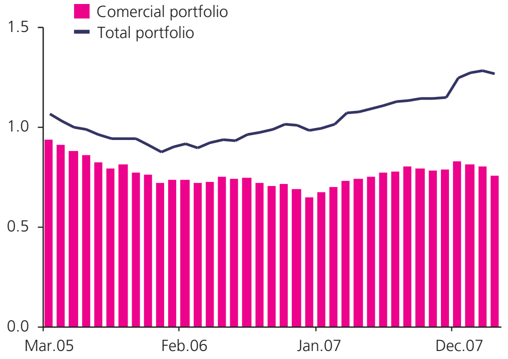
(*) Issues registered between January and April of each year but not yet issued.

Source: SVS.

Figure III.4

Loan-loss provisions (*)

(percent of each portfolio)



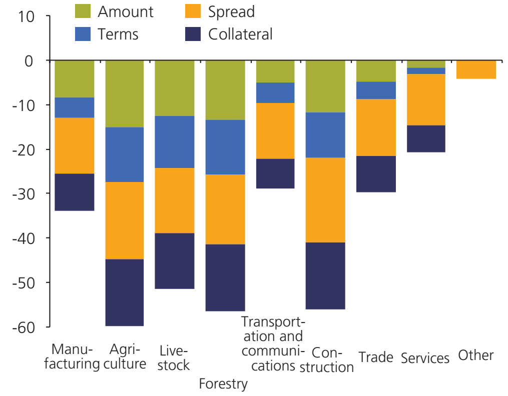
(*) Moving year ended in each quarter.

Source: Central Bank calculations, based on data from the SBIF.

Figure III.5

Index of the change in credit conditions for medium-sized firms (1) (2)

(percent)



(1) Firms with annual sales between UF25,000 and UF100,000.
(2) Constructed on the basis of the Central Bank's Bank Credit Survey. Negative values indicate more restrictive conditions.

Source: Central Bank of Chile.

With regard to corporate default risk, the banks' loan-loss provisions as a percentage of their commercial portfolio has been situated around 0.8% in recent months, and it shows no signs of weakening as would be expected in the current phase of the cycle (figure III.4).

The Central Bank's Survey of Bank Credit in March 2008 indicated that the banks anticipate more restrictive credit conditions for medium and large firms, which account for 45% of total business loans. This applies to all sectors, but it is especially the case for agriculture and livestock, forestry, and construction. In these sectors, most banks anticipate an increase in required collateral, as well as a reduction in the amount and terms of loans. The most significant factors underpinning this outlook for tradable sectors are the evolution of the exchange rate and the higher energy costs[3]/. For the nontradable sectors, the key factor is the higher inflation seen in recent quarters (figure III.5).

SVS-registered firms continue to post a healthy financial position, but they have less cushion for facing shocks

The group of firms registered with the SVS maintains a healthy financial position and a relatively low default risk on financial liabilities as of the first quarter of 2008. Some of their financial indicators, however, have deteriorated slightly. The operating margin of these firms fell slightly, on average, to 10.8% in March 2008. The group's profitability, in contrast, has remained stable, with a ROA of around 3.7% (figure III.6).

The group's payment capacity and debt indicators also show slight changes (figure III.7). The firms' balance sheet exposure to fluctuations in the exchange rate continues to be relatively low (net mismatches of 1.6% of total assets as of March 2008). However, this indicator only provides partial information on a firm's ability to face exchange rate fluctuations, because it does not take into account the impact of this variable on flows that determine operating income, such as exports, imports, and other foreign currency income or outflows.

The corporate sector's investment level has been dynamic. The mining sector has made significant investments, while non-mining firms also increased their investment, especially in the last quarter of 2007. This investment has been financed primarily with own resources (operating flows) and, to a lesser extent, with third-party debt (figure III.8).

The percentage of financial debt in vulnerable SVS firms has risen slightly

Within the group of firms registered with the SVS (excluding public firms and infrastructure), the share of financial debt in vulnerable firms has risen since the last *Report*[4]/. The percentage of debt held by firms with an interest coverage of less than two times rose from 7.2% in December 2006 to 8.5% in March 2008, as a result of a drop in operating margins. Within the same group, firms with a high exposure (leverage over 1.5 times) went from holding 7.2% of financial debt to 3.8% in the same period, with a slight increase between December 2007 and March of this year. Finally, if these

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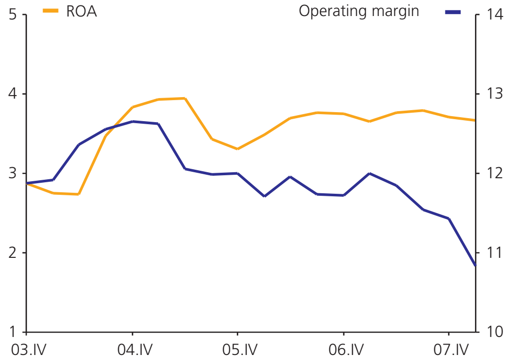
[3]/ Tradable sectors include manufacturing, agriculture, livestock, and forestry.

[4]/ The measure of vulnerability considered in this *Report* is the payment capacity on financial debt. At-risk firms are identified through their exposure, measured through their leverage ratio and their share in the total financial debt of the sample. The analysis focuses on the group with financial leverage ratios above 1.5 times and interest coverage below two times. For these firms to come to represent a systemic threat, they must not have mechanisms to mitigate default risk.

Figure III.6

Margin and profitability (*)

(moving average, percent)



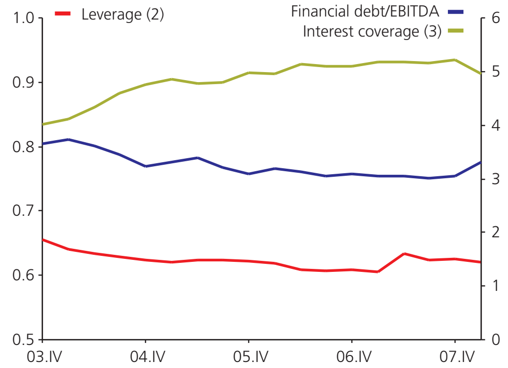
(*) Consolidated financial statements. Excludes mining.

Source: Central Bank calculations, based on data from the SVS.

Figure III.7

Debt and payment capacity (1)

(times)



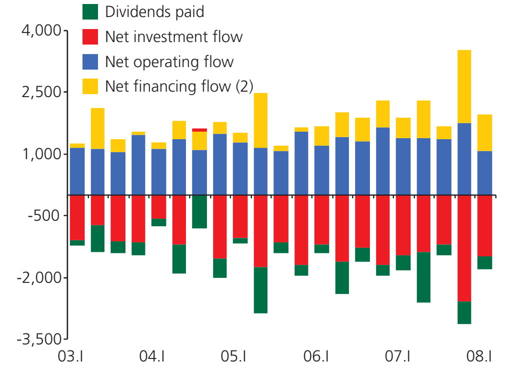
(1) Consolidated financial statements. Excludes mining.
(2) Financial debt/(Equity+minority interest).
(3) Interest coverage, moving year.

Source: Central Bank calculations, based on data from the SVS.

Figure III.8

Firms' sources and uses of funds (1)

(quarterly flows, billions of March 2008 pesos)



(1) Consolidated financial statements. Excludes mining.
(2) Excludes dividends paid.

Source: Central Bank calculations, based on data from the SVS.

vulnerability criteria are considered jointly, the share of financial debt in the hands of firms with a low interest coverage and high leverage rose slightly from 2.2% in December 2006 to 2.4% in March 2008 (figure III.9).

When the analysis of financial indicators separates out firms that are more sensitive to energy costs, it shows that the operating margin and interest coverage of this group weakened in 2006 (table III.1). However, a detailed review of these firms reveals that their overall financial situation remains healthy, so there are no implications for the financial stability of the corporate sector.

Table III.1

Financial indicators of firms, by sensitivity to energy costs (*)

	2001	2002	2003	2004	2005	2006	2007
Average sales (UF million)							
Firms sensitive to energy	2.4	2.5	2.5	3.0	3.2	3.3	3.4
Rest	2.2	2.5	2.4	2.7	2.8	2.9	2.8
Operating margin (percent)							
Firms sensitive to energy	5.5	6.3	6.4	9.0	8.2	5.5	8.0
Rest	12.7	12.3	11.8	11.3	11.2	11.6	11.8
Interest coverage (times)							
Firms sensitive to energy	3.5	4.1	4.6	6.7	7.3	4.6	6.3
Rest	2.9	2.7	3.2	3.7	4.5	4.9	4.5
Leverage (times)							
Firms sensitive to energy	0.27	0.29	0.30	0.29	0.34	0.48	0.44
Rest	0.40	0.41	0.42	0.42	0.37	0.37	0.37

(*) Excludes firms in the mining sector. Using data from the 2003 input-output matrix, the industries that are most sensitive to energy inputs were identified: 21 of the 73 categories were classified as being sensitive to energy costs. This information was then used to construct the group of SVS-registered firms that are sensitive to energy costs, comprising firms belonging to these 21 industries.

Source: Central bank calculations, based on data from the SVS and the Central Bank of Chile.

Within this aggregate view, some sectors have felt the recent shocks to the national economy more strongly than others. One of these is the electricity sector, as indicated in the last *Report*. In particular, some electricity generators have encountered problems on having to buy energy on the spot market to fulfill their contracts. In this context, some generators had to initiate renegotiations with their bond holders and bank creditors in the first months of 2008.

Finally, in the first quarter of 2008, the bonds of some infrastructure concessionaires were downgraded, driven by the downgrade of international bond insurers. The impact on current concession projects is estimated to be low, mainly because current operations do not require additional financing. However, this episode can be expected to lead to changes in the way future projects are financed, since the insured bond scheme has become less attractive.

In the most adverse scenario in the stress tests, interest coverage remains above two times for the majority of firms in the sample

Based on data for December 2007, the payment capacity indicators under scenario 1 described in chapter I are similar to those reported in the previous *Report*. However, compared with September 2007, a larger share of firms with local bank debt fall within the interest coverage range of one to two times, with a smaller share between two and five times (figure III.10)[5]/.

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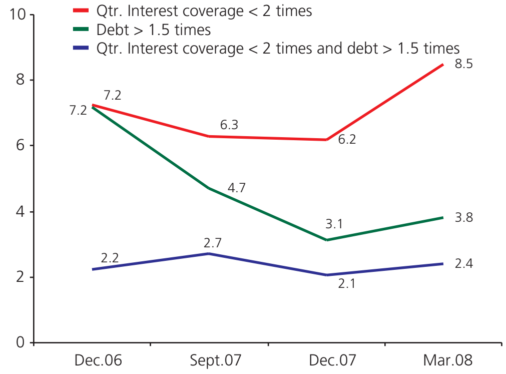
[5]/ The methodology used in these stress tests is described in Rodríguez and Winkler (2007). The scenarios used are described in Jara, Luna and Oda (2008).

Figure III.9

Vulnerable financial debt (*)

(percent of total debt)



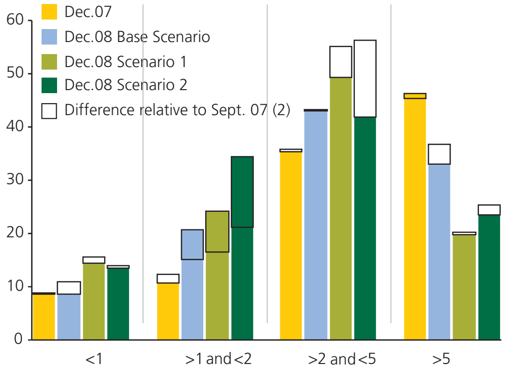
(*) Does not include state firms or infrastructure concessionnaires.

Source: Central Bank calculations, based on data from the SVS.

Figure III.10

Local bank debt and payment capacity under alternative scenarios (1)

(percent, times)



(1) Percent of the sample's local bank debt, by range of interest coverage ratio.
(2) Shaded areas represent data as of September 2007.

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

Based on the data and trends presented here, the corporate sector continues to be robust for facing adverse shocks. However, the analysis also indicates that the less favorable macroeconomic environment has reduced the sector's cushion for reacting to the shocks.

Table III.2

Household debt

(annual change, percent)

	2006				2007				2008
	I	II	III	IV	I	II	III	IV	I
	(March 2008 pesos)								
Mortgage	15.0	15.6	15.7	13.5	14.8	15.3	14.7	15.4	n.a.
Bank	16.6	16.5	15.9	13.9	14.9	15.8	14.7	15.3	15.3
Nonbank (1)	6.0	10.3	14.1	10.8	14.5	12.8	15.0	15.4	n.a.
Consumer	22.9	23.7	21.9	19.9	19.5	17.6	16.3	13.8	9.9 (p)
Bank (2)	21.2	22.3	23.0	21.0	18.0	15.1	10.3	7.0	5.3
Nonbank (3)	26.6	26.8	19.3	17.6	22.8	22.9	30.1	29.3	21.3 (p)
Total	18.3	19.0	18.3	16.2	16.9	16.3	15.4	14.7	n.a.
	(current pesos)								
Consumer	27.8	28.5	25.3	23.0	22.6	21.4	23.1	22.7	20.0(p)

n.a.: Not available.
(p) Provisional data.
(1) Includes securitized mortgage debt.
(2) Does not include consumer leasing.
(3) Includes retailers (over 90 days), private compensation funds, cooperatives, automobile financing, insurance companies, and securitized debt.

Source: Central Bank calculations, based on data from the SBIF, SVS and SuSeSo.

Households

The total debt of households is estimated at $27.604 trillion as of December 2007. Of this total, 77% corresponds to bank debt and represents 25% of total bank assets.

Consumer debt continues to grow in nominal terms, although it fell in real terms, and substitution toward shorter-term debt has occurred

While the growth rate of consumer loans in the banking system continues to fall, this was offset by an increase in loans from other loan sources. In general, these other suppliers provide credit at shorter terms. Total consumer debt thus registered a nominal growth rate of around 20% as of March 2008 (table III.2)[6]/.

The slowdown in the growth of bank consumer debt is related to two factors (figure III.11). First, the most attractive segments from a risk and return perspective offer little room for faster growth. Sources in the sector indicate that the expansion of credit has been directed toward lower-income segments, which traditionally have a more limited access to banking services. The industry faces greater uncertainty in these segments and is therefore more cautious. Second, the economy is at a point in the cycle that implies a somewhat less favorable outlook. The banks have to scale back their loans to reduce their exposure to risks associated with this new scenario.

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[6]/ In situations characterized by higher-than-expected inflation rates, the nominal growth rate better reflects the desired evolution of both household debt and credit lending than the real growth rate. This applies to peso-denominated loans, which currently make up the majority of consumer loans in Chile. The real evolution is more appropriate for UF-denominated loans, including virtually all mortgages, since the indexation captures the magnitudes of the impact of the unexpected inflation. At the same time, inflation lowers the value of nominal debts, which can alleviate households' financial burden depending on how inflation-protected is their income.

Non-bank consumer loans grew faster even in real terms. This mainly reflects developments among retailers and institutions that provide car loans. In the case of retailers, the growth of loans at over 90 days can be tied to increased sales. In this industry, the use of credit cards issued by the retailer is one of the pillars of competition, since it allows the retailer to build customer loyalty, obtain information on demand patterns, and generate revenue from loans and debt service.

The simultaneous expansion of credit on the part of entities that do not share information —as is the case with retailers versus banks— represents a challenge for the issuers' risk assessment, since it is not possible to observe the total financial burden of the credit users. Nevertheless, the risk appears to be limited at this time, since the amounts involved are small relative to loans by other issuers. Retail loans at over one year account for only 1.8% of total household loans (table III.3). Even more importantly, the financial burden originating from retail debt represents 11% of the financial burden of the average bank debtor. Finally, the results of the 2007 Household Financial Survey indicate that only 14% of households have debt with both retailers and the banking system (box III.1).

In contrast to consumer debt, mortgage debt maintained a real annual growth rate of 15%, although the rate slowed in March of this year (figure III.12). The average maturity on the stock of mortgage loans continued to extend, reaching 18 years in December 2007.

With debt growing faster than disposable income, debt indicators have risen

While the real growth of household debt slowed in the last quarter of 2007, it still grew faster than disposable income. Consequently, the ratio of long-term debt to disposable income (DIR) reached 53.4%, thereby increasing 1.9 percentage points relative to the third quarter of 2007. The financial burden-to-income ratio (FIR) on long-term household debt income reached 11.0%, rising 0.4 percentage point relative to September 2007 (figure III.13).

Loan-loss provisions increased in the consumer banking industry

The consumer banking industry's annualized loan-loss provisions rose significantly in late 2007, reaching 11.5% of the respective portfolio in December. In March 2008, provisions reached 7.7%, which is much higher than the 5.8% average of the period from September 2004 to March 2008. The higher loan-loss provisions are consistent with a less favorable macroeconomic outlook and the expansion of credit into less familiar segments. In the case of mortgage loans, loan loss provisions as a percentage of loans remained at record lows, although they rose to 0.75% in March 2008, above levels of the previous months (figure III.14).

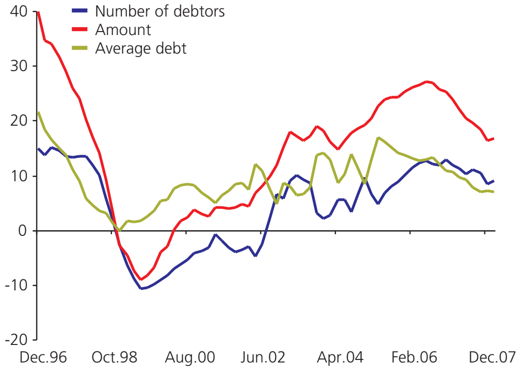
The new external financial environment implies that lending standards must continue to be carefully evaluated

At the margin, loans to households have been expanded into less familiar segments, with higher levels of uncertainty and risk. This, together with the less favorable perception of the macroeconomic environment, makes it necessary for financial institutions to continue to carefully evaluate their

Figure III.11

Bank consumer debt (*)

(annual change, percent)



(*) Amount and average debt at current prices.

Source: Central Bank calculations, based on data from the SBIF.

Table III.3

Household debt breakdown

(percent of total)

	2003	2005	2007
Mortgage debt	59.9	57.6	56.6
Bank	49.1	49.3	48.7
Nonbank (*)	10.8	8.3	7.9
Consumer debt	40.1	42.4	43.4
Bank, less than 1 year	8.9	8.0	7.3
Bank, over 1 year	19.7	21.1	21.1
Retail, 90 days to 1 year (*)	3.0	3.0	2.8
Retail, over 1 year	0.4	1.1	1.8
Private compensation funds	4.1	3.8	4.6
Cooperatives	2.1	2.6	2.9
Nonbank car	1.9	2.5	2.7
Insurance companies	0.0	0.1	0.3

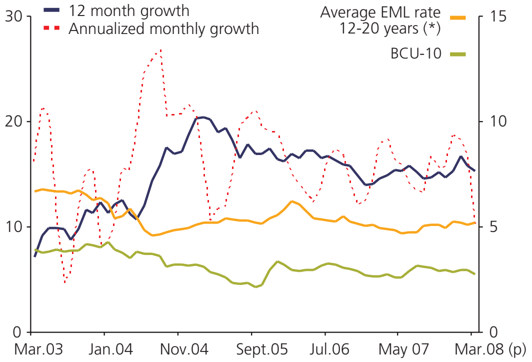
(*) Includes securitized debt.

Source: Central Bank calculations, based on data from the SBIF, SVS, and SuSeSo.

Figure III.12

Bank mortgage loans and interest rates

(real change in the stock, percent)



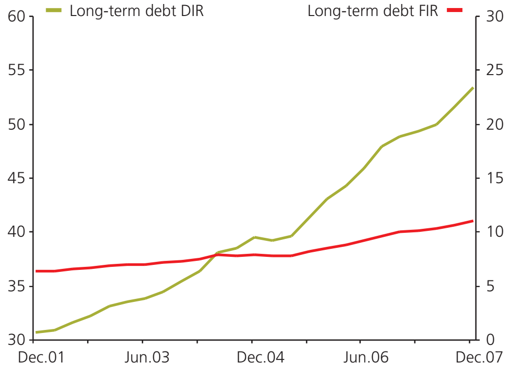
(p) Provisional data.
(*) EML = Endorsable mortgage loans.

Source: Central Bank calculations, based on data from the SBIF.

Figure III.13

Long-term debt (DIR) and financial burden (FIR)

(percent of disposable income)

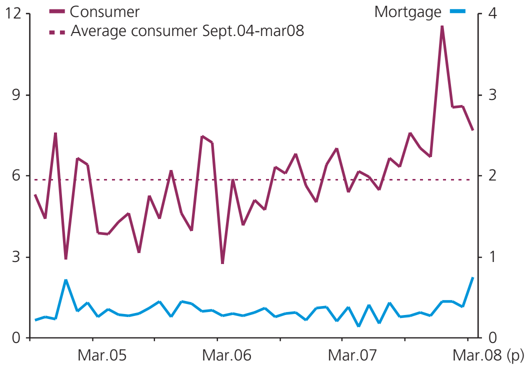


Source: Central Bank calculations, based on data from the SBIF, SuSeSo and SVS.

Figure III.14

Loan-loss provisions

(percent of each category)



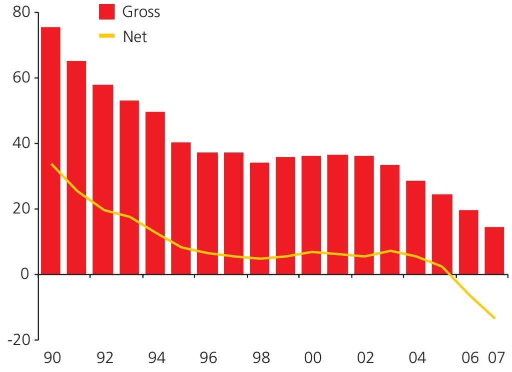
(p) Provisional data.

Source: Central Bank calculations, based on data from the SBIF.

Figure III.15

Consolidated public debt

(percent of GDP)



Source: Central Bank calculations, based on data from the Office of the Controler, Budget Division of the Finance Ministry and the General Treasury.

lending processes. Similarly, households must also be prudent in their borrowing decisions.

Consolidated Government

The fiscal rule plays an important stabilizing role in the Chilean financial system, and in 2007 it translated into an increase in the net position and liquidity of the Consolidated Government

In 2007, the Central Government recorded an overall positive balance of 8.7% of GDP, mainly as a result of the high copper price and compliance with the fiscal surplus rule of 1% of GDP[7]/. Financial management translated this balance into successive reductions in gross and net debt over the course of the year, ending 2007 at 4.1% and –13.7% of GDP, respectively. The considerable reduction in net debt is mainly explained by the significant accumulation of assets in foreign currency: from 7.1% of GDP in 2006 to 12.3% in 2007.

Given that the Central Bank again reduced its net debtor position to 0.2% of GDP at year-end 2007, the Consolidated Government reduced its gross and net debt from 19.5% and –6.1% in December 2006, respectively, to 14.6% and –13.5% at year-end 2007 (figure III.15). This took place in the context of a shrinking debtor position in pesos and a growing creditor position in foreign currency (figures III.16 and III.17).

The Central Government's assets reached approximately US$26.131 billion in March 2008. The funds destined for the Pension Reserve Fund (FRP) and the Social and Economic Stabilization Fund (FEES) represent 72% of total assets. Of these funds, 50% is in dollars, 40% in euros, and the remaining 10% in yen. The average maturity is around 2.5 years, which is longer than average maturity of the Central Bank reserves (one year). Given that 59% of the remaining assets are denominated in foreign currency, 88.4% of total assets are denominated in foreign currency as of 31 March 2008.

The gross debt of the Central Government again fell as a percentage of GDP. This trend, which has held since 2003, is explained by the reduction of foreign-currency-denominated debt. As of 31 December 2007, almost half the gross debt was expressed in foreign currency and 47% in UF. The debt in pesos and in UF increased almost without interruption from that date onward, mainly because of the policy on issuing BTU and BTP. The issues planned for 2008 are 20- and 30-year BTUs and ten-year BTPs. In March 2008, the balance of BTUs was UF72.1 million, while that of BTPs was $171.7 billion.

Variable-rate debt was markedly reduced in 2007, mainly through the prepayment of all fiscal promissory notes (figure III.18).

In a period of growing uncertainty with regard to the future evolution of relative prices —including the copper price— the fiscal rule plays an important stabilizing role in the Chilean financial system.

Given the external turbulence, the Central Bank is implementing a reserve hoarding plan

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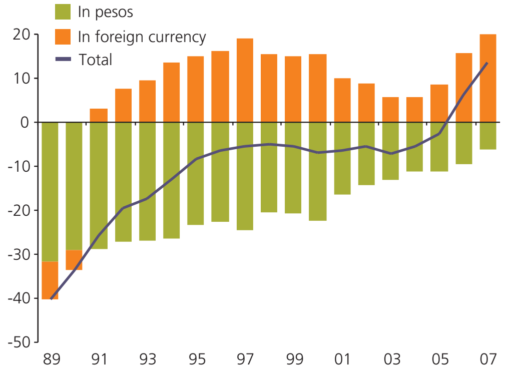
[7]/ Beginning in 2008, the fiscal surplus rule considers a structural balance of 0.5% of GDP.

Figure III.16

Net positions of the Consolidated Government (*)

(percent of GDP)



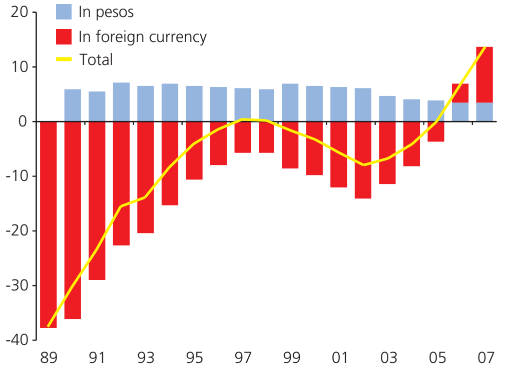
(*) A positive number implies a net asset position; a negative number indicates a net liability position.

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

Figure III.17

Net positions of the Central Government (*)

(percent of GDP)



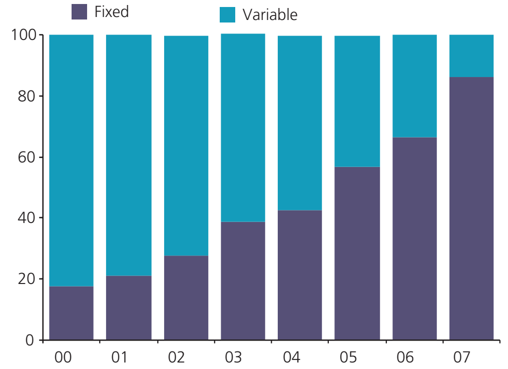
(*) A positive number implies a net asset position; a negative number indicates a net liability position.

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

Figure III.18

Central Government debt, by type of interest rate contracted

(percent of total)



Source: Finance Ministry.

An important fiscal surplus is foreseen for 2008, despite the reduction of the structural balance to 0.5% of GDP[8]/. Basically, because the copper price should exceed the estimate incorporated in the Budget Law of 2008, the estimated Central Government surplus would be over the 4.8% of GDP considered in the Law. This balance would translate into a new increase in the Central Government's net creditor position, mainly through the accumulation of foreign assets, in accordance with the Fiscal Responsibility Law.

Nevertheless, the worsening of the external financial scenario and, therefore, the increased probability of a severe liquidity crunch led the Central Bank to announce a program of reserve hoarding over the rest of 2008, for a total of US$8 billion (box II.1).

This program will determine the evolution of the Central Bank's assets and liabilities over the course of the year. The acquisition of US$8 billion will be carried out between 14 April and 12 December 2008. The dollar purchases will be sterilized through monetary and open market operations and through the issue of Central Bank debt securities, so that the supply of peso liquidity to the market will be consistent with the monetary policy rate.

Due to the accumulation of international reserves, the Central Bank's assets will increase from 12.8% to 16.1% of GDP by the end of 2008, and reserves will grow from 9.8% to 13.3% of output. The management of these reserves takes into account risk management policies that promote a prudent administration, especially in the current context of international financial turbulence (box III.2).

Liabilities, in turn, will increase from 15.3% to 18.8% of GDP by the end of 2008. Monetary policy notes (nominal and inflation-indexed) are projected to grow from 9.1% to 13.9% of GDP, due to the sterilization of the purchase of international reserves and, to some extent, to a restructuring of liabilities. About 71% of the total promissory notes will correspond to UF-indexed debt.

On accumulating international reserves, the Central Bank incurs financial costs. These costs stem from the difference between the interest rate earned on the international reserves invested overseas and the local interest rate. Given the differential between current internal and external interest rates and forecasts ten years ahead, it is estimated that in that period, the intervention will cost the Central Bank the equivalent of 0.7% of 2008 GDP. The Central Bank is thus projected to have a flow deficit of around 0.4% of GDP.

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[8]/ The average copper price considered in the Budget Law is US$2.5 per pound, whereas the May Monetary Policy Report projects an average price of US$3.5 per pound.

Box III.1: **The 2007 Household Financial Survey**

In fulfilling its mandate to monitor financial stability, the Central Bank of Chile carried out the 2007 Household Financial Survey (*Encuesta Financiera de Hogares,* EFH). This initiative, which is groundbreaking in the region, follows the best practices of leading central banks in this area, as well as the recommendations of international organizations like the IMF and the European Central Bank. The systematic study of the information contained in the EFH will lead to a broader understanding of the financial behavior of households, which will contribute to a better analysis of the financial stability of the Chilean economy. This box summarizes the main characteristics of the 2007 EFH and presents the first results of the analysis currently in progress.

The EFH will provide measures of the financial balance of households and their ability to service their financial commitments. The survey will contribute to a clearer picture of the use and evolution of the different means of payment and, in the future, to a better understanding of the dynamics of household financial decisions.

Between November 2007 and January 2008, 4,021 households were interviewed throughout the country. The survey involved personal interviews based on an electronic questionnaire[9]/. The 2007 EFH collected information on the following areas: the employment situation of household members, employment and non-employment income, real estate assets and mortgage financing, financial assets, non-mortgage debts, perception of the financial burden, access to and use of credit, retirement savings and insurance, general structure of household expenses, and the use of different means of payment. The information obtained in the survey will be used exclusively for the purposes of researching and monitoring the aggregate situation of households.

An analysis of the financial situation of households in the 2007 EFH reveals that 61% of households have debt, and this share is similar across the different income quintiles (table III.4). About 57% of households have non-mortgage debt (consumer debt), while non-mortgage bank debt is concentrated in 22% of the households. In contrast, 46% of households have credit outstanding with retailers, and the middle income quintiles encompass the largest number of households with this type of debt.

Table III.4

Households' debt and asset holdings
(percent of households)

	Income quintiles					
	I	II	III	IV	V	Total
Debt holdings	53	63	67	67	57	61
Nonmortgage (consumer)	51	60	62	63	51	57
Bank	13	15	21	28	33	22
Retail	41	52	52	48	35	46
Bank and retail	8	10	14	20	20	14
Some bank or retail debt	47	58	58	56	48	53
Mortgage	8	10	16	20	22	15
Asset holdings	63	73	82	87	90	79
Real estate assets	55	67	72	75	72	68
Non-real-estate assets	23	31	35	54	72	43
Financial assets	7	7	7	14	25	12
Other assets (*)	17	26	32	50	66	38

(*) Motorized vehicles and other.

Source: 2007 Household Financial Survey, Central Bank of Chile.

The share of households with mortgage debt is 15%, although these households are concentrated in the highest income quintiles. Some households use a range of financing sources simultaneously; 14% of households have debt with both the banking system and retailers.

Fully 79% of households have some type of asset, with a high degree of real estate holdings in all the income quintiles (55% in the lowest income quintile and 72% in the highest income quintile)[10]/. In addition, 43% of households report having non-real-estate assets. This is the case even in the lowest income quintile, where 23% report that they have non-real-estate assets. Nevertheless, only 12% of households indicate that they have financial assets, and these are mainly in the highest income quintile.

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[9]/ The University of Chile's Microdata Center implemented the 2007 EFH. The survey is representative at the national urban level.

[10]/ Home ownership is high in the lowest income quintiles largely as a result of social housing programs.

Box III.2: **Bank credit risk management in the international reserve investment policy**

The provisions of the Central Bank of Chile's international reserve investment policy address bank credit risk management. Exposure to this type of risk mainly stems from the acceptance of time deposits, as well as from investments in certificates of deposit and Jumbo *Public Pfandbriefe*[11]/ and from foreign exchange operations. This box briefly describes the current policy in this area, which is particularly relevant given the current context of international financial turbulence.

The policy on bank credit risk management encompasses the following measures:

— The establishment of an overall maximum limit on exposure to bank credit risk in the investment portfolio, which was reduced from 42% to 35% in February 2008. The current benchmark, for monitoring purposes, is 30%.

— The definition of individual limits on exposure to each bank, in terms of both the maturity and the amount of the investments, as a function of the bank's risk rating and size of capital. The maximum amounts allowed range from US$90 to US$540 million, and the term limits are from 6 to 12 months. With regard to the counterparty eligibility criterion, a bank must have a minimum capital of US$1.0 billion and a long-term risk rating equal to or above "A" from at least two of the three selected ratings agencies (Fitch, Moody's, and Standard & Poor's).

— The setting of an aggregate limit on the risk exposure with banking institutions with a risk rating of A and A+, which today is 5% of the investment portfolio.

Table III.5 summarizes the matrix in which each financial institutions is rated based on the term limits and amounts allowed.

In practice, there are internal procedures for regulating how these investments are made. Moreover, the financial position of eligible counterparties is assessed daily through a series of risk indicators, including credit default swaps (CDS) (aggregate and individual when feasible); sovereign and bank rate differentials; and each institution's spread vis-à-vis the market average. In the event of any sign that an institution is misaligned with general market conditions, operations with the firm are suspended pending further information. Independent units within the investment operations department monitor compliance with procedures, limits, risks, and performance of reserve management.

Table III.5

Amount and term limits allowed per institution, by risk rating

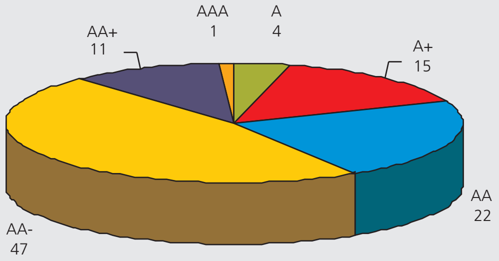
	Capital above US$ 4 billion		Capital between US$ 1 and US$ 4 billion	
Risk rating	Maximum allowed (US$ million)	Terms (months)	Maximum allowed (US$ million)	Terms (months)
AAA	540	12	450	12
AA+	360	12	270	12
AA	360	12	270	12
AA-	360	9	270	9
A+	180	6	90	6
A	180	6	90	6

Source: Central Bank of Chile.

As of 31 March, the investment portfolio totaled US$15.431 billion, of which 33.55% was invested in instruments exposed to bank counterparty risk. Total outstanding deposits break down as follows: 80% are with institutions rated between AA– and AA+, 19% with institutions rated between A and A+, and 1% with institutions rated AAA. Positions are held in 37 of the 95 eligible banking institutions (figure III.19).

Figure III.19

Breakdown of bank risk in international reserves, by risk rating (percent)



Source: Central Bank of Chile.

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[11]/ Mortgage bonds backed by long-term assets, issued by German banking institutions.

Since 2006, and within the framework of its policy on transparency, the Central Bank has published on its website the objectives of international reserve management, the institutional framework of reserve administration, the investment policy, the structure and composition of reserves, details on risk management, and the yields obtained. Furthermore, the Bank's *Annual Report* includes the list of banking institutions involved in outstanding investment operations at year-end. The Central Bank's standards on transparency in these matters have been noted by the IMF.

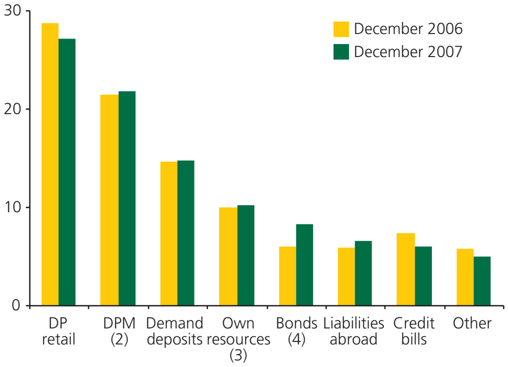
IV. Assessment of systemic risks

This chapter analyzes the potential impacts on the stability of the banking system and access to the international financial markets, of the threats and vulnerabilities identified in the previous chapters.

Figure IV.1

Sources of bank financing

(percent of total liabilites) (1)



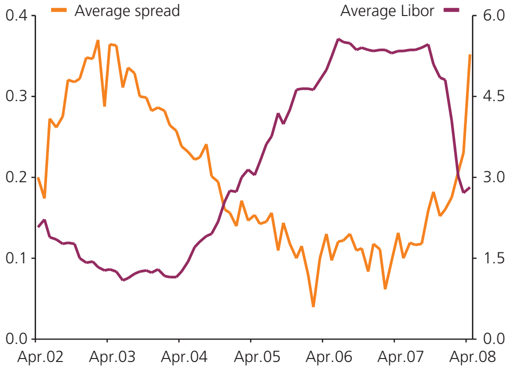
(1) Total liabilities net of contingent liabilities and derivative instruments at fair value.
(2) Wholesale time deposits, including mutual and pension funds.
(3) Includes core capital, provisions, net value of derivative instruments at fair value, and net profit.
(4) Includes senior and subordinate bonds.

Source: Central Bank calculations, based on data from the SBIF.

Figure IV.2

Cost of bank external debt

(percentage points)



Source: Central Bank of Chile.

Banking sector

This section examines recent developments in the local banking system and its capacity to absorb adverse shocks, which is related to its capital strength and the levels of exposure to credit, market, and liquidity risk, among others.

Despite the turbulence in the global financial markets, the access of the banking system to external financing does not show signs of tightening

Over the course of 2007, the banking system obtained external financing for approximately US$2.8 billion, thereby increasing its external debt stock, but holding the relative share of total bank financing steady at around 8% of loans and 6% of total liabilities (figure IV.1). Although the average spread on new foreign loans has tripled since last August, the average Libor has fallen two percentage points, and the net effect has been a reduction in the cost of new external financing for the banking system (figure IV.2).

The Chilean banking system does not have direct exposure to the U.S. subprime market. Therefore, the financial crisis in the main advanced economies has not had a strong impact on the stock quotes of local banks or on the risk rating of bank deposits, which maintain an AA+ rating, on average.

The increase in the pension funds' foreign investment limit has affected the banking system's foreign currency position and structure of financing

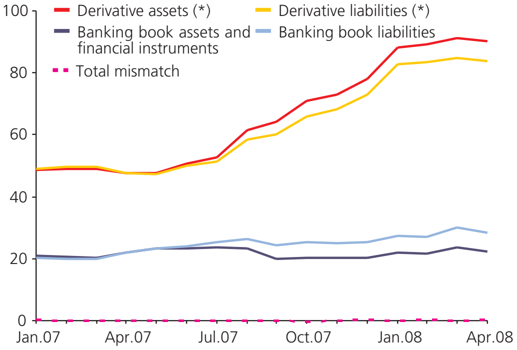
Until the middle of last year, the banking system maintained an almost matched foreign currency position, in both the banking book and the trading book. However, forward operations totaled US$8.6 billion between August 2007 and April 2008, as the counterpart of the pension funds' increased need for currency hedging. These operations contributed to increasing the banking system's derivative asset or buy position to US$90 billion as of April (figure IV.3 and box IV.1). The greater use of lines and other sources of external financing has, on net, kept a rein on foreign currency exposure, at around US$300 million, or approximately 2% of capital.

In 2007 the share of the pension funds in total bank financing was stable at around 12% (or US$20 billion). The increases in the maximum investment

Figure IV.3

Balance of the banking system in foreign currency

(US$ billion)



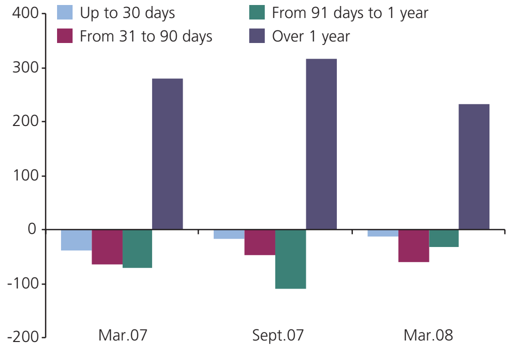
(*) Includes notional value of foreign currency swaps and forwards.

Source: Central Bank calculations, based on data from the SBIF.

Figure IV.4

Banking system mismatch (*)

(percent of core capital)



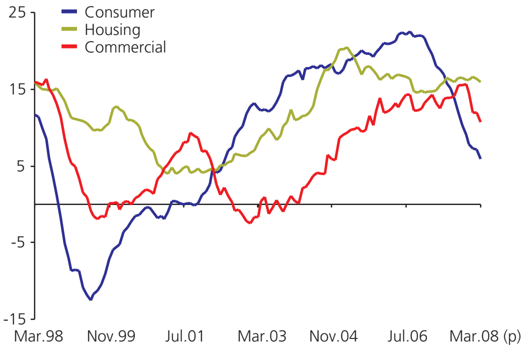
(*) Adjusted banking and trading book assets minus liabilities, according to which banks with a level A solvency rating (and authorized by the SBIF) can assign a fraction of their demand deposits (classified as "retail") to a time band over 30 days.

Source: SBIF.

Figure IV.5

Bank loans

(real annual change, percent)



(p) Provisional data.

Source: Central Bank calculations, based on data from the SBIF.

abroad limit implemented last year and early this year —equivalent to 15 percentage points of total retirement savings, or US$20 billion— represent an important risk factor for the banking system. This risk has been partially mitigated by the relatively low appeal of investments in the international financial markets. Nevertheless, several banks have reacted to the above developments by expanding their programs for issuing long-term bonds, accumulating short-term financial assets, and implementing other actions oriented to diversifying their sources of both local and external financing (figure IV.4). This is particularly appropriate in light of recent events in the U.S. and European financial markets, which underscore the importance of an adequate liquidity and financing risk management policy on the part of the financial institutions.

In a less favorable economic environment, bank credit is less dynamic

Commercial loans, which represent around two-thirds of total loans, continued to grow strongly until the end of 2007, mainly in the large firm segment, thanks to the significant increase in investment (chapter III). In the first quarter of 2008, however, the growth of commercial loans has slowed somewhat, from a real annual rate of 15% to around 11% (figure IV.5 and box IV.2). This slowdown is consistent with a less favorable perception of the domestic and international economic environment, as well as an increase in the cost of local funds stemming from higher inflation and monetary policy decisions. In fact, the interest rate on commercial loans rose more than 100 basis points in the first quarter of this year. This has affected lending standards, widening the spreads on the cost of funds and raising the premium on riskier loans (figure IV.6).

Consumer loans, which have been slowing since 2006, registered a real annual growth rate of around 6% in March 2008. However, more than 90% of these loans were made in nominal pesos, so in real terms the slowdown is being accentuated by the higher levels of inflation seen since the second half of 2007. Measured in nominal terms, the annual growth rate of consumer loans was around 14% in the first quarter of 2008.

At the system level, consumer loans represent nearly 12% of total loans. This figure rises to 80% for niche banks oriented to this loan segment. The banking system also has indirect exposure through loans to firms that are highly exposed to the consumer segment, such as retailers, private compensation funds (*cajas de compensación*), and savings and loan cooperatives. As of December 2007, the liabilities that these debtors held with the banking system represented close to 4% of total loans[1]/.

Loan-loss provisions have increased faster than the past-due loan portfolio, which favors the coverage ratio

As a result of the worsening perception of risk associated with the different loan segments, especially the consumer portfolio, the banks increased their loan-loss provisions in the first quarter of 2008, although the past-due loan portfolio is practically unchanged (figure IV.7).

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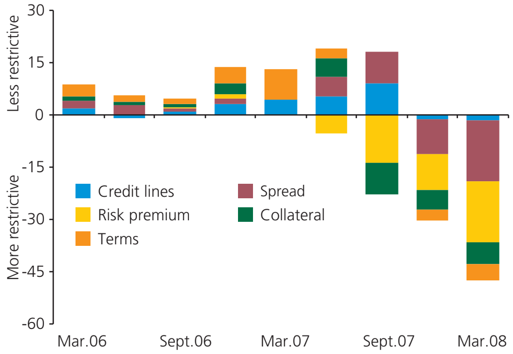
[1]/ Calculated on the basis of SBIF and SVS data.

Figure IV.6

Index of the change in credit conditions for large firms (1) (2)

(percent)



(1) Firms with annual sales over UF 100,000.

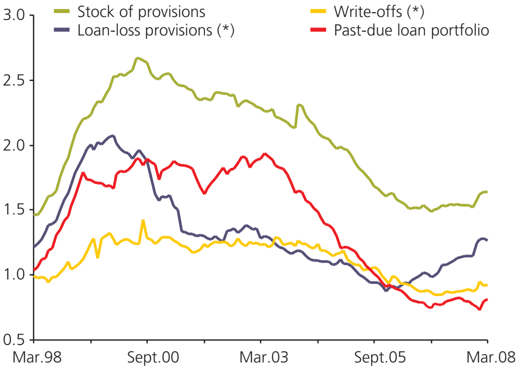
(2) Constructed on the basis of the Central Bank of Chile's Survey of Bank Credit. Negative values indicate more restrictive conditions.

Source: Central Bank of Chile.

Figure IV.7

Credit risk indicators

(percent of total loans)



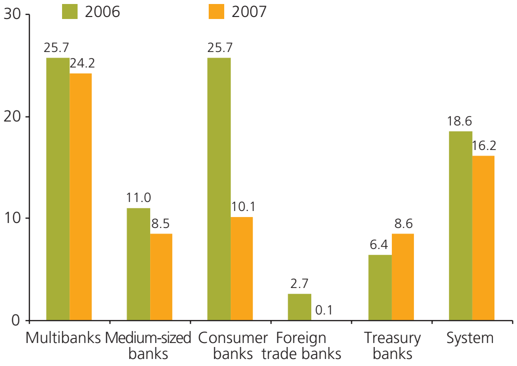
(*) Moving years ending each month.

Source: Central Bank calculations, based on data from the SBIF.

Figure IV.8

Distribution of the return on equity, by group of banks

(percent of core capital)



Source: Central Bank calculations, based on data from the SBIF.

Banks maintained their solvency and profitability levels, but reduced their excess capital

With the exception of banks that are more oriented to treasury business, bank profitability fell last year, especially in case of niche banks focused on the consumer loan segment (figure IV.8). Even so, the system's profitability remained near 16%, which is above the average of the last 15 years (14%).

The system's capital adequacy ratio (CAR) has been stable at around 12% of risk-weighted assets, although the number of entities in the lower range of the distribution has risen (figure IV.9). This represents a challenge with regard to the banking system's ability to sustain a credit expansion like the one seen in recent years. If banks maintain the average growth rate of loans without raising core capital, some banks would reduce their CAR to less than 10% by the end of this year. However, the growth of bank loans has slowed, and several of the banks with little excess capital have already initiated or are in the process of setting up programs to increase their core capital through the issue of new stocks and subordinate bonds.

Stress tests

Stress tests, as an analytical tool, contribute to the identification of weaknesses and the sizing up of financial strengths in a given moment in time. Given their rather static nature, however, they do not necessarily provide an exhaustive vision of the effects of specific risk scenarios.

The tests carried out in December 2007 suggest that the banking system is capable of absorbing the materialization of the risk scenarios described in chapter I[2]/.

Exposure to credit risk has risen relative to the second half of 2007, while exposure to market risk has fallen

Under the risk scenarios considered, the system losses associated with credit risk would represent 7% of capital in scenario 1, and 3% of capital in scenario 2. This is mainly due to the less favorable outlook in the credit market, which has been reflected in an increase in loan-loss provisions in the first quarter of 2008.

The risk associated with losses from the repricing of financial instruments in the face of changes in the rate structure is less than 0.1% of system capital. At the same time, the losses associated with interest rate risk, stemming from the repricing of their assets and liabilities, has fallen relative to the last *Report*. Finally, exposure to currency risk remains limited.

In the risk scenarios, the system's average return on equity drops relative to December 2007, by 6% of capital in scenario 1 and 1% in scenario 2 (figure IV.10). This difference reflects the greater severity of scenario 1. Some banks (which together represent 3.7% of the system's capital) reported losses in 2007. Under scenario 1, banks in this situation would

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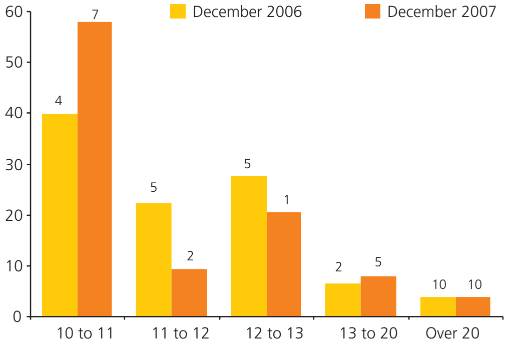
[2]/ For details on the scenarios, see Jara, Luna, and Oda (2008).

Figure IV.9

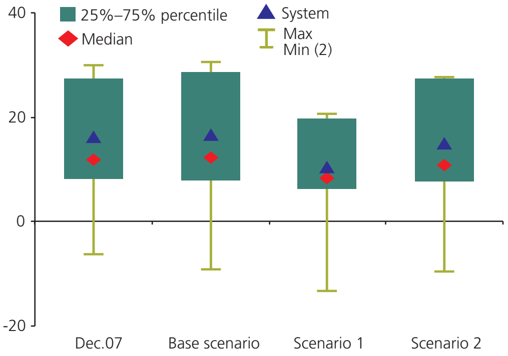
Distribution of the capital adequacy ratio
(percent of risk-weighted assets, number of banks)



Source: Central Bank calculations, based on data from the SBIF.

Figure IV.10

Impact of different risk scenarios on the return on equity (1)
(percent)

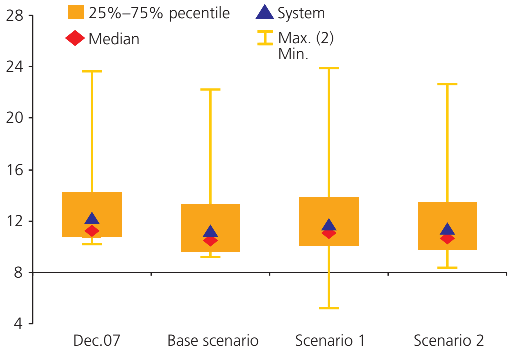


(1) The data are weighted by the core capital of each institution in December 2007.
(2) Minimums correspond to the 1st percentile.

Source: Central Bank calculations, based on data from the SBIF.

Figure IV.11

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



(1) The data are weighted by the core capital of each institution in December 2007.
(2) Maximums correspond to the 90th percentile.

Source: Central Bank calculations, based on data from the SBIF.

represent 7.6% of the system's capital. The estimated losses stem from the materialization of credit risk, and they are mainly generated through consumer loans. In the test, this has a stronger impact on entities whose loan portfolios are concentrated in this loan segment.

As a result of the estimated losses, and without taking into account possible capitalization, the system's CAR would drop from 12.2% in December 2007, to 11.7% in scenario 1 and 11.4% in scenario 2 (figure IV.11). The heterogeneity in the structure of loan assets on the banks' balance sheets and also in the banks' business strategies explains the wide dispersion in the ratio under both scenarios.

External financing

This section examines the recent evolution and the outlook for the Chilean economy's external financing, as well as the risks that could affect its continuity.

Resident non-financial companies and banks have increased their foreign debt, demonstrating that they continue to have access to financing despite the current turbulence

The total external debt of the Chilean economy reached US$58.166 billion in March 2008, which represents an increase of nearly 20% in annual terms and 8% relative to September (table IV.1). External debt has increased steadily since the second quarter of 2007, largely due to the growth of mainly long-term personal and firms liabilities. The external liabilities of banks (mostly short term) also grew in the same period, which could be partly explained by the substitution of local financing, as mentioned in previous *Reports*. Finally, commercial loans also grew more in recent quarters than in previous periods. In any case, growth fell in the last moving quarter, with the reduction distributed homogeneously among agents (figure IV.12).

Table IV.1

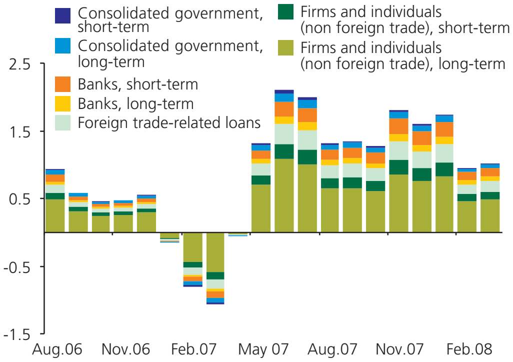
External debt of the Chilean economy
(US$ million)

	2005 Dec.	**2006 Dec.**	**2007 Sept.**	**2007 Dec.**	**2008 Mar.**
Short-term, residual	16,182	17,478	22,315	22,556	23,511
Banks	5,502	5,300	6,941	7,001	8,690
Firms and individuals	10,562	11,467	14,511	14,653	14,545
Commercial loans	5,255	6,685	8,420	8,456	8,709
Consolidated Government	118	710	864	902	276
Long-term, residual	30,029	31,756	31,525	33,266	34,655
Banks	1,882	2,334	2,934	3,485	3,667
Commercial loans	23,090	25,791	25,725	26,867	28,063
Consolidated Government	4,139	3,632	2,865	2,914	2,925
Total external debt	**46,211**	**49,234**	**53,840**	**55,822**	**58,166**
Short-term maturity	7,095	9,318	10,187	11,175	12,144
Long-term maturity	39,116	39,916	43,653	44,647	46,022

Source: Central Bank of Chile.

Figure IV.12

Contribution to the quarterly growth of external debt (*)
(percent)

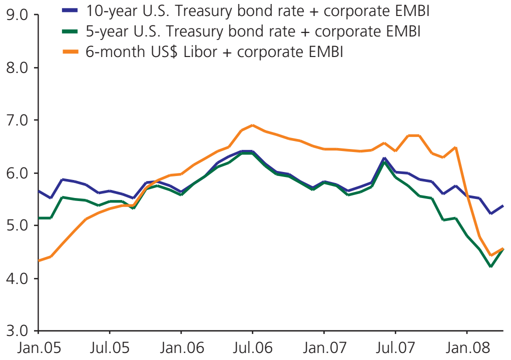


(*) Short- and long-term, residual. Moving quarters ending each month.

Source: Central Bank of Chile.

Figure IV.13

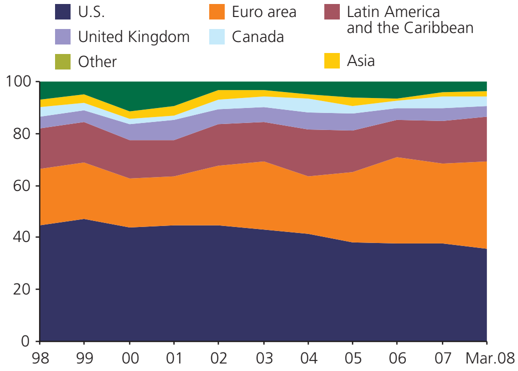
Cost of external financing
(percent)



Sources: Bloomberg and Central Bank of Chile.

Figure IV.14

Bank creditors, by geographic area
(percent of external bank debt)



Source: Central Bank of Chile.

Country and corporate risk premiums have increased, although this has been offset by reductions in long- and short-term rates

In response to the current international financial turbulence, both country and corporate risk premiums have risen. Both are situated around 170 basis points, which represents an increase of between 70 and 90 basis points, respectively, over the levels in August 2007. Despite these developments, the cost of financing has fallen as a result of the marked drop in both short- and long-term rates (figure IV.13).

About 50% of Chile's external debt is contracted with banks, and nearly a third of these are from the U.S.

A breakdown of the debt by creditors reveals that nearly 50% is contracted with banks and just under 30% with firms. Of the bank debt, close to a third of the institutions are located in the U.S., 30% in the euro area, 17% in other Latin American and Caribbean countries, and 4% in the United Kingdom (figure IV.14).

Roughly 40% of Chile's external debt comes due in less than a year and may thus need to be refinanced. Of this short-term residual debt, 37% is with bank counterparties, which could offer less favorable conditions on renegotiating than in the recent period. This is due to the tighter liquidity conditions in the international financial market, and it mainly affects the banking system.

The majority of this debt is contracted with European banks, which have been relatively less affected thus far than U.S. banks (table IV.2).

Table IV.2

Short-term residual external debt, by region and institutional sector
(billions of December 2007 dollars)

	Institutional sector		
Region	**Banks**	**Firms**	**Total**
Europe	3,618	2,791	6,409
U.S. and Canada	3,434	480	3,913
Other	93	287	380
Total	**7,145**	**3,557**	**10,702**

Source: Central Bank of Chile.

The net debtor international investment position is increasing, as a result of changes in financial asset prices and, to a lesser extent, exchange rate variation

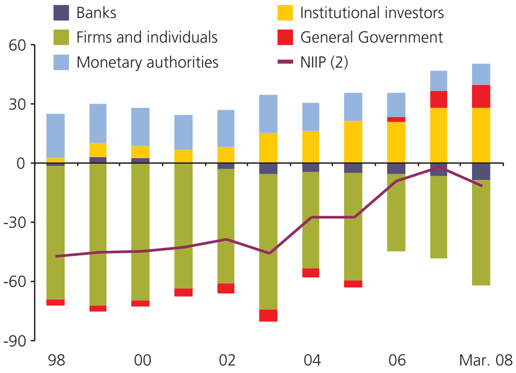
Following a period of continuous reductions, the economy's net debtor international investment position (IIP) grew significantly as of March 2008, approaching 12% of GDP (figure IV.15). This is the highest recorded level since 2006, and stems from a greater increase in liabilities (17% of GDP) than assets (7.1% of GDP).

Within the liabilities, FDI posted the sharpest rise, reaching 71% of GDP in the first quarter of this year, versus 59% in December 2007. This difference is explained in the majority (nearly 60%) by the appreciation of the peso,

Figure IV.15

Net international investment position, by institutional sector

(percent of GDP) (1)



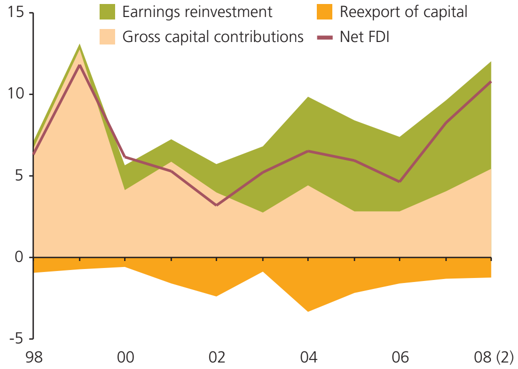
(1) GDP at a constant real exchange rate (index Dec. 05 = 100).
(2) Net international investment position.

Source: Central Bank of Chile.

Figure IV.16

Foreign direct investment flows in Chile

(percent of GDP) (1)



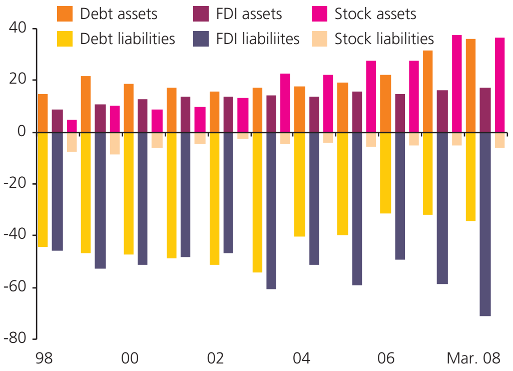
(1) GDP at a constant real exchange rate (index Dec. 05 = 100).
(2) Moving year ending in the first quarter.

Source: Central Bank of Chile.

Figure IV.17

Gross international investment position, by instrument

(percent of GDP) (*)



(1) GDP at a constant real exchange rate (index Dec. 05 = 100).

Source: Central Bank of Chile.

with 20% explained by net reinvestment and approximately 10% by new capital (net of reinvestment) (figure IV.16). Debt liabilities, in turn, increased by 2.5% of GDP, driven by the growth of non-bank private sector debt (figure IV.17). On the creditor side of the investment position, portfolio assets shrank slightly, which mainly reflects the lower pricing of the pension funds' external assets as a result of the fall in world stock markets in the first quarter. This was partially offset by an increase in other institutional investors' debt securities. The General Government's IIP rose from 9% to 12% of GDP, due to the increase in investment portfolio assets and other investment. This is mostly explained by exchange rate movements and by the purchase of debt securities, currencies, and deposits.

Table IV.3

External liquidity and solvency indicators

	Average 2001-06	2004 Dec.	2005 Dec.	2006 Dec.	2007 Dec.	2008 Mar.
Solvency						
External debt/GDP	48	45	38	33	34	34
Current account balance/GDP	-0,3	1.7	1.1	4.7	4.4	2.5
External debt/Exports	130	110	90	70	83	83
Liquidity						
DECPR/ External debt (1)	30	32	33	34	40	40
DECPR/Official international reserves	81	88	89	85	133	131
DECPR/Unrestricted NIR (2)	107	119	153	127	146	137
Other						
Long-term external debt/External debt	83	82	82	78	80	79
Fixed-rate external debt outstanding (net of swaps)/External debt	58	61	56	58	68	56
Memorandum						
DECPR/(NIR + FEES) (3)					73	67
DECPR/(Unrestricted NIR + FEES)					77	68

DECPR/(NIR + FEES) (3)
DECPR/(Unrestricted NIR + FEES)

(1) DECPR: short-term residual external debt.
(2) Unrestricted NIR: official reserves minus short-term commitments in foreign currency (maturing BCX, BCD, swaps), fiscal deposits at the Central Bank and others.
(3) Economic and Social Stabilization Fund.

Source: Central Bank of Chile.

While solvency indicators continue to be robust, liquidity indicators fell due to the increase in short-term residual debt

Solvency indicators for the economy do not show any major changes since the last *Report*, given that the growth of external debt has occurred in conjunction with a faster growth of GDP and exports (table IV.3).

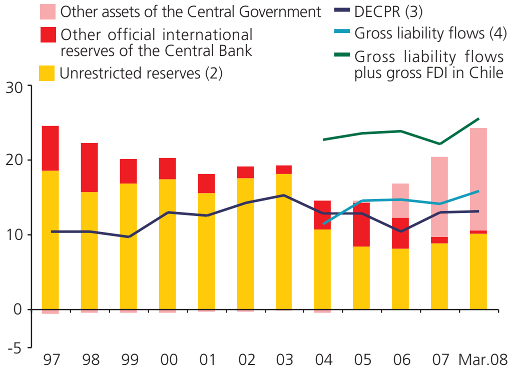
The economy's foreign currency assets continue to grow, owing to the increased holding of foreign assets by institutional investors, firms, and the Government. Several liquidity indicators have worsened, however, because short-term residual debt grew in 2007 while reserves were largerly unchanged. The increase in short-term residual debt is driven, in part, by the expansion of bank debt.

Finally, gross financing flows are considerable in an economy with a significant degree of international financial integration, and measures of these flows against reserves have also deteriorated (figure IV.18 and box II.1). Despite the continued access to external financing as of the close of this

Report, a more severe international liquidity crunch cannot be ruled out, in line with the developments analyzed herein. This risk scenario motivated of the Central Bank's decision to hoard an additional US$8 billion in reserves over the course of the year.

Figure IV.18

Availability of net external financial liquidity
(percent of GDP) (1)



(1) GDP at a constant real exchange rate (index Dec. 05 = 100). External liquidity includes short-term loans, currency and deposits, and portfolio investment. It does not include derivative positions.
(2) Official reserves minus short-term commitments in foreign currency (maturing BCX, BCD, swaps).
(3) Short-term residual external debt.
(4) Debits in the financial account of the balance of payments, excluding foreign direct investment (FDI).

Source: Central Bank of Chile.

Box IV.1: **Hedging the pension funds' exchange rate risk and its effect on the local banking industry**

The institutional investors' need for foreign currency hedging is mainly channeled through local commercial banks, so as to minimize counterparty risk and/or to comply with regulatory restrictions[3]. The local bank generally acts as an intermediary, seeking to match the long or asset position (buying foreign currency futures) with a short or liability position (selling foreign currency futures). This box reviews the evolution of the pension funds' main counterparties in hedging operations and the banks' counterparties in the forward market, and explores how the banks have adjusted their balance sheets to match the greater net asset position in derivatives since mid-2007.

Counterparties in hedging transactions

The growth in the pension funds' investments in foreign securities has increased their demand for currency hedging, especially through peso-dollar and UF-dollar forward contracts, generating a net asset position in foreign currency derivatives in the local banking system. In fact, the pension funds have almost doubled their demand for hedging, from US$12 billion in January 2007 to US$22.6 billion in April 2008. The majority of these contracts have been executed with multibanks and medium-sized banks (figure IV.19)[4].

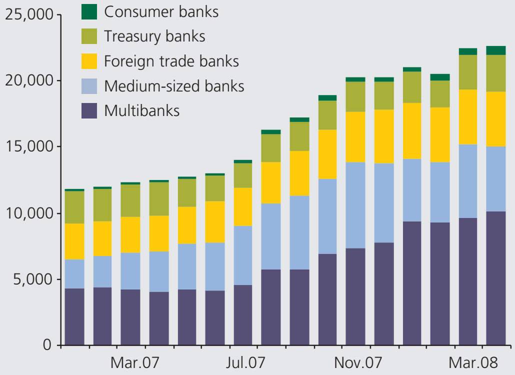
The life insurance companies and mutual funds have also sold dollar futures, but for significantly lower amounts (approximately US$1.3 billion).

For the banking system as a whole, an alternative for matching asset positions —generated by the hedging needs of the institutional investors— is to offer exchange rate risk hedging to other agents that have a foreign currency liability position and that do not have a natural hedge against that risk. This is the case, for example, of import firms and firms with foreign-currency-denominated debt.

Figure IV.19

Counterparties in forward operations by the pension funds

(US$ million)



Source: SAFP.

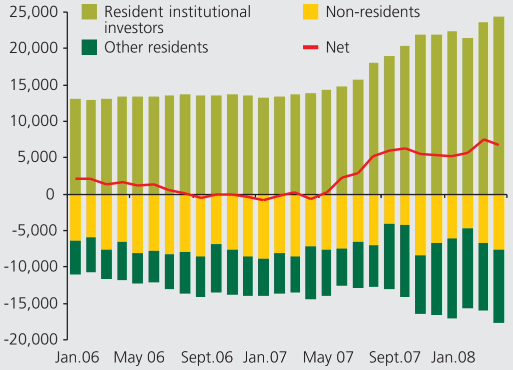
The banking system also sells hedging to non-resident investors that want a net liability position in Chilean pesos. On average, these investors have bought dollar forwards totaling US$7 billion.

The local banking system's net asset position in derivatives has thus grown since September 2007, reaching US$6.79 billion in April of 2008 (figure IV.20).

Figure IV.20

Net derivatives position of the local banking system (*)

(US$ million)



(*) Corresponds to net positions by agent, excluding interbank operations.

Source: Central Bank of Chile.

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[3] For example, SAFP regulations establish that the institutions that act as counterparties in the pension funds' financial risk hedging operations "must be legally established in Chile or authorized to operate in the country" (*Circular* 1216).

[4] See the Glossary for a definition of multibanks and medium-sized banks.

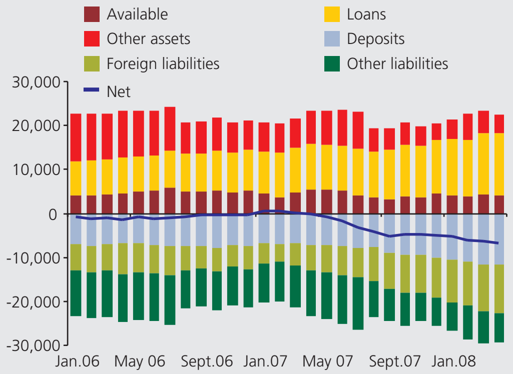
Transactions recorded in the banking book [5]

Another way for the banks to hedge the foreign currency asset position generated by the derivatives position is to take their own foreign currency liability positions. This has been reflected in increased foreign debt on the part of the local banking system and in greater foreign currency receipts, —basically deposits (figure IV.21). In addition, the banking system's dollar assets have been relatively stable, such that the banking system registered a net foreign currency liability position of US$6.74 billion in April 2008.

In sum, the local banking system has kept its net currency mismatch under control, thanks to the use of foreign currency liabilities to offset the increased asset position in derivatives.

Figure IV.21

Foreign currency assets and liabilities of the local banking system
(US$ million)



Source: SBIF.

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[5] See the Glossary for a definition of the banking book.

Box IV.2: **Adjustments to the bank loan series**

As part of the process of adopting the new International Financial Reporting Standards (IFRS) in the national banking system, a new format for recording information in bank financial statements and balance sheets became effective in January of this year[6]/.

One of the main advantages of this new format is that it makes it easier to identify bank products, especially loans. Under the previous format, some loan operations either were not recorded as loans or were charged to a broader account. The most important changes in the accounting of bank loans include the following: (i) contingent loans are no longer included in bank loans and are recorded as off-balance-sheet transactions; (ii) new loan accounts have been introduced on bank balance sheets; and (iii) some loans have been reassigned from one loan segment to another (for example, housing construction loans that were previously recorded as commercial loans are now in the home financing loan portfolio).

As a result of these accounting changes, current bank loan data are not directly comparable with the series through December 2007[7]/.

Similarly, financial indicators that are constructed based on the new series are not comparable, as in the case of indicators that measure credit risk or the growth of bank lending.

To ensure the availability of comparable series for analyzing and monitoring the banking system, the Central Bank has made some adjustments to the new financial data to make the new loan series compatible with the accounting standards in place through December 2007.

Main adjustments

- Until December 2007, commercial and foreign trade loans were made up of real and contingent loans. Since the implementation of the IFRS, contingent loans are no longer included in bank loans, but rather are recorded in complementary accounts. The first adjustment, therefore, was to add the contingent component to the current series, that is, the items "special and bank guarantees," "collateral securities," and "letters of guarantee" were added to commercial loans. Similarly, letters of credit (issued and confirmed) were added to the current foreign trade loan series.

- Loans to finance housing construction[8]/ used to be recorded in the commercial loan portfolio, but starting this year they are accounted as home financing loans. To adjust these loan series, home construction loans are subtracted from the new home loan series and added to the new commercial loan series.

- Under the IFRS format, banks are currently recording the use of credit cards with payment pending in the commercial or consumer loan portfolio, depending on whether the card holders are firms or individuals, respectively[9]/. Previously, these loan items were not usually recorded as bank loans, so this new loan component is deducted from the new commercial and consumer loan series.

The analysis presented in this *Report* is based on loan series constructed in accordance with this adjustment methodology.

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[6]/ See the box "International financial reporting standards in the local banking sector," in the *Financial Stability Report*, second half 2007.

[7]/ The new financial reporting format also changed the recording of other accounting items, such as equity and some components of the income statement.

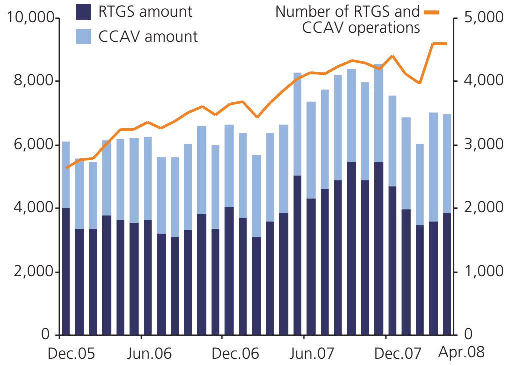
[8]/ Corresponds to the balance sheet account, "General loans with letters of credit."

[9]/ Corresponds to the amount used by the card holder prior to the card's payment due date.

V. Financial regulations and infrastructure

Figure V.1

Payments settled in the large-value payment systems (*)
(Ch$ billion, number of operations)

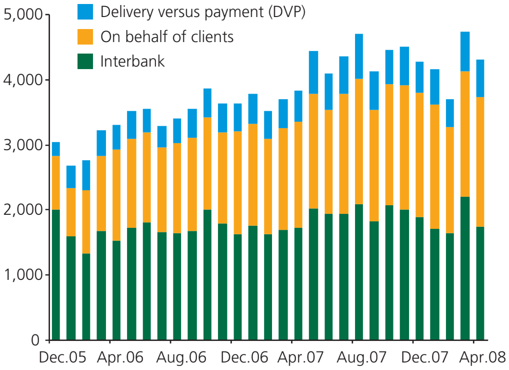


(*) Monthly daily average.

Sources: Combanc and Central Bank of Chile.

Figure V.2

Types of payments settled in the large-value payment systems (1) (2)
(Ch$ billion)



(1) Monthly daily average.
(2) Excludes Central Bank of Chile operations.

Sources: Combanc and Central Bank of Chile.

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

Payment systems and financial infrastructure

The payment systems are an essential component of the financial infrastructure. Their safe and efficient functioning is fundamental for the good performance of the economy, the effectiveness of monetary policy, and financial stability. The Central Bank of Chile has the responsibility of overseeing the normal functioning of the payment systems. It therefore has the authority to regulate and supervise different aspects of these systems.

Large-value payment systems

The large-value payment systems (LVPS) 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). Both systems process interbank, on behalf of clients, and delivery versus payment (DVP) transactions.

The large-value payment systems processed $7 trillion and 4,600 payments a day in April. The first four months of 2008 thus closed with higher levels of activity than recorded in the same period last year. These figures represent a growth of 7.5% in amount and 18% in volume. Of the total payments cleared, $3.9 trillion were processed in the RTGS system, while $3.1 trillion were processed in the CCAV. The average value of each transaction cleared in the system was equal to $1.5 billion per payment (figure V.1).

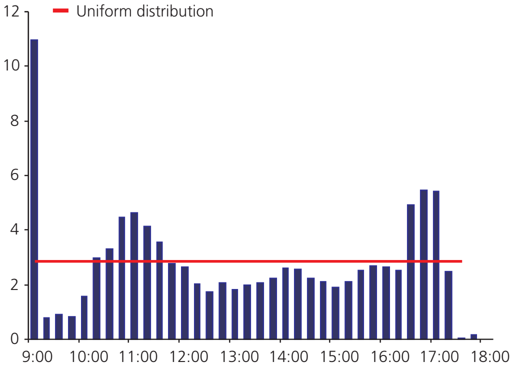
The growth relative to the same period last year, in terms of both number and amount of payments cleared, is mainly explained by the increase in DVP transactions (18%) and client account transactions (20%). Of the total payments processed in the large-value payment systems as of April 2008, 31% corresponded to interbank payments, 35% to on behalf of clients' transactions, and 10% to DVP transactions (figure V.2).

An analysis of the intraday distribution of payments processed through the RTGS system reveals that transactions cleared are evenly distributed, which contributes to the smooth functioning of the system. Nevertheless, there are three periods of greater activity across the daily cycle. The first

Figure V.3

Hourly distribution of payments settled in the RTGS system (*)

(percent of total amounts, time)



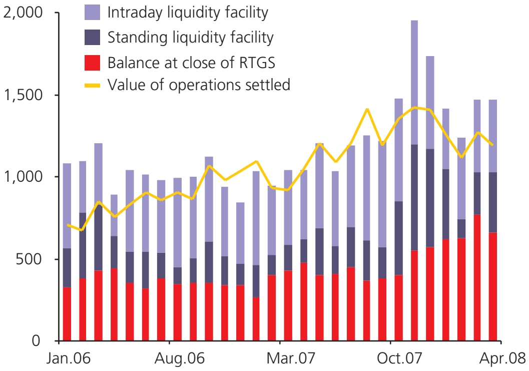
(*) 2007.

Source: Central Bank of Chile.

Figure V.4

Liquidity in the RTGS system (*)

(Ch$ billion)



(*) Monthly daily average.

Source: Central Bank of Chile.

Table V.1

Main retail means of payment

	2004	2005	2006	2007
	(Ch$ billion)			
Checks	503,038	463,924	348,207	371,835
ATMs	7,673	8,633	8,838	10,270
Nonbank credit cards	n.a.	n.a.	n.a.	3,811
Bank credit cards	1,495	1,996	2,140	2,627
Debit cards	804	942	1,172	1,188
Internet operations	n.a.	n.a.	n.a.	n.a.
	(number of operations in thousands)			
Checks	284,286	276,589	266,585	259,017
ATMs	233,617	246,115	238,633	264,268
Nonbank credit cards	n.a.	n.a.	n.a.	159,898
Bank credit cards	50,799	63.,780	61,572	68,159
Debit cards	42,645	52,157	62,282	70,130
Internet operations	46,556	56,991	88,183	107,014

n.a.: Not available.

Source: SBIF.

occurs immediately on opening for business (9:00 a.m.), which is related to the constitution of guarantees on the part of banking entities for the start of CCAV operations. The second period of heightened activity takes place between 10:45 and 11:15 a.m. and is tied to the settlement of transactions on the Santiago Stock Exchange involving the expiration of interbank loans and foreign currency trading. Finally, payments involving client transfers, interbank loans, mutual fund transactions, and securities market DVP operations are clustered between 4:30 and 5:00 p.m. (figure V.3).

To ensure the timely settlement of transactions in the RTGS system, the banking entities use a combination of their own resources and mechanisms that facilitate the system's operation. Specifically, they draw on the balance that they maintain in their transaction accounts at the close of the business day, as well as the Intraday Liquidity Facility (*Facilidad de Liquidez Intradía*, or FLI) and returns from the use of the Standing Liquidity Facility (*Facilidad Permanente de Liquidez*, or FPL). The latter gives the banks access to liquidity at one-day terms, with an annual interest rate equal to the MPR plus 0.25%. The banks' liquidity estimates at the start of the day determine the level of use of the Intraday Liquidity Facility. Over the course of the day, a participant's payments may also be financed through incoming payments and interbank loans. Banks appear to manage their liquidity efficiently, since the available funds are consistent with the value of payments cleared daily in the system (figure V.4).

Retail payment systems

The retail payment systems —which are used to make payments and transfer funds between individuals and/or firms— are characterized by processing a large number of smaller-value transactions, normally tied to the sale and purchase of goods and services.

Payments made with checks continue to lose ground to other less traditional means of payment. In 2007 the number of checks processed fell 3%, while transactions using credit cards and the Internet grew by over 20%.

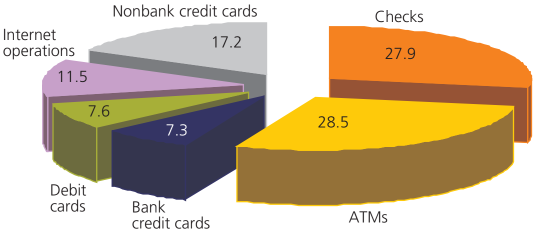
In terms of the value of transactions, credit cards grew more than the other payment means during the year (23% nominal). Automatic teller machines (ATMs) were second, with a 16% nominal increase in the total value of transactions (table V.1).

An analysis of the distribution of credit cards among bank and non-bank issuers reveals that the latter have gained considerable ground. Data published by the SBIF indicate that there are 22 million active non-bank cards, or more than four times the number of active bank cards. This strong position of non-bank issuers is confirmed by the amount of transactions in the year ($3.8 trillion), which is 45% more than the amount transacted with bank credit cards ($2.6 trillion).

Finally, 86% of total non-bank credit card transactions took place in the business associated with the ownership and/or management of the company issuing the cards, while the remaining 14% were made in nonrelated

Figure V.5

Importance of the retail means of payment (*)
(percent)



(*) As of December 2007. Share of total number of transactions.

Source: Central Bank calculations, based on data from the SBIF.

companies. These payments are considered significant from the perspective of safeguarding financial stability (figure V.5)[1].

Financial framework and prudential regulation

Regulatory framework dictated by the Central Bank of Chile

Reduction in the minimum terms for bank deposits and receipts (January 2008, www.bcentral.cl)

The Central Bank, following approval by the SBIF, reduced the minimum deposit terms from 30 to 7 days for the following cases:

a. Nonindexed time deposits and receipts, regardless of the currency of denomination.

b. Time deposits and receipts in current domestic currency, indexed to the U.S. dollar exchange rate and other authorized currency exchange rates (the indexing system set forth in chapter II.B.3, Nº2, letter c, of the *Compendium of Financial Regulations*).

This decision was made in the context of the new regulatory framework introduced recently by the Central Bank and the SBIF, with regard to the management and control of financial risks on the part the local banking system, taking into account the experience of other countries. The new minimum terms came into effect on Tuesday, 26 February 2008.

Raising of the limit on pension fund investment in foreign securities (April 2008, www.bcentral.cl)

In April, the Central Bank raised the limit on the pension funds' investment in foreign securities to 45%. In gradually expanding these foreign investment limits, the Central Bank has been exercising the authorities granted it by article 45 of DL 3500 of 1980, as amended by Law 20,210.

The new limit became effective on Thursday, 24 April 2008.

Regulations issued by other supervisory organizations in the country

Pension Reform (Ministry of Labor and Social Security, March 2008, www.mintrab.org.cl)

Law 20255 was enacted in March 2008, establishing the "Reform of the Pension System" and incorporating a number of important changes to DL 3500 of 1980, the legal body of the pension system. One of the important changes introduced by this reform, from a financial perspective, is the broadening of the spectrum of investment alternatives for the pension funds in Chile and overseas. To this end, an "Investment Regime" was created, conceived as a more flexible regulatory instrument for defining investment limits. This regime will be issued through a resolution pronounced by the SAFP and underwritten by the Finance Ministry, following consultation with the Technical Investment Counsel. The Council will be made up of experts in the areas of finance, capital markets, and investment[2].

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[1] Card systems are considered significant when they are used to make payments and other transactions with entities that are not related to the issuer for an amount equal to or greater than UF1,000,000.

Other changes introduced by this reform include the following: a new legal structure for establishing corporate governing bodies (for example, the definition of requirements for appointing the directors of the pension fund administrators, or AFPs), the regulation of commissions (for example, the regulation of limits on commissions charged), and new powers for the SAFP to establish regulations on the adequate monitoring of portfolio risk (box V.I).

SBIF establishes standards on the quality and transparency of information (SBIF, March 2008, www.sbif.cl)

The SBIF implemented a series of modifications to its regulatory guidelines, primarily to increase the level of transparency of information on the financial products offered in the local banking system. Specifically, chapter 18-14 ("Transparency of Public Information") was incorporated in the SBIF guidelines, establishing minimum requirements for banks to comply when providing information to their clients. To maintain consistency with this new regulatory body, the SBIF modified chapter 1-20, establishing new instructions for the charging and notification of commissions on checking accounts and credit cards. Finally, with regard to this same area, in chapter 1-13, the sections on credit risk and quality of service were reformulated.

Documents of interest published by national and international organizations

"Observations on Risk Management Practices during the Recent Market Turbulence" (Senior Supervisors Group, March 2008)

This publication reports on the analysis of a sample of large financial entities, undertaken with the objective of evaluating the success of their risk management practices in the face of the current financial market turbulence. The analysis was complemented by the results of a round table meeting between supervisory agencies and industry representatives, carried out last February in the Federal Reserve Bank of New York.

One of the conclusions of the study is that the best-performing entities are typically more active in managing their consolidated balance sheets, liquidity, capital, and the alignment of their treasury functions and risk management processes. This conclusion leads to a proposal to strengthen the supervisory agenda, mainly by shoring up the Basel II capital requirements, liquidity management policies, best practices in risk management, and the promotion of communication and cooperation among supervisors and market participants.

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[2] The Technical Investment Counsel is made up of two members appointed by the Executive, one person appointed by the Central Bank of Chile's Board, and two people appointed by the Pension Fund Administrators (AFPs).

"Enhancing Market and Institutional Resilience" (Financial Stability Forum, April 2008)

This document identifies the causes of the recent financial turbulence and makes recommendations for addressing it. The development of these recommendations is the result of the joint work by some of the most influential organizations in the main international financial centers[3]/. One of these organizations, the Basel Committee on Banking Supervision (BCBS), put out an independent publication, which is presented as a support document that complements the Financial Stability Forum (FSF) report, with recommendations focused on the banking sector[4]/.

Both the FSF and the BCBS emphasize strengthening prudential regulation, especially in terms of achieving greater safeguards for over-the-counter (OTC) derivatives and/or structured products. They thus recommend, for example, increasing the Basel II capital requirements for collateralized debt obligations (CDOs) and asset-backed securities (ABSs)[5]/. A second line of recommendations involves promoting greater transparency in the financial markets, especially in terms of the accounting of off-balance-sheet transactions, the dissemination of pricing of complex financial instruments, and a greater availability of information on the agents that participate in the securitization processes. Finally, they propose changes in the functions of risk-rating agencies, primarily to improve the quality of their ratings.

"Liquidity Risk: Management and Supervisory Challenges" (BIS, February 2008)

The BCBS summarizes some of the most important financial developments for the adequate management of liquidity risks, developed through the cumulative work of the Working Group on Liquidity (WGL), established by the BCBS in 2000. The document also analyses the financial difficulties that have emerged starting in 2007 and reviews the document "Sound Practices for Managing Liquidity," published by the BCBS in 2000.

The main areas identified for strengthening liquidity risk management correspond to the use of measures that capture a broader spectrum of this type of risk, stress tests that place more emphasis on market information, coordination among supervisors and the management intraday and foreign currency liquidity risk.

"Financial Stability and Depositor Protection: Strengthening the Framework" (Bank of England, January 2008)

The British Government, the Financial Services Authority (FSA) and the Bank of England present a proposal for strengthening and modernizing the

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[3]/ Basel Committee on Banking Supervision (BCBS), the International Organization of Securities Commissions (IOSCO), the International Association of Insurance Supervisors (IAIS), the Joint Forum, the International Accounting Standards Board (IASB), the Committee on Payment and Settlement System (CPSS), the Committee on the Global Financial System (CGFS), the IMF, the BIS, and other public and private participants.

[4]/ BCBS, BIS (2008).

[5]/ BCBS and IOSCO proposals have been announced for late 2008.

U.K. regulatory regime, based on the experiences of the recent episodes of financial instability and building on the document "Banking Reform: Protecting Depositors," published in October 2007. The proposal also takes into account the report "The Run on the Rock," published on 26 January by the House of Commons Treasury Committee.

The proposal sets out five objectives: strengthening the financial system (improving risk management inside banks and securitization markets); reducing the likelihood of bank failures (strengthening the regulatory structure); reducing the impact of bank failures should they occur (the introduction of a "special resolution regime"); establishing effective client compensation mechanisms; and strengthening the functions of the Bank of England (improving coordination with other supervisors). These proposals were made available for consultation and discussion by financial institutions, consumer representatives, and international counterparties.

"Blueprint for a Modernized Financial Regulatory Structure" (U.S. Department of the Treasury, March 2008)

The U.S. Department of the Treasury has presented a proposal for moving forward on a broad reform to the regulatory system of that country. An analysis of the content of the proposals finds that the elements that would be implemented in the immediate future can be interpreted as a response to the recent financial difficulties that have affected the U.S. financial markets. For example, one proposal involves the creation of a new federal agency focused on overseeing the mortgage origination process.

The medium- and long-term proposals address the need for structural modifications to the U.S. regulatory system. The proposals are aimed at building a regulatory infrastructure that ideally would be designed around three regulatory functions, covering a broad range of action and avoiding the overlap of functions. The first of these functions would center on market stability and would be undertaken by the Federal Reserve, which for this purpose would be given additional powers and duties. A second regulator would specialize in prudential regulation, with authority over a broad segment of financial institutions. Finally, a third regulator would be oriented to consumer protection.

Box V.1: **Financial aspects of the Pension Reform**

Law 20255 was enacted in March 2008, creating the unified pension system, modifying the institutional structure to accommodate that system, and incorporating changes to the pension system established in Law DL 3500 of 1980 and related issues. This box describes the main changes introduced by this Pension Reform from a financial perspective.

Investment Regime and the Technical Investment Council

This law establishes an Investment Regime, conceived as a more flexible regulatory framework for defining the characteristics of instruments eligible for pension fund investment, establishing investment limits that are not specified in the law, regulating indirect investment by the pension funds, and determining the mechanisms and time frame for eliminating excess investment. This regime will be issued by pronouncement from the SAFP and underwritten by the Finance Ministry, following a report by the Technical Investment Council (*Consejo Técnico de Inversiones*, CTI).

The law also created the CTI, a standing committee whose objective is to write reports, proposals, and pronouncements on the Investment Regime. The Council will be composed of five members: one to be appointed by the executive branch, one by the Central Bank's Board, one by the Pension Fund Administrators (AFPs), and two by the deans of accredited universities. The members of the CTI will serve for four years, and they can renew their appointment or be reelected for one additional consecutive period.

New structure of investment limits

The law establishes just five investment limits, deemed significant for containing pension fund risk and necessary for the multifund scheme. Of these five limits, four will be set by the Central Bank. The limits are applicable to state instruments, investment in foreign securities, unhedged foreign currency investments, relatively riskier instruments, and variable-income securities. They are outlined below.

(i) The law establishes a range for investment in state instruments, which varies by type of fund: 30% to 40% for type A and B funds, 35% to 50% for type C funds, 40% to 70% for type D funds, and 50% to 80% for type E funds.

(ii) The law provides for a gradual increase in the overall limit on the pension funds' investments abroad, together with individual limits for each type of fund, with the higher of the two being the applicable rate (table V.2).

Table V.2

Pension funds limits for investment abroad
(percent of each type of fund)

Type of fund	Range 1 (first year)	Range 2 (second year)
A	25 to 80	45 to 100
B	20 to 70	40 to 90
C	15 to 60	30 to 75
D	10 to 30	20 to 45
E	5 to 25	15 to 35
Overall limit	30 to 60	30 to 80

Source: SAFP.

(iii) The limits on unhedged foreign currency investments have been expanded. The new ranges by type of fund are as follows: 30% to 50% for type A funds, 25% to 40% for type B funds, 20% to 35% for type C funds, 15% to 25% for type D funds, and 10% to 15% for type E funds.

(iv) The range established for relatively riskier instruments is between 10% and 20% for each type of fund. This class of instruments includes debt with a rating below BBB or without a rating, stocks that do not meet the requirements of the Investment Regime, low liquidity instruments, and notes from issuers with less than three years in business.

(v) The law also sets limits on investment in foreign and domestic variable-income instruments by type of fund. The values are similar to the current limits: 80% of the value of type A funds, 60% for type B funds, 40% for type C funds, and 20% for type D funds. In addition, the law authorizes 5% for type E funds.

Other important provisions

The new law gives AFPs greater responsibility for managing their investments, by requiring them to formally establish investment policies and to notify the SAFP and the public about these policies. They are also required to set up an investment committee within their respective boards of directors, which will be responsible for designing and overseeing the investment policies.

Finally, the SAFP has been vested with new powers to establish regulatory guidelines on the adequate monitoring of portfolio risk, although the law does not explicitly identify a specific methodology for achieving this objective.

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Glossary

ABS: Asset-backed security. A long-term bond backed by a set of assets, usually made up of consumer loans (credit cards and car loans), student loans, home equity loans, or commercial loans. ABSs that are backed by mortgage assets are called mortgage-backed securities (MBSs).

Alt-A: Mortgage loans granted to individuals whose credit risk is between prime and subprime. In general, the individuals who obtain these mortgages have good credit histories, but a high debt-to-income ratio or insufficient documentation to back their income.

Bank loans: Commercial loans and foreign trade credit granted by local banks.

Banking book: An accounting book that includes both asset and liability positions in instruments, contracts, and other operations that are not included in the trading book. The instruments recorded in this book are generally associated with the traditional activities of the banking sector, such as loans and deposits, or are financial instruments that the institution acquires with the intention of holding to maturity.

Basis point: Unit of measure of the volatility of a bond that is traded in financial markets, equal to one-hundredth of one percent (0.01%).

CCAV: Large-Value Payment Clearing House (*Cámara de Compensación de Pagos de Alto Valor*). Electronic system of interbank payments that operates as a netting engine, with procedures to ensure the final clearing of the net results of each settlement cycle in the RTGS system.

CDO: Collateralized debt obligation. An investment-grade instrument backed by a set of bonds, loans, or other assets (generally non mortgage assets).

CDS: Credit default swap. A derivative instrument that provides insurance against the credit risk of the issuer of a given underlying sovereign or corporate bond. The institution that grants the CDS commits to covering the loss associated with a previously established credit event occurring before the bond's maturity date.

Central Government: Institutions associated with the three branches of the State (Executive, Legislative, and Judicial), as well as Law 13196, the interest earned from recognition bonds, and the oil price stabilization fund.

Conduits: Investment companies that are financed by issuing commercial paper and that generally invest in ABSs and MBSs. The majority are sponsored by a bank, which grants the company a credit line for 100% of its underlying assets.

Consolidated Government: The total Central Government and the Central Bank of Chile Chile.

Consumer banks: Banks whose main business is centered to consumer loans.

Core capital: A bank's paid-in capital plus reserves.

Credit risk: The possibility that a bank debtor or counterparty will fail to meet its contractual obligation, whether in interest or capital.

Currency risk: Exposure to losses caused by adverse changes in the value of the foreign currencies in which the instruments, contracts, and other transactions recorded on the balance sheet are denominated.

DIR: Debt-to-income ratio. Measures the debt held by households with different financial and non-financial entities as a percentage of their disposable income.

DVP: Delivery versus payment. A clearing mechanism that links a securities transfer system with a funds transfer system, guaranteeing that the delivery of the securities occurs simultaneously with the payment thereof.

EBITDA: Earnings before interest, taxes, depreciation, and amortization. Used as an approximation of operating cash flow.

Effective capital: The numerator in the capital adequacy ratio, which corresponds to paid-in capital and reserves, plus a share of subordinate bonds up to 50% of core capital, plus general provisions up to 1.25% of risk-weighted assets.

External debt: Financial commitments with non-residents. Includes bank debt, bonds, and other overseas loans, as well as loans associated with foreign direct investment.

FEES: Economic and Social Stabilization Fund (*Fondo de Estabilización Económica and Social*). Created in 2007 by Finance Ministry's Decree with Force of Law DFL 1 of 2006. The Fund's objective is to accumulate the surplus flows that are generated by the application of the structural balance rule, and it will serve as a source of financing in future deficit periods.

Financial debt: Interest-bearing debt, measured as bank debt, plus liabilities with the public (bonds and commercial paper).

Financial indebtedness (leverage): Ratio of financial indebtedness, measured as financial debt/(Equity plus minority interest).

FIR: Financial burden ratio. Measures the payments that households must make to fulfill their consumer and mortgage loan commitments (interest expenses plus amortizations), as a percentage of their disposable income.

FLI: Intraday Liquidity Facility (*Facilidad de Liquidez Intradía*). Financing granted by the Central Bank of Chile to facilitate the settlement of transactions in the RTGS system, via the purchase of debt securities with a repurchase agreement in the same day.

Foreign trade banks: Banks whose main business is oriented to foreign trade loans. They also invest in derivative and non-derivative financial instruments.

Forward contract: A contract between two parties, establishing a commitment to exchange a certain quantity of an asset on a future date, at a predetermined price.

Forward curve: A graph of forward rates all for the same maturity but with different forward periods, graph of instant interest rate implicit in the yield curve of the Central Bank of Chile's debt instruments.

FPL: Standing Liquidity Facility (*Facilidad Permanente de Liquidez*). Financing granted by the Central Bank of Chile at a one-day maturity via the purchase of securities with a repurchase agreement. This facility is contracted at an annual interest rate equal to the MPR plus 0.25%.

FRP: Pension Fund Reserve (*Fondo de Reserva de Pensiones*). A fund created by the Fiscal Accountability Law, whose objective is to complement the financing of fiscal liabilities arising from the state minimum pension guarantee on old age, disability, and survivor's pensions and welfare benefits. It is managed by the Central Bank of Chile in its role as Fiscal Agent, under investment guidelines defined by the Finance Ministry's Decree 1382 and complementary instructions.

General Government: Comprises all the subnational governments (municipalities) and all the non-profit institutions, which are controlled or financed mainly by resident government units (*Manual de Estadísticas de Finanzas Públicas*, 2001. IMF).

Hedge fund: An investment fund that manages high-risk portfolios using advanced investment techniques, in both domestic and international markets. The fund's objective is to generate the highest returns possible, whether in absolute terms or compared with a benchmark for a specific market.

IFRS: International Financial Reporting Standards. A set of standards issued by the International Accounting Standards Board (IASB), whose goal is the comparable and transparent revelation of financial statement information, for all the participants in the world capital markets.

IIP: International investment position. The economy's stock of external financial assets and liabilities, valued at market price.

Input-output matrix: A simplified representation of the economy that shows the structure of the generation and use of the supply of goods and services, for a selected period defined as the base year.

Interest coverage: A measure of payment capacity, defined as the ratio of EBITDA to financial expenses.

Interest rate risk: Exposure to losses caused by adverse changes in interest rates, which affect the value of the instruments, contracts, and other transactions recorded on the balance sheet.

LBO: Leveraged buyout. The use of debt (bonds or loans) to acquire another company. The assets of the company to be acquired are frequently used as collateral for the loans, together with the assets of the company making the purchase. The goal of an LBO is to allow a company to make large acquisitions without having to put up too much capital.

LVPS: Large-value payment systems. Comprises the RTGS and CCAV systems.

M1: A measure of the money supply that includes currency in circulation, the value of checking accounts held by the non-financial private sector (net of clearing), non-checking demand deposits, and demand savings accounts.

M2: M1 plus time deposits, time savings deposits, mutual fund shares with investments in debt instruments with a maturity of up to one year, and deposits with savings and loan cooperatives, less the time deposits of the aforementioned mutual funds and savings and loan cooperatives.

Margin call: A call from a fund manager (commercial banks, investment banks, hedge funds, mutual funds, and others) to its investors to increase their deposits or put up additional collateral. This usually occurs when the capital contributed by investors, as a share of the market value of their financial assets, is below the minimum ratio accepted by the respective fund manager.

Market risk: The potential loss in value of the net positions held by a financial entity, as the result of adverse changes in market prices.

MBS: Mortgage-backed security. An ABS backed by mortgages.

Medium-sized banks: Banks with a smaller market share than multibanks, but a similar level of diversification.

Multibanks: Banks with a large market share and a high degree of diversification in their operations (loans and derivative and non-derivative financial instruments).

NIIP: Net international investment position. The difference between the economy's external assets and liabilities.

Operating margin: A firm's profitability, independent of how it is financed. Measured as the ratio of operating income to sales revenues.

Overnight rate: The rate at which the banks grant immediate financing to other banks.

Price-earnings ratio: The ratio of a stock's market price and its nominal earnings per share for a given period, expressed in number of times.

Prime deposit rate: Interest rate that financial institutions offer their best clients on short- and medium-term deposits.

"Promedio cámara" interest rate swap: Derivatives contract between two parties, who carry out an exchange of flows at future dates, between a fixed rate established when the contract is written and a variable rate (fixed-for-floating swap). The variable rate corresponds to the average interest rate of the interbank *cámara* (clearing house), which in turn is derived from the average *cámara* index.

Public offering securities: Instruments issued by firms and traded in the capital market.

Repricing: A component of interest rate risk, corresponding to the exposure to losses caused by rolling over of assets and liabilities with different maturities under different financial conditions.

Repurchase (reverse repurchase) agreements: Sale (purchase) collateralized with an agreement or commitment to repurchase (sell back) the security. Also known as repos.

Risk-weighted assets: Denominator of the capital adequacy ratio. Corresponds to bank assets weighted by one of the five credit risk factors, net of provisions, considered in article 67 of the General Banking Law.

ROA: Return on assets. Measured as the ratio of earnings after taxes, amortizations, and extraordinary items to total assets. It is the total profitability of the firm, which is divided among creditors and shareholders.

ROE: Return on equity. Measured as the ratio of earnings after taxes, amortizations, and extraordinary items to shareholders' equity plus minority interest. It is the shareholders' return.

RTGS: Real-time gross settlements system. Electronic interbank payment system managed by the Central Bank of Chile, in which the processing and clearing of transactions is carried out continuously, individually, and in real time.

Senior bonds: Ordinary long-term bond issued by banks.

SIV: Structured investment vehicle. Very similar to conduits, except that sponsoring banks only provide credit lines equal to 5% or 10% of their underlying assets.

Subordinate bonds: Long-term bonds issued by banks, with a maturity of not less than five years and with no prepayment clauses. Because subordinate bonds are repaid after the claims of other creditors are settled in the case of bank liquidation, a share of these bonds is computed as effective capital.

Subprime: A loan segment of the U.S. financial market. They are loans (usually mortgages) granted to debtors whose characteristics and payment history are below the average standards of the banking industry, such that they present a greater default risk than the average for other loans. The loans granted to debtors that satisfy the average standards of the banking industry are called prime.

Swap rate: The fixed rate in an interest rate swap, which is exchanged with the observed average interbank interest rate, based on a given amount of capital and a specified period in the future.

TIPS: Treasury Inflation-Protected Security. A special type of U.S. Treasury bond or note that offers protection against inflation, as measured by the consumer price index.

Total debt: Current plus long-term liabilities. These include all of a firm's liabilities with third parties other than its shareholders.

Trading book: An accounting book that includes both asset and liability positions in instruments that are actively and frequently traded by the financial institution, or that are held with the intention of selling them in the short term.

Treasury banks: Banks dedicated to investment in derivative and non-derivative financial instruments, and that do not grant loans.

Unrestricted reserves: Official reserves less short-term commitments in foreign currency (maturing BCX, BCD, and swaps), fiscal deposits with the Central Bank, and others.

Abbreviations

ACHEF: Asociación Chilena de Empresas de Factoring (Association of Chilean factoring firms).
AFP: Administradoras de Fondos de Pensiones (Pension fund administrators).
BCD: Central Bank bonds expressed in dollars.
BCP: Central Bank bonds expressed in pesos.
BCU: Inflation-indexed Central Bank bonds, expressed in UF.
BCX: Central Bank dollar bonds.
BIS: Bank for International Settlements.
BTP: Treasury bonds expressed in pesos.
BTU: Treasury bonds expressed in UF.
EMBI: Emerging market bond index.
FDI: Foreign direct investment.
GDP: Gross domestic product.
IMF: International Monetary Fund.
IPSA: Índice de Precios Selectivo de Acciones (Selective stock price index).
IR: International reserves
LIBOR: London Inter-Bank Offered Rate.
MPR: Monetary Policy Rate.
MSCI: Morgan Stanley Capital International.
NBER: National Bureau of Economic Research.
NIR: Net international reserves.
OPEC: Organization of Petroleum Exporting Countries
SAFP: Superintendencia de Administradores de Fondos de Pensiones (Superintendency of pension fund administrators).
SBIF: Superintendencia de Bancos e Instituciones Financieras (Superintendency of banks and financial institutions).
SuSeSo: Superintendencia de Seguridad Social (Superintendency of social security).
SVS: Superintendencia de Valores and Seguros (Superintendency of securities and insurance).
S&P: Standard & Poor's.
UF: Unidad de Fomento (an inflation-indexed unit of account).
U.S.: United States of America.
WTI: Western Texas Intermediate.

Characterization of the external and internal risk ratings of firms registered with the SVS[1]

Authors: Luis Antonio Ahumada,[2] Daniel Oda, and Sergio Huerta Vial[3].

I. Introduction

The ratings of debt instrument issuers will have a very important role in determining the Chilean banking system's minimum regulatory capital. This is because the program designed by the Superintendency of Banks and Financial Institutions (*Superintendencia de Bancos e Instituciones Financieras,* SBIF) to implement Basel II in Chile contemplates, in its first stage, using the standardized approach (SA) for measuring credit risk, as proposed in this accord. Following this approach, the risk ratings assigned by risk-rating agencies (external ratings) are linked to parameters that determine the amount of weighted assets exposed to credit risk, which then makes it possible to determine the adequate level of minimum capital for each bank.

According to SBIF data, 24% of the 532 firms registered with the Superintendency of Securities and Insurance (*Superintendencia de Valores y Seguros,* SVS) in December 2005 had a risk rating from local rating agencies[4]. If the international risk ratings of firms with borrowings from the local financial system are also taken into account, the SA would have covered close to 13% of all loans on that date[5].

Despite the low percentage of bank exposure to firms with external ratings in 2005, the growing number of bond issues and of firms listed on the stock exchange in recent years should increase this share in the future, and therefore the number of local banks to which the SA is applied should also rise.

With regard to Basel II's implementation, questions have been raised in the international arena about the effects of capital requirements on volatility, as a result of cyclical variations in economic activity and their effect on risk ratings. The objective of this article is to illustrate how the Chilean banking system's regulatory capital would have evolved in recent years if Basel II's SA had been applied.

The article also demonstrates various characteristics of external risk classification, such as the historical annual transition from one rating category to another and changes in the risk assessment of local rating agencies in relation to the evolution of economic activity.

Thanks to collaboration between the SBIF and the Central Bank, we have been able to access data on the ratings commercial banks assign to SVS-registered companies while maintaining a commercial relationship with them (so called internal rating)[6]. This article characterizes the evolution of these internal ratings in a similar manner to the characterization of external ratings.

Finally, the article looks for consistencies between the risk assessment of SVS-registered companies carried out by external rating agencies and those by banks. The degree of consistency between external and internal ratings is relevant because in the medium term, numerous institutions could migrate to a system of capital determination based on internal ratings. It is thus interesting to evaluate the consequences of the use of these ratings on the system's capital volatility. The article also shows the volatility that capital requirements would have experienced if the internal rating methodology had been applied[7].

There are, however, some issues to consider when comparing external and internal ratings. It could be argued, for example, that banks have more frequent contact with firms and could therefore react sooner to changes in financial conditions. Internal ratings would thus be more sensitive to changes in credit risk. At the same time, competition in lending could lead banks to be less strict when assigning risk ratings. Other factors that could provoke a difference in ratings is the hierarchy of debt stemming from pledged collateral and the existence of corporate bond covenants versus bank loan covenants.

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[1] The opinions expressed herein are the exclusive responsibility of the authors and do not necessarily represent those of the Central Bank of Chile, its Board, or the Superintendency of Banks and Financial Institutions.

[2] Central Bank of Chile, e-mails: lahumada@bcentral.cl and dodaze@bcentral.cl

[3] Superintendency of Banks and Financial Institutions, e-mail sahuerta@sbif.cl

[4] Local ratings correspond to issues. For the purposes of this article, we assume that the rating of an issue is equivalent to the rating of the issuer.

[5] "Risk rating, risk weights and capital requirements in the credit risk standardized approach."Consultative Working Document, SBIF, December 2006.

[6] This article is part of the joint research program on financial stability developed by the SBIF and the Central Bank of Chile.

[7] For a description of the banking system's internal rating methodology, see chapters 7–10 of the SBIF's Updated Compilation of Regulations (*Recopilación Actualizada de Normas*, RAN).

However, assuming that these or other factors that could influence the risk rating process remain stable over time, and assuming that the frequency and quality of access to information is similar for banks and external rating agencies, both entities should react similarly when receiving new information. Since this article is basically descriptive, its purpose is to present some stylized facts rather than try to formally answer these or other questions.

The SBIF's proposal for transitioning to Basel II specifies four weights for rating local corporate exposure in domestic currency: 20% for AAA firms, 50% for firms rated between AA+ and A+, 100% between A and BB, and 150% for the rest (table 1)[8]. Table 1 presents an ad hoc equivalence of external ratings with the internal rating scale stipulated in the SBIF regulations on provisions (footnote 5). This equivalence is constructed by approximating the probability of default associated with external ratings to the stipulations contained in Circular 7-10 for corporate exposure with a normal degree of risk. Internal ratings with higher-than-normal risk refer to operations with "insufficient payment capacity" and with "estimated losses" (rather than "expected losses"), meaning that the assimilation between these and external ratings is not trivial. For the purposes of this article, we assume that internal ratings with higher-than-normal risk have a weight of 150%. This distribution will be used to describe the evolution of internal and external ratings in the following sections.

Table 1

External ratings, internal ratings and Basel II credit risk weights

Circular 7-10 RAN (*)		Basel II (%)	S&P	Class
		20	AAA	Investment grade
		50	AA+	
Debtors with normal risk	A1		AA	
	A2		AA-	
	A3		A+	
	B	100	A	
Debtors with higher -than-normal risk	C1		A-	
	C2		BBB+	
	C3		BBB	
	C4		BBB-	
	D1		BB+	
	D2		BB	
		150	BB-	Speculative-investment grade
			B+	
			B	
			B-	
			CCC+	
			CCC	
			CCC-	
			CC	
			D	

(*) SBIF's Updated Compilation of Regulations.

Source: Central Bank calculations, based on data from S&P and SBIF.

II. Characterization of external ratings

The information on external risk ratings was taken from files available on the SVS website. The sample considers local ratings in domestic currency of corporate bonds rated by risk-rating agencies that operated in the domestic market from January 1997 to December 2006 (*Consultores Asociados*, Duff, Feller Rate, Fitch Ratings, Humphreys, and ICR Chile)[9].

Figure 1 presents the risk rating groups —summarized in table 1 and based on the risk weights for local corporate exposure in domestic currency— for firms with an external rating and local bank debt, as proposed by the SBIF[10]. This figure is useful because it illustrates the potential impact of Basel II implementation if the standardized approach were extended to companies with local risk ratings.

The largest share of bond-issuing firms is rated between A+ and AA+. In the third quarter of 2006, only 20% of rated firms had a risk weighted factor of 100% (A/BB), whereas 62% were rated between A+ and AA+, meaning their risk weighted factor was at 50%. The rest of the companies (AAA) were weighted at 20%. Of these, 14 were infrastructure corporations and the other two were Enap and Codelco.

To illustrate the dynamics of external ratings, table 2 shows the historical annual transitions of bond-issuing firms, with ratings by all rating agencies[11]. This matrix reveals the historical probability of either staying in a category or changing from one category to another in a one-year period. It is based on bond ratings in effect from 1997 to date.

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[8] The weighting factors associated with external ratings are taken from an internal document developed by the SBIF for the purpose of running the models in parallel in 2007 during the transition to Basel II. These constitute the rating scale stipulated in Securities Market Law 18,045.

[9] The sample under analysis excludes financial institutions.

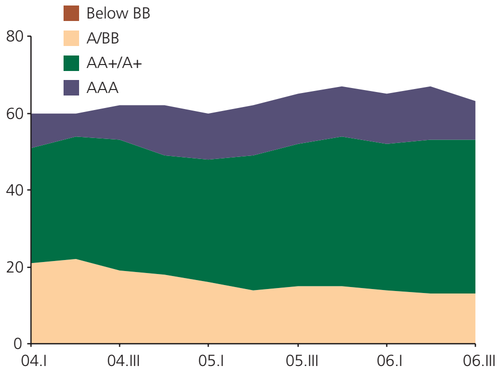
[10] See the reference in footnote 3.

[11] To construct the transition matrix, we use each company's lowest rating, whether external or internal —an assumption held throughout the rest of the article.This assumption is consistent with the stipulations of several financial regulations.

Figure 1

Distribution of external risk ratings

(number of firms) (*)



(*) Firms with local bank debt.

Source: Central bank calculations, based on data from the SVS and Central Bank of Chile.

The table shows, first, that companies with a AAA rating have a greater probability of staying in this category than companies with other ratings. Second, the probability of remaining in a given category generally decreases with as the level of risk assigned to a firm increases, except for firms with an AA+ rating. Third, most companies are rated A- or higher. On average, 90% of annual transitions are into adjacent rating categories. In addition, if we use the SA's risk rating groups proposed by the SBIF (table 1), the probability of remaining in the 100% category is 82%. A company's probability of remaining in the 50% category for one year is 91.5%. We can thus predict that variations in regulatory capital could be very low once Basel II is implemented.

Table 2

Historical external rating transitions matrix

(percent of annual change)

	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	< BB
AAA	91,3		3,3	2,7	0,1	1,2	0,1	1,0	0,1				
AA+	0,6	68,5	22,7	4,0	0,6	2,8	0,6	0,3					
AA	2,5	2,9	78,7	8,0	2,5	1,2	1,6	1,1		0,7	0,3	0,4	0,1
AA-	1,0	1,2	8,3	72,8	11,5	3,2	0,9		0,8		0,0	0,2	
A+	0,4	0,1	1,4	16,2	68,5	10,6	1,3	0,6	0,2	0,1	0,1	0,4	
A	1,1	1,0	1,5	3,9	18,5	64,0	8,4	0,7	0,7		0,0	0,1	
A-	0,2	0,2	1,4	1,8	2,5	20,3	54,8	11,2	3,4	0,7	1,4	0,0	2,0
BBB+	4,2	0,5	1,1	1,1	5,3	1,1	28,0	54,5				3,2	1,1
BBB	0,9	0,9	0,9	12,1	12,1		18,1	15,5	35,3	0,9		1,7	1,7
BBB-			1,6			3,1	1,6	34,4	25,0	32,8		1,6	
BB+	8,0			4,0						88,0	0,0		
BB	1,5		2,9	4,4	4,4		2,9			22,1	27,9	33,8	
< BB			5,6			11,1	5,6					77,8	0,0

Source: Central Bank calculations, based on data from the SVS.

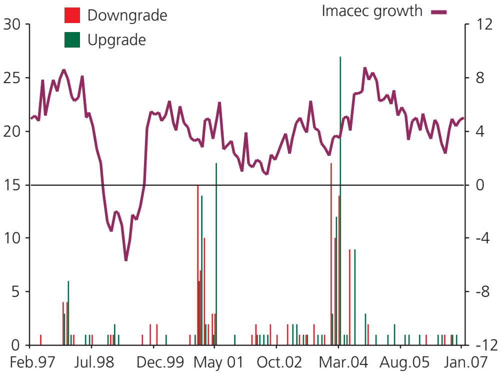
Additional information on the dynamics of external ratings can be garnered from the frequency of changes between rating groups over time. The number of rating drops or hikes in each category tends to be concentrated over time (figure 2). In the period of analysis, there were two episodes in which re-rating were more frequent. The first and more significant happened two years after the twelve-month variation of Chile's Monthly Index of Economic Activity (Imacec) was negative in the fourth quarter of 1998. The second episode happened in the first quarter of 2004.

Figure 2 suggests that risk-rating agencies tend to wait until the deterioration of companies' financial conditions becomes more evident before lowering their risk ratings. At the end of the period, there is a greater number of risk rating hikes than drops, which might be explained by the consolidation of macroeconomic fundamentals. Finally, the periods with a high number of rating drops tend to be coupled with hikes, which may suggest, rather, the occurrence of a redistribution of risk in the corporate sector.

Figure 2

Changes in ratings of bond-issuing firms

(number, percent)



Source: Central Bank calculations, based on data from the SVS and Central Bank of Chile.

III. Characterization of internal ratings

Data on the internal ratings of firms that hold bank debt was taken from the SBIF's Information System. This database has an annual frequency from 1995 to 2003, and a monthly frequency starting in January 2004, when the current SBIF provisions regime entered into force. Our analysis is centered in this period.

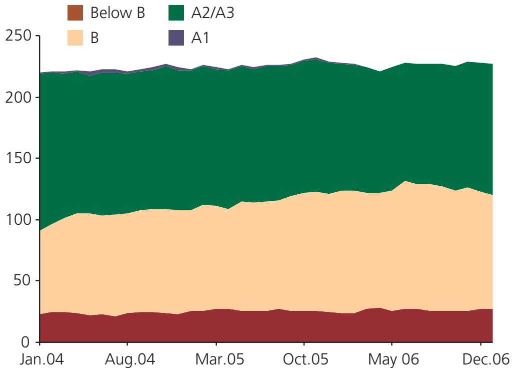
Figure 3 shows the distribution of internal corporate ratings for the period January 2004 to January 2007. The ratings are grouped in accordance with the categories established in regulation 7-10 of the SBIF's Updated Compilation of Regulations (*Recopilación Actualizada de Normas*, RAN). The purpose of this grouping is to assimilate the distribution of default probabilities associated with external ratings, as illustrated in table 1.

In the period analyzed, the number of A1-rated firms in all institutions is very low, which suggests two possibilities: (1) that these companies can turn to external financing by taking on debt abroad or by issuing public bonds; or (2) that banks may be applying more conservative criteria than external rating agencies[12]/. As in figure 1, the risk categories remain quite stable over time.

Figure 3

Distribution of internal risk ratings

(number of firms)



Source: Central Bank calculations, based on data from the SBIF and Central Bank of Chile.

The historical internal rating transition matrix for the period 2004–2007 presents a number of differences relative to the external rating transition matrix (table 3). First, the main diagonals are generally lower than the corresponding external rating diagonals. Even so, there is a 95% probability that rating changes will be to adjacent categories, which creates a panorama of stability in regulatory capital that is very similar to that of external ratings. Second, corporate exposure with higher-than-normal risk is highly persistent (absorbing state), or has a very low probability of improving its rating. However, this group of firms quantitatively represents only 2% of all ratings. Finally, the opposite is seen with category A1, where persistence is low.

Table 3

Historical internal rating transitions matrix

(percent of annual change)

	A1	A2	A3	B	< B
A1	26.3	15.8	28.9		28.9
A2	0.5	69.2	20.0	10.1	0.3
A3		8.0	76.9	14.3	0.8
B			6.6	88.9	4.4
< B			0.7	6.3	93.1

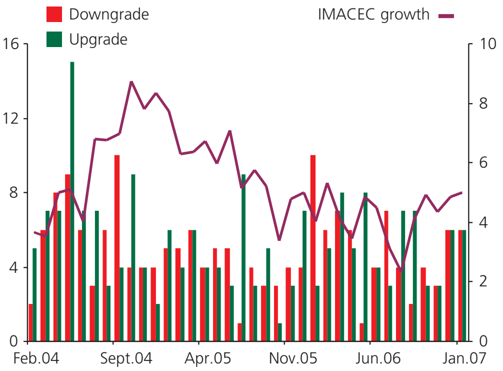
Source: Central Bank calculations, based on data from the SBIF.

Consistent with the information presented in figure 2, internal ratings improve in mid-2004; this may be related to increased economic activity since the beginning of that period. However, the figure differs slightly from figure 4, as there are a considerable number of rating hikes and drops, which may be explained by the fact that the sample of rated firms is much larger in the case of banks. In other words, external ratings —the majority of which are for bond issuers— do not demonstrate such discrete changes.

Figure 4

Changes in internal rating groups

(number, percent)



Source: Central Bank calculations, based on data from the SBIF and Central Bank of Chile.

IV. External ratings and their impact on regulatory capital

First, this section attempts to indirectly evaluate the consistency of internal and external ratings. It describes how internal ratings react to changes in external ratings. Even when rating systems basically rely on the same set of information for developing their opinion about a firm's credit risk (and also considering that internal ratings are not directly observable), it is more likely that banks will react to changes in external ratings than the other way around[13]/. We also present figures to graphically illustrate the discriminating power of a basic set of financial indicators that are grouped by risk rating, as described in table 1.

Second, the section explores how regulatory capital would have evolved if Basel II had been implemented. First, the minimum regulatory capital for the financial system is calculated, in accordance with Basel I stipulations, as indicated in Title VII of the General Banking Law. This basically means multiplying a company's debt with a given bank by 8%. We then calculate the minimum regulatory capital that would have resulted by multiplying the debts by the weights considered in the SBIF proposal under the SA, and then applying the 8% minimum capital (table 1). The same exercise is done for internal ratings.

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[12]/ As in figure 1, figure 3 uses the firm's lowest rating in the system for each period.

[13]/ Despite the scarce number of companies rated in category A1, Chapter 7-10 of the RAN stipulates that companies whose securities held in domestic currency have a private risk rating equal to or higher than AA- will be assigned a rating in said category.

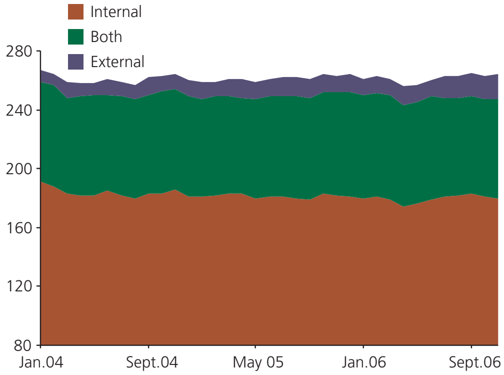
Consistency

To contextualize the following discussion, figure 5 shows the number of firms that only have either external or internal ratings and those that have both.

This figure provides perspective on some of the information shown below. The sample contains an average of 261 companies, of which approximately 4% only have external ratings, 20% have internal and external ratings, and the remaining 76% only have internal ratings in the period of analysis.

Figure 5

Risk rating composition
(number of firms)



Source: Central Bank calculations, based on data from the SBIF and la SVS.

Table 4 shows the relationship between the rating changes of rating agencies and banks from January 2004 to December 2006. Under the assumption that internal ratings by banks could react to changes in external ratings, the latter are lagged and advanced one period, respectively[14]. For example, column (2) reflects the change in internal rating within the year, and column (1) reflects the change in internal rating in the face of external rating changes more than one year earlier.

Under the new provisions regime, banks seem to be more sensitive to external rating changes that occur after one year has passed (column (1)). There seems to be greater coherence in the responses of internal ratings, given that the least relevant reaction is that in which banks would advance the rating. As shown, the sum of rating changes that are not highlighted in gray have a lower correlation, which would indicate a greater consistency between internal and external ratings.

Table 4

Consistency between internal and external rating changes
(percent)

		(1) External (lagged)		(2) External		(3) External (advanced)	
		Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade
Internal	Downgrade	0.47	0.27	0.17	0.46	0.13	0.54
	Upgrade	0.02	0.24	0.01	0.35	0.00	0.33

Source: Central Bank calculations, based on data from the SBIF.

Table 5 shows the immediate correlation of internal and external ratings among some financial institutions and two of the biggest rating agencies that operate in Chile (Fitch Ratings and Feller Rate). There is a good deal of divergence in the reported correlations. Two institutions tends to be correlated with the rating agencies, and another institution has a very low correlation.

Table 5

Correlation among risk rating groups
(correlation coefficient)

	Fitch Ratings	Feller Rate
Bank1	0.17	0.25
Bank 2	0.00	0.08
Bank 3	0.44	0.58
Bank 4	0.47	0.44

Source: Central Bank calculations, based on data from the SBIF.

Figures 6 and 7 show the relationship between a set of financial indicators for the risk ratings groups suggested in Basel II's SA. The financial indicators used are: indebtedness, measured as total liabilities over capital; profitability, measured as earnings over capital; liability cover, measured as operating income over financial expenses; and size, approximated by total assets.

There is a good deal of similarity in the distribution of the respective curves for each group of risk ratings. Generally speaking, firms in higher rating categories have greater liquidity, greater liability cover, and greater profitability than firms that are not investment grade or that have a lower rating. These similarities can be found despite the fact that the set of firms with internal ratings only is proportionally much larger in number (figure 5).

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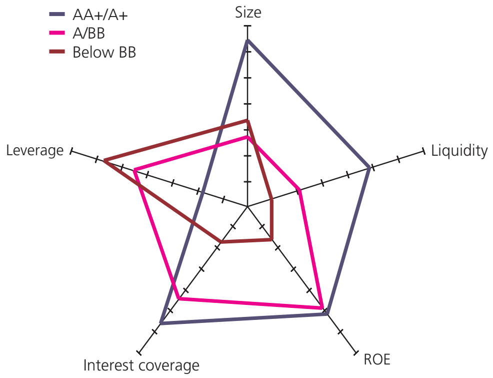
[14] In the exercise, the period of analysis is annual.

Figure 6

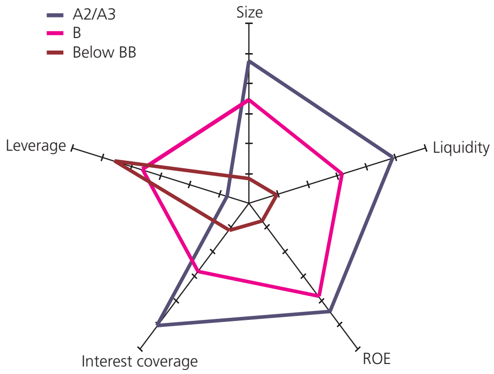
Financial indicators by external rating
(normalized indicators)



Source: Central Bank calculations, based on data from the SBIF and SVS.

Figure 7

Financial indicators by internal rating
(normalized indicators)



Source: Central Bank calculations, based on data from the SBIF and SVS.

These illustrations provide preliminary evidence that both external and internal ratings are highly consistent with the financial condition of rated firms.

The impact of Basel II on minimum regulatory capital

As a final exercise, we quantify minimum capital requirements for corporate exposure as if Basel II had been in force during the period 2004–2006, for the group of firms with bond issues and with both external and internal ratings.

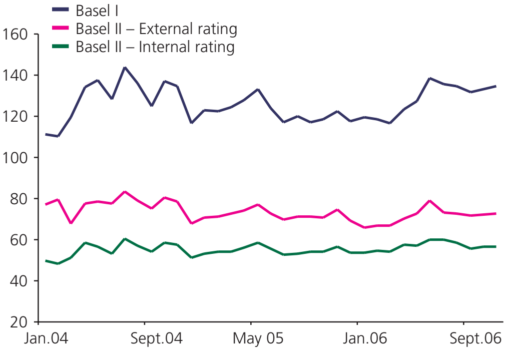
This exercise shows that capital requirements corresponding to firms with external ratings would have been reduced by 42% relative to Basel I capital requirements (figure 8). If internal ratings in effect in the period had been applied to each bank, capital requirements would have been reduced by 51%, on average.

The resulting variability of capital is very similar to the current variability with Basel I. The absence of volatility in minimum regulatory capital can be explained by a low number of re-ratings outside the groups established in the regulation. This, in turn, can be explained by the fact that the period used for the simulation experienced stable growth. Good macroeconomic conditions would also have reduced the re-rating of firms in categories with a 150% weight. The available evidence suggests that this rating drop is highly improbable for this group of SVS-registered firms, even in periods of slower growth.

The reduction in capital requirements for corporate exposure could generate faster credit growth for the corporate sector, given the lower cost of capital per unit of credit granted. We estimate that if external ratings had been applied, loans would have grown by 4% as a result of the release of capital. This effect, however, could be counteracted by the incorporation of additional capital requirements included in Basel II.

Figure 8

Capital requirement by risk rating
(Ch$ billion)



Source: Central Bank calculations, based on data from the SBIF and SVS.

Figure 8 also shows that the impact of applying credit risk weights to internal ratings would be even greater than the impact of external ratings for corporate exposure. In this case, despite the fact that approximately 25 firms would be subject to a 150% weight, their impact on the system's capital requirement is not significant since bank exposure to this group of firms is limited.

V. Conclusions

The characterization of external and internal ratings of SVS-registered firms produces several interesting results. First, the rating groups proposed by the SBIF for implementing Basel II's SA would not generate volatility in minimum capital requirements, given that most rating changes tend to occur within a given range of ratings that have the same weight. The absence of greater volatility in capital requirements would be accompanied by a reduction in the absolute capital requirement, which could lead to a greater banking integration of the corporate sector and motivate other firms to undergo the rating process.

We observed a significant lag in the external re-rating of firms, especially after the economy's period of negative growth in 1998. Risk-rating agencies waited for the deterioration of a company's financial condition to become evident before re-rating its risk level.

Finally, and although the evidence is not conclusive, external rating changes are consistent with changes in the internal ratings assigned by banks. This suggests that the collection of relevant data to assess credit risk is similar for both types of agencies.

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Volatility measures for financial markets[1]

Autores: Rodrigo Alfaro y Carmen Gloria Silva [2]

I. Introduction

In times of financial turbulence, asset prices and returns fluctuate much more sharply than under normal circumstances. This phenomenon is described as an increase in volatility. External episodes in the current economic scenario have generated unusual movements in international and regional stock markets. Volatility in the S&P 500, one of the main U.S. stock market indices, increased significantly between August 2007 and March 2008[3]. Similar to international trends, the Chilean stock market has also experienced large variations, as has the peso-dollar exchange rate.

Volatility has traditionally been measured using the closing price of assets and considering extensive data, such as standard deviation, RiskMetrics, and conditional variance or GARCH models[4]. In periods of turbulence, however, analysts have found that series tend to diverge from their historical parameters, meaning that only the shortest-term data become relevant.

The literature shows that measures that use intraday information are, in theory, more efficient[5]. For that, these measures are likely to be more reliable in times of financial instability.

In an earlier work (Alfaro and Silva, 2008), we present evidence for the case of the Chilean stock exchange. That study shows that the GARCH model parameters change during the period of analysis (1996–2007). This finding is supported by the increase in unconditional volatility and the model's persistence during episodes of greater financial turbulence. Taking that into account, we propose a measure of daily volatility calculated using maximum and minimum prices of the IPSA stock index, which would be robust to all kinds of episodes.

This article extends our previous analysis to the nominal exchange rate (NER). The results show that these volatility measures are more precise, and they are therefore preferable during periods of turbulence. We also show that when applied to the S&P 500, the measures are positively correlated with the VIX (another volatility indicator available for this index).

II. Daily volatility measures

The variables o, c, h and l are the logarithms of asset prices observed during a given day: the opening, closing, maximum, and minimum prices. We then have the following definitions:

$$\sigma^2_{CC} \equiv (c - o)^2, \qquad (1)$$

$$\sigma^2_{HL} \equiv (h - l)^2, \qquad (2)$$

$$\sigma^2_{RS} \equiv (h - o)(h - c) + (l - o)(l - c) \qquad (3)$$

where *CC* is the variance measure using the asset's closing prices;[6] *HL* is the variance estimator that uses maximum and minimum prices observed over the course of the day, following Parkinson (1980), and *RS* is the volatility estimator proposed by Rogers and Satchell (1991). *RS* controls for the asset's return to avoid spurious results caused when the asset presents a trend during the day[7].

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[1] The opinions expressed herein are of the exclusive responsibility of the authors and do not necessarily represent those of the Central Bank of Chile or its Board. We appreciate comments and suggestions made by Pablo García, Kevin Cowan, Rodrigo Cifuentes, and an anonymous referee, and those made by participants of an internal seminar held by the Central Bank of Chile's Financial Policy Division.

[2] Central Bank of Chile, e-mails: ralfaro@bcentral.cl and csilva@bcentral.cl.

[3] Current levels are not yet higher than those seen in 2001 and 2002, following the abrupt devaluation of dot-com firms.

[4] For a review of this literature, see Engle (2001), Hull (2000), or Wilmott (2006).

[5] See, for example, Parkinson (1980), Garman and Klass (1980), or Rogers and Satchell (1991).

[6] We assume that the opening price is the same as the previous day's closing price, so the asset price does not jump when not traded. For technical details, see Yang and Zhang (2000).

[7] For example, an asset is considered to have an upward trend when the opening price is its minimum and the closing price is its maximum. In this case, RS is zero, since what is seen on that day is a positive return with no volatility.

The advantage of *HL* and *RS* over *CC* is that they more efficiently measure daily variance, given that they incorporate intraday asset price information[8]/. Their disadvantage, however, is that they are biased. There are two sources of bias. The first stems from the presence of the asset's trend (returns) and affects *HL* and *CC*. The second is caused by the quantity of the asset's daily transactions and is significant for *HL* and *RS*.

Yang and Zhang (2000) argue that the bias created by the presence of a return (positive or negative) should be relatively small if daily data or moving averages with small windows are used. For this reason, we consider that this source of bias is not significant for the variables in this study.

With regard to the effect of the number of transactions, the literature only covers stock markets in advanced economies, where the number of transactions is very high. Specifically, Parkinson (1980) establishes a correction factor of 2.77 for *HL*, while Rogers and Satchell (1991) show that *RS* is unbiased in these markets. Both results are obtained, theoretically, under the assumption of normal returns. For the case of financial markets with a limited number of transactions, there is no theoretical correction that controls for this bias. However, in Alfaro and Silva (2008), we propose an empirical method to address this problem: we compute correction factors for *HL* and *RS* using the median of the ratio between *HL* and *CC* and between *RS* and *CC*. These factors can be plugged into the *HL* and *RS* formula to calculate an annualized daily volatility measure:

$$\hat{\sigma}_{HL} = K_{HL} \cdot \left(\frac{H_t}{L_t} - 1 \right) \qquad (4)$$

$$\hat{\sigma}_{RS} = K_{RS} \cdot \sqrt{\left[\left(\frac{H_t}{C_t} - 1 \right) \cdot \left(\frac{H_t}{O_t} - 1 \right) + \left(\frac{L_t}{C_t} - 1 \right) \cdot \left(\frac{L_t}{O_t} - 1 \right) \right]} \qquad (5)$$

where H_t, L_t, O_t y C_t are the maximum, minimum, opening, and closing prices recorded on a given day, while the constants Ks combine the bias and annualization factors[9]/.

III. Volatility measures based on the option prices

An alternative measure of volatility can be calculated using options whose underlying is the asset of interest. For example, implied volatility can be calculated by pricing the option using the Black-Scholes model, leaving the volatility parameter unknown[10]/. Demeterfi *et al*. (1999) discuss a more general measure of volatility, where the expected value is taken from the VIX volatility index of S&P 500 options over a 30-day period, calculated by the CBOE.

The VIX provides an estimate of the risk level of U.S. stocks, and its variation implies a change in the economic perception of the corporate sector. Since the underlying corresponds to the S&P 500, it is natural that the VIX be used to compare the *CC, HL*, and *RS* measures applied to this share index. We thus review it briefly in this section. VIX is 100 times, where:

$$(6) \qquad \hat{\sigma}^2_{VC} = \frac{2e^{rT}}{T} \left[\sum_i w_i Q(K_i) \right] - \frac{1}{T} \left(\frac{F}{G} - 1 \right)^2$$

In the above formula, *T* is the maturity of the options (30 days), *F* is an approximation of the forward price (the average of at-the-money call and put options), K_i is the strike price of option i, wi is the midpoint between the strike prices on each side of K_i over K_i squared. $Q(K_i)$ is the value of the option associated with the strike price K_i, which is a call option if $K_i > F$ and a put option if $K_i < F$. Finally, *G* is the strike price immediately under *F*, and r is the risk-free rate. It is possible to demonstrate that this measure captures an asset's true volatility[11]/.

IV. Empirical results

First, daily measure correction factors are calculated for the IPSA and the NER. Using daily data from January 2004 to March 2008, we estimated the ratios between the *HL* and *CC* measures and between *RS* and *CC*, resulting in the following correction factors: *KHL*=1,000 and *KRS*=1,800 for both the IPSA and the NER[12]/. In the case of the S&P 500, we used correction factors suggested by the literature for developed stock markets, which means *KHL*=947 and *KRS*=1,580.

Tables 1 through 3 present the results for the NER, IPSA, and *S&P* 500, considering the entire period of analysis (2004–2008) and three periods of financial turbulence.

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[8]/ Parkinson (1980) shows that the bias-corrected variance of *HL* is one-fifth the variance of *CC*. Rogers and Satchell (1991) find that the variance of *RS* is one-sixth the variance of *CC*.

[9]/ For simplicity, the measures proposed are based on a percentage change in prices, rather than logs.

[10]/ A practical calculation of this measure is the VXO volatility index of S&P 100 options over a 30-day period, computed by the Chicago Board Options Exchange (CBOE). This is also used in financial reports like the *Quarterly Review*, published by BIS. The March 2008 issue presents implied volatilities for Nikkei 225 and DJ EURO STOXX.

[11]/ A formal demonstration of this indicator, and its theoretic motivation, can be found in Demeterfi *et al*. (1999).

[12]/ Alfaro and Silva (2008) calculate the same factor for the IPSA using a longer period (1996 to 2007).

Table 1

Volatility of the exchange rate
(percent)

Measures	2004-2008	May 06-Jun.06	Feb.07	Aug.07-Mar.08
Closing prices (*CC*)				
Average	6.58	8.48	5.28	7.12
Median	4.72	8.21	4.85	5.41
Standard deviation	6.79	6.74	3.29	6.72
Percentile 5%	0.00	1.10	0.66	0.30
Percentile 95%	19.89	22.20	11.61	21.89
Maximum and minimum (*HL*)				
Average	7.33	6.94	5.06	7.42
Median	6.30	6.29	4.68	6.24
Standard deviationr	4.79	2.47	2.27	5.87
Percentile 5%	1.61	3.67	1.20	0.39
Percentile 95%	15.50	12.12	8.89	18.08
Rogers and Satchell (*RS*)				
Average	6.11	5.41	4.09	6.02
Median	5.34	5.34	3.67	4.95
Standard deviation	5.53	3.48	3.00	6.84
Percentile 5%	0.00	0.00	0.00	0.00
Percentile 95%	15.11	9.86	9.75	16.19

Source: Central Bank calculations, based on data from Bloomberg.

Table 2

Volatility of the IPSA
(percent)

Measures	2004-2008	May 06-Jun.06	Feb.07	Aug.07-Mar.08
Closing prices (*CC*)				
Average	11.24	13.39	21.38	19.02
Median	8.83	8.96	19.28	15.69
Standard deviation	10.64	13.69	19.48	16.60
Percentile 5%	0.66	0.72	3.65	1.03
Percentile 95%	29.73	36.67	48.48	45.29
Maximum and minimum (*HL*)				
Average	11.72	12.95	17.29	19.98
Median	9.63	10.62	13.93	16.33
Standard deviation	9.59	9.13	12.80	14.04
Percentil 5%	3.67	3.66	5.38	6.85
Percentil 95%	26.83	27.10	47.10	42.07
Rogers and Satchell (*RS*)				
Average	11.13	11.13	12.60	19.06
Median	8.62	9.35	8.37	14.39
Standard deviation	12.43	8.19	9.54	16.72
Percentil 5%	2.81	2.86	4.65	4.93
Percentil 95%	25.11	30.66	31.19	42.79

Source: Central Bank calculations, based on data from Bloomberg.

As the tables show, *HL* and *RS* generally have smaller standard deviations than *CC*. This means that volatility can be more efficiently estimated when data on minimum and maximum prices are included. Also, as expected, *RS* has lower averages than *HL* and *CC*, since it does not consider events with return. Similarly, in most cases *RS* is more dispersed than *HL*. This is accentuated in periods of turbulence, like between August 2007 and March 2008.

For the IPSA, *HL* and *RS* do not differ in the samples that were considered. This indicates that *HL* is an appropriate measure for the IPSA. We find the same conclusion in Alfaro and Silva (2008). However, for the NER and the *S&P* 500, the results demonstrate differences in these measures in some of the periods selected.

Table 3

Volatility of the S&P 500
(percent)

Measures	2004 2008	May 06 - Jun.06	Feb.07	Aug.07 - Mar.08
Closing prices (*CC*)				
Average	9.47	10.92	7.45	13.82
Median	7.05	8.27	2.68	12.73
Standard deviation	8.91	8.86	12.34	12.55
Percentile 5%	0.73	1.33	1.33	0.78
Percentile 95%	25.78	28.17	16.42	44.57
Maximum and minimum (*HL*)				
Average	9.80	10.71	8.05	13.75
Median	8.44	10.15	5.14	14.81
Standard deviation	5.62	4.60	8.42	8.01
Percentile 5%	3.91	4.66	3.17	6.05
Percentile 95%	20.22	18.81	15.82	31.34
Rogers y Satchell (*RS*)				
Average	8.62	8.83	7.43	11.58
Median	7.50	8.69	5.29	12.32
Standard deviation	5.78	5.49	5.72	8.68
Percentile 5%	2.08	0.91	2.58	3.28
Percentile 95%	18.42	17.38	16.14	31.07

Source: Central Bank calculations, based on data from Bloomberg.

Table 4 reports descriptive statistics for VIX. On average, this measure is greater than the realized volatility of the *S&P* 500 (*CC*, *HL*, or *RS*), while its standard deviation is lower. This is because the VIX is an index of average volatility for the next 30 days[13]/.

Table 4

Volatility of *S&P* 500 options (VIX)
(percent)

	2004 2008	May 06 - Jun.06	Feb.07	Aug.07 - Mar.08
Average	15.24	15.69	11.16	20.29
Median	13.97	15.89	10.34	23.98
Standard deviation	4.45	2.80	2.11	5.48
Percentile 5%	10.74	11.88	10.07	17.99
Percentile 95%	25.54	20.62	15.71	29.40

Source: Central Bank calculations, based on data from Bloomberg.

As expected, the VIX reacts to periods of financial turbulence. For example, between August 2007 and March 2008, it held at an average level of 20, fluctuating between 18 and 29, which are markedly high figures for the period of analysis.

Finally, table 5 shows the correlations between the volatility measures *CC, HL*, and *RS* calculated for the S&P 500 and the VIX index. For the full sample, these measures have correlations on the order of 70% for daily data and 90% for moving averages[14]/. The correlations of the *HL* and *RS* measures are equal to or higher than those calculated for *CC*. Thus, *HL* and *RS* respond to VIX variations and could be good substitutes when VIX is not available, as in financial markets that do not have derivative instruments.

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[13]/ The VIX level would be higher than realized volatility because it includes the uncertainty incorporated in the options.

Table 5

Correlation of the VIX with measures of *S&P* 500 volatility
(percent)

	2004 2008	May 06 - Jun.06	Feb.07	Aug.07 - Mar.08
Daily measures				
CC	0.45	0.14	0.83	0.43
HL	0.67	0.46	0.90	0.68
RS	0.52	0.51	0.89	0.54
Moving windows (1)				
CC (2)	0.89	0.58	0.38	0.88
HL	0.90	0.56	0.43	0.87
RS	0.86	0.50	0.53	0.82

(1) Exponentially weighted, using a factor of 0.94.
(2) In this case, the measure is equivalent to RiskMetrics.
Source: Central Bank calculations, based on data from Bloomberg.

V. Conclusions

In this paper, we have presented volatility measures for the IPSA and *S&P* 500 stock indices and for the nominal exchange rate in different scenarios of financial turbulence.

The results empirically confirm the advantages of the volatility measures proposed by Parkinson (1980) and Rogers and Satchell (1991).

For all the assets analyzed, these measures are less dispersed than those solely based on closing prices (*CC*).

Additionally, in the case of the *S&P* 500, the *HL* and *RS* measures demonstrate correlations with the VIX that are equal to or greater than those obtained with *CC*. For this reason, they could be good substitutes in financial markets where options are not available.

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[14]/ A moving average should raise the correlation of *CC*, *HL*, and *RS* with the VIX, because the latter is an average of the expected volatilities over the next 30 days.

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Juan Esteban Laval Z.
Legal Representative

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Santiago, Chile
Agustinas 1180, Santiago, Chile
P.O. Box 967, Santiago, Chile
Tel.: 56-2-670 2000
Fax: 56-2-670 2231
www.bcentral.cl
bcch@bcentral.cl

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