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CHILE

Selected Issues

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Approved by the Western Hemisphere Department

July 5, 2002

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I. Social and Demographic Indicators

Area (thousand sq. km.)	756.1
Population	
Total 2000 (est., million)	15.2
Urban population (in percent of total)	85.6
Density (per sq. km)	20.1
Annual rate of growth, 1996-2000 (percent per year)	1.4
Population characteristics (1998)	
Life expectancy at birth (years)	75.2
Crude birth rate (per thousand)	17.5
Crude death rate (per thousand)	5.5
Infant mortality rate (per thousand live births)	10.3
Mortality rate between ages 1 and 4 (per thousand)	0.5
Income distribution (2000)	
Percent of total income received:	
By richest 10 percent of households	41.0
By poorest 20 percent of households	3.7
Gini coefficient	0.56
Distribution of labor force, in percent of total (2000)	
Agriculture and fishing	13.8
Mining	1.4
Industry	14.4
Construction	7.2
Services and Trade	62.6

GDP (2001)	Ch$ billion	42,192
	US$ billion	66.4
GDP per capita (US$), 2001		4,309
Health		
Population per physician (1998)		840
Population per hospital bed (1998)		484
Access to electricity (1996)		
Percent of dwellings		
Urban		99.4
Rural		74.8
Access to safe water		
Percent of population (1995)		91
Urban		99
Rural		47
Education		
Adult literacy rate (1998)		95.4
Enrollment rates, percent of the age group		
Primary education (1998)		98.3
Secondary education (1998)		86.9
Tertiary education (1997)		33.8

II. Economic Indicators, 1997-2001

	1997	1998	1999	2000	Prel. 2001
	(In percent of GDP)				
Origin of GDP					
Agriculture, forestry, and fishing	5.3	5.3	5.3	5.4	5.6
Mining and quarrying	7.0	7.3	8.2	8.3	8.4
Manufacturing	17.2	16.3	16.2	16.2	15.7
Construction	9.3	9.2	8.3	8.0	8.1
Commerce	11.2	11.3	10.8	10.7	10.7
Transport, storage, communications	6.7	6.9	7.0	7.3	7.5
Other	43.3	43.8	44.1	44.2	44.1
	(Annual percent changes, unless otherwise indicated)				
National accounts and prices					
Real GDP	6.6	3.2	-1.0	4.4	2.8
Real GDP per capita	5.1	1.8	-2.3	3.1	1.5
GDP deflator	4.3	1.9	2.7	4.2	1.5
Consumer price index (period average)	6.1	5.1	3.3	3.8	3.6
Consumer price index (end of period)	6.0	4.7	2.3	4.5	2.6
Unemployment rate (in percent)	6.1	6.2	9.7	9.2	9.1
	(Ratios to GDP)				
Gross domestic investment	27.7	26.9	21.3	22.5	20.7
Of which: public investment	4.8	4.8	4.0	3.5	3.7
Gross national savings	23.3	21.8	20.9	21.1	18.8
External savings	4.4	5.1	0.4	1.4	1.9
Private consumption	63.3	64.9	64.4	63.8	64.5
Public consumption	11.1	11.5	12.3	12.3	12.7
Central government finances					
Total revenues	21.7	21.1	20.4	21.6	22.6
Total expenditures	19.8	21.2	22.6	22.5	23.5
Of which: interest	0.4	0.6	0.3	0.5	0.5
Savings	5.2	3.4	1.5	2.4	2.5
Primary balance	2.3	0.6	-1.9	-0.5	-0.4
Overall balance	1.9	-0.1	-2.2	-0.9	-0.9

Chile: Basic Data

	1997	1998	1999	2000	Prel. 2001
	(12-month percentage changes, unless otherwise indicated)				
Money and credit					
Liabilities to private sector	16.3	9.7	15.7	9.5	10.1
Of which:					
Narrow money (M1A)	16.6	-5.5	20.4	7.9	8.1
Broad money (M3)	13.0	8.5	5.1	5.1	5.4
Net domestic assets of financial system 1/	-0.5	13.0	7.0	10.8	12.5
Of which:					
Credit to nonfinancial public sector (net)	-2.0	2.1	2.6	1.5	1.4
Credit to private sector	11.7	4.1	2.0	6.5	4.8
Liabilities to the private sector, in percent of GDP	84.6	88.3	100.8	101.9	108.3
Three-month interest rate (in percent)	13.4	16.4	10.7	10.8	7.2
	(In billions of U.S. dollars, unless otherwise indicated)				
Balance of payments					
Current account	-3.7	-4.0	-0.3	-1.1	-1.2
Merchandise trade balance	-1.4	-2.0	2.5	2.2	2.1
Exports (f.o.b.)	17.9	16.4	17.2	19.2	18.5
Imports (f.o.b.)	-19.3	-18.4	-14.7	-17.1	-16.4
Services and transfers (net)	-2.3	-2.0	-2.7	-3.2	-3.3
Of which: interest	-1.4	-1.5	-1.5	-1.9	-1.7
Capital and financial account	7.4	3.3	-0.8	1.2	0.7
Foreign direct investment	3.4	2.2	4.4	-1.1	1.0
Portfolio investment	2.4	-0.8	0.1	-0.3	-0.2
Other capital (net)	1.6	1.9	-5.3	2.6	-0.1
Errors and omissions	-0.5	-1.3	0.4	0.1	0.1
Overall balance	3.2	-2.1	-0.7	0.2	-0.4
Exports (in percent of GDP)	27.1	26.3	29.3	31.7	34.7
Imports (in percent of GDP)	29.2	29.6	27.4	30.3	32.7
Current account (in percent of GDP)	-4.4	-5.1	-0.4	-1.4	-1.9
Merchandise exports (in US$, annual percentage change)	7.5	-8.7	5.1	11.9	-3.8
Merchandise imports (in US$, annual percentage change)	9.0	-4.8	-19.8	16.0	-4.0
Terms of trade (annual percentage change)	1.9	-4.7	5.7	5.5	-7.6
Real effective exchange rate (12-month percentage change)	9.8	-6.1	-6.2	2.5	-9.5
International reserve position and external debt (as of December 31)					
Gross official reserves	17.8	16.0	14.7	14.7	14.2
(in months of imports of goods)	11.1	10.5	12.0	10.3	10.4
Net official reserves	17.8	16.0	14.7	14.7	14.2
Net reserves of the banking system	0.4	0.9	3.9	2.9	2.9
Outstanding external debt, in percent of GDP 2/	32.3	40.0	46.8	49.2	56.9
Public	6.2	7.2	8.0	7.4	8.7
Private	26.2	32.8	38.8	41.8	48.2
Total debt service ratio (in percent of exports)	19.9	19.4	23.5	24.9	26.4
Of which: interest	6.5	7.5	7.2	8.2	7.8
Gross reserves/short-term debt (in percent) 2/	496.4	385.2	367.8	230.2	220.2
IMF data (as of May 31, 2002)					
Membership status:					Article VIII
Quota					856.1
Fund holdings of Chilean pesos					574.5
(as percent of quota)					67.1
Outstanding purchases and loans					None
SDR Department					
Net cumulative allocation					121.9
Holdings					24.4

Sources: Chilean authorities; World Bank; IMF; and Fund staff estimates.

1/ Changes as percent of liabilities to the private sector at beginning of period. Flows based on end-of-period exchange rates.
2/ Excludes short-term trade credit.

I. Overview

1. This paper presents four studies on selected issues of the Chilean economy. Chapter II examines a number of potential factors that may have influenced the short-run behavior of the exchange rate between the Chilean peso and the U.S. dollar during the period of floating exchange rate, including the possible impact of developments in Argentina during 2001. Noting the consensus that the prices for Chile's copper exports will eventually recover from current, historically low levels, Chapter III investigates whether copper's price can be successfully forecasted over medium-term horizons, emphasizing the properties of copper prices most relevant in the Chilean context, including for fiscal policymaking. Chapters IV and V provide a snapshot of the Chilean banking and corporate sectors, respectively, and highlight information on their strength by looking at key indicators.

2. Motivated by the large depreciation of the Chilean peso during most of 2001, and the high exchange rate volatility in the third quarter of the year, the chapter **"The Short-Run Behavior of the Peso/Dollar Spot Rate Under the Free Floating Regime: Is there an Argentine Factor? Is there Evidence of Shift-Contagion?"** analyzes the daily movements in the peso exchange rate during 2 ½ years of Chile's floating exchange rate regime. The analysis is multivariate, controlling for a wide range of potential explanatory factors. The chapter also discusses the possibility of contagion from Argentina during 2001. In particular, it focuses on shift-contagion: whether the existing fundamental linkage between Chile's exchange rate and Argentina sovereign risk suddenly and temporarily changed in 2001.

3. The study finds that developments in Argentina have influenced Chile's exchange rate during 2001, but that this effect was smaller than suggested by simple bivariate correlations. During the sample period, the most important factor among those considered turns out to be Brazil's exchange rate followed by Brazil's sovereign risk. Although the possible causal relationships are difficult to disentangle, the evidence is consistent with the idea that some of the effect of Argentina on Chile might have operated indirectly, through effects on Brazil. The chapter also finds evidence of shift-contagion, which began in July 2001, intensified in August, and had vanished by end-2001. The market interest rate differential is found to have influenced the exchange rate in the expected direction, but the effect of copper prices on the exchange rate is unclear.

4. The considerable volatility of the price of copper is a matter of special relevance for Chile, where copper accounts for more than a third of exports and profits from a state-owned copper company are an important part of government revenue. Furthermore, the government has in place a new target for the structural fiscal balance that includes an adjustment for copper price fluctuations. Since copper prices recently have been very low—by historical standards—it is important to ask whether a substantial price recovery is likely. The chapter **"Forecasting Copper Prices in the Chilean Context"** finds that it is possible to forecast medium- and long-term copper price movements with some success, even using simple models based only on the past history of copper prices. Comparison of the out-of-sample forecasting performance of several models, along with other evidence, suggests that the price of copper is indeed subject to temporary—though rather long-lived—shocks.

5. Chapter III interprets the evidence as being consistent with the basic logic of Chile's new fiscal policy regime, but cautions that there will remain considerable uncertainty over the level to which copper prices may be converging, as well as how long a given temporary price shock will last. To put this uncertainty in quantitative perspective, the chapter presents a set of simulations, illustrating implications of various scenarios for Chilean fiscal policy. The chapter also analyzes prices from the copper futures market, demonstrating that these have predictive power, and presenting a methodology through which available 2 1/4 year futures prices might be used to infer market expectations over longer horizons.

6. In light of both the deceleration of growth and the external shocks faced by Chile during the last few years, the staff took a closer look at the Chilean banking system. Chapter IV, entitled "**Chile's Banking System Soundness,**" reports prudential, profitability, and efficiency indicators as well as the results of stress tests conducted by staff in late 2001.

7. Chapter IV finds that bank capitalization continues to be adequate and the proportion of the system's loans that are overdue has remained stable at low levels. Net after-tax income also improved during the year, reflecting gains in net interest inflows, reduced requirements for constituting loan-loss provisions, and continued increases in efficiency. The stress tests (which used the August 2001 balance sheets as a base) computed for each bank the net losses resulting from shocks to interest rates, to the exchange rate, and to loan quality. After each shock, the Basel ratio for each bank was re-calculated. It was found that in most cases, the majority of the banks continued to meet the minimum capital requirement established in the Basel Accord. The chapter also reports the long-term foreign and local currency credit ratings by domestic and international ratings agencies. The ratings present a picture of a stable banking system with the four largest banks displaying some of the highest ratings.

8. Chapter V, entitled **"A Note on the Corporate Sector's Potential Vulnerability,"** provides a brief overview of Chile's corporate sector's structural characteristics and seeks to identify potential vulnerabilities by looking at the evolution of balance sheet and cash-flow indicators that have been useful to predict financial distress in other countries. These indicators include measures of interest cover, leverage, liquidity , and profitability. The chapter also examines the corporate sector's foreign exchange exposure.

9. The results suggest that the financial position of Chile's corporate sector is sound overall, with no evident sign of vulnerability and limited exposure to foreign exchange risk. The time profile of some of the indicators considered also suggests that this position was even stronger in the mid-1990s, except for the foreign exchange exposure, which appears to have decreased in recent years. The chapter also explains some of the limitations of the analysis, and calls for further work on these issues.

II. The Short-Run Behavior of the Peso/Dollar Spot Rate Under the Free Floating Regime: Is there an "Argentine" factor? Is there Evidence of "Shift-Contagion" from Argentina?[1]

A. Introduction

10. Several factors appear associated with the sharp depreciation of the Chilean peso vis-a-vis the US dollar in 2001 (Figure 1), and there is no consensus on which were the main driving forces. More generally, the Chilean exchange rate regime changed in September 1999, with the introduction of a free float in the context of an inflation targeting framework, and little empirical analysis of the behavior of the peso/dollar rate has been conducted thus far because of the short sample period.[2]

11. Nonetheless, there is some agreement among market analysts as well as policy-makers about the presence of "contagion" from Argentina in 2001, broadly defined as an unusually strong influence on the Chilean foreign exchange market of developments in that country.[3] Evidence of increased correlation between measures of the Argentine country risk and the peso/dollar spot rate seems to support the view that developments in Argentina had an important influence on the nominal exchange rate in 2001 (Figure 2, first panel).[4] But this

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[1] Prepared by Alessandro Rebucci (PDR). This paper draws on past and current joint work with Matteo Ciccarelli (University of Alicante, Spain), and builds upon previous work by Steven Phillips and Andrew Swiston on this topic. The author would like to thank Matteo Ciccarelli, Marco Espinosa, Saul Lizondo, Jens Nystedt, Steven Phillips, Mauricio Villafuerte, and Jeronimo Zettelmeyer for numerous comments and discussions, and Jin Hur, Rich Kelly, and Andrew Swiston for excellent research assistance. The author is particularly grateful to discussants (Rodrigo Fuentes and Pablo Garcia) and seminar participants at the Banco Central de Chile for their insightful comments. The views expressed in this paper are those of the author and do not necessarily represent those of the IMF or IMF policy. Remaining errors are mine. E-mail: Arebucci@imf.org.

[2] A notable exception are Morande and Tapia (2002), who analyze the impact of developments in Argentina on the Chilean foreign exchange market in addition to several other exchange rate policy issues under the new regime.

[3] The word "contagion" is often used to describe the transmission of shocks or crises across markets or countries through a diverse set of channels. Here, the term is explicitly used in a broad sense to encompass its most commonly understood meanings. A specific definition of contagion is adopted later on in the paper.

[4] The Chilean central bank reports comparable evidence in its January 2002 Monetary Policy Report (Table II.11), based on adjusted correlations as suggested by Rigobon (2001). Several private sector analysts advanced explanations based on evidence similar to that reported in Figures 1 and 2 in the second half of 2001.

measure of contagion does not control for other potential explanatory factors. By omitting other possible explanatory factors, this type of analysis may lead to erroneously identify the presence of contagion and, more generally, to overstate the quantitative importance of developments in Argentina.

12. Under inflation targeting, the nominal exchange rate may be part of the transmission mechanism of monetary policy, and its fluctuations might have significant balance sheet effects. Hence, being aware of the factors associated with nominal exchange rate fluctuations may also inform the conduct of day-to-day monetary policy and help to monitor economy-wide vulnerabilities.

13. Knowing whether a sharp fluctuation in the nominal exchange rate is due to changed fundamentals or unusual circumstances may also inform the choice of an adequate policy response to such a movement. Thus, from a policy perspective, it would be useful to establish whether the aforementioned evidence of close association with Argentina is robust to the consideration of other potential explanatory factors.

14. This paper analyses empirically two issues: (i) the short-run behavior of the peso/dollar spot rate under the new exchange rate regime, including the presence of an "Argentine" factor; and (ii) whether the exchange rate was affected by "contagion" from Argentina in 2001.

15. To address the first issue, we estimate a simple dynamic regression equation for the log-change of the peso/dollar rate that includes a comprehensive set of potential explanatory factors, and then compare the relative explanatory power of these factors.

16. Addressing the second issue requires a more precise definition of "contagion" and an empirical method to measure it. Here, we adopt a specific definition of contagion from the existing literature and, following Rigobon (2001), define it as "shift-contagion"—i.e., a sudden change in the cross-country linkages following a crisis in one or more countries or, equivalently, as a shift in the transmission mechanism of shocks across markets following a shock in one or more markets. To measure shift-contagion we reestimate the dynamic regression equation specified allowing the coefficients to change over time, as suggested by Canova (1993) to model empirically high frequency nominal exchange rate data, and then analyze the time profile and the magnitude of these coefficients looking for quantitatively significant changes.

17. The main result of the analysis is that, indeed, there is an "Argentine" factor associated with the peso/dollar rate, as one could expect given the geographic proximity and the trade and investment linkages between the two countries, but its importance should not be overstated. From a quantitative point of view, the association with Brazilian variables—or the underlying factors explaining the behavior of Brazilian variables—turns out to be

stronger.[5] Perhaps surprisingly, the copper price does not seem have been an important factor associated with short-run movements in the peso/dollar rate during the period considered, even though copper price (or terms of trade shocks more generally) could be longer-term fundamental factors affecting the value of the peso. As one could expect based on both theory and evidence from comparable countries, monetary policy appears to have an effect on the exchange rate, with an increase in the short-term interest rate differential with the US leading to an appreciation on impact. This effect however appears quantitatively small. The empirical results show also evidence of shift-contagion from Argentina, following the acceleration of the crisis in July and receding toward the end of 2001, after the Argentine default and devaluation.

18. The estimation results suggest that an evaluation of the transmission mechanism of monetary policy in Chile should take the exchange rate channel into account, in addition to the liquidity and the credit channels. A second implication is that interest rate policy could in principle help in supporting the peso in turbulent times, but may require a sharp interest rates increase if the elasticity were small. Finally, the analysis suggests that attention should also be paid to developments in other countries, in addition to Argentina, to monitor vulnerability stemming from foreign exchange risk exposure.

19. The paper is organized as follows. Section B discusses the set of potential explanatory factors considered and provides preliminary evidence on their co-movement and statistical properties. Section C discusses the dynamic regression specified and reports the results on the factors affecting the short-term movements of the peso/dollar rate from OLS estimation. Section D elaborates on the definition and the specific measure of contagion used in the paper and reports on the evidence of contagion from Argentina. Section E concludes.

B. Variables Potentially Associated with the Chilean Peso/US Dollar Spot Rate

20. This section motivates the set of possible explanatory factors considered in the rest of the paper. It describes the variables used to quantify these factors and reports summary statistics on the properties of their distributions. This preliminary evidence motivates in part the econometric specifications adopted and may help to interpret some counter-intuitive estimation results found in sections C and D.

A set of potential explanatory factors

21. The empirical analysis of the paper is based on a fairly comprehensive set of potential explanatory factors, which are listed in Table 1 together with their definitions and units of

[5] This association showed some instability after the sample period in this study, first subsiding, and subsequently strengthening again. Such a pattern is reminiscent of the exchange rate behavior in 2001 in response to developments in Argentina, which this paper suggests has resulted, at least in part, from transitory "contagion".

measurement. Table 1 also contains sampling and data source information.[6] This set includes (i) a terms of trade factor, (ii) domestic factors, (iii) regional factors, (iv) and global factors.

22. The high-frequency terms of trade proxy used is the London Metal Exchange (LME) spot copper price (DLc), which is a natural choice because of the large share of copper exports in Chile's total exports. The copper price also hit a historical minimum in real terms at about the same time as the peso/dollar rate peaked in late-October/early-November 2001 (Figure 1). Moreover, there is evidence that terms of trade variables may be important for modeling nominal exchange rates successfully (albeit at a lower frequency than daily) in economies with a similar size relative to the world economy, export structure, and monetary policy regime as Chile (Chen and Rogoff, 2002).

23. Domestic factors are measured in terms of return differentials over US comparable assets. This sub-set includes three interest rate differentials—over a there-month, one-year, and ten-year horizon, respectively—and a daily stock return differential. The level of the short-term interest rate differential (m) does not need to be motivated, but its inclusion is particularly important in this exercise because this variable swung markedly over sample period, reaching a relative minimum in October 2001 (Figure 1).[7] The daily change in this variable (Dm) attempts to measure monetary policy innovations. Daily changes in the Chilean component of the EMBI Global index (DiCHL) and the differential between the implied 1-year NDF yield for the Chilean peso and the 1-year yield on US treasuries (constant maturity) (DfCHL) are standard indicators of country and currency risk, respectively. The level of the daily return differential between the US S&P500 index and the Chilean IGPA index (s)—the latter denominated in local currency—may be interpreted as an indicator of the expected future growth-differential based on some stock valuation models.

24. The regional factors considered include daily changes in the level of the Argentine and the Brazilian components of the EMBI Plus index (DiAR and DiBR, respectively), the implied NDF spreads (DfAR and dDfBR)—calculated as described above for Chile—log-changes in the spot nominal exchange rates vis-a-vis the US dollar (DLeAR and DLeBR, respectively).[8] We include currency and country risk even though they may be closely

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[6] Unless otherwise noted, all variables used in the empirical analysis are transformed as described in Table 1.

[7] This variable is the difference between a Chilean real (inflation-adjusted) and a nominal US interest rate on annual basis (this is why it is close to zero, or slightly negative during most of the sample period (Figure 1)). Since the inflation differential (on annual basis) between Chile and the US was relatively stable over the sample period, this feature of the data may not necessarily affect the results of the analysis, but makes it more difficult to interpret the estimated elasticity.

[8] The Argentina peso was identically equal to 1 (or zero in log-terms) until it was officially devalued. Note that the daily change in the components of the EMBI index and the NDF

(continued)

interrelated, because conceptually they are separate factors. To hold one factor constant while attempting to measure the impact of the other may thus help to obtain more easily interpretable results. Brazil is the largest economy in Latin America. It has also the same monetary regime as Chile and is very closely interrelated with Argentina. Moreover, the Chilean peso has moved in tandem with the Brazilian real for most of the period considered (Figures 1 and 2). Hence, it is natural to consider Brazil as the main regional factor in addition to Argentina.[9]

25. Finally, the global factors considered are a semiconductor price index and the euro/dollar spot rate (DLb and DLeEU), both taken in log-change form. Their most important role is to control for the global slowdown of the world economy and for the US dollar own' strength over the sample period.

26. The specific set of variables chosen could be easily motivated at the level of individual indicators in terms of a variety of nominal exchange rate models. It is also relatively comprehensive, but remains parsimonious in relation to the number of degrees of freedom available for estimation. In addition, the choice of these variables takes the time horizon and the purposes of the analysis into consideration.

27. Other variables could certainly be included in the analysis. An obvious omission is perhaps the oil price that would represent a second terms of trade indicator. Additional regional variables too could be considered. A Chilean corporate sector bond spread could control for the private sector's incentives or ability to tap international capital markets. The NASDAQ stock market index would capture the bursting of the IT bubble in 2000, while a spread between US high yield and high grade corporate bond yields could help to disentangle the impact of increased "global risk aversion" following the events of September 11. Further, the set of potential explanatory factors considered omits measures of the strength of domestic and foreign hedging demand, as well as a measure of Chilean central bank intervention in the second half of 2001.

28. Nonetheless, modeling nominal exchange rates empirically is notoriously difficult, and no one set of potential explanatory factors would be completely satisfactory; the set chosen may be regarded as a reasonable compromise.

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spread may be interpreted as the change in the probability of a sovereign credit or currency event.

[9] Note that while one could easily argue that Argentina is affected by Brazil and the other way around (given Brazil economic size and Argentina's share of the total stock of emerging market debt outstanding before the crisis), it is much more difficult to imagine that Chile may have a direct, substantial influence on either of these two countries. In other words, there does not appear to be an endogeneity problem in our analysis in so far as we are willing to accept that Chile has not affected either of these two countries, or the US for that matter.

Preliminary evidence

29. Both steps of the empirical analysis are based on the same sample period and use daily data from June 2, 1999 to January 31, 2002, where the period June-August 1999 is included only for consistency with the rolling correlation analysis in Figure 2. This sample includes 641 observations obtained by taking only common trading days across different markets. The sample takes into account the fact that Chilean and US holiday and non-trading periods do not overlap fully. The first difference of the level, or the log-level, of the variables are calculated with respect to the previous trading day included in the sample. By proceeding in this manner, consistency across variables at any given point in time is assured. Because of this, however, the first difference following a holiday may refer to more than one trading day.[10]

30. By looking at the joint unconditional distribution of the series first (Table 2), we can see that Argentine and Brazilian markets appear to co-move strongly among themselves (last 6 columns), and with the Chilean foreign exchange rate market (first column), except for the Argentine exchange rate that was fixed for most of the period. No other domestic or foreign variable appears to be strongly associated with the Chilean spot rate, including particularly the copper price.[11] Other notable correlations are those between the copper and the semiconductor markets—not surprising because both commodities respond to the international business cycle in the short-term (second column)—and those slightly weaker involving the short-term interest rate differential (fourth column and fourth row of the matrix). This evidence suggests that a few variables could be safely excluded from the analysis, including particularly the Argentine spot rate.

31. Tables 3 reports summary statistics on the marginal unconditional distributions of these series. From this table, we can see that many series are symmetrically distributed, as evidenced by a sample mean very close to the sample median and a skewness statistic close to the normal value of zero. Most series, however, have thicker or thinner tails than those of a normally distributed variable. This is evidenced by a kurtosis statistic different from the normal value of three. As one would expect based on this evidence, a formal test of the null assumption of normality is strongly rejected by the data for all series considered (result not

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[10] This potentially creates outliers artificially. Alternatively, observations following non-overlapping holidays would reflect different information sets across variables and time. Either way, we would introduce some noise into the data. Given the nature of the exercise and the fact that the estimation procedure used is robust to the presence of outliers, the former approach is preferable.

[11] The simple correlation between the *levels* of the Chilean spot rate and the copper price is -0.6 over the period September 1999 - January 2002 (i.e., a decline is associated with a depreciation). But simple pair wise correlations among the level of asset prices may capture spurious relations in so far as these variables have a unit root and are not cointegrated.

reported). This preliminary evidence suggests that it would be important to take into account the presence of data non-normality in estimation.

32. By looking at the conditional distribution of daily log-changes and squared log-changes in the peso/dollar rate (Figure 3)—again, as one could have expected—we finds little evidence of predictability and some evidence of persistence in the conditional variance. This is shown by sample auto-correlation coefficients not significantly different from zero after the first lag in the case of log-changes (upper panel), and by auto-correlation coefficients significantly different from zero well beyond the first lag in the case of squared log-changes. This evidence is consistent with a large body of empirical-finance literature showing that high-frequency exchange rate data display low persistence and conditional heteroskedasticity, among other characteristics, when analyzed in log-change form. As a result, one lag should be sufficient to model their short-run dynamics. A second implication is that standard errors of regressions will have to be adjusted, to take conditional heteroskedasticity into account, while assessing the statistical significance of the estimated coefficients.

33. To conclude, the preliminary analysis of the data highlights the existence of relatively strong co-movements among the Chilean spot rate and a few of the variables considered over the whole sample period, even after removing the likely presence of trends in the data by means of a first-difference transformation. The preliminary analysis of the data also highlights the importance of taking non-normality and conditional heteroskedasticity into consideration when modeling these series.

C. Is There an "Argentine Factor"?

34. This section discusses briefly the specification of the dynamic regression equation used to analyze the relative importance of potential explanatory variables of short-run movements in the peso/dollar rate during the free floating period, and reports results from the ordinary least squares (OLS) estimation of this equation.

A standard dynamic regression equation

35. The dynamic regression equation used is the following autoregressive-distributed lag model (ADL):[12]

$$DLe_t = \alpha^0 + \alpha^1 DLe_{t-1} + \alpha^2 m_{t-1} + \alpha^3 Dm_{t-1} + \alpha^4 DiCHL_{t-1} + \alpha^5 s_{t-1} +$$

$$\gamma^1 DLc_t + \gamma^2 DLb_t + \gamma^3 DLeEU_t + \qquad (1)$$

[12] The ADL model is a general and flexible specification that can accommodate a rich variety of linear dynamic structures. See Hendry (1995) for a discussion.

$$\gamma^4 DiAR_t + \gamma^5 DfAR_t + \gamma^6 DiBR_t + \gamma^7 DfAR_t + \alpha_t^8 DLeBR_t + \varepsilon_t,$$

where D denotes the first difference operator and L the natural logarithmic transformation, and all variables are as defined in the previous section.

36. Equation (1) may be interpreted as an uncovered interest rate parity condition (UIP) augmented to control for the presence of a country risk premium (the Chilean bond spread), exogenous terms of trade shocks (the copper price), common regional and global shocks (Argentina and Brazil), and the international business cycle (the semiconductor price and the euro/dollar exchange rate). In turn, the UIP may be seen as one building block of a larger model for the nominal exchange rate such as, for instance, the Donbusch overshooting model. In econometric terms, (1) may also be seen as one block of a larger vector autoregressive model (VAR) for the analysis of monetary policy in a small open economy.

37. There are several notable features of the econometric specification adopted. First, consistent with the preliminary evidence on the lack of predictability of exchange rate log-changes reported above, only one lag of the endogenous variable is included in the equation, implying a fast dynamic adjustment process. Second, all asset return differentials are entered with a lag to avoid the introduction of a simultaneity bias, because of the possible response of Chilean returns to contemporaneous changes in the exchange rate.[13] All other variables are entered into the regression contemporaneously, assuming that they are not contemporaneously affected by movements in the peso/dollar rate. Third, in order to avoid the possibility of running a spurious regression, all variables are entered in first difference form except the short-term interest rate and the stock market return differentials.[14]

38. It should also be noted that all variables have been standardized (by subtracting the sample mean and dividing by the sample standard deviation reported in Table 3). This normalization does not affect the substance of the results in any way and permits a direct comparison of the magnitude of the estimated regression coefficients among themselves and with the sample correlations reported in Table 2. In particular, if the regression is run with

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[13] Note that the first lag of these return differentials may be interpreted as an instrument for their contemporaneous value. Alternatively, the dynamic regression specified could be seen as a reduced form equation of a larger VAR model. Either way, the properties and the interpretation of the coefficients of the exogenous variables considered are not affected.

[14] While removing any unit root present, the first-difference transformation loses the information contained in the level of the variables of interest. This information loss represents a statistical problem if the variables are co-integrated. This possibility, for instance, could be particularly relevant for copper. Exploring it carefully at daily frequency, however, would not be straightforward as the nominal copper price is likely to be fractionally integrated rather than being a simpler unit root process.

standardized variables, the simple correlation coefficient is identical to the OLS coefficient of a bivariate regression. For instance, the simple correlation coefficient between the Argentine spread and peso/dollar rate would be the same as the OLS coefficient of a regression of the latter on the former. By adding additional explanatory variables, we can then obtain a direct and quantitative measure of the robustness of this pair-wise correlation to the inclusion of other factors.

Empirical results from OLS estimation

39. Equation (1) may be safely estimated by OLS under the assumption that simultaneity or omitted bias problems have been dealt with by choosing a satisfactory set of explanatory variables, none of which is contemporaneously affected by changes in the peso/dollar rate. In fact, the presence of heteroskedasticity may affect the precision of the estimated coefficients, but this is easily corrected by adjusting the standard errors estimates accordingly.[15]

40. Table 4 reports the estimated OLS coefficients of equation (1) in column 1; two alternative specifications to check the results' robustness in columns 2 and 3; and the sample correlation coefficients of Table 2 for ease of comparison. The regression in column 2 excludes Brazilian variables, while the regression in column 3 adds to the baseline specification in column 1 a term measuring the impact of the level of the copper price on the level of the exchange rate. For each regression variable, the table reports the estimated coefficients, the heteroskedatic-adjusted t-statistics, and the regression R-square.

41. In general, the results for the baseline specification (column 1) suggest that the estimated regression fits the data reasonably well given the low predictability of nominal exchange rate changes, with an R-squared statistic of about 0.2. Moreover, all variables have the expected sign, even though not all coefficients are statistical significant at conventional confidence levels.[16]

42. According to the baseline results (column 1), the effect of developments in Argentina on the peso/dollar rate is smaller than what is suggested by a simple correlation once

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[15] Interpreted as an augmented UIP condition, equation (1) could be misspecified, if the expectation error were auto correlated, leading not only to inefficiency but also to inconsistency of the OLS estimates. The practical relevance of this and other potential misspecification issues in the context of the time-varying specification used to verify the robustness of OLS results are discussed briefly in the next section. The author thanks Pablo García at the Banco Central de Chile for this observation.

[16] Given the relatively high sample correlation among Argentine and Brazilian variables (Table 2), one may argue that the results of the analysis may be affected by problems of multicollinearity. Multicollinearity should result in large standard errors relative to the size of the estimated coefficients, and thus low statistical significance, but this is not borne out by the empirical results reported.

additional explanatory factors are considered: the coefficient of the Argentine sovereign risk indicator drops from about 0.2 to 0.07 and is only border-line significant statistically at conventional confidence levels. The coefficient of the currency risk indicator also decreases, but appears clearly significant statistically.

43. The most important variables in explaining the short-term behavior of the peso/dollar rate are the Brazilian sovereign risk and the real/dollar spot rate (column 1): these coefficients have the same order of magnitude of the simple correlations and are statistically significant. Given that Argentine variables have a stronger impact when entered into the regression equation without Brazilian variables (column 2), and that the two countries co-move very closely (Tables 2), it is possible that Brazil may be an important channel through which Argentina has affected Chile over the past couple of years. A second possibility to bear in mind in interpreting these results is that Brazilian variables might be picking up other common factors omitted from the analysis, such as "global risk aversion" as discussed in the previous section.

44. Consistently with the preliminary evidence in Table 2, no other variable included in the regression reported in column 1 appears to have a significant effect on the peso/dollar rate, except for the two monetary policy variables and the semiconductor price index, which are marginally significant statistically. The Chilean sovereign risk indicator and the stock market return differential, in particular, are neither quantitatively important nor statistically significant.

45. It is perhaps surprising that daily log-changes in the copper price appear unrelated with daily log-changes in the peso/dollar rate in the baseline specification (column 1). This result, however, should be taken with caution for two reasons. First, the baseline specification omits possible long-term determinants of the peso/dollar rate, and a robustness check (column 3) suggests that the copper price might be a significant factor over a longer time-horizon.[17] Second, both copper and semiconductor prices may be affected by the same common factor, the international business cycle, as evidenced by their non-negligible sample correlation coefficient. The semiconductor price, in turn, is border-line significant statistically in the regression equation, even though it has a very small coefficient. This result suggests that the copper price may affect Chile also in the short-term, but its impact has been

[17] While an empirical analysis of the equilibrium level of the exchange rate is beyond the scope of this paper, some evidence on the role of copper over a longer time horizon may be gathered by including in the baseline specification a term measuring deviations from the pair-wise relation between the level of these two variables, which represents a stylized "equilibrium" relation. The regression reported in column 3 of Table 4 include such a term, which is the lagged residual of a simple OLS regression of the log-level of the exchange rate on the log-level of the copper price, a constant and a trend. As noted earlier, however, this way of proceeding would be incorrect if the exchange rate has a unit root and the copper price is fractionally integrated. For this reason, the evidence reported is not definitive.

captured here by the semiconductor price variable, which is almost four times as volatile as the copper price over the sample period (Table 2). More generally, other sources of terms of trade shocks are omitted from the estimated equation, even though simply adding the oil price to this regression did not change the results (not reported).

46. Domestic and foreign monetary policy, as measured by the short-term interest rate differential used, are found to influence the exchange rate in the expected direction during the period considered, even though the impact is very small: a 100 bps increase in the short-term differential leads to a 1.3 bps appreciation on impact, holding all other variables constants. [18] In terms of the sign of the effect of monetary policy on the nominal exchange rate, this result is consistent with previous evidence reported by Zettelmeyer (2000) and suggests that the widening of the interest rate differential in the second half of 2001, following cuts in US interest rates, may have provided some support to the peso during that period. However, intervention in the foreign exchange rate market, which took place during that period but is not accounted for in this regressions, has likely also had a role in stabilizing the peso.

47. In summary, the impact of developments in Argentina on Chile appears smaller than suggested by simple correlations between the peso/dollar rate and Argentine country and currency risk indicators. However, Argentina might have affected Chile also through Brazil, which is an obvious omitted channel from that type of analysis. Brazil appears to be the most important factor during the free floating period. By the same logic, however, underlying the "Brazil" factor there might be other explanatory variables omitted from the analysis as discussed in section B. The result should be interpreted as a warning to monitor a wider set of variables to understand the behavior of nominal exchange rate, including also developments in Brazil. The absence of a direct association between the copper price and the exchange rate should be taken with caution for the reasons explained. Among the domestic factors considered, only monetary policy seems associated with short-term movements in the peso/dollar rate during the free-floating period. But even this relation appears rather weak.

D. Is There Evidence of "Shift-Contagion" from Argentina?

48. This section turns to the more subtle question of whether the impact of developments in Argentina on the Chilean foreign exchange market during the second half of 2001 was

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[18] Note that $\alpha^2 m_{t-1} + \alpha^3 Dm_{t-1} = (\alpha^2 + \alpha^3) m_{t-1} - \alpha^3 m_{t-2}$, where α^2 is only border-line significant while α^3 is clearly significant statistically in Table 4 (column 1). The short-run impact on DLe_t of an increase in m_t, therefore, is given by $(\alpha^2 + \alpha^3 - \alpha^3)$, which is equal to -0.04 according to Table 4 (column 1). Then, by recalling that all variables are standardized and that the standard deviation of DLe_t and m_t are 49 and 157 bps, respectively (Table 3), the calculation of the estimated impact reported in the text follows (1.248bps = -0.04 time 49bps divided 157bps).

unusually strong, so as to suggest the presence of "contagion" broadly defined as discussed in the introduction.

49. In order to proceed, we need a precise definition and an operational measure of "contagion". The next sub-section discusses the specific definition of contagion adopted. The measure of shift-contagion used is presented subsequently. The empirical results follow.

Defining contagion

50. There is no clear definition of "contagion" commonly accepted among economists despite the considerable effort gone into the analysis of this phenomenon over the last decade or so. This paper uses the definition of "contagion" adopted by Rigobon and Forbes (2000 and 2001) (henceforth, RF). RF define "contagion" as *a change or a shift in the linkages across markets following a shock or a crisis in one or more markets* and call this "shift-contagion" to differentiate it from other definitions used in the literature.[19] A strong association between two markets both before and after a crisis in one market is not considered contagion according to this definition. RF call the latter occurrence "interdependence" to underlay the distinction between these concepts.[20]

51. According to RF, the concept of shift-contagion allows also to distinguish naturally between two strands of theoretical explanations of the transmission of crises across countries: those that predict a change in cross-markets linkages during a crisis on the one hand, and those that assume crisis are transmitted through stable linkages across states of the world on the other hand. Establishing which type of transmission channel is prevailing might have important policy implications. In particular, short-term "insulation" policies, such as for instance through various means of public sector intervention in the economy, may be more

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[19] This definition does not specify whether the observed change is expected to be *temporary* to qualify as shift-contagion. Nonetheless, a permanent shift in a fundamental relation—often called "structural breaks" in the econometric literature—does not conform well to an intuitive definition of "contagion". For this reason, henceforth, we shall assume that shift-contagion refers to a temporary change in the underlying cross-market relation.

[20] *For example, ... when Brazil abandoned its peg what did we predict would happen to Argentina? Brazil and Argentina are located in the same region, have many similarities, and have many direct linkages through trade and finance. These two economies are closely connected in all states of the world, and it is not surprising that a large negative shock to one country is quickly passed on to the other. If this transmission of the shock from Brazil to Argentina is a continuation of the same cross-market linkages that exist during more tranquil periods (and not a shift in these linkages) then this should not be considered shift-contagion.* (Forbes and Rigobon, 2000, pages 13-14).

likely to be desirable and effective in the presence of shift-contagion, but may not be the best (nor a viable) response in presence of interdependence or structural breaks.[21]

52. As pointed out by RF, the concept of shift-contagion is not only intuitive and meaningful from a policy perspective, but also lends itself to be identified empirically, in principle. In theory, it would be just a matter to check the strength of cross-market linkages before and after a crisis to see whether they have changed significantly. In practice, measuring shift-contagion poses a host of statistical problems that we discuss briefly in the next sub-section.

Measuring contagion

53. There are several approaches to measure shift-contagion in the literature.[22] Typically, the empirical model is estimated before and after the crisis, or including dummy variables for the crisis period. Then, the statistical significance of the dummy variables, or the statistical significance of the estimated differences before and after the crisis, is checked. Thus, these methods assume that both the source *and* the precise timing of the crisis is known.[23] This is a drawback, especially for the analysis of the Argentine crisis that unfolded slowly but persisted longer than previous crises.

54. As shown by Rigobon (2001) formally, most of the existing methods to measure shift-contagion suffer also from other statistical problems.[24] As now well known, *cross-market correlations* may increase even in the absence of a shift in the underlying linkages if volatility increases in the crisis country, thereby introducing a bias in statistical tests based on simple correlations.[25] Also, this bias can be corrected only in the absence of simultaneity and

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[21] See De Gregorio (2001) for a discussion of Chile's exchange rate developments and policies in 2001 in this normative perspective.

[22] See Rigobon (2001) for a formal comparative analysis.

[23] RF work with sub samples. Examples of studies that use dummy variables include Favero and Giavazzi (2001), and Baig and Goldfajn (2000).

[24] The discussion here focuses only on methods based on cross-market correlations and OLS regressions. These are the most commonly used, and the most directly comparable with the method used in this paper.

[25] Baig and Goldfajn (2000) note, however, that increased volatility in the crisis country may be seen as the source of "contagion", and the consequent strengthening of cross-market correlations even in the absence of a shift in the underlying relations is part of the "contagion" process. In this case, cross-market correlations continue to provide useful information, even though they cannot be used to disentangle a shift in the linkage from other reasons for the increased co-movement across markets following a crisis.

omitted variables problems. Hence, even assuming that developments in Chile do not affect developments in Argentina, and adjusting the cross-market correlation for the increased volatility in Argentina during the final stage of the crisis, an omitted variable bias may still distort the investigation of contagion based on this approach.

55. *OLS-based methods* can be safely applied in the absence of simultaneity and omitted variable problems, with the advantage that they provide also evidence on the specific channels through which shocks or crises are transmitted across markets (e.g., trade, finance, investors preference and technology, etc.). However, in the joint presence of heteroskedasticity and either omitted variables or simultaneity, OLS-based statistical tests too are biased. Moreover, under these circumstances, there are no simple corrections that can be implemented.

56. The measurement approach used here is to model cross-market linkages as changing randomly all the time, and then analyze their estimated time profile by looking for quantitatively sizable and economically plausible shifts. More specifically, suppose the true cross-market relation is represented by the following equation:

$$y_t = \beta_t x_t + \varepsilon_t, \tag{2}$$

where β_t follows a random walk process without drift,

$$\beta_t = \beta_{t-1} + \zeta_t. \tag{3}$$

57. Following Canova (1993), we estimate the series of parameter values ($\hat{\beta}_t$) for all times t with a numerical Bayesian procedure as discussed by Ciccarelli and Rebucci (2002), and then look at the time profile of this series for sizable shifts. As estimation is Bayesian, there is a lesser need to test the statistical significance of any notable shift identified.[26]

58. This approach to the measurement of shift-contagion has other advantages. First, it does not require knowledge of the precise timing of a crisis. Second, as in the case of OLS-based methods, it may provide evidence on the specific channels of transmission of shocks across markets, and it allows to distinguish between the effect of increased volatility in the crisis country from shifts in the underlying relation. Third, unlike OLS-based methods, the approach may be adjusted to take possible omitted factors into consideration.[27] Finally, as

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[26] This is because a Bayesian estimation procedure, in principle, derives the entire statistical distribution of the parameter of interest, as opposed to *one* draw from such a distribution under a classical approach. The analogous of a classical test for parameter stability, however, could be easily implemented.

[27] A formal analysis of this particular as well as other potential misspecification issues is work in progress jointly with Matteo Ciccarelli. Investigating the presence of contagion only

(continued)

shown by Canova (1993), a specification as (2)-(3) is particularly well suited to model empirically the statistical properties of high frequency nominal exchange rate data.

59. In short, under the implicit assumptions that (i) none of the explanatory factors considered are endogenous to the peso/dollar rate, and (ii) there are no omitted factors from the analysis, a time-shift in the coefficients of (1) may be reasonably interpreted as evidence of shift-contagion.

Empirical results from Bayesian estimation

60. The estimation results based on (1) specified as in (2)-(3) are reported in Figure 4.[28] For each coefficient in (1), and each trading day in the sample, Figure 4 reports the mean and the first and the third quartile of the estimated posterior distribution. The mean of the posterior distribution—the central line in the plots—mat be compared to the OLS estimates in Table 4. The inter-quartile band—the two lines around the mean—contains 50 percent of the probability mass under the estimated posterior distribution, and may be compared to a 50 percent classical confidence interval. Each panel reports also the sample correlation coefficient from Table 2 and the OLS coefficient from Table 4 for ease of comparison. All regressors are standardized as explained before so that the coefficients are directly comparable across variables.

61. By eyeballing these plots, it is evident that some instability characterizes the posterior distribution of all coefficients at some point over the sample period. The estimated posterior means move slightly up and down, but they track closely OLS coefficients through the middle of 2001. This implies also that the results based on OLS estimation of (1) discussed in the previous section are broadly robust to a more careful consideration of the statistical properties of the data.

62. The estimated relation, however, starts becoming visibly more unstable in May-June, 2001. This is strikingly clear in the case of Argentine risk indicators, but it is evident also in the case of other factors linked to the peso/dollar rate. To analyze this evidence more accurately, Figure 5 zooms on the second part of the sample (January 2001 to January 2002),

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in one country, as in this paper, however, it is simpler to address the problem by searching for a comprehensive set of explanatory variables—as long as they are observable. In this case, therefore, there is also a lesser need to implement such an adjustment.

[28] The dynamic specification of the regression equation is the exactly the same as in (1). The most important difference compared to the specification of (1) is the time-variation of the parameters, but a more general distributional assumption on the error term ε_t is also made, by assuming that the error term is t-distributed rather than normally distributed as usually done.

plotting the posterior mean of key coefficients together with the level of the peso/dollar rate (where an increase means a depreciation of the peso).

63. Figure 5 shows that, indeed, the coefficients of the Argentine country risk indicator start to increase markedly at the beginning of July 2001—following some decline in the proceeding two-three months—around the time the peso first jumped after the Argentine "mega-swap" failed to restore investor confidence.[29] The magnitude of coefficient of the Argentine country risk indicator, in particular, more than doubled in a few days after July 3, to reach a relative peak at about three times its end-June level on August 1, following a second downgrade of the Argentine sovereign rating in a few weeks. The magnitude of this coefficient reached its maximum on October 10, declining gradually thereafter, to bottom out on December 28 and revert to per-June 2001 values in early January 2002 (despite the Argentine country risk remaining at very high levels). This is clear evidence of a temporary change in the linkage between the two countries, and thus suggests the presence of shift-contagion according to the measure used. Figure 5 also shows that the coefficients on the interest rate differential and the Brazilian real/dollar exchange rate were higher (in absolute terms) after mid-2001.

64. In summary, while some parameter instability is evident even before the acceleration of the Argentina crisis in July 2001, it appears that the order of magnitude of the changes in the relation between the exchange rate and the set of determinants considered has "shifted gear" following the acceleration of the Argentina crisis in the second part of 2001. These shifts appear to have been more persistent in same cases than in others. These shifts seems also broadly associated with the timing of the crisis in Argentina and developments in other emerging markets, including particularly as regards the timing of the decoupling from Argentina. Overall, there appears to be clear evidence of shift-contagion from Argentina on the Chilean foreign exchange rate market in second half of 2001. Evidence that is unlikely to be contaminated by the statistical properties of the data given the particular measure used

E. Conclusions

65. This paper quantified the statistical association between the peso/dollar rate and a large set of potential short run explanatory factors since it started to float freely in September 1999, and investigated the presence of contagion from Argentina in the second half of 2001.

66. The paper finds that Argentina is one fundamental factor associated with the Chilean exchange rate over the past couple of years, but its quantitative relevance may have been overstated by analyses based on simple correlation coefficients. Bilateral trade linkages between these two countries are not strong, while the direct investment position of the

[29] Argentina announced the "mega-swap" plan in mid-May, additional fiscal measures to stimulate confidence in mid-June, and the "zero-deficit" policy on July 11, the same day in which Moody's and Standard &Poor's downgraded the sovereign rating by one notch.

domestic corporate sector in Argentina is reportedly well cushioned by a solid capital base. On these bases, perhaps, one would not have expected a very strong fundamental linkage between these two countries.

67. The finding of shift-contagion from the Argentine crisis during the second half of 2001 documented in the paper is consistent with the previous conclusion, as it highlights a temporary departure from more fundamental valuations. The paper does not explain why shift-contagion may have occurred. Nonetheless, market and press reports suggest that a sudden reassessment of hedging needs of domestic and foreign investors may have played an important role in generating a self-reinforcing association between developments in the neighboring country and the domestic foreign exchange rate market following the acceleration of the crisis in July 2001. This process ended in late-October, together with a general improvement of investor sentiment in global financial markets, as evidenced by the behavior of indicators of global risk aversion. Overall, this evidence is consistent with the view that the Chilean foreign exchange market was hit by exceptional turbulence in 2001: as shown by a marked shift in the estimated relation between the exchange rate and its possible determinants, the peso reacted way beyond what was, in principle, warranted by the shift in these variables.

68. It is perhaps somewhat surprising that movements in the copper price do not seem associated to exchange rate fluctuations during the free-floating period. This conclusion should be interpreted with caution, though. The copper price is not the only source of terms of trade shocks for the Chilean economy, even though it is the most important one. Copper may be also a longer-term determinant of the peso/dollar rate; something we cannot establish easily in the empirical framework used in this paper. In addition, a high-frequency international business cycle indicator that is relatively well correlated with the copper price appears to be weakly associated with the exchange rate. More analysis of the role of copper in explaining nominal exchange rate fluctuations in Chile is needed, possibly using different empirical methods and data frequency.

69. Statistically, Brazilian variables turned out to be more closely associated with short-term fluctuations in the peso/dollar rate during the free-floating period than Argentine variables. Thus, Brazilian variables are an evident omission from any simple correlation analysis between Chile and Argentina.

70. The only other variable found to be associated with the peso/dollar appears to be the short-term interest rate differential with the US, which was interpreted as a monetary policy indicator. This indicator appears significantly related to the exchange rate with the expected sign, but the implied elasticity is small. This finding suggests that even if the exchange rate is part of the transmission channel of monetary policy, it should not play a large role. Secondly, an hypothetical interest rate defense of the currency from a speculative attack might require a large increase in the interest rate because of the low implied elasticity.

Table 1. The Set of Potential Explanatory Factors Considered

Acronimous	Name	Definition	Unit of Measure	Sampling	Source
DLc	Chilean spot rate	Log-change in the Chilean peso /U.S. dollar rate	Daily return in percent	Closing quote	Bloomberg
DLc	Copper price	Log-change in the London metal Exchange spot copper price	Daily return in percent	Closing quote	Bloomberg
m	Interest rate differential	Short-term interest rate differential (TAB-90 rate minus federal fund rate) (TAB-90 rate in UF)	Percentage point per year	Daily average	Bloomberg and Associacion de Bancos
Dm	Interest rate differential change	Change in short-term interest rate differential (TAB-90 rate minus federal fund rate)	Percentage point per year	Daily average	Bloomberg
DiCHL	Chilean sovereign risk	Change in the Chilean component of the EMBI Global index	Percentage point per year	Unknown	Bloomberg
DfCHL	Chilean currency risk	Change in the differential between the implied one-year NDF interest rate and the one-year U.S. Treasury yield (constant to maturity)	Percentage point per year	Mid-yield	Bloomberg and IMF ICM Department
s	Stock market differential	Stock market daily return differential (IGPA index minus S&P500 index)	Percentage point per day	Closing quote	Bloomberg
DiAR+	Argentine sovereign risk	Change in the Argentine component of the EMBI+ index	Percentage point per year	Closing quote	Bloomberg
DfAR	Argentine currency risk	Change in the differential between the implied one-year NDF interest rate and the one-year U.S. Treasury yield (constant to maturity)	Percentage point per year	Mid-yield	Bloomberg and IMF ICM Department
DLeAR	Argentine spot rate	Log-change in the Argentine peso/U.S. dollar rate	Daily return in percent	Closing quote	Bloomberg
DiBR+	Brazilian sovereign risk	Change in the Brazilian component of the EMBI+ index	Percentage point per year	Closing quote	Bloomberg
DfBR	Brazilian currency risk	Change in the differential between the implied one-year NDF interest rate and the one-year U.S. Treasury yield (constant to maturity)	Percentage point per year	Mid-yield	Bloomberg and IMF ICM Department
DLeBR	Brazilian spot rate	Log-change in the Brazilian real/US dollar rate	Daily return in percent	Closing quote	Bloomberg
DLb	Semiconductor price	Log-change in a semiconductor spot price (DRAM module, 100 mghz bus 128 MB)	Daily return in percent	Unknown	Datastream (DRMU03S)
DLeEU	Euro spot rate	Log-change in the Euro/U.S. dollar rate	Daily return in percent	Closing quote	Bloomberg

All exchange rates are expressed in units of national currencies per U.S. dollar.

Table 2. Sample Correlation Matrix (June 2, 1999 - January 31, 2002)

	Chilean Spot Rate	Semi-conductor Price	Euro Spot Rate	Interest Rate Differen-tial	Interest Rate Differen-tial Change	Chilean Sovereign Risk	Chilean Currency Risk	Stock Market Differen-tial	Copper Price	Brazilian Sovereign Risk	Brazilian Currency Risk	Brazilian Spot Rate	Argentine Sovereign Risk	Argentine Currency Risk	Argentine Spot Rate
	Dle	DLb	DLeEU	m	Dm	DiCHLg	DfCHL	s	DLc	DiBR+	DfBR	DLeBR	DiAR+	DfAR	DLeAR
Chilean spot rate	1.00														
Semiconductor price	-0.07	1.00													
Euro spot rate	0.01	0.03	1.00												
Interest rate differential	-0.06	0.15	0.01	1.00											
Interest rate differential change	-0.03	0.03	-0.01	0.11	1.00										
Chilean sovereign risk	0.01	0.00	-0.03	-0.03	-0.04	1.00									
Chilean currency risk	-0.07	0.00	0.01	-0.05	-0.07	0.06	1.00								
Stock market differential	0.09	-0.06	-0.06	0.01	-0.03	0.04	0.03	1.00							
Copper price	-0.04	0.14	-0.02	0.07	0.05	0.03	-0.02	-0.11	1.00						
Brazilian sovereign risk	0.33	-0.07	-0.07	-0.08	-0.11	0.10	0.07	0.22	-0.10	1.00					
Brazilian currency risk	0.15	-0.05	-0.01	-0.03	-0.05	0.03	0.05	0.05	0.00	0.24	1.00				
Brazilian spot rate	0.37	0.01	0.02	-0.06	-0.06	0.00	0.02	0.09	-0.08	0.41	0.18	1.00			
Argentine sovereign risk	0.19	-0.02	0.06	0.11	-0.02	0.02	-0.02	-0.01	0.01	0.36	0.14	0.19	1.00		
Argentine currency risk	0.18	-0.02	0.00	0.12	-0.03	-0.10	0.06	-0.06	0.03	0.25	0.18	0.22	0.34	1.00	
Argentine spot rate	0.05	0.03	0.02	0.22	0.00	0.02	-0.07	-0.03	0.01	0.02	0.01	0.06	0.11	-0.07	1.00

Sources: Bloomberg; Datastream; Fund database (ICM Dept.); and Fund staff calculations.

Table 3: Sample Descriptive Statistics (June 2, 1999-January 31, 2002)

	Chilean spot rate	Semi-conductor Price	Euro spot rate	Interest rate differential	Interest rate differential change	Chilean sovereign risk	Chilean currency risk	Stock market differential	Copper price	Brazilian sovereign risk	Brazilian currency risk	Brazilian spot rate	Argentine sovereign risk	Argentine currency risk	Argentine spot rate
	Dle	DLb	DLeEU	m	Dm	DiCHLg	DfCHL	s	DLc	DiBR+	DfBR	DLeBR	DiAR+	DfAR	DLcAR
Mean	0.05	-0.19	0.03	0.28	0.00	0.00	-0.01	0.05	0.02	0.00	0.00	0.05	0.06	0.21	0.10
Median	0.04	0.00	0.04	-0.04	0.00	0.00	-0.01	0.07	0.00	-0.01	-0.01	0.08	0.01	0.00	0.00
Standard Deviation	0.49	4.17	0.69	1.57	0.18	0.08	0.15	1.28	1.18	0.18	0.40	0.88	0.72	3.16	1.67
Kurtosis	2.62	27.48	3.17	3.15	19.35	15.74	4.42	1.67	6.18	1.73	5.86	4.51	45.13	65.17	266.33
Skewness	0.35	2.84	-0.56	1.88	0.02	-0.33	0.04	-0.08	0.77	0.27	0.68	-0.07	0.51	-0.60	14.26
Minimum	-1.92	-17.89	-4.47	-1.42	-1.41	-0.55	-0.72	-4.88	-4.77	-0.71	-1.96	-4.40	-7.96	-38.88	-7.84
Maximum	2.43	42.02	2.03	6.00	1.39	0.55	0.86	6.54	8.90	0.69	2.16	5.21	7.15	33.30	33.65
Number of observations	641	641	641	641	641	641	641	641	641	641	641	641	641	641	641

Sources: Bloomberg; Datastream; Fund database (ICM Dept.); and Fund staff calculations.

Table 4. Empirical Results from OLS Estimation with Time-Invariant Coefficients
(Sample: June 2, 1999 - January 31, 2002)

Model 1/	Corr. Coeff.	1	2	3
Independent variables 2/				
Lagged Chilean spot rate (log-change)	0.12	0.09	0.12	0.09
		1.80	2.57	1.89
Semiconductor price (log-change)	-0.07	-0.04	-0.03	-0.05
		-1.11	-0.77	-1.30
Euro spot rate (log-change)	0.01	0.01	0.00	0.01
		0.30	0.03	0.21
Interest rate differential (lagged level)	-0.06	-0.04	-0.09	-0.04
		-1.00	-1.51	-0.99
Interest rate differential change (lagged change)	-0.03	0.05	0.05	0.05
		1.92	1.62	2.12
Chilean sovereign risk (lagged change)	0.01	-0.02	-0.02	-0.02
		-0.63	-0.63	-0.65
Stock market differential (lagged level)	0.09	-0.002	0.05	0.00
		-0.04	1.26	0.04
Copper price (log-change)	-0.04	-0.01	-0.04	-0.01
		-0.16	-0.90	-0.24
Copper gap (lagged log-level)	0.04	na	na	-0.09
		na	na	-2.35
Brazilian sovereign risk (change)	0.33	0.16	na	0.16
		2.67	na	2.63
Brazilian currency risk (change)	0.15	0.04	na	0.03
		0.09	na	0.75
Brazilian spot rate (log-change)	0.37	0.26	na	0.26
		5.78	na	5.76
Argentine sovereign risk (change)	0.19	0.07	0.16	0.07
		1.48	2.60	1.59
Argentine currency risk (change)	0.18	0.07	0.15	0.07
		1.95	3.35	1.88
No. of observations	641	641	641	641
R-Square	na	0.19	0.09	0.20

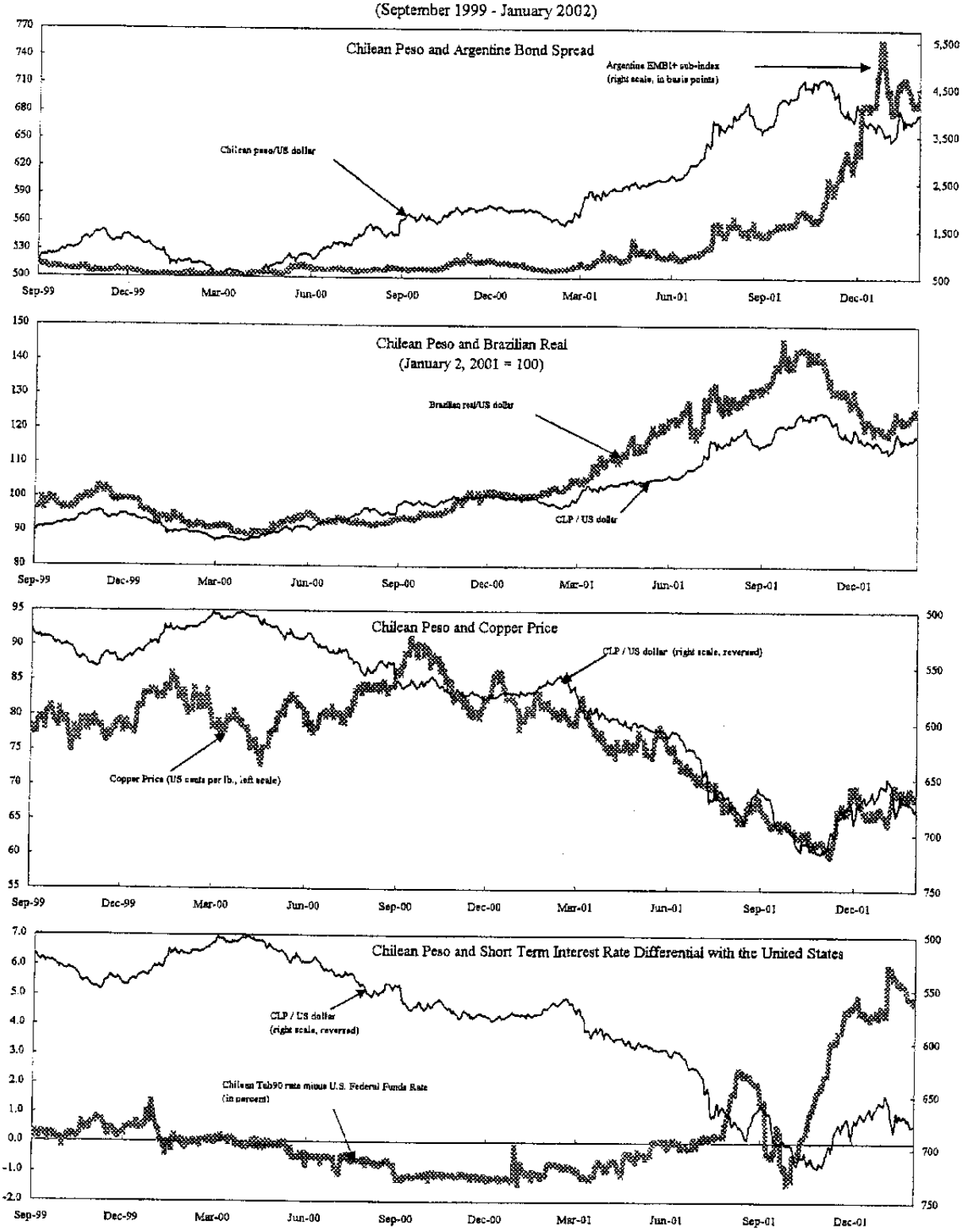
Sources: Bloomberg; Datastream; Fund database (ICM Dept.); and Fund staff calculations.

1/ The dependent variable is always the log-change in the peso/dollar rate.

2/ OLS regression coefficients and heteroskedastic consistent t-values, respectively, reported.

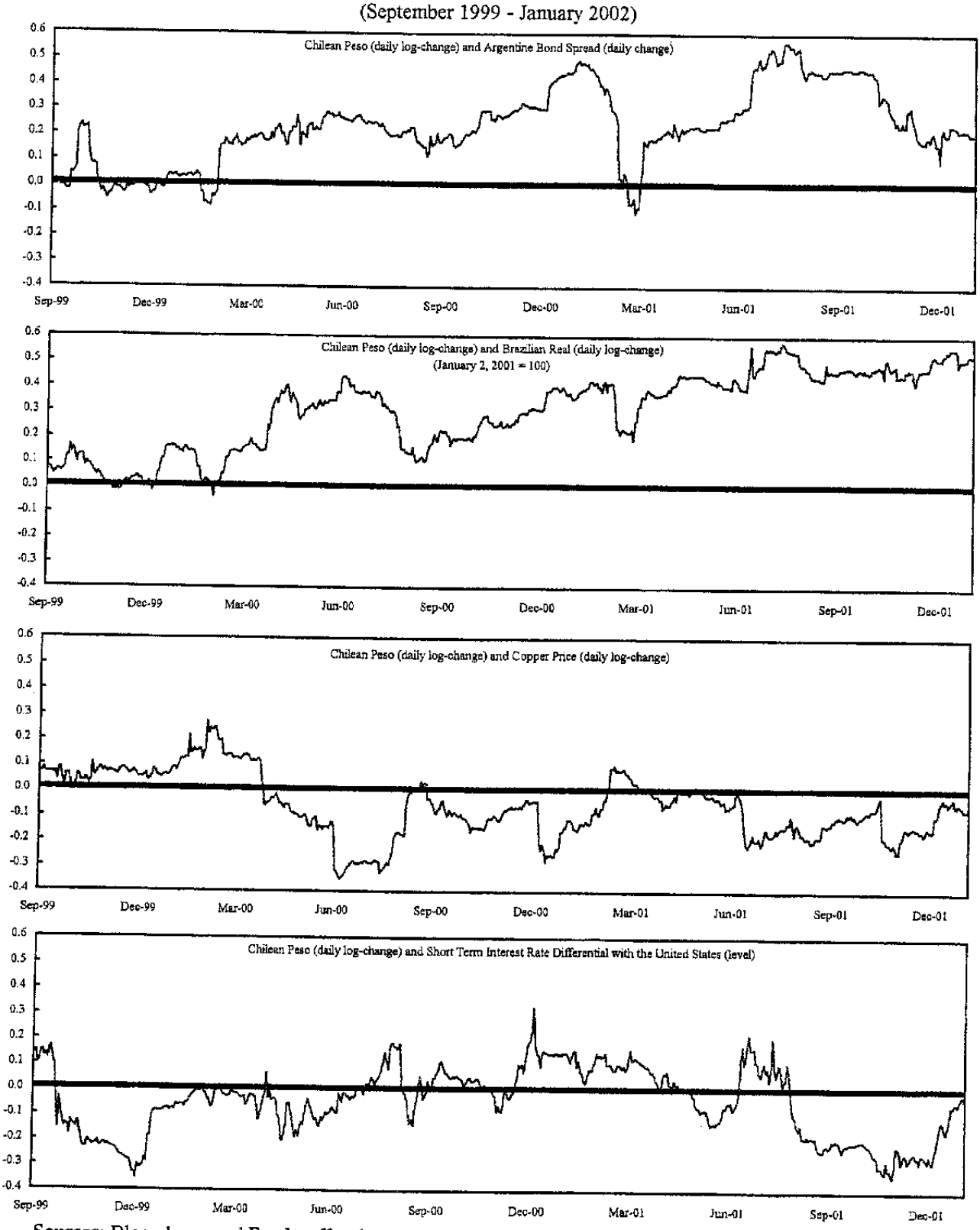
3/ ECM = Le - 8.53 + 0.3*Lc - 0.0004*Trend (+ means "undervalued" w.r.t. equilibrium, which is normalized to zero.)

Figure 1. The Chilean Peso/US Dollar Spot Rate and Selected Determinants 1/
(September 1999 - January 2002)



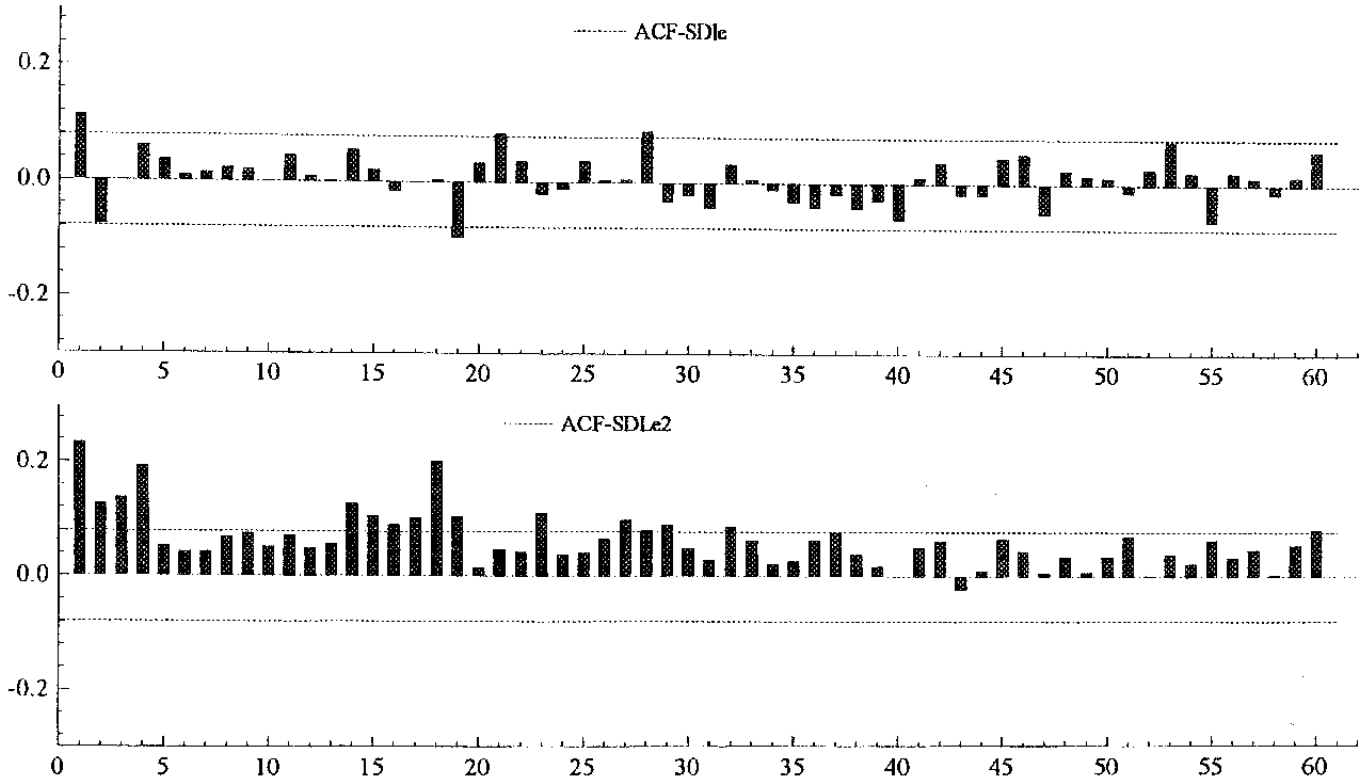
Sources: Bloomberg; and Fund staff estimates.
1/ All variables expressed in levels.

Figure 2. Rolling 80-Day Correlations with Selected Potential Determinants
(September 1999 - January 2002)



Sources: Bloomberg; and Fund staff estimates.

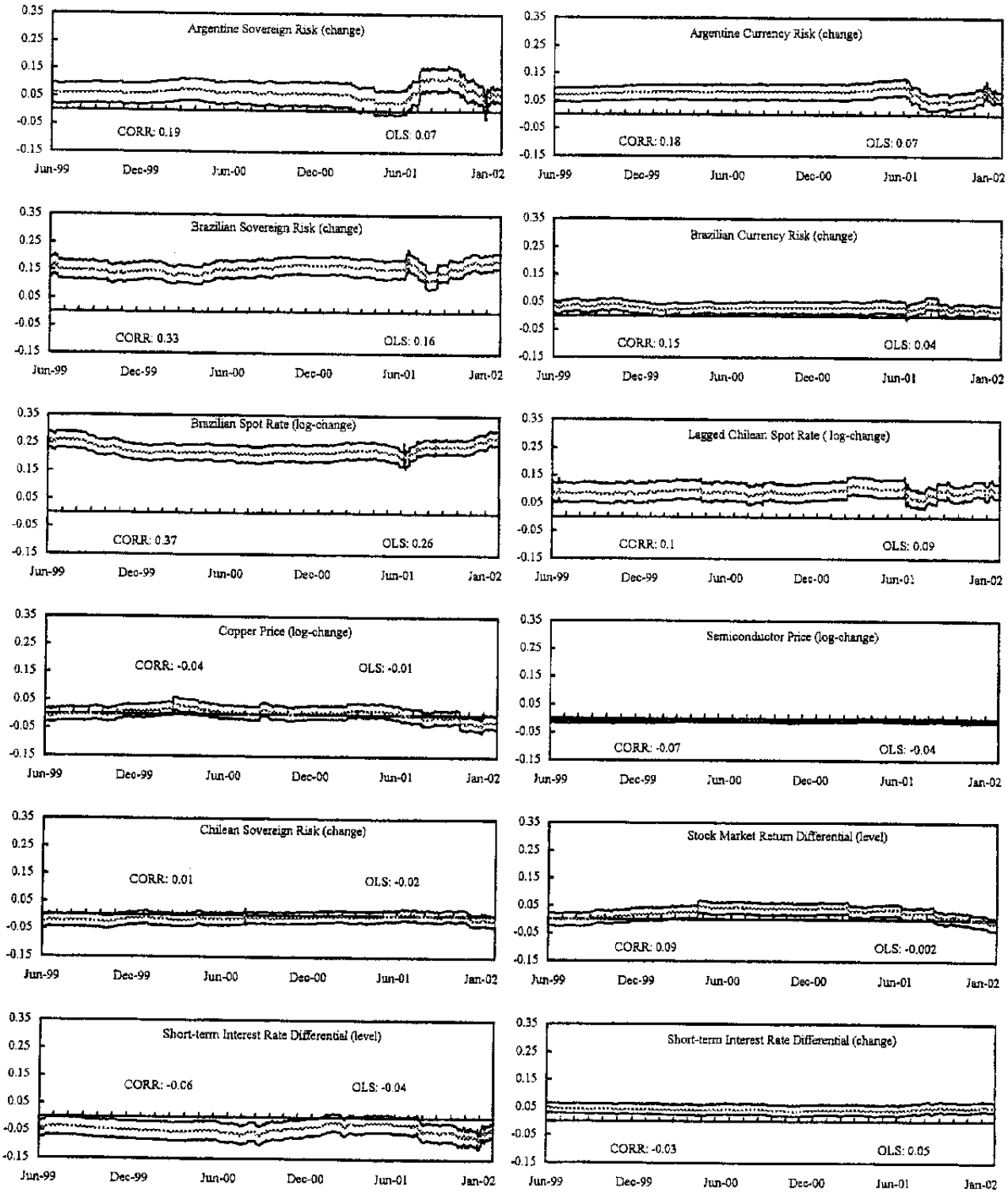
Figure 3. Persistence of Daily Exchange Rate Log-Changes and Squared Log-Changes 1/



Source: Fund staff estimates.

1/ ACF means auto-correlation function; SDLe is the log-change of the peso/dollar rate; SDLe2 is the square of the log-change.

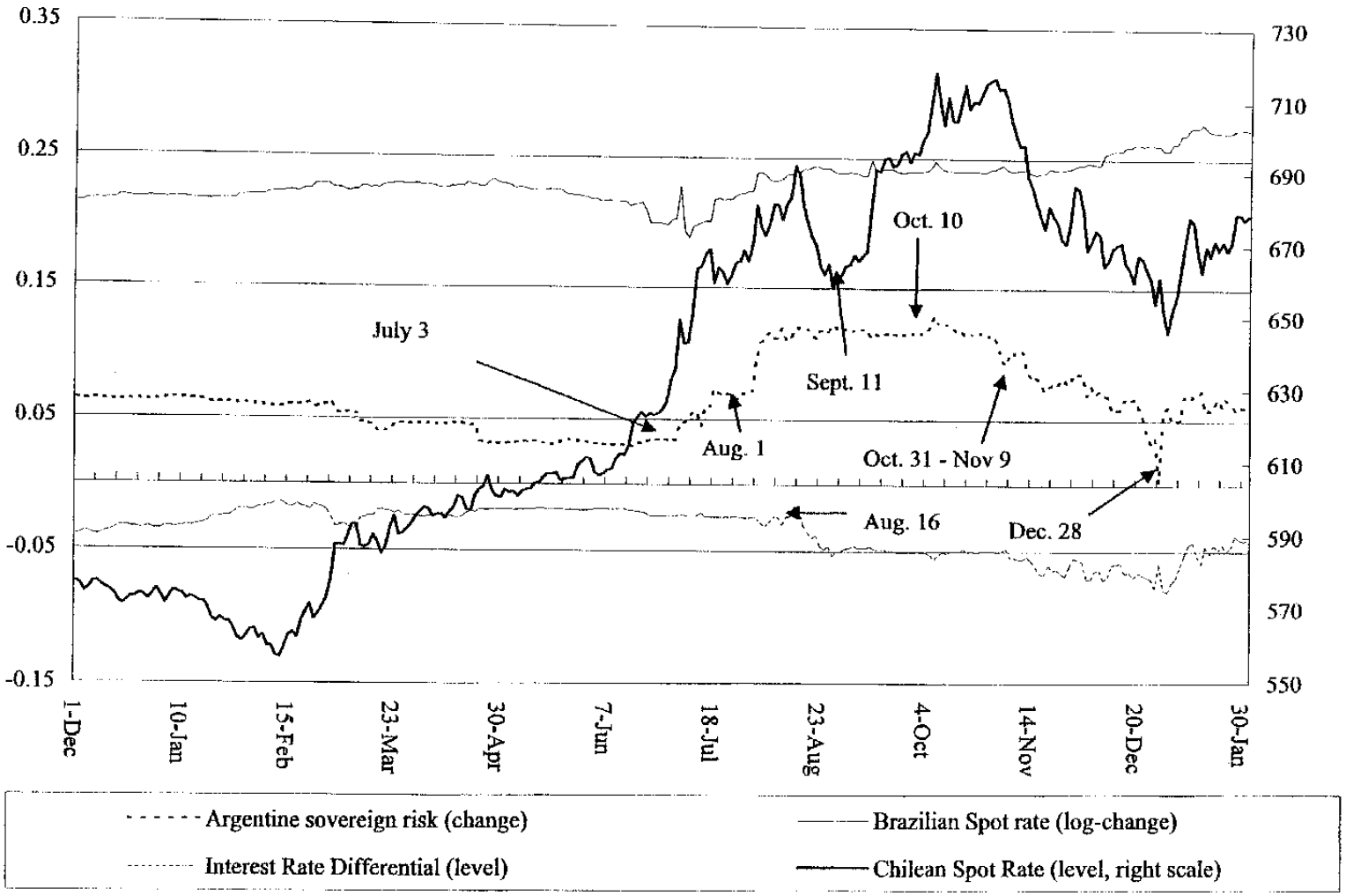
Figure 4. Empirical Results from Bayesian Estimation with Time-Varying Coefficients
(June 1, 2001 - January 31, 2002)



Sources: Bloomberg; Datastream; and Fund staff estimates.

1/ First quartile, mean, and third quartile of the posterior distribution reported.

Figure 5. Posterior Means of Key Regression Coefficients. (January 2001-January 2002)



Sources: Bloomberg; and IMF staff estimates.

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III. Forecasting Copper Prices in the Chilean Context[30]

A. Introduction

71. The future evolution of copper prices is a matter of interest in the case of Chile. While it is possible to exaggerate the "dependence" of Chile, and of the Chilean government finances, on copper export revenue, such revenue has represented 7–10 percent of GDP and 35–40 percent of exports in recent years. Transfers to the government from CODELCO, the state-owned copper company, have ranged from less than 2 percent of central government revenue (1998 and 1999) to more than 10 percent of such revenue (as recently as 1995), depending mainly on the state of world copper prices. Indeed, copper prices are highly volatile.

72. The Chilean economy as a whole copes with this volatility in a number of ways, including not only a floating exchange rate regime but also a high degree of foreign ownership of copper mines (which dampens the impact of copper price fluctuations on Chilean national income and wealth, and on the external current account balance). In the case of the government, there is the longstanding mechanism of the copper stabilization fund; more recently, the government's new target for the structural fiscal balance includes an adjustment for copper price fluctuations. In general, such schemes make most sense if the price in question has a component that is temporary and forecastable and does not have a steep trend.[31]

73. This paper asks what expectations can we reasonably have about copper prices in the medium to long run; that is, over horizons of say, five–ten years ahead. Is there a basis to have any expectations at all, other than whatever is today's price? These questions are of special interest currently, since real copper prices are near historical lows: is it reasonable to think of this situation as temporary, to make medium-term forecasts for the Chilean economy, and fiscal plans for the government, on the presumption that prices must eventually rise? Is it reasonable to presume that "copper risk" is mainly on the upside? We

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[30] Prepared by Steve Phillips and Andrew Swiston (WHD). The authors thank especially Professor Christopher Gilbert for his advice and expertise on the copper market and for providing certain data. Helpful comments were also received from participants at a seminar hosted by the Central Bank of Chile, including Esteban Jadresic, Alvaro Rojas, and Rodrigo Valdes, and at the IMF from Saul Lizondo, Alessandro Rebucci, Marco Espinosa, and Mauricio Villafuerte.

[31] As will be discussed later, Chile's new structural balance system includes a technical innovation that may be seen as a pragmatic approach to a situation in which the ideal answers to these questions do not hold with certainty. Specifically, the reference price used aims not to capture a notional "long-run" price, but rather the average price expected for the coming ten years.

emphasize that the objective is not to know with confidence the precise level of copper prices five or ten years from now, but rather, to ask whether there is a reasonable basis for expecting them to be significantly higher than they have been recently. If the answer is yes—that large temporary copper price shocks do exist, as this paper concludes—it becomes worth asking another question: what is the typical duration of such temporary shocks?

74. We have two rationales for focusing so much beyond the short run. First, since in the Chilean case neither the government nor the economy as a whole is liquidity constrained, having an accurate idea of copper prices a short period ahead—even if desirable for some purposes—is not critical. Second, we suppose that temporary price shocks might be rather long lived (Cashin, Liang, and McDermott (1999) suggest a typical half life of more than six years).

75. This study considers, and evaluates out-of-sample, a number of forecasts. One group comprises several very simple time-series models, using only information on past copper prices to generate forecasts. We build on the recent study by Engel and Valdes (2001), who evaluate a wide range of time-series models but find that most have essentially no forecasting power at all over horizons of one to five years. Engel and Valdes do find that a simple AR(1) model has some forecasting power, but its margin of victory over a naïve alternative forecast is not great. We investigate whether the limited success of the AR(1) model is related to the long—and perhaps variable—duration of copper price shocks. Indeed, when we consider forecast horizons of six to ten years, the AR(1) model's margin of victory widens. We also examine the performance of several other simple forecasting alternatives. The object is not to identify a true model of copper prices, nor to find the best possible forecasting tool, but rather to draw useful conclusions about the nature of copper price behavior from the relative forecasting success of alternative approaches.

76. Rather than using past copper prices, a much different forecasting approach would be to use futures market prices as a basis for medium- and long-term forecasts. Since the longest futures contract regularly traded is only 2¼ years, we investigate whether their prices might be used to draw inferences about (market expectations of) the level of copper prices over a longer horizon. We show that these futures prices do have some forecasting power (over a 2¼-year horizon) *and* that such futures prices have behaved as if the market believed that most copper price fluctuations were temporary. These findings suggest that futures prices should be considered seriously, at least as an indicator of the likely direction of copper price movements over a longer horizon. On the other hand, though futures prices do seem to be related to a market view of the level to which copper prices will eventually converge, we find evidence that this view has changed over time.

77. The chapter is organized as follows. Section B provides background, with a descriptive look at how copper prices have behaved in the past. It also describes some basic aspects of the world copper market, including how it is analyzed by industry experts. Section C evaluates the out-of-sample forecasting performance of several models, as well as London Metals Exchange (LME) futures prices, in relation to a naïve benchmark forecast.

78. Section D demonstrates that 2¼-year copper futures prices—although quite volatile themselves—have systematically pointed to copper price increases (declines) when copper prices have been low (high). In fact, the level of the spot price alone explains a very large part of the gap between futures and spot prices observed on a given day. We investigate the stability of this relationship over time, and the prospects for using it to infer market views of a "long-run" level of copper prices and the expected duration of temporary shocks.

79. Section E summarizes the findings of the previous sections and goes on to consider their possible implications for Chile, focusing mainly on the government's structural balance target and its adjustment for copper price fluctuations. Inevitably, there will be uncertainty not only over the level (if any) to which copper prices are converging, but also over the time needed to reach that level. This section seeks to put these two sources of uncertainty in quantitative perspective with some illustrative simulations, taking account of the relative size of copper in the Chilean economy, as well as key aspects of the government's overall fiscal position.

B. Background: Consensus Views of the Copper Market and a Look at the Data

80. This section provides an initial, descriptive look at how copper prices have behaved in the past. This turns out to be enough to illustrate a number of key points, and to give some intuition for the results presented later. As additional background, this section first describes some basic aspects of the global copper market, including how it is viewed by industry analysts and how experts on the copper industry make their own long-term price forecasts.

A consensus view of the copper market

81. Though it is widely acknowledged that copper prices are difficult to forecast accurately, there is broad agreement among analysts of the industry about how to frame an analysis of the market, how copper prices can be expected to behave over time, and how best to generate medium-term forecasts.

82. This consensus holds that copper price shocks are often temporary in nature. In turn, this belief implies the potential to forecast movements in copper prices on the basis of the expected decay of already-observed temporary shocks. This is not to say that permanent price shocks are not also possible; however, except over the very long run (when only permanent shocks matter, by definition) movements driven by short-term factors tend to be large relative to those from permanent shocks, or possible long-run "trends."

83. Such a view is consistent with the use of a copper adjustment in the Chilean fiscal balance target. Its strong contrast to a possible alternative should be emphasized. One might suspect instead that a commodity such as copper should be analyzed as an asset, for which intertemporal arbitrage would play a dominant role in price determination, in the extreme ruling out any forecastable temporary component to copper prices (essentially, because any expectations of a future change in price would only cause that change to materialize immediately). However, the consensus is that such intertemporal arbitrage in practice does

not play such a dominant role, and it is considered misleading to think of copper simply as an asset, a stock in finite supply. In that case, Hotelling's theory would predict that the price would over time tend to increase at the rate of interest (i.e., enough to compensate holders of copper for not selling, while not creating above-normal returns), which is clearly at odds with the evidence. Instead, the consensus analyzes the supply of the copper as a flow; indeed, the idea is that the long-run supply curve is rather flat.[32]

84. In the consensus view, the difficulty of forecasting the price of copper does not arise from a predominance of unanticipated permanent shocks, but rather from the difficulty of forecasting temporary shocks to the variables influencing copper supply and demand. Moreover, because both supply and demand are thought to be inelastic to price changes in the short run[33], shocks to either side can require the price of copper to move substantially to clear the market. Shocks shifting the short-run demand curve are considered especially important, with a key factor being the state of the world economy in the business cycle (e.g., because much of copper demand arises from construction and other investment activity sensitive to the business cycle).

85. Even if temporary shocks do predominate in the short run, is there a long-run trend—in one direction or the other—underneath all the noise? As noted, the positive Hotelling effect is absent. One might suspect instead a downward trend, perhaps on the (Prebisch-Singer) notion that primary goods would have a low income elasticity of demand or that in time substitutes would inevitably be developed. However, the consensus view does not seem to include a particular expectation about the direction of demand shifts over time, other than the positive effect arising from growth of the world economy.[34] If the consensus sees an important trend, it is on the supply side, with ongoing technological progress pushing down the cost of production, and thus the supply curve and market price of copper. As will be seen shortly, however, it is difficult to detect a significant positive or negative trend from the

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[32] That is, flat over the relevant range of copper quantities, as determined by the position of the demand curve, and holding other things constant, such as production technologies.

[33] For the supply side, a rule of thumb is that it takes about eight years for an investment in an entirely new copper mine to enter production, and about four years to significantly expand the capacity of an existing mine. Such lags limit the short-run supply response to upward price developments. As for price declines, fixed and sunk costs limit the supply response by existing mines (and, in some countries, environmental regulations requiring land rehabilitation imply costs of shutting down a mine). Still, some mines do cease production during price downturns; indeed, this has happened within the last few years.

[34] One demand factor promoting a positive view of demand developments has been copper's use in electronic devices. The development of fiber optic cable as a substitute in some uses has been a negative factor. See Vial (1989) for a broader view of both supply and demand determinants.

historical record of (real) copper prices. At least so far, it seems that supply and demand shocks have tended to offset each other over long periods.

86. How then do industry experts go about making their own medium- to long-term copper price forecasts? Reflecting the above, attention focuses on the supply side, constructing a world supply curve by aggregating the individual cost curves of mines in existence or in the pipeline. Assumptions about the evolution of demand (beyond the period of business cycle fluctuations) tend to be essentially neutral and play a lesser role in projecting the market-clearing price. It seems that there is considerable information sharing among industry gurus, and a half-dozen or so groups tend to generate forecasts in the same ballpark. Unfortunately, forecasts of this kind are not amenable to rigorous, systematic evaluation of their predictive accuracy.

A long look at the data: copper prices since 1908

87. Figure 1 shows the evolution of (real) copper prices since 1908. For our purposes, a few basic points can be noted:

- No steep trend, either upward or downward, is obvious over this long period. It is true that the most recent observation (for 2001) is very near the sample's minimum level, but the minimum in fact occurred 65 years earlier. Similarly, the sample's maximum (in 1966) is separated from the next-highest value (1916) by 50 years. Statistically, we find no significant trend or drift in the series.[35]

- Despite the absence of a steep trend, tremendous variation in the period is seen. The sample maximum is more than four times the sample minimum. Even disregarding, say, the ten most outlying observations, the range of the remaining observations is still wide, in economic terms: from about 60 to 180 U.S. cents per pound (in 1999 prices).

- Though the price series is obviously autocorrelated, the sample is long enough to see the series cross over the sample mean and median values quite a few times.[36] However, the time spent between such crossings can be considerable (e.g., about ten years for the boom that began in 1964, and even longer for the crash after about 1930.)

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[35] Attempting to fit a time trend, or regressing the changes of the data on a constant, both with and without taking logs of the data, did yield negative signs but none of the estimates were significant (the associated probability values were in the range of about 0.40 to 0.70).

[36] By this observation we are not claiming that copper prices were always returning to a stable equilibrium value; the point here is just to document the superficial appearance of large temporary—but long-lived—cycles in copper prices.

- The price data are skewed upward, with a few very high outliers. This skewness could suggest asymmetry in the price adjustment process, with positive shocks decaying more quickly than negative ones. (As seen in the bottom panel of Figure 1, the log transformation results in a much less skewed series.[37])

88. Figure 2 provides a finer view of the second half of the sample, with monthly data (available from 1957). It is interesting to note that the current episode of (historically) very low prices (defined say, as below about 75 cents/lb., in 1999 prices) is now approaching in duration the only other longish period of low prices seen in the last 45 years: the five years after mid-1982.

89. Such eyeballing of the data seems to support the conventional wisdom of large temporary shocks to copper prices. But it also gives the impression that such shocks may take many years to decay.

90. Of course, the existence of temporary shocks would not rule out a role for permanent shocks occurring alongside. We find it helpful to think of the copper price series, in principle, as the sum of two components: one stationary, driven by shocks that eventually disappear entirely, and the other with a unit root. A priori, one would suppose that at least some permanent shocks would exist alongside temporary shocks to copper prices. But for many purposes, what matters is not the existence but rather the relative size of these two components.[38]

91. On this question, it is interesting that the (net) accumulation of any permanent shocks over the last 90-some years has not carried the real price of copper off more strongly, in one direction or the other, than seen in Figure 1. Even a random walk without drift might have been expected to carry the price further over long horizons—indeed, this is essentially the result of the *variance ratio analysis* conducted by Engel and Valdes (2001). They apply Cochrane's variance ratio statistic to virtually the same data shown in our Figure 1. Taking account of the finite sample properties of this statistic, they find evidence of a large temporary component. Indeed, Engel and Valdes find a striking correspondence between the

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[37] The skewness measure falls from +1.12 to +0.43 for the logged series. Kurtosis is 3.74 in the original data and 2.55 in the logged data. As regards normality, this is strongly rejected in the original data, but cannot be rejected in the logged data (Jarque-Bera statistic of 3.69, with associated probability value of 0.16).

[38] Thus, we are not motivated to apply unit root tests to copper price series. Such tests typically have low power to reject a null hypothesis that in turn is not very interesting (mere presence of a unit root, without reference to its relative contribution to observed price fluctuations).

actual variance ratio statistics and those which would be generated by a simple AR(1) process having no permanent component at all.[39]

C. Evaluation of the Accuracy of Alternative Copper Price Forecasts

92. In this section we examine the forecasting accuracy of several simple forecasting methods, comparing the track record of each to that of a benchmark forecast based simply on a random walk. These forecasts are assessed according to the conventional criterion of minimizing root mean squared error (RMSE).

93. We first consider accuracy, over horizons as long as 10 years, of forecasts from the AR(1) model for which Engel and Valdes (2001) found some support, as well as others based on averages of past prices (historical and rolling means). We then analyze the forecast accuracy of futures market prices, where data limitations force us to consider horizons no longer than 2¼ years.

Forecast accuracy over long horizons: AR(1) and past averages, 1970–2001

94. In analyzing the track records of forecasts generated using AR(1) estimates or historical or rolling means, we are not suggesting that these kinds of forecasts might be the best possible. Rather, we evaluate them because their relative forecasting performance illustrates—in simple terms—some essential points. Moreover, these forecasts are amenable to repeated out-of-sample evaluation.

95. The forecasts are evaluated over ten horizons, ranging from one to ten years, drawing on annual data for real copper prices from 1908-2001. The basic period of forecast evaluation is 1970–2001, nearly identical to that used by Engel and Valdes. We also report results for 1940–2001.

96. Table 1, and its companion Figures 3 and 4, allow comparison of different forecasts' accuracy over each of the ten horizons. In Table 1, the results are reported first as RMSEs (times 100) and then as ratios of RMSEs to that of the random walk benchmark (i.e., Theil's U statistic).[40] Figures 3 and 4 allow a visual comparison of these Theil's U values.

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[39] Schwartz (1997), using another methodology, also finds strong mean reversion in copper prices.

[40] Note that the number of forecast error observations in each RMSE calculation is always the same, either 32 (for the 1970–2001 evaluation period) or 62 (for the 1940–2001 period). Moving left to right across Table 1, what varies instead is the number of years of past data available to generate the forecast.

97. The essential results are most readily seen in Figure 3. For very short horizons of only 1 or 2 years, forecasts derived from past prices seem to be of no use, performing either much worse, or only slightly better, than the random walk benchmark. For longer horizons, however, these forecasts have some success, and indeed, the longer the horizon considered, the greater is their margin of victory over the benchmark. More specifically:

- The results corroborate the Engel and Valdes finding, for the period since 1970, that an AR(1) beats a random walk for forecast horizons of two–five years. Indeed, we find that the AR(1)'s margin of victory is much wider than found by Engel and Valdes: e.g., for the five-year horizon, a Theil's U of 0.81 (rather than 0.92).[41]

- Extending the analysis to horizons of 6 to 10 years, we find that the AR(1) beats the random walk by a widening margin, with Theil's U dropping to 0.73 by the tenth year. We interpret this pattern as consistent with the existence of an important temporary, but rather long-lived, component to copper price shocks. Evidently, the AR(1) is able to capture and utilize, however crudely, this temporary component to have some forecasting power.

- Simple forecasts based on *rolling* means for the previous 10, or previous 20, years are not successful, doing worse than a random walk at most horizons, and only slightly better at the longest horizons. However, the *historical* mean (i.e., the cumulative mean using all available previous data, back to 1908) does much better, and outperforms a random walk at all but the shortest horizon.[42] That taking account of past information—the more of it, the better—tends to improve the forecast is another sign that temporary, but long-lived, shocks are an important feature of copper prices.

- Finally, the second half of Table 1 and Figure 4, demonstrate that the basic findings just mentioned apply also when the evaluation period is doubled in length, considering forecasts for 1940–2001.

98. Are these results significant, in economic or statistical terms? For horizons of five years or longer, many of the Theil's U values in Table 1 imply a reduction in forecast RMSE of about 20 percent or more; in our judgment, this qualifies as "economic" significance.

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[41] This difference presumably reflects Engel & Valdes' use of fixed span (35-year) rolling regressions to generate forecasts, whereas we "roll" only the sample's end date, always using all the past data available—back to 1908—to estimate the equation from which the forecasts are derived. That using more past data tends to generate more accurate forecasts is itself interesting, suggesting that structural breaks or other permanent shocks have not been dominant.

[42] Note that at the nine- and ten-year horizons the historical mean even beats the AR(1), by a small margin.

Regarding statistical significance, we use a form of the Diebold-Mariano (1995) statistic to see whether the track record of the best performers in Table 1 is statistically different from that of the random walk alternative.[43] The results, shown in Table 1, are not strong, especially for the shorter horizons, where the null hypothesis of equal forecasting performance cannot be rejected. For horizons longer than three years, the results tend to be borderline. Many of the Diebold-Mariano statistics exceed in absolute value, or are very near, the 10 percent critical value (about –1.7 in samples of these sizes). However, the modified Diebold-Mariano test is known to be over-sized in small samples; i.e., rejecting the null hypothesis somewhat too often.[44]

99. In light of the (relative) out-of-sample success of the AR(1) and historical mean forecasts, it is interesting to see how estimates of the AR(1) model's implied steady-state value, and calculations of the historical mean, would have evolved during the sample period (i.e., as each year of new data became available). Figure 5's top panel shows this, along with the actual spot price series. Note that for many years, both the steady-state estimates and the historical mean have been rather stable, around 4.7 or 4.8 in log terms, or about 110 or 120 U.S. cents/lb. in constant prices of 1999. Such levels are far above the actual prices observed in the last several years, and considerably above the reference price recently used in the Chilean structural balance adjustment (about U.S. 90 cents). Of course, these observations should be interpreted with caution; one should not conclude from this that 110–120 cents is "the" long-run price. We note especially that the AR(1) model, whatever its relative forecasting success in the past, is a crude device, and will be slow to pick up any permanent shocks that may have hit lately.

100. It is natural to also consider the AR(1) estimates for hints about the typical *duration* of temporary copper price shocks. Figure 5's bottom panel shows how the estimate of autoregressive coefficient has evolved over time. The implied half-life estimate has tended to be about four years. The latest estimate, with an autoregressive coefficient of 0.848, implies a half life of 4.2 years for the (log) real copper price. Again, caution is in order, as such a result could reflect some potentially strong sources of bias. One possibility is an upward bias arising from temporal aggregation of prices into annual values.[45] To illustrate the point, when we re-estimate the AR(1) using monthly data instead, the estimated autoregressive coefficient implies a half life of less than 2.7 years, compared to four years in the annual data.[46] On the

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[43] We use the modification of the Diebold-Mariano statistic proposed by Harvey, Leybourne, and Newbold (1997). See Table 1 for details.

[44] See Harvey, Leybourne, and Newbold (1997) for an investigation of this problem.

[45] Taylor (2001) emphasizes this problem in the case of mean-reversion tests of the law of one price.

[46] This result refers to a different sample period, since we have monthly data only after 1957. But it is the difference in frequency of the data, rather than in the sample period, that

(continued)

other hand, downward bias is also possible. If copper prices have a unit root component, then OLS estimates of the autoregressive coefficient, and the associated half life, will be biased downward. Cashin, Liang, and McDermott (1999) concern themselves with this potential problem and advocate using instead a "median-unbiased" estimator of the autoregressive coefficient in analyzing commodity prices. For the case of copper, their results do indeed imply a much longer half life, at 6.6 years, even when estimated using monthly data. The confidence interval associated with this estimate is however very wide, ranging from slightly under two years to infinity. The authors interpret such a large confidence interval as indicating that copper price shocks vary considerably in their duration.

Accuracy over shorter horizons: futures prices and AR(1)

101. We turn next to the accuracy of forecasts directly based on copper futures prices. In particular, we want to learn whether 2¼- year futures—the longest regularly traded—have any predictive power. For this question, we compare errors from futures prices with errors from a random walk benchmark. Since it turns out that the futures are relatively successful, we then go on to check how their performance compares to that of an AR(1) alternative used to generate forecasts for the same horizon, during the same sample period.

102. Recall that the above analysis was based on annual observations, with forecasts evaluated over periods of several decades, and forecasts horizons as long as 10 years, reflecting our interest in the medium- to long-run behavior of copper prices. In contrast, here we are forced, by data availability limitations, to analyze shorter evaluation periods, to begin the analysis in the mid-1990s, and to consider forecast horizons no longer than 2¼ years. The analysis is conducted using monthly data.[47] (A further difference, the significance of which is discussed shortly, is that here we work with nominal rather than real prices, since futures prices are set in nominal terms.)

103. The evaluation period is determined by the availability of LME 2¼ year futures data on a consistent basis starting only in July 1993. With monthly data through March 2002, we have 8¾ years of futures data (105 monthly observations), of which we can compare forecasts and outcomes for a period of 6 ½ years (78 observations, October 1995-March 2002). Although a longer evaluation period would be desirable, the available period has been a rich one for our purposes, with copper prices swinging widely. (Section D

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accounts for the difference in results: when we re-estimate the AR(1) using annual data for 1957–2001 only, the estimated half life is 4.0 years, quite similar to the 1908–2001 results.

[47] We use prices from the 3rd Wednesday of each month. Futures prices are available on a daily basis, but we use monthly data to facilitate comparison with forecasts from AR(1) estimated using monthly real copper prices.

presents and discusses aspects of LME futures data in more detail.) Again, the evaluation criterion is RMSE.

104. Table 2 presents the results not only for 2¼ year (27 month) futures, but also for the two shorter horizons for which futures data are available from the LME web site (15 months and 3 months). Here again we see a pattern in which the longer the forecast horizon, the more successful are the forecasts considered in comparison to the random walk benchmark. At the three-month horizon, futures prices essentially do no better than the random walk, with a Theil's U very close to one. At the 15-month horizon, however, Theil's U falls to around 0.8, while the 27-month futures do better yet, with a Theil's U of about 0.7, signifying a 30 percent reduction in RMSE.[48]

105. These findings continue to hold when the futures forecasts are compared to enhanced versions of the random walk benchmark that take into account expected inflation. In principle, the simple random walk benchmark is at some disadvantage in this competition, since the nominal futures prices analyzed presumably incorporate expected inflation over the forecast horizon; whereas a forecast based simply on today's (nominal) spot copper price does not. To gauge the extent of this problem, we construct alternative benchmark forecasts of the nominal spot rate based on the current spot rate, but adjusted for the inflation expected over the forecast horizon. For expected inflation, we use either a (generous) perfect foresight assumption or simply the average rate of actual inflation over the entire sample period. Table 2 shows that Theil's U ratios are barely affected by considering these alternative benchmarks. Such a result is not surprising, given the low rate of inflation within the evaluation period.

106. Given the forecasting success of futures prices relative to random walk benchmarks, it is worth asking whether the AR(1) model analyzed earlier could do as well, for forecasts of the same horizon and in the same evaluation period. To find out, we re-estimate the AR(1) using monthly real copper price data from the IFS, beginning in January 1957, and then use the results to generate a 27-month ahead forecast of the real copper price.[49] It turns out that the AR(1) does not do well at this horizon. Whereas the futures-based forecasts had achieved

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[48] Regarding statistical significance, the modified D-M statistics for the 15-month and 27-month horizons are -2.0 and -1.7, respectively. The former is statistically significant, but the latter is borderline. (The power of these tests to reject the null hypothesis is limited by the shortness of the sample period relative to the forecast horizon.)

[49] As before, the AR(1) forecasts are evaluated on an out-of-sample basis. The AR(1) model is re-estimated for each new forecast, rolling the estimation sample's end-date. For example, the first forecast is obtained by estimating the AR(1) over January 1957-July 1993, then applying the results to the actual real copper price of July 1993 to generate a forecast of the real price in October 1995 (27 months ahead). The final forecast, for the March 2002 price, is based on AR(1) estimates from a January 1957-December 1999 sample.

a 30 percent reduction in RMSE relative to a random walk, in the same evaluation period the AR(1) does worse than a random walk, with a Theil's U ratio of 1.11 (RMSEs of 31.5 and 28.3, respectively.)

107. To summarize the main points of this section, we found that very simple forecasts, based only on past copper prices, have some success at forecasting copper prices at long horizons—indeed, the longer the horizon, the better the relative performance. We interpret this as evidence that temporary but long-lasting shocks are an important part of the story. Futures prices are found to have predictive power, outperforming a random walk at a horizon of 2¼ years. Since futures prices are not available for horizons longer than 2¼ years, we explore in the next section whether these data might nevertheless be used to infer market beliefs about where copper prices are heading over longer horizons.

108. Before proceeding, however, we note some further results on the accuracy of forecasts based directly on copper futures prices. Above, we evaluated such forecasts only in terms of the size of their errors, relative to those of a random walk benchmark, since our aim was to learn whether futures prices had some predictive power. The positive results found, of course, do not necessarily mean that such forecasts are highly accurate, nor that they are the best forecasts available, nor that they are efficient in the statistical sense. In a further analysis, we also conducted tests related to several other standard forecast evaluation criteria. The following results refer to a data set, obtained from Professor Christopher Gilbert, of LME spot and 3-month futures prices, spanning more than 25 years:[50]

- *Test of unbiasedness*. We found no sign of bias, as the mean forecast error (of logged data) was +0.00078, or less than 0.1 percent, with a t-statistic of just 0.07. Checking further, by dividing the sample into four sub-periods, the mean errors were negative in the first and last periods, and positive in the middle two periods; none were statistically different from zero.

- *Test of efficiency: regression of actual change against forecasted change.* No sign of inefficiency, as the intercept term was close to zero (t-statistic of 0.09) and the slope coefficient was not statistically different from +1 (coefficient of +0.611, with standard error of 0.40).[51]

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[50] This is the longest data set we could find, allowing an evaluation period consisting of over 100 *nonoverlapping* three-month forecast horizons. Since we use only quarterly observations from this data set, there is no issue of overlapping observations in the statistical results.

[51] Of course, this means that the slope coefficient was also not different from zero, suggesting that three-month futures prices may have little explanatory power (and consistent with our earlier finding that three-month futures do not outperform a random walk).

- *Test of efficiency: independence of errors from past values.* Considering 1 to 6 lags, we found no statistically significant correlation of the forecast errors.

D. Copper Futures Prices: What Is the Market Telling Us?

109. Two considerations motivate our further investigation of futures prices here. One is that they have some predictive power, as shown in the last section, at least over a horizon of about two years. Second, from an operational perspective, using readily observed futures prices might be an easy—and transparent—way of generating and updating frequently forecasts needed for policy purposes. Of course, a particular time-series model could be selected and then used repeatedly to provide forecasts on an ongoing and transparent basis. However, futures prices should provide a much richer base than mechanically utilizing past copper price movements, in principle, synthesizing all information available to markets, and in particular being quicker to respond to structural breaks or other permanent shocks.

110. We are interested in two questions: (i) do futures prices behave in a way that supports the underlying premise of the Chilean structural balance's copper revenue adjustment, and that could be useful in that context? and (ii) if so, is it possible to make inferences useful for policy purposes?

111. Regarding (i), the question is whether futures prices suggest that the market believes that there is an important temporary component to spot copper prices and that it can identify temporary fluctuations as they occur (not merely ex post). Here, an "important" temporary component means not only that temporary fluctuations are of an economically interesting magnitude, but also that such fluctuations are large in relation to any permanent movements that are likely to occur (that is, over the medium-term horizon of policy interest). Put another way, does the market have a fairly stable view of where copper prices will be over the medium term? Regarding (ii), the objective is to infer market beliefs about the duration of a "typical" temporary price shock, and about the level (if any) to which spot prices are expected to converge over the medium term.

112. We examine the behavior of forward prices for 27-month contracts, the longest for which data are available.[52] Importantly, the analysis does *not* need to presume that temporary shocks will have completely, or even mostly, dissipated over a horizon of only 27 months, only that the process of decay will have begun.

113. Figure 6 provides a first look at the data, a time series plot of almost nine years of daily LME data for both spot and 27-month prices, from July 1993 to March 2002. From this

[52] The 27-month contract is not the one most traded. However, with shorter contracts—say three months—there is the potential problem that if there is a moving average component to price shocks, this may still be building up, in the short run perhaps outweighing the tendency of temporary shocks to decay.

perspective, futures prices seem to move closely with spot prices; it is not obvious that futures prices might point to a stable view of where spot prices will be in the years ahead.

114. A closer look, however, shows that futures prices have not merely followed spot prices, but in fact *have differed from spot prices in a systematic manner*. The bottom panel of Figure 6 presents the same data, but this time with the futures price plotted against the spot. While the *level* of the futures price is strongly positively correlated with the spot price, this pattern could simply mean that the 27-month horizon is not long enough to include the expected complete decay of temporary shocks. Indeed, the relationship suggested by this chart has a *slope clearly much less than one*, suggesting expectations of such decay. Note also that on virtually every day when the nominal spot price was below about 80 (higher than about 90) U.S. cents/lb., the futures price was higher (lower) than the spot price.

115. Inspired by Figure 6, we set out to study the relationship between future and spot prices more carefully, using regression analysis. For this, the basic model we analyze, along with a number of variants, is the following:

$$(1) \qquad \ln(f27_t) - \ln(s_t) = a + B \ln(s_t / USWPI_t) + e_t$$

where t refers to monthly observations (LME data for the third Wednesday of each month) for the period July 1993 to March 2002.

116. Here, we interpret ln (f27) – ln (s), the log difference of the 27-month future and spot prices, as a measure of the expected average rate of change of the spot price over the coming 2¼ years.[53] This variable we regress on a constant and the log of the current *real* spot price. The idea is that the market's view of an "equilibrium" or steady-state price—if any—would be conceived in real terms. As is conventional in analyses of copper prices, we measure the real price by deflating by the US WPI.[54] (Performing this deflation makes little difference to the results, since the cumulative increase in the US WPI over these nine years was minimal. For this reason, we do not concern ourselves with inflation that might be expected over the 2¼-year horizons of the futures contracts, and that in principle would call for an adjustment for expected inflation on the LHS of eq. (1).)

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[53] We have also investigated separately regressions for shorter futures contracts, of 15 and 3 months. The estimated slope coefficients from these regressions do vary in the expected direction: i.e., the shorter the horizon, the less negative is the slope.

[54] Considering that most copper production occurs outside the United States, one might suppose that if the equilibrium spot price were mainly cost-based, then the spot price series in equation (1) would be better measured by adjusting the nominal US$ spot price instead by the U.S. real exchange rate. Recalling that in a bivariate regression measurement error in the regressor will bias the slope coefficient toward zero, we investigated this possibility empirically, but did not find a stronger relationship. In fact, no relationship was found at all.

117. Taking the log of the real spot price reduces the heteroskedasticity in the sample (readily apparent in the raw data in Figure 6) and reflects our hypothesis that the speed of adjustment to real copper price shocks will be greater in response to positive shocks than to negative ones. To further explore this possibility, we also estimate a variant of eq. (1) that allows for a possible "kink" in the estimated relationship. In particular, by adding a spline term, we can estimate separately the coefficients B_{low} and B_{high}, which apply when the real spot price is below and above, respectively, a threshold of 85 U.S. cents/lb. (a value suggested by Figure 6).

118. We consider the absolute value of the estimated coefficient B as an indicator of the *expected speed of adjustment, or rate of decay,* of temporary copper price shocks. Assuming a constant rate of decay, the estimated half life of such shocks is $\ln(0.5)/\ln(1+B)^{-2.25}$ years. In addition, solving the estimated equation for a steady-state real copper price—at which the difference between the future and spot price would be zero—may provide an indication of market beliefs about an "equilibrium" copper price ($-a/B$, in log terms). In this way, we hope to use the 2¼-year futures data to infer beliefs about copper prices over a horizon longer than 2¼ years.

119. The error term in eq. (1) likely represents such factors as mismeasurement of the conceptualized variables, as well as misspecification of the adjustment process. For example, our treatments of nonlinearities may not be adequate; moreover, even if individual shocks were each expected to decay at a constant rate, that rate might plausibly be expected to vary with different types of shocks.[55] We must, therefore, interpret the estimated B as some kind of average adjustment speed expected for shocks during the sample period. A more serious concern is that some shocks during the period may not have been expected to decay at all. A positive (negative) permanent shock can be thought of as shifting the simple bivariate relationship in eq. (1) "upward" ("downward"). Our hope is that any such shifts during the sample period were small; more on this shortly.

120. Table 3 presents regression results for eq. (1) and a number of variants. The top half of the table shows results with t-statistics based on Newey-West standard errors, the bottom half repeats the exercise but with estimation that includes a first-order autoregressive error process.[56] We highlight the following points:

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[55] For example, the price effect of a work stoppage in a major copper producer might be expected to be very short-lived, while a permanent positive demand shock might raise prices temporarily, but for many years, given the long gestation period for expanding mining capacity.

[56] Preliminary OLS regressions found strong autocorrelation of the regression errors at the one-month lag, but not at longer lags.

- The estimated coefficient for the real spot price is always negative and significantly different from zero by wide margins, implying market expectations of the eventual decay of temporary shocks. Moreover, the current real spot price alone explains a large share of the variation in expectations of its future rate of change. Apparently, the market has believed that most of the large copper price fluctuations observed over the sample period would eventually disappear.

- There is no indication that the estimated relationship is spurious: re-running equation (1) in first-differences of the monthly data yields an estimate of B of a similar magnitude, and again with a very large t-statistic. (The R-squared of this regression is 0.70, rather impressive for a bivariate regression estimated in changes.)

- Regarding the speed of adjustment, the results tend to suggest a half life in the neighborhood of two years. There is, however, evidence of asymmetric adjustment to real spot price shocks (that is, beyond that already implied by a relationship that is linear in logs). The sign of the estimated spline term implies that positive shocks decay faster than negative ones; in most cases this term is statistically significant.

- The implied estimates of a steady-state copper price are in the neighborhood of 85 U.S. cents per lb. (in 1999 prices).

121. However, even if markets viewed most copper price shocks as temporary, further analysis suggests that the market view of an equilibrium real copper price did not remain perfectly stable over the sample period. As a simple robustness check, we added a time trend regressor to the eq. (1) specification, as well as to the nonlinear (spline) specification. As seen in Table 3 (rows d, e, i, and j), this change does not upset the basic finding that B is negative and statistically significant by a wide margin. However, the time trend regressor is always statistically significant (and negative, in our sample period). Moreover, a visual inspection of the regression errors from eq. (1) suggested some "structural breaks" within the sample period. Indeed, dummies added for the periods July 1993–October 1994 and June 2000–March 2002 also turned out to be statistically significant (results not shown).[57] It seems therefore that regressions of eq. (1) may not be able to provide a precise estimate of a stable equilibrium price. Put another way, in forecasting the price of copper, the most recent observations of futures prices deserve to be given more weight than past observations.

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[57] With a significant positive dummy at the beginning of the sample period, and a significant negative dummy at its end, the time trend regressor loses its statistical significance and in fact turns positive. We, therefore, would warn against concluding that equilibrium copper prices have been following a deterministic downward trend. It would be fair to say, however, that the signs of the coefficients on the time trend regressor, and on the two time dummies mentioned above, indicate that the statistically significant relationship captured by eq. (1) shifted downward within the sample period, in turn implying lowered perceptions of any equilibrium price.

E. Summary and Some Implications for Chile

122. In this section, we briefly summarize the findings of the chapter, emphasizing the points most relevant for Chile. We go on to consider their possible implications for Chile, focusing on the government's structural balance target and its adjustment for copper price fluctuations.

Summary and interpretation of results

123. We consider that our findings tend to support the basic validity of the copper adjustment in Chile's structural balance target, and the more general idea that full and immediate economic adjustment to all copper price shocks is not necessary. Most importantly, the evidence suggests the following about copper prices: the absence of a strong drift or trend; large temporary shocks; and even that most shocks may be temporary. These last two points are supported by our finding that simple forecasting models—using only information from past copper prices—have predictive power especially over long horizons, as well as by Engel and Valdes' variance ratio analysis. We find also that futures market prices behave as if market participants believe that most copper price fluctuations are temporary (and our finding that futures prices have predictive power suggests that such market beliefs are worth taking seriously).

124. But some cautionary points hold as well. That a strong downward trend in copper prices has not been observed in the past does not mean that such a trend could not start tomorrow (or even have begun already). Moreover, even if no such trend were to develop, there is no reason to rule out the possibility that a significant one-time, permanent shock could occur (or already have occurred recently). For policymaking purposes, the problem is to detect and distinguish any such shock quickly, in the midst of the usual large temporary shocks. Making the task more difficult is the likelihood that temporary copper price shocks are quite long-lived on average, and probably also variable in length. Under such circumstances, techniques using only the time-series of past copper prices will not be up to the job, so it is natural to turn to industry experts with wide-ranging knowledge of copper market fundamentals.

125. Unfortunately, expert forecasts of medium- and long-term copper prices are difficult to systematically evaluate for accuracy, so a certain amount of faith is necessary in choosing to believe one particular expert view. One approach would attempt to utilize the expertise embodied in the market's determination of futures prices. Though this approach has its problems, the finding that futures prices have some forecasting power suggests that further work on utilizing such prices could be worthwhile.

126. How then can policy decisions be made under such uncertainty? In the case of fiscal policy, the Chilean authorities have recently established a structural balance target that includes an adjustment for copper price fluctuations. Several aspects of its design can be seen as pragmatic ways to cope with the above-mentioned types of uncertainty. In particular, the

reference price has been defined not as "the" long-run price, but rather as the average price expected *over the next ten years*. This approach injects a degree of conservatism (that is, in the current environment of historically low prices and expectations of eventual price recovery). Moreover, since the reference price will be updated annually by a committee of experts, there will be a regular opportunity to revise and correct over time (e.g., if a permanent shock were at first incorrectly identified as being temporary). Note also that the delegation of the question to a committee allows the government to avoid having to subjectively choose among competing forecasts (the reference price is based on the mean forecasts of the individual committee members) and to avoid the loss of regime credibility that might occur if it instead chose the reference price according to its own discretion.

Chile's structural balance rule: some illustrative simulations[58]

127. Inevitably, there will be considerable uncertainty not only over the level (if any) to which copper prices are converging, but also over the time needed to reach that level. We seek to put these two sources of uncertainty in quantitative perspective with some illustrative simulations, taking account of the relative size of copper in the Chilean economy, as well as key aspects of the government's overall fiscal position.

128. For all the simulations, we take 70 U.S. cents per pound (1999 prices) as the initial value, which is close to where actual prices have been in recent years, including in both 1999 and 2001. Since this level is historically low, it may illustrate the implications of an atypically large price shock. From this base, we consider six alternative price recovery scenarios, as follows:

- Convergence of the real copper price to one of two levels: 90 and 110 US cents per pound. Recall that the latter is close to the historical mean, as well as the steady-state value implied by the AR(1) estimates. The former is selected arbitrarily, to illustrate a scenario that is worse for Chile though still characterized by some price recovery.

- Adjustment of the spot price such that the gap between the current and long-run prices (both in log terms) is reduced by half over a specified period. We consider three such half-life values, defining a rather wide range: 2½ years, 4 years, and 6½ years.[59] Without advocating any one of these values, we note that they are inspired, respectively, by the analysis of LME futures prices in Section IV, the AR(1) estimates in annual data, and the results of Cashin, Liang, and McDermott (1999).

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[58] See Phillips (2001) for a broad explanation and analysis of Chile's structural balance target.

[59] Using annual data in natural log form, these half-lives correspond to AR(1) coefficients on the lagged real copper price of 0.758, 0.841, and 0.899, respectively.

129. Thus, these simulations assume no trend, only a smooth adjustment (in the absence of further shocks) back to a stable equilibrium or steady-state level.

130. Figure 7 shows the implications of these six scenarios, plotting the paths of the simulated copper spot price (in the two left panels). The implied copper "reference price" is also shown, in the two right panels. In practice, a commission each year will meet to determine/update the reference price as the average price expected for the coming ten years; for these simulations, we simply calculate the reference price as the average of the simulated prices for the next ten years. Note that this reference price changes over time, even in the absence of any new shocks.

131. As intended, the six *spot price paths* in Figure 7 illustrate a considerable diversity of outcomes. The wide range of adjustment speeds selected plays its role, but over time, of course, what matters most is the level to which the price converges. Turning to the six associated *reference price paths*, one can get a sense of the degree of conservatism implied by defining the reference price as the one–ten year ahead average (i.e., instead of the steady-state level). Of course, the reference price, at all horizons, lies between the spot and steady-state price levels, but to which is it closer? The answer depends on the assumed speed of adjustment. For our intermediate case—a half life of four years—the reference price falls just about mid-way between the spot and steady-state levels (at all horizons). For the fast adjustment case, the reference price lies closer to the steady-state; for the slow adjustment case, the reference price lies close to the spot price.[60]

132. Figure 8 tries to put this range of possibilities into some economic perspective, depicting the associated copper "revenue gap" paths implied by each scenario. The revenue gap represent the copper related adjustment that would be made in each year to the central government's actual fiscal balance, in order to arrive at the structural balance. We simulate this path by simply taking the difference between the simulated (real) spot and reference prices, then scaling the result—under a number of assumptions—to yield the revenue gap as a percent of Chile's GDP.[61]

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[60] Specifically, for the case with fastest adjustment, the reference price "gap" (i.e., its deviation from the steady-state level) is about 30 percent of the spot price gap. For the case with the slowest adjustment, the reference price gap is about 60 percent of the spot price gap.

[61] In practice, the copper adjustment to the fiscal accounts depends not only on the difference between the spot and reference prices. Other factors include Codelco's production volume and the real exchange rate. The simulations here assume a constant real exchange rate and that Codelco's volume grows at the same rate as Chile's real GDP. This allows us to calculate the gap by simply taking the difference in simulated spot and reference prices (in real 1999 U.S. cents per lb.) and then dividing by a factor of 20 (since in 1999, the difference between the actual price and the reference price was about 20 U.S. cents per lb., while the official measure of Chile's structural balance included a copper price adjustment of 1 percent of GDP).

133. It turns out that the role of different speeds of decay depends on the horizon considered. At three or four years out, the speed of adjustment hardly matters. For shorter horizons, a faster speed actually produces a bigger gap (because the forward-looking reference price jumps ahead more quickly); at longer horizons, a faster adjustment speed is associated with a smaller gap.

134. The essential point of these simulations is that the copper revenue adjustments depicted are neither terribly large, nor so small as to be of no practical consequence. Nearly all the simulated adjustments are less than 1 percent of Chilean GDP, limiting the extent to which the *actual* fiscal balance would differ from the government's *structural* balance target level of +1 percent of GDP. While other factors need to be taken into consideration (such as the target's adjustment for the output gap and the central bank deficit not included in the target), copper adjustments of this magnitude do not raise questions of the sustainability of public finances, given the current low level of government debt, the level of the fiscal target, and ongoing economic growth. At the same time, the simulated copper adjustments are not trivial in magnitude. The copper price adjustment does give fiscal policy some important space and time for maneuver, even as the government adheres to a point target for the (structural) fiscal balance.

Table 1. Comparisons of Real Copper Price Forecast Accuracy: RMSEs, Theil's U, and Diebold-Mariano Statistics

(errors defined as LN(actual) - LN(forecast))

	Forecast horizon (years ahead, t+1 through t+10)									
	1	2	3	4	5	6	7	8	9	10
	A. Forecasts for 1970-2001 Evaluation Period (n=32)									
RMSE x 100										
Random Walk (w/o drift)	20.8	30.1	33.3	35.7	37.4	38.0	40.6	43.8	46.8	50.2
Past Means										
rolling 10-yr. mean	30.7	34.0	36.5	38.3	39.7	40.9	42.4	43.7	44.5	45.1
rolling 20-yr. mean	34.3	35.7	36.7	37.5	38.4	39.4	40.7	41.9	43.0	44.0
cumulative from 1908	31.6	31.9	32.2	32.5	32.7	33.0	33.3	33.6	**33.8**	**33.9**
AR(1), estimated 1908 - (t)	**19.8**	**27.1**	**28.9**	**29.7**	**30.2**	**31.2**	**32.0**	**33.5**	35.4	36.5
Theil's U										
Random Walk (w/o drift)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Past Means										
rolling 10-yr. mean	1.47	1.13	1.10	1.07	1.06	1.08	1.04	1.00	0.95	0.90
rolling 20-yr. mean	1.65	1.19	1.10	1.05	1.03	1.04	1.00	0.96	0.92	0.88
cumulative from 1908	1.52	1.06	0.97	0.91	0.88	0.87	0.82	0.77	**0.72**	**0.67**
AR(1), estimated 1908 - (t)	**0.95**	**0.90**	**0.87**	**0.83**	**0.81**	**0.82**	**0.79**	**0.76**	0.76	0.73
Modified D-M statistic										
AR (1)	-1.13	-1.40	-1.36	-1.78	-2.01	-1.94	-1.77	-1.48	-1.48	-1.70
Cumulative mean									-1.21	-1.59

(continued)

Table 1. Comparisons of Real Copper Price Forecast Accuracy: RMSEs, Theil's U, and Diebold-Mariano Statistics

(errors defined as LN(actual) - LN(forecast))

	Forecast horizon (years ahead, t+1 through t+10)									
	1	2	3	4	5	6	7	8	9	10
	B. Forecasts for 1940-2001 Evaluation Period (n=62)									
RMSE x 100										
Random Walk (w/o drift)	19.3	28.6	31.8	34.0	36.9	38.8	40.3	41.9	42.8	44.4
Past Means										
rolling 10-yr. mean	29.7	32.4	34.4	35.9	37.0	38.0	39.2	40.2	41.2	42.2
rolling 20-yr. mean	33.8	35.6	36.9	38.0	39.1	40.1	41.1	42.2	43.3	44.4
cumulative from 1908	33.4	33.8	34.2	34.5	34.8	35.1	35.3	35.6	**35.9**	**36.2**
AR(1), estimated 1908 - (t)	**18.9**	**26.9**	**29.4**	**31.2**	**33.2**	**34.5**	**34.8**	**35.4**	36.1	36.7
Theil's U										
Random Walk (w/o drift)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Past Means										
rolling 10-yr. mean	1.54	1.13	1.08	1.05	1.00	0.98	0.97	0.96	0.96	0.95
rolling 20-yr. mean	1.76	1.24	1.16	1.12	1.06	1.03	1.02	1.01	1.01	1.00
cumulative from 1908	1.73	1.18	1.07	1.01	0.94	0.91	0.88	0.85	**0.84**	**0.82**
AR(1), estimated 1908 - (t)	**0.98**	**0.94**	**0.92**	**0.92**	**0.90**	**0.89**	**0.86**	**0.85**	0.84	0.83
Modified D-M statistic										
AR (1)	-0.46	-1.06	-1.17	-1.33	-1.61	-2.04	-2.09	-1.85	-1.63	-1.61
Cumulative mean									-1.17	-1.24

Source: IMF staff estimates.

Notes: Figures in **bold** lettering correspond to best forecasting performance at a given horizon and evaluation period. Based on annual data for real copper prices, as obtained from Codelco for 1908-1999, and extended to 2001 using IFS. D-M statistics using the Harvey, Leybourne and Granger (1997) modification of the the statistic proposed by Diebold and Mariano (1995). The null hypothesis is that the mean "loss differential" (defined as the squared errors of the forecast in question minus the squared error of the random walk forecast) is zero. The statistic can be evaluated using the t-distribution, with n-1 degrees of freedom, but it is known to be somewhat oversized in small samples.

Table 2: Forecast Accuracy of Futures Prices Relative to Random Walk Benchmark

	3 month horizon	15 month horizon	27 month horizon
October 1995 - March 2002 (outcomes)			
Number of monthly observations	78	78	78
Random walk benchmarks:			
(a) with no inflation adjustment	11.3	23.0	29.8
(b) adjusted for "average" inflation	11.3	23.7	30.7
(c) adjusted for actual inflation (perfect foresight)	11.0	21.9	28.6
LME Futures	10.9	17.8	20.7
Theil's U: RMSE futures / RMSE random walk			
(a)	*0.97*	*0.77*	*0.69*
(b)	*0.96*	*0.75*	*0.67*
(c)	*0.98*	*0.81*	*0.72*
October 1994 - March 2002 (outcomes)			
Number of monthly observations	90	90	
Random walk benchmarks:			
(a) with no inflation adjustment	11.1	27.0	...
(b) adjusted for "average" inflation	11.2	27.2	...
(c) adjusted for actual inflation (perfect foresight)	10.9	25.4	...
LME Futures	10.8	22.6	...
Theil's U: RMSE futures / RMSE random walk			
(a)	*0.97*	*0.84*	...
(b)	*0.96*	*0.83*	...
(c)	*0.99*	*0.89*	...
October 1993 - March 2002 (outcomes)			
Number of monthly observations	102		
Random walk benchmarks:			
(a) with no inflation adjustment	11.8	...	...
(b) adjusted for "average" inflation	11.8	...	...
(c) adjusted for actual inflation (perfect foresight)	11.5	...	...
LME Futures	11.3	...	...
Theil's U: RMSE futures / RMSE random walk			
(a)	*0.96*	...	...
(b)	*0.96*	...	...
(c)	*0.98*	...	...

Source: IMF staff estimates.

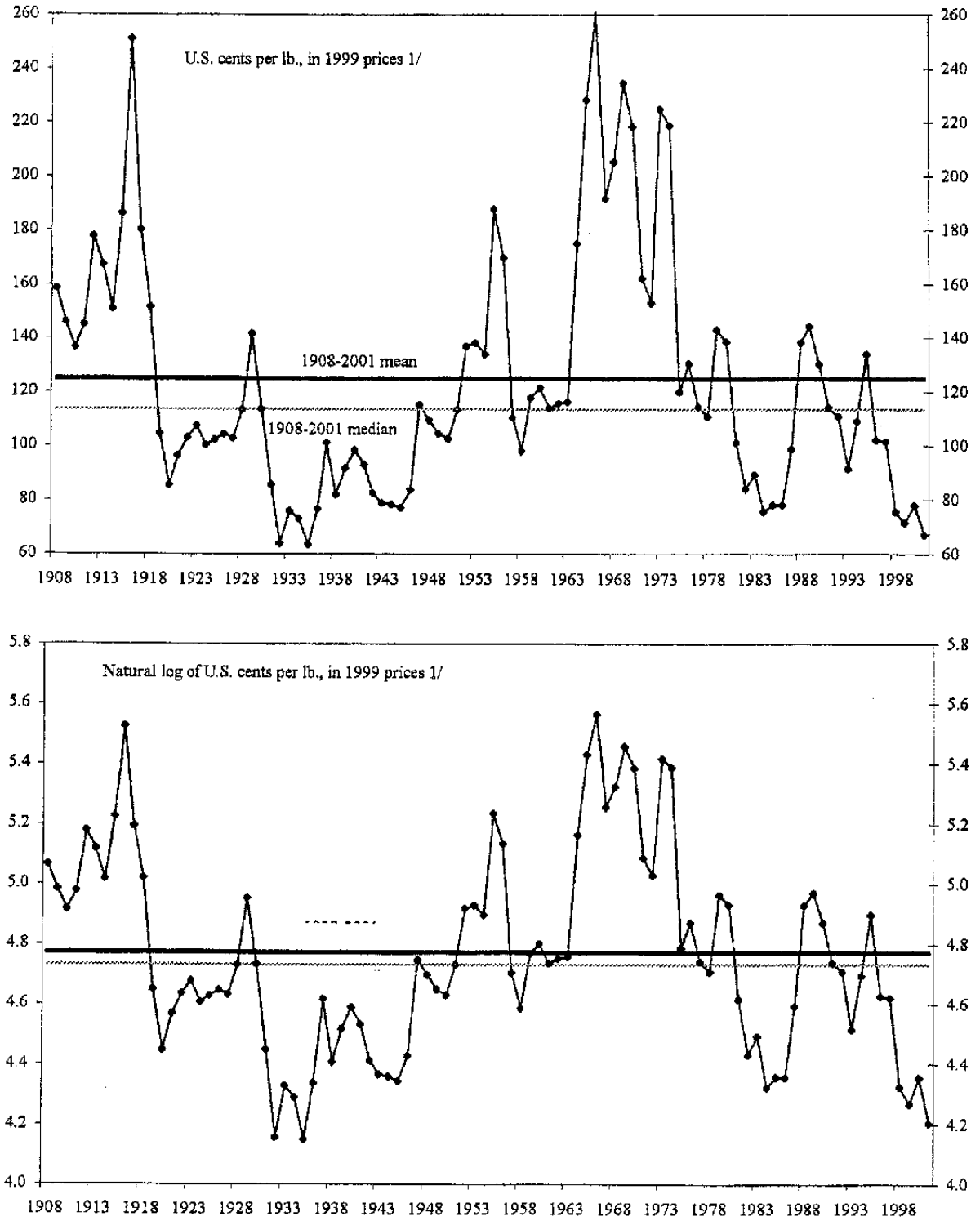
RMSE calculations are based on monthly data in log form, multiplied by 100.
For the random walk forecasts, variant (a) is the current spot price. Variants (b) and (c) adjust this for expected inflation. Variant (b) is calculated using expected inflation of 0.98 percent per year, equal to average U.S. PPI inflation during July 1993-March 2002. Variant (c) uses the actual U.S. PPI change over each forecast horizon, thereby assuming perfect foresight of inflation.

Table 3. LME Future-Spot Regression Results
July 1993-March 2002, 105 monthly observations, 3rd Wednesday of each month
(t-statistics in parentheses)

Regression	*a*	*B*	for s<85 B_{low}	for s>85 B_{high}	spline coeff.	TIME	R-squared	estimated steady-state s (UScents/lb., 1999 prices)	estimated half-life (in years) negative shocks	estimated half-life (in years) positive shocks
OLS with Newey-West standard errors										
a. Eq. (1)	1.92 (15.39)	-0.434 (-15.43)	n.a.	n.a.	n.a.	...	0.84	83.4	2.7	2.7
b. Eq. (1), *plus*: Spline at s=85	1.17 (3.51)	...	-0.260 (-3.31)	-0.523 (-11.15)	-0.264 (-2.34)	...	0.85	87.7	5.2	2.1
c. Eq. (1) in 1st differences	0.00 (-0.48)	-0.601 (-11.20)	n.a.	n.a.	n.a.	...	0.70	...	1.7	1.7
d. Eq. (1), *plus*: TREND	2.61 (22.1)	-0.571 (-22.8)	n.a.	n.a.	n.a.	-0.0015 (-6.60)	0.91	...	1.8	1.8
e. Eq. (1), *plus*: Spline at s=85 TREND	2.39 (6.40)	...	-0.521 (-6.17)	-0.587 (-17.84)	-0.067 (-0.65)	-0.0014 (-5.13)	0.91	...	2.1	1.8
Using AR(1) errors										
f. Eq. (1)	2.54 (14.53)	-0.574 (-14.68)	n.a.	n.a.	n.a.	...	0.95	83.9	1.8	1.8
g. Eq. (1), *plus*: Spline at s=85	1.59 (5.50)	...	-0.354 (-5.29)	-0.689 (-15.06)	-0.335 (-4.03)	...	0.96	87.2	3.6	1.3
h. Eq. (1) in 1st differences	0.00 (-0.36)	-0.601 (-15.38)	n.a.	n.a.	n.a.	...	0.70	...	1.7	1.7
i. Eq. (1), *plus*: TREND	2.70 (16.0)	-0.589 (-16.99)	n.a.	n.a.	n.a.	-0.0015 (-4.17)	0.95	...	1.8	1.8
j. Eq. (1), *plus*: Spline at s=85 TREND	1.82 (6.14)	...	-0.386 (-5.87)	-0.686 (-15.70)	-0.300 (-3.69)	-0.0014 (-3.18)	0.96	...	3.2	1.3

Source: IMF staff estimates.

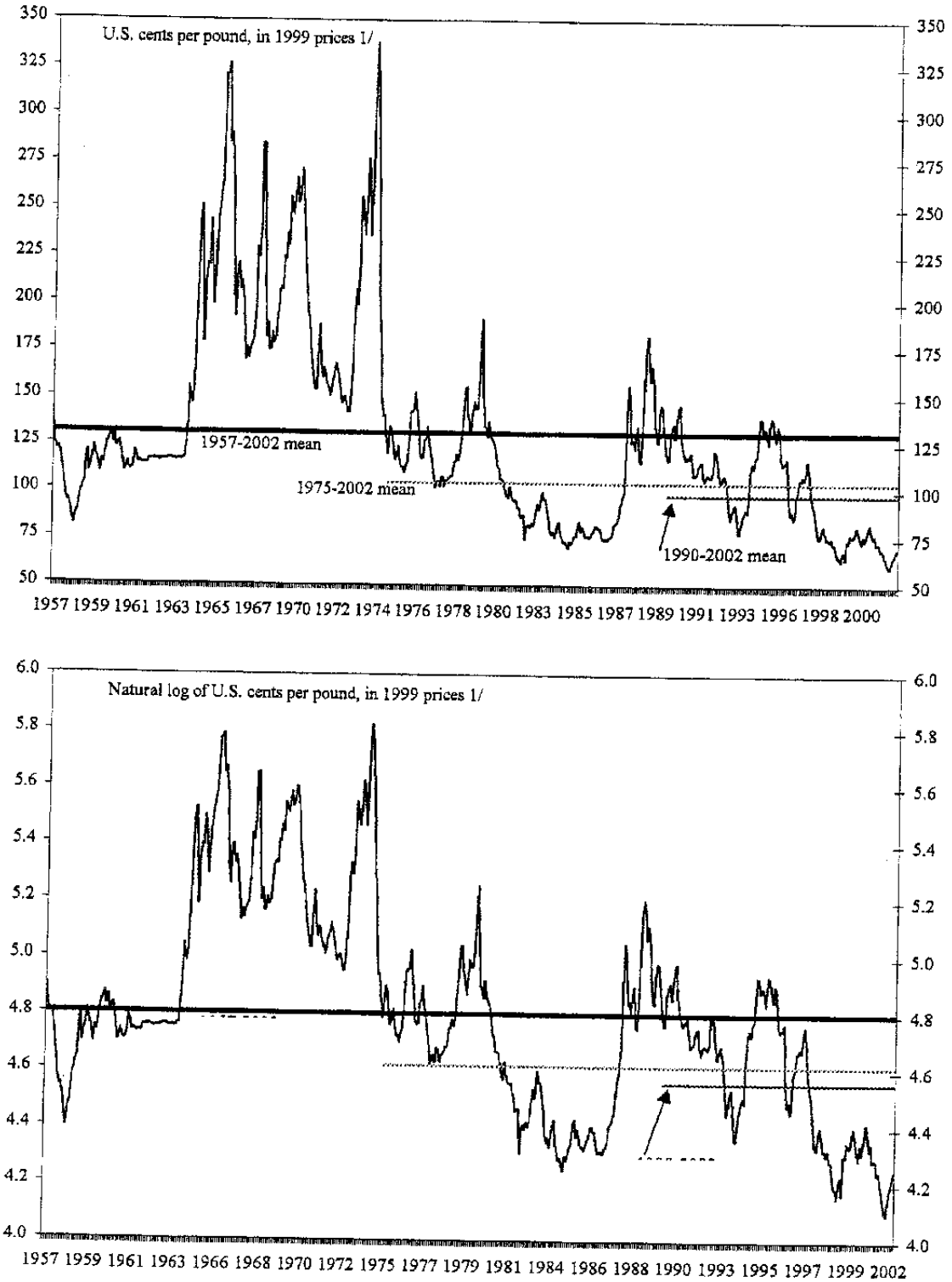
Figure 1. Annual Real Copper Prices (1908 - 2001)



Source: CODELCO.

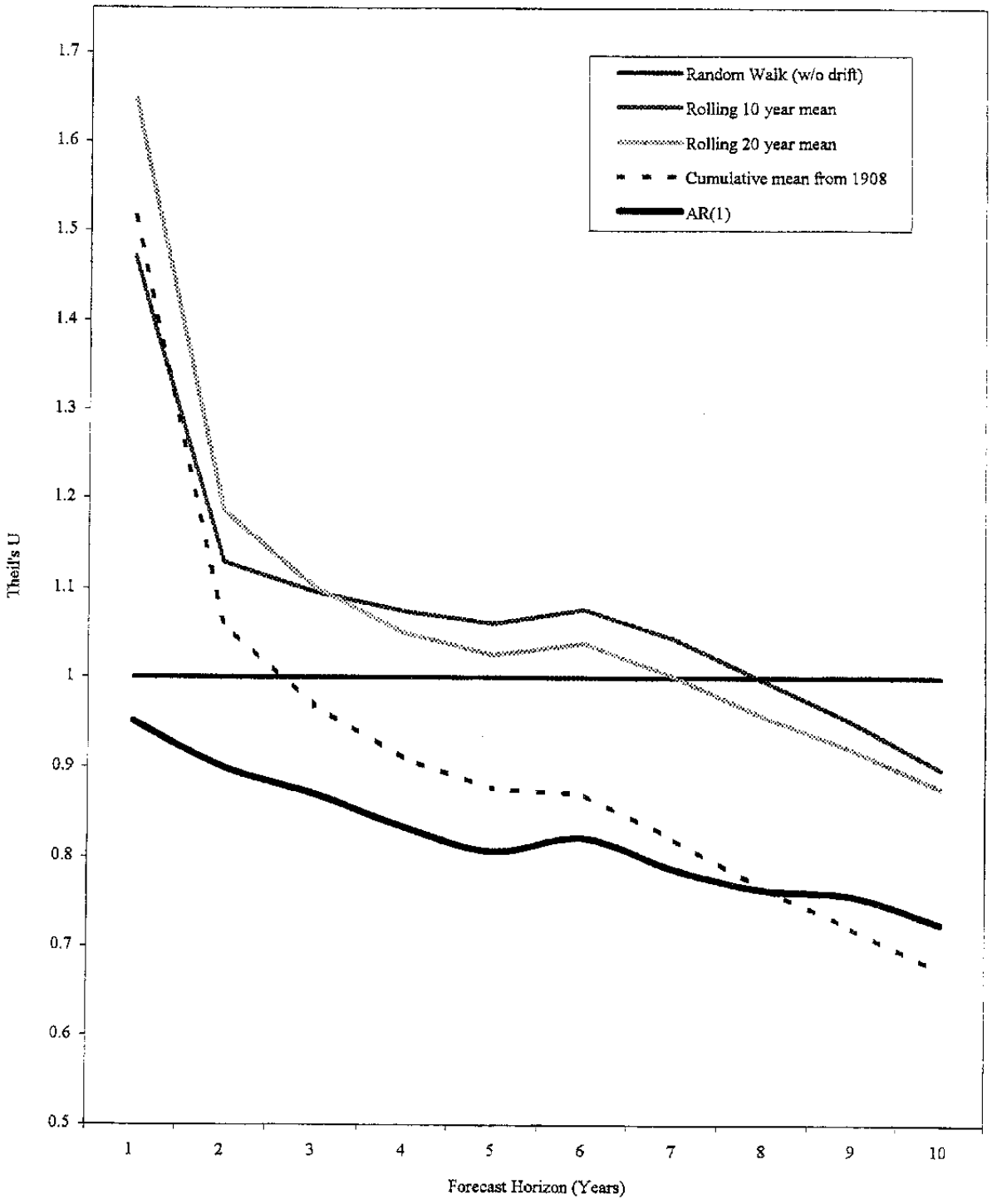
1/ Copper price deflated by U.S. wholesale price index.

Figure 2. Monthly Real Copper Prices (January 1957 - March 2002)



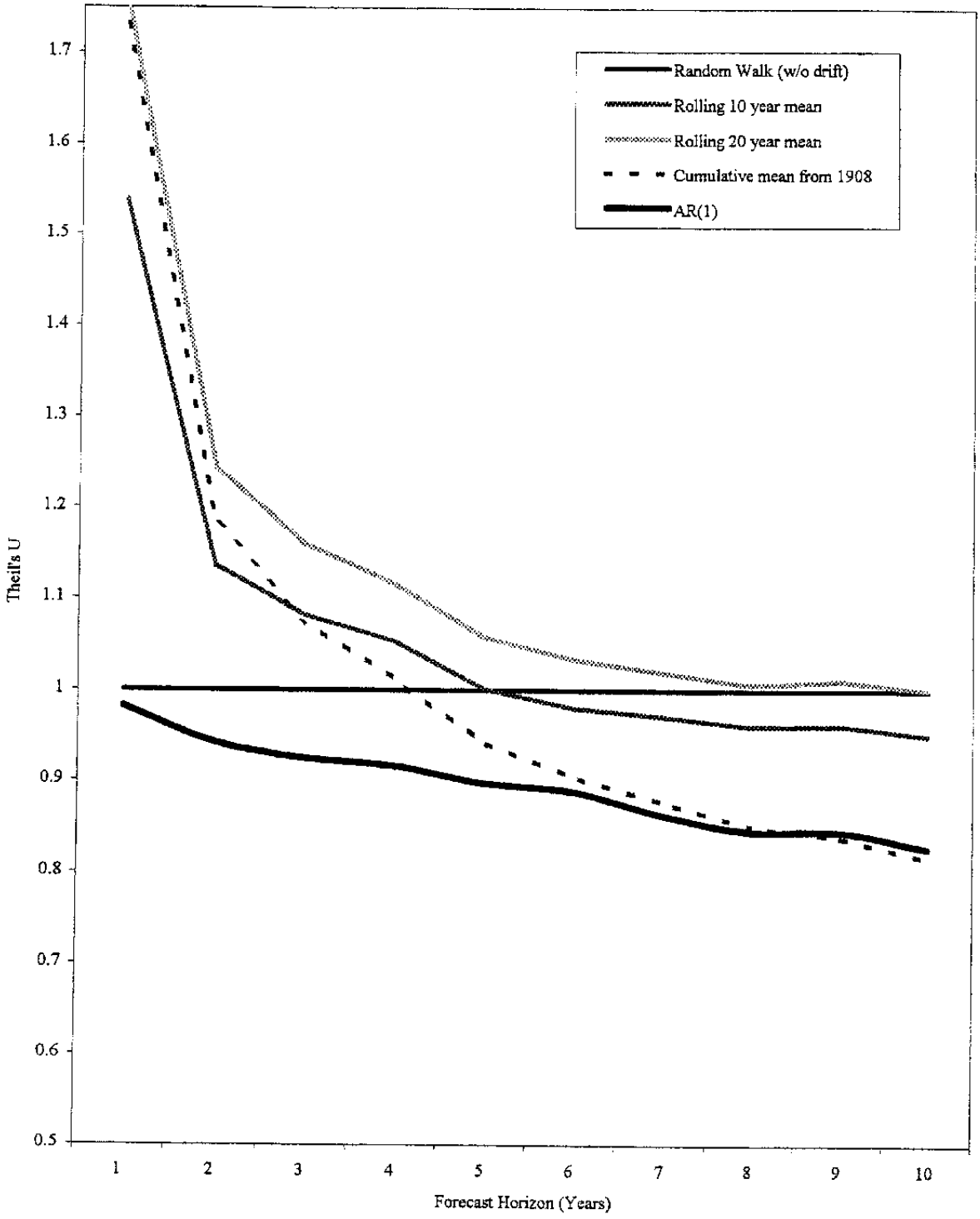
Source: IMF, *International Financial Statistics.*
1/ Copper price deflated by U.S. wholesale price index.

Figure 3. Relative Accuracy of Alternative Forecasts of Real Copper Price
(Evaluation Period: 1970 to 2001)
Theil's U for Horizons of 1-10 years.



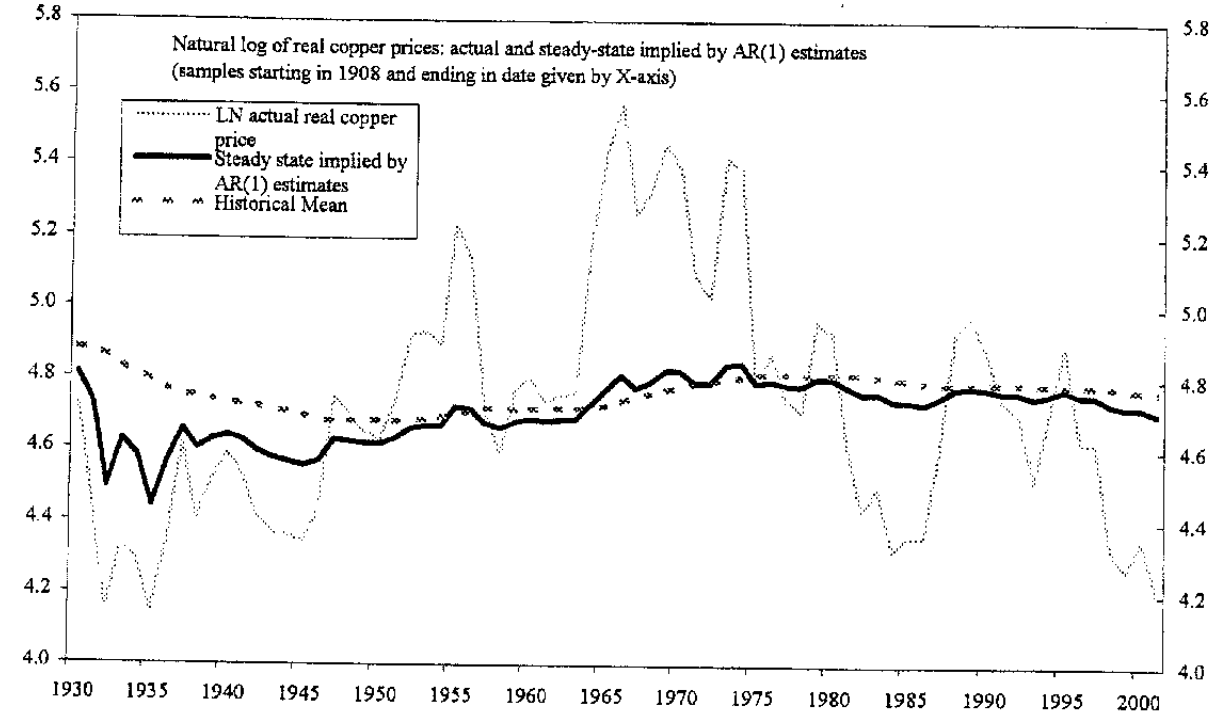
Source: IMF staff estimates.

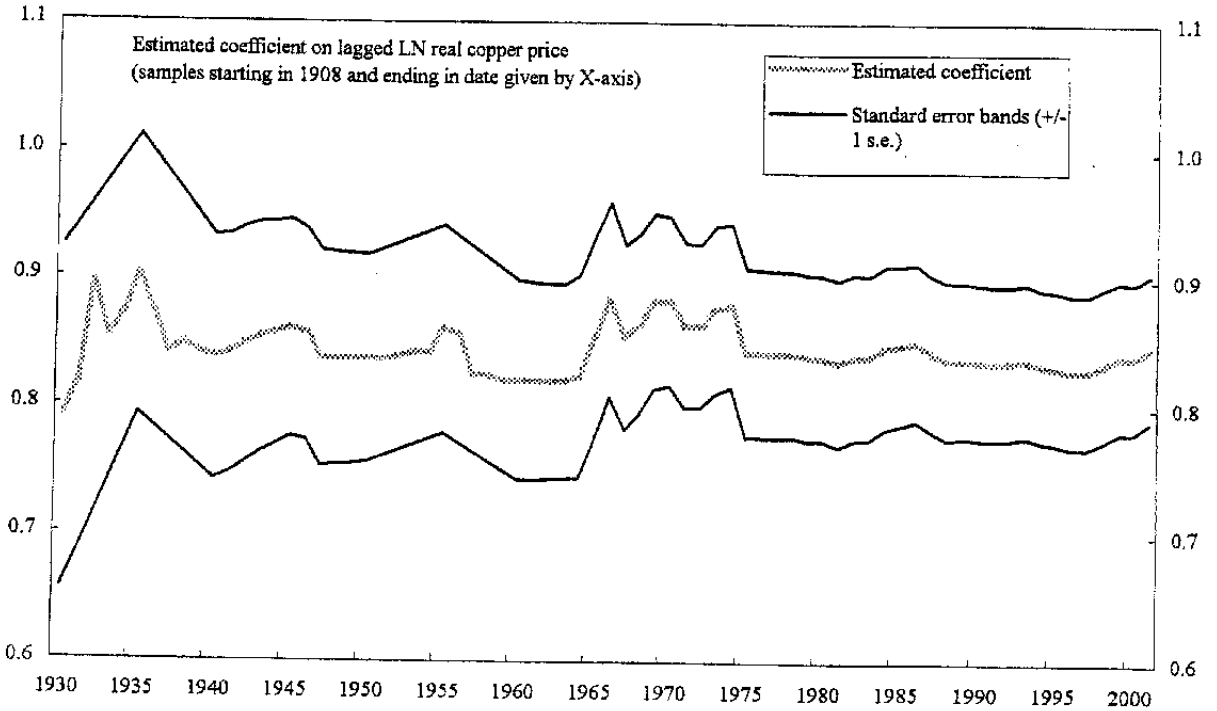
Figure 4. Relative Accuracy of Alternative Forecasts of Real Copper Price
(Evaluation Period: 1940 to 2001)
Theil's U for Horizons of 1-10 years.



Source: IMF Staff estimates.

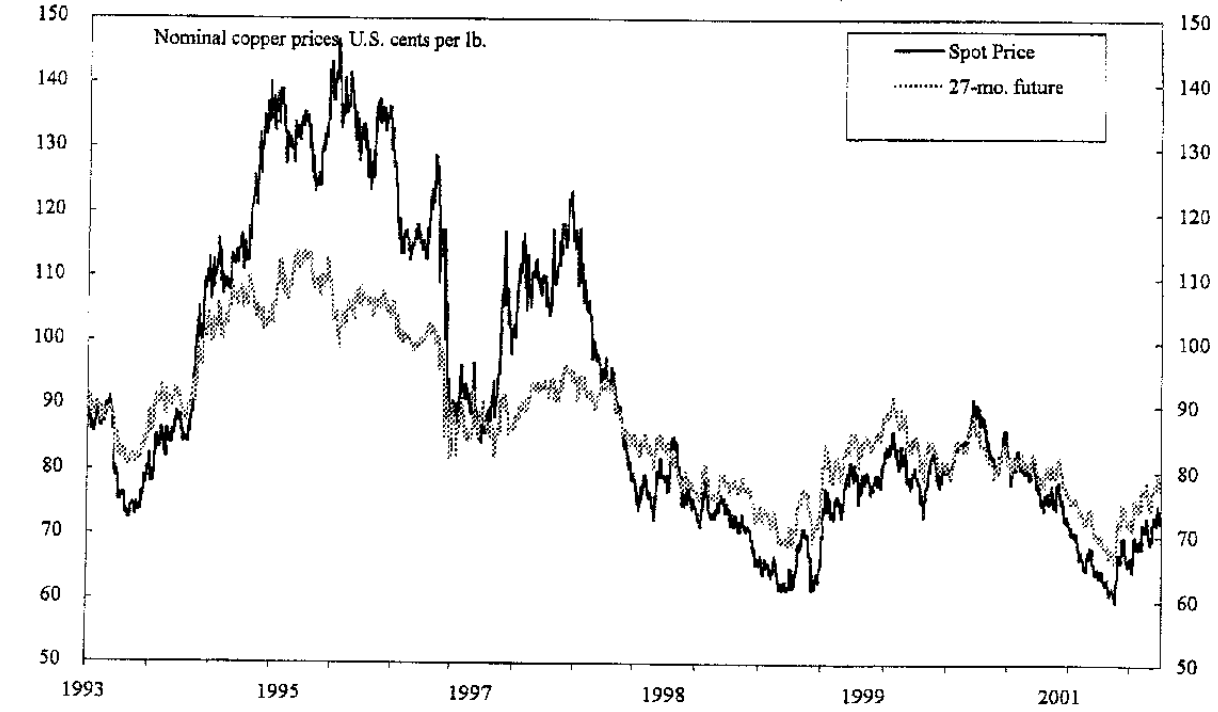
Figure 5. Real Copper Prices: AR(1) Estimation Results
(Samples beginning 1908 and ending 1930 - 2001)

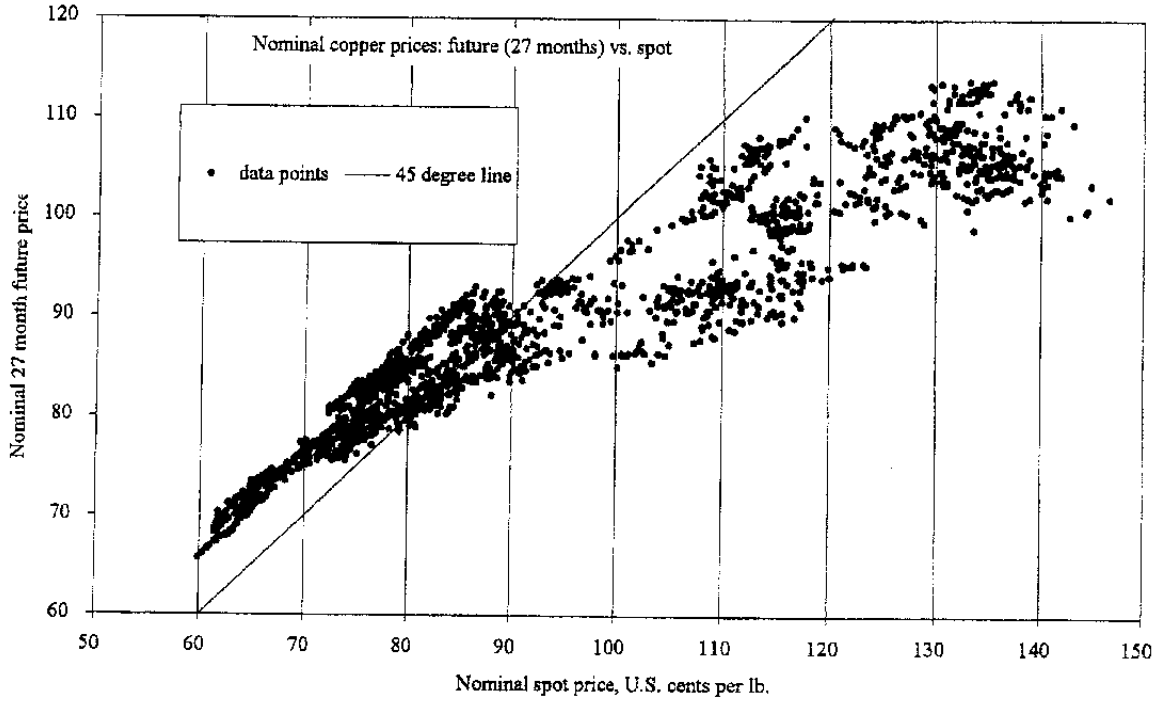




Sources: CODELCO; and IMF staff estimates.

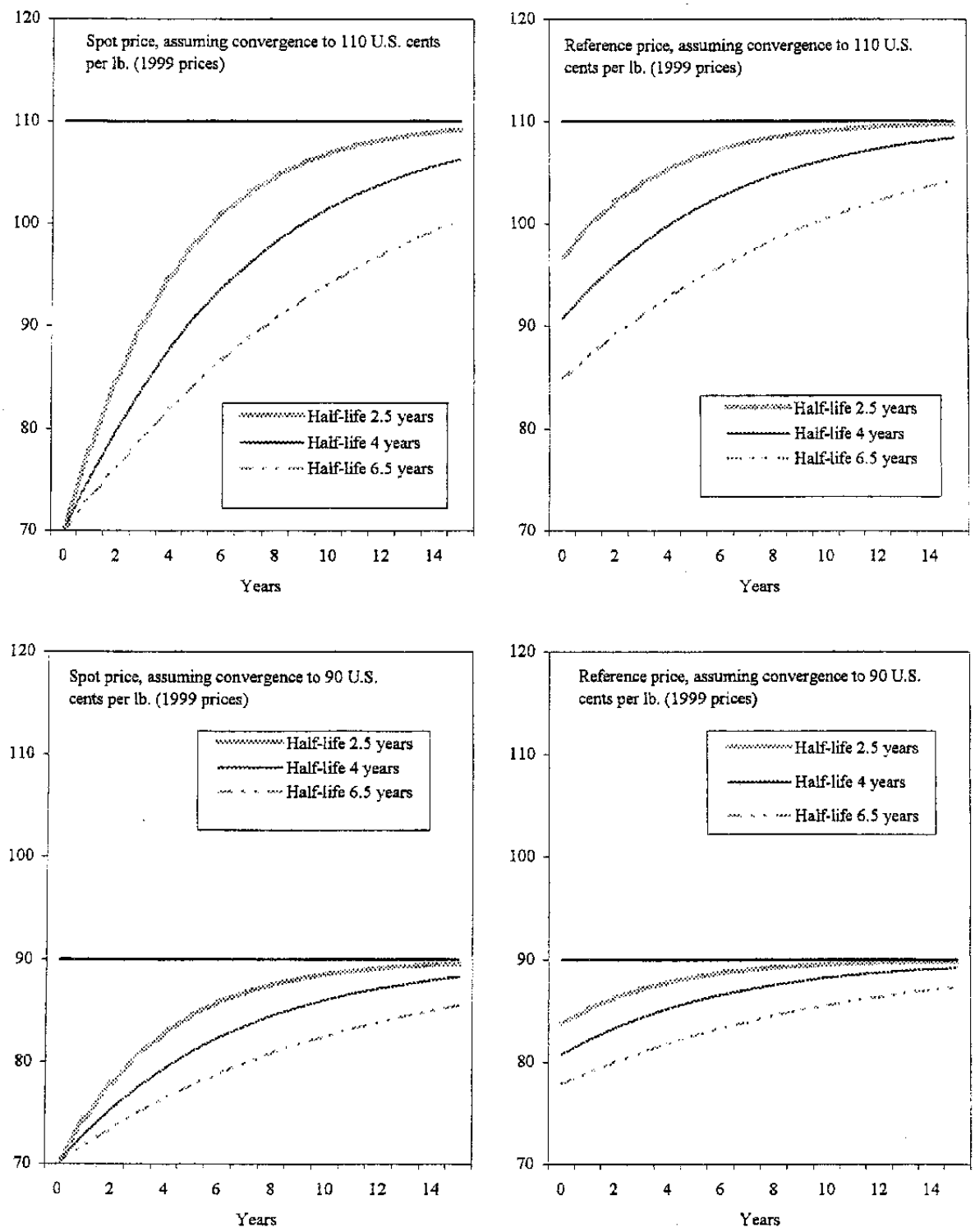
Figure 6. LME Copper Spot Prices and 27-Month Futures Prices
(July 1993 - March 2002)





Sources: London Metals Exchange; and IMF staff estimates.

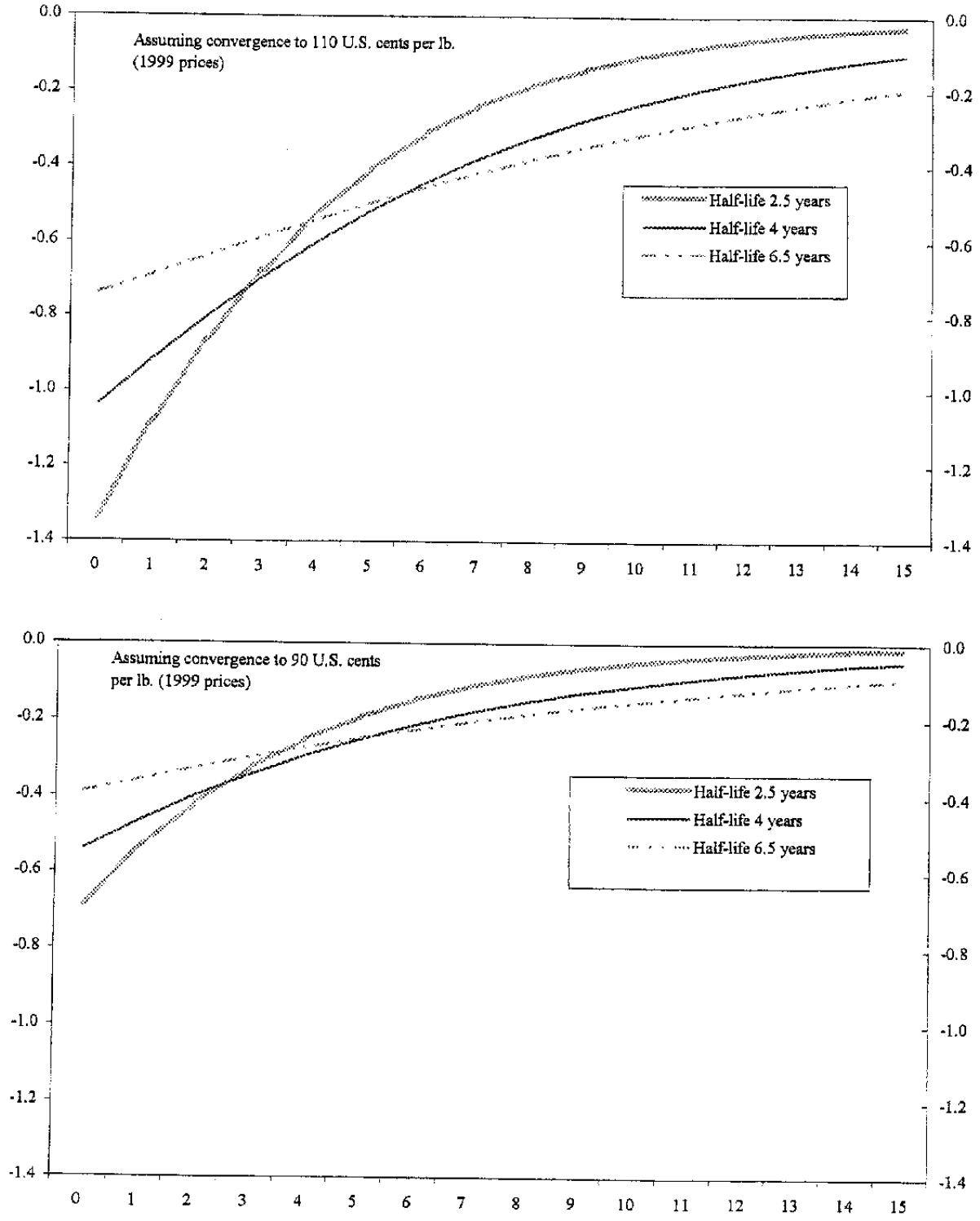
Figure 7. Simulated Spot and Reference Price Paths 1/



Source: IMF staff estimates. (See text for explanation.)

1/ Half-life values refer to the evolution of the logarithm of real copper prices. The simulation results have been converted to (real) U.S. cents per pound.

Figure 8. Copper "Revenue Gap" Simulations
(In percent of GDP)



Source: IMF staff estimates. (See text for explanation.)

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IV. Chile's Banking System Soundness[62]

A. Introduction

135. This chapter provides a brief description of the Chilean banking system and reports standard measures of its financial health. In particular, the chapter highlights standard prudential indicators, the results of stress tests conducted by staff, and recent rating agencies' evaluation of the banking system.

B. Structure and Activities of the Banking System

136. The Chilean banking system is relatively large for the size of the economy and has substantial foreign participation. As of December 2001, the banking system held about US$61 billion in assets or about 95 percent of GDP—including about US$46.3 billion in loans and US$12.3 billion in negotiable financial instruments. At present, the Chilean banking system consists of a government-owned bank (Banco del Estado), fifteen private banks, and nine branches of foreign banks. In addition, Chile has one finance company (or consumer credit agency) which conducts many operations similar to banks but is not allowed to offer checking accounts or engage in international business. Seven of the system's banks (ABN Amro, BBVA Banco Bhif, Deutsche Bank, Dresdner BNP, Santander, Santiago, and Scotiabank SudAmericano) are either majority owned (directly or indirectly) or controlled by foreign bank interests. As shown in Table 1, foreign-owned or controlled banks and branches account for about 45 percent of total deposits and loans.

137. Most foreign banks have tended to concentrate on earning fees from syndicated loans to Chilean firms and in generating income from trading securities. However, Santander and BBVA have a full fledged banking presence, albeit, with significant exposure to Chilean corporations acquired with Spanish capital. Citibank and BankBoston also have significant exposures to Chilean corporations and multinational firms with Chilean operations.

138. Banco del Estado (BE) ensures the provision of banking services to all regions of the country through its widespread branch network. Reflecting its mission, BE maintains a large volume of passbook savings accounts and makes a substantial amount of low income housing loans.

139. The banking system continues to evolve. While five new banks (Deutsche Bank, Monex, Safra, Ripley, and HNS) were recently licensed, two existing foreign banks—American Express and Bank of America—were in the process of downgrading their banking operations to representative offices.

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[62] Prepared by John Leimone (MAE) with input from Marco Espinosa (WHD).

140. There is a substantial degree of price indexation in banks' assets and liabilities (although this has been declining recently), but dollarization is low. In August 2001, the Central Bank of Chile (BCCh) announced a major change in the design of its monetary policy operations. Specifically, the BCCh announced that it was changing its daily operating target from a "real" rate of interest (measured in terms of UFs, an inflation-adjusted unit of account) in the overnight interbank market to a nominal interest rate (denominated in pesos) in this market.[63] This change in policy has induced a shift in the composition of bank deposits and loans from UF-denominated to non-index instruments. For example, as of April 2002, 36 percent of bank deposits were inflation indexed compared to 61 percent in July 2001. Dollarization of the banking system continues to be low, although it has been growing gradually over the last few years. By the end of 2001, 14 percent of bank deposits were dollar indexed compared with 12 percent a year earlier.

C. Concentration in the Banking System

141. The system is fairly concentrated, with the largest ten banks accounting for some 85 percent of deposits and loans. Furthermore, a significant increase in concentration of banking activity will result from two recently approved mergers. The shareholders of Banco de Chile (the second largest in the system) and Banco Edwards voted to approve the merger of their respective institutions, which was approved in December by the Banking Superintendency (SBIF). The newly merged institution will account for about 20 percent of the total banking system. A merger between Banco de Santiago and Banco Santander, Chile (the largest and the fourth largest, respectively) was also approved recently. When completed, this merger would account for at least 25 percent of total deposits of the banking system.[64] Thus, the two largest banks would represent almost half of the system's deposits.

142. Concentration in the banking system normally could raise two types of concerns: the possibility of anti-competitive practices, and the possibility of increased systemic risk. To increase competition in the financial system and thus help diminish the likelihood of monopolistic practices, the authorities have recently reduced the minimum capital requirements to open a bank. Entry in the banking industry, and thus competition, has also been facilitated by a reform introduced to the banking law in 1997; this reform stipulates that applications for bank licenses can only be denied if the applicant fails to comply with a list of clearly specified requirements (including, inter alia, proof of solvency and integrity of the founding shareholders), thereby reducing official discretion over licensing decisions. To address concerns about systemic risk arising from banks that may be "too big to fail," the authorities have recently introduced regulations that grants the SBIF authority to establish

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[63] Interest on other BCCh instruments, namely, credit facilities and the overnight deposit facility, are also set in nominal terms.

[64] Some experts suggest that once the merger is finalized, it is very likely that the merged bank will sell about 5 percent of its loan portfolio.

certain conditions for the approval of bank mergers or acquisitions (or the taking control of two or more banks by the same person or controlling group), when these operations result in a bank (or group of banks controlled by the same person or group) that accounts for a significant market share (defined as above 15 percent of the banking system's loans); these conditions include, inter alia, minimum capital requirement of up to 14 percent of risk-adjusted assets, above the customary 8 percent. Systemic risk concerns may also be eased, if as expected, the newly merged banks have an advantage in diversifying their portfolio over its parts, banks continue to upgrade their risk management practices and bank regulations and its monitoring continue to change to take into account newly evolving risks. The authorities are also studying the structure of the safety net in conjunction with planned reforms of the payment system, expected to be completed toward the end of 2002 or early 2003.[65] Refinements in the safety net should help ease systemic risk concerns from the liability side of the banking system.

D. Risk Management Policies and Prudential Indicators

143. The SBIF and the central bank have a number of regulations aimed at limiting banks' credit risk, connected lending, and foreign exchange exposure. Also, regardless of national origin of the bank's ownership, all banks have internal risk management policies that complement official regulations regarding liquidity, interest rate, and exchange rate risk. In house risk management policies are based on a variety of methodologies. For the banking book, limits may be established based on earnings at risk and the sensitivity of the economic value of the institution's capital to specific risks. For the trading book, banks employ position limits, duration limits, sensitivity limits, value-at-risk limits, and stop-loss or call-loss limits. Foreign-owned banks and branches are considered to be more advanced than smaller domestic banks in their overall capacity for risk management. The advantage reflects the reliance on risk management systems developed by head offices mainly located in countries with advanced financial and banking markets.

144. Notwithstanding the slowdown in economic growth and the negative shocks faced by Chile in 2001, overall prudential indicators continue to point to a healthy banking system. The quality of their loan portfolio remained stable, the system continued to exhibit healthy profits and to be well capitalized.

145. A set of prudential and earning indicators is presented in Table 2. The table shows that the system remained well capitalized as of December 2001, in spite of a small decline in the Basel risk rated capital adequacy during the year (the simple capital to asset ratio increased somewhat). The capital adequacy ratio for the system as a whole was 12.7 percent, with the lowest ratio for an individual bank at 10.3 percent. Net income after taxes improved during the year, both as a rate of return on assets and as a rate of return on equity, reflecting

[65] The reforms are being studied by the BCCh, the SBIF, the Ministry of Finance, and the Chilean Banking Association.

continued increases in efficiency, gains in net interest inflows, a boost in capital gains on the banks' holdings of securities and a reduction in the need to make loan loss provisions. The level of provisions for all banks exceeded the outstanding amount of overdue loans as of December 2001, reflecting the tapering off of the rise in the ratio of overdue to total loans that emerged in 1998.[66] At the same time, liquidity risk indicators used by the SBIF have remained stable.

E. Stress Tests

146. Notwithstanding the favorable prudential indicators listed in Table 2, the Chilean banking system could still be exposed to a number of potential shocks. Last year, Chile's exchange rate experienced a significant depreciation suggesting that exchange rate volatility could be a potential problem. Also, while worldwide interest rates came down significantly throughout 2001, an unexpected sharp rebound could have a significant impact on the balance sheet of the banking system. At the same time, Chile's slow expansion could lead banks to face a higher rate of defaults on loans.

147. In order to assess the future vulnerability of the banking system to these types of shocks, in late 2001, staff conducted stress tests using the August 2001 bank balance sheets as a base. Drawing from historical events, the tests calculated (for each bank) the losses (or profits) resulting from a 25 percent depreciation of the peso with respect to the U.S. dollar, a sharp increase in interest rates, and a 90 percent increase in nonperforming loans (which was assumed to be fully provisioned).

148. In order to test the banking system's resilience to a foreign exchange depreciation, a hypothetical 25 percent depreciation of the peso (similar to the actual depreciation experienced in the first 10 months of 2001) was applied to the net foreign exchange rate exposure of each bank (defined as the difference between the assets and liabilities denominated or indexed to dollars and the net forward position in foreign exchange). The stress test suggests that the banking system's current capacity to withstand foreign exchange rate changes is fairly robust. After the valuation effects of this shock were accounted for, about half of the banks would have benefited from the depreciation and the Basel ratio for all banks would still have continued to meet the minimum regulatory requirements.[67]

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[66] Chile differs from GAAP accounting practices regarding overdue loans. In particular, only the portion of a loan overdue for more than 90 days is classified as overdue, unless legal proceedings are initiated for recovery. Based on SBIF adjustments, estimated overdue loans using U.S. GAAP methodology would result in a figure of less than 3.9 percent of the total loan portfolio.

[67] Under central bank regulatory requirements, no domestic bank can have a positive or negative foreign exchange rate position of more than 20 percent relative to their capital. Specifically, twenty one banks (fourteen) of the banks in the study had a foreign exchange exposure, in absolute terms, lower than 20 percent (10 percent) relative to their capital.

149. Next, a sharp increase in the interest yield curve that simulated a shock of the magnitude experienced during the Russian crisis of June-September 1998 was considered. Because changes in interest rates affect both a bank's income flows and a bank's net worth, both types of effects were evaluated. A repricing gap model of interest rate risk was used to analyze the potential impact on net income over a period of up to twelve months. First, all assets and liabilities were sorted in a few time categories, according to their interest rate sensitivities (remaining time to repricing for floating rate instruments, remaining time maturity for fixed rate instruments). Based on this information, a repricing gap model of interest rate risk was used to analyse the sensitivity to interest rate shocks of the difference between the flow of interest earned by a financial institution on its assets and the flow of interest paid on its liabilities. The repricing gap model was used to calculate the change in net interest income in each time category and for the total portfolio on a bank-by-bank basis following a potential shock. This information was used to analyze the impact on annual net interest earnings in UFs, pesos, and dollars (assuming no variations in the exchange rate), respectively. The potential effects of this test on the Basel capital requirements were analyzed. The exercise found that all banks would have continue to meet the regulatory requirement. Also, a duration gap model for the sum of the trading and banking book was used to estimate the potential changes in net present value of each bank and therefore the potential effect on the Basel capital requirements. The exercise found that the Basel ratio for two banks would have fallen slightly below the 8 percent regulatory requirement.

150. The third shock considered was an increase in credit risk. Other things equal, it was assumed that overdue loans increased to close to 3.5 percent of total loans from the 1.8 percent prevailing in August 2001, similar to the rise that occurred several years ago in the wake of the Asian crisis. The test also assumed 100 percent provisioning of the simulated increase in overdue loans. In this credit stress test, the Basel ratio would have been about 4 percent for one bank, while for a second bank this ratio would have fallen slightly below 7 percent below the regulatory capital adequacy ratio. The capacity of current earnings to absorb losses was not taken into account for any of the stress tests. Since all Chilean banks were reporting positive after-tax earnings in 2001, these results are therefore conservative.

F. Grading by Rating Agencies

151. Ratings agencies share the opinion that the Chilean banking system is among the strongest in Latin America, and that is well regulated. For example, in a report dated December 2001, S&P stated that some banks' ratings had been upgraded, that the system's asset quality was stable and that the Chilean banking system was one of the best supervised among all emerging markets. Also, a May 2002 Country report by Fitch Ratings explains that Chile had endured the emerging market crises of the 1990s with minimal side effects thanks to the successful de-coupling from the rest of Latin America. The report also credits the General Banking Act of 1997 with providing the foundations for Chile's current strong

regulatory framework. [68] Finally, tables 3 and 4 present the long-term foreign and local currency classifications by international and local rating agencies available as of June 2002. These tables present a picture of a stable banking system with the four largest banks displaying some of the highest ratings and with most of them featuring a positive outlook.

[68] See "Latin American Roundup: Argentina and the Region," by C. Krossler, S&P, December 2001 and "The Chilean Banking System" by G. Lopez-Cortes, FitchRatings, May 2002.

Table 1. Structure of the Banking System 1/
(December 2001)

	Assets	Loans	Deposits
Private banks (15)	77.9	80.6	77.2
Of which: controlled by foreign interests	38.9	38.5	37.0
Foreign braches (9)	9.4	6.3	8.5
State bank (1)	12.3	12.5	13.7
Finance company (1)	0.4	0.6	0.7
Total system	100.0	100.0	100.0

Source: Banking Superintendency (SBIF).

1/ In percent of total. Totals may not add to 100 percent due to rounding.

Table 2: Financial System Indicators
(In percent)

	December					
	1996 1/	1997 1/	1998	1999	2000	2001
Solvency						
Effective capital/risk weighted assets 2/	...	...	12.48	13.53	13.34	12.73
Basic capital/total assets 3/	...	...	7.49	7.75	7.51	8.01
Credit risk						
Loan loss provisions/total loans	1.34	1.42	1.91	2.55	2.52	2.37
Overdue loans/total loans	0.95	0.96	1.45	1.67	1.73	1.62
Results						
After tax income/adjusted assets (ROA)	1.14	1.01	0.90	0.73	1.00	1.32
After tax income/capital and reserves (ROE)	15.50	13.67	11.54	9.36	12.70	17.70
Efficiency						
Operating costs/gross operational margin	66.52	66.44	61.44	60.19	58.30	54.80
Operating costs/adjusted assets	3.33	3.19	3.13	2.94	2.84	2.78
Liquidity risk						
Gross interbank credit/adjusted assets	2.31	2.40	2.68	2.18	1.95	0.97
Disposable funds net of clearing items+ Financial investments/Adjusted assets	20.91	19.35	19.45	22.93	22.31	22.18
Disposable funds net of clearing items+ Financial investments/liquid liabilities	23.51	21.70	22.14	25.98	25.76	26.47

Source: Banking Superintendency (SBIF).

1/ Prior to the Banking Law of 1997, banks were instead subject to a prudential ratio of capital to debt.

2/ Effective capital corresponds to: basic capital less equity plus the sum of voluntary provisions and subordinated bonds.

3/ Basic capital is equivalent to capital and reserves.

Table 3: Long-term Foreign Currency Credit Ratings
and Most Recent Ratings Change or Affirmation

	Fitch	Moody's	S & P
Banco de Chile	A- 3/15/2002	Baa1 3/28/2002	A- outlook stable As of May 2002
Banco del Estado	A- 8/2/2001	Baa1 3/28/2002	A- outlook positive as of March 2002
Banco Santander	A- 4/22/2002	Baa1 since Oct 1996, outlook positive as of 4/24/2002	A- 10/11/2001 outlook positive as of April 2002
Banco Santiago	A- 4/22/2002	Baa1 since Mar 1997, outlook positive as of 4/24/2002	A- 10/13/2001 outlook positive as of April 2002
Scotiabank Sud Americano	n/a	Baa1 downgraded 5/24/2002	n/a
BBVA Bhif	n/a	Baa1 3/28/2002	n/a
Banco Sudamericano	n/a	n/a	BBB- 7/3/2001 outlook stable as of April 2002
Banco BICE	n/a	Baa1 3/28/2002	n/a

Sources: Fitch, Moody, and S & P.

Table 4: Long-term, Local Currency Credit Ratings
(As of May 2002)

	Feller Rate	Fitch Chile
ABN AMRO Bank (Chile)	AA+	AA
Banco Bice	AA	AA
Banco de Crédito e Inversiones	AA	AA
Banco de Chile	AA+	AA+
Banco de la Nación Argentina	n/a	BB+
Banco del Desarrollo	A-	A
Banco del Estado de Chile	AA+	AA+
Banco do Brasil	BBB	BBB
Banco Falabella	A+	A
Banco Internacional	BBB+	A-
Banco Ripley	A-	A-
Banco Santander-Chile	AA+	AA+
Banco Santiago	AA+	AA+
Banco Security	AA-	AA-
Banco Sudameris	A+	AA-
BankBoston N.A.	AA	AA-
BBVA Banco Bhif	AA-	n/a
Citibank N.A.	AA+	AA+
Corpbanca	A+	A+
Deutsche Bank (Chile)	AA	AA
Dresdner Bank Lateinamerika	AA	AA
Financiera Conosur	BBB	BBB+
HSBC Bank USA	AA+	AA-
JPMorgan Chase Bank	AA+	AA+
Scotiabank Sud Americano	A	AA-
The Bank of Tokyo-Mitsubishi Ltd.	AA-	AA-

Sources: Feller and Fitch.

V. A Note on the Corporate Sector's Potential Vulnerability[69]

A. Introduction

152. Given the role of the corporate sector as a source, as well as a transmission channel, of financial crisis in a number of countries in recent years, it is important to be aware of potential fragilities in this sector's financial position, especially at a time of economic instability in neighboring countries and broader external volatility.

153. Given the importance of the corporate sector in the Chilean economy, it is evident that potential vulnerability in this sector would be closely associated with an economy-wide vulnerability.[70] In Chile, the corporate sector (broadly defined as comprising all private sector, non-financial incorporated enterprises) is the dominant user of foreign and domestic financing: it owed more than 80 percent of the country's external debt at the end of 2001 (itself about 60 percent of GDP), accounted for about 60 percent of total bank credit, and held about 50 percent of total foreign assets at end-2000 (mostly in foreign direct investment and trade credits). The corporate sector is linked also to other sectors of the domestic economy through production, investment, and consumption linkages. Thus, it is essential to assess its financial soundness to monitor aggregate vulnerability.

154. This notes seeks to identify potential vulnerabilities of Chile's corporate sector to a range of shocks, including particularly financing and exchange rate shocks, by looking at the level and the time-profile of selected balance sheet and cash flow indicators that have turned out to be relatively good predictors of financial distress in other countries—see Stone (2002a and 2002b)

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[69] Prepared by Alessandro Rebucci (PDR) and Andrew Swiston (WHD). The authors would like to thank Marco Espinosa, Ketil Hviding, Saul Lizondo, Laura Papi, and Mauricio Villafuerte, and the discussants (Sergio Lehmann and Alejandro Jara) and the participants at a seminar at the Banco Central de Chile for numerous and useful comments and discussions. They are particularly grateful to Steven Phillips for steering much of their work on these issues, and to Eduardo Ochoa at the Superintendencia de Valores y Seguros for kindly providing some of the data used. The views expressed in this paper are those of the authors and do not necessarily represent those of the IMF or IMF policy. Remaining errors are ours.

[70] In this note, "vulnerability" is broadly defined as the *risk* that the financial position of an "entity" (the whole economy, a bank, a firm, a sector, etc.) becomes unsustainable, *possibly* leading to an external or internal financial crisis, whereas an entity's position is considered sustainable if it is both solvent and liquid.

and Mulder and Perrelli (2001).[71] To place this indicator-based analysis in context, the note provides also a brief overview of the corporate sector's structural characteristics.

155. The evidence analyzed suggests that the financial position of Chile's corporate sector is sound overall, with no evident signs of vulnerability and limited exposure to foreign exchange risk. The time profile of some of the indicators considered suggests that this position was even stronger in the mid-late 1990s (apart from exchange rate exposure, which appears to have decreased in recent years); this is an indication that the Asian crisis first, and the less buoyant growth performance later, may have taken some toll on the corporate sector's financial strength. The evidence suggests also that some economic sectors are potentially more vulnerable than others. These are tentative and partial conclusions in the context of a solid legal framework (including also an effective bankruptcy regime) conducive to healthy domestic financial development, and in the presence of significant foreign ownership, especially in those sectors which appear to be relatively more vulnerable.

156. The analysis is subject to a number of limitations, and thus the conclusions should not be regarded as final. The main limitation is the limited availability of data on a comparable basis across countries. The issues under considerations also are diverse and complex, and it is difficult to produce a comprehensive assessment. Therefore, additional analysis would be needed to grasp more firmly the aggregate implications of the large amount of company data currently available on Chile's corporate sector. The existence of this information is doubtless an additional strength of the environment in which Chile's corporate sector operates, and no doubt the company-specific information is continuously processed by market analysts, particularly with a view to judging the value of individual companies' securities. For questions of economy-wide vulnerability, however, a more aggregated analysis is warranted. In so far as more aggregate information and analysis may help the functioning of markets, there is much scope for further work in this area.

157. The note is organized as follows: section B considers structural characteristics such as the ownership structure, legal framework, and main sources of financing; section C examines balance sheet and cash flow indicators of leverage, profitability, and liquidity; and section D explores the issue of foreign exchange risk exposure.

B. An Overview of Chile's Corporate Sector

158. Chile's business sector (including state-owned and financial enterprises) comprises about 500 incorporated large-size enterprises and 500,000 formal micro-, small-and medium-size enterprises (SMEs), according to data from the Superintendencia de Valores y Seguros (SVS) and the National Institute of Statistics.

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[71] A more traditional vulnerability assessment for the economy as a whole based on indicators of reserve adequacy, competitiveness, etc. is provided by Phillips (2000). An update of some those indicators is reported in the accompanying staff report for this Article IV consultation.

159. As already mentioned, the corporate sector is here defined as comprising all private sector, non-financial incorporated enterprises, which represent the majority of the universe of 500 incorporated companies. Thus, this definition excludes SMEs and state-owned enterprises, as well as private incorporated enterprises operating in the financial sector. While this is not necessarily the only possible definition, it is one that better fits Chile's specific economic and institutional context and the purpose of the analysis.

160. In Chile, the role of state-owned enterprises is limited and well defined. The public sector controls one commercial bank (Banco del Estado) and three large nonfinancial enterprises with combined assets valued about 13 percent of GDP at end-2000 (most of which belonging to CODELCO, the national copper company); the remaining 31 largest non-financial public enterprises had combined assets valued 6 percent of GDP at end-2000. As a whole, the state-owned enterprise sector is profitable, and it is responsible for less than 10 percent of Chile's external debt. As regards the SMEs, their financial position is not crucial from a vulnerability perspective given their relatively low level of financial integration with the rest of the economy and that they have no access to international capital markets.[72]

161. The distribution of Chilean firms across economic sector of operation is broadly in line with that of GDP. Firms in the corporate sectors, however, differ markedly in size, ownership, and financial structure. Hence, we now move on to describe some broad characteristics of this "population," which are not only relevant to assess vulnerability but also support our choice to focus on a much smaller "sample" in the analysis (based on indictors) in the rest of this chapter (Sections C and D).

Ownership

162. Ownership in the corporate sector appears to be rather concentrated. Although about 300 different shares were listed on the Santiago Stock Exchange at end-2000 (a high number by international benchmarks), the portion of the these firms' equity floating on the market is relatively small, suggesting that a large share of the economy's equity is still "privately" owned.[73] The economy's equity is concentrated in about 40 economic groups or conglomerates with very diversified business interests in the economy, including in the financial sector.[74]

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[72] SMEs reportedly employ a significant share of the labor force, and their aggregate performance may have an impact on the economy as whole—and thus also on the corporate sector—at least through the domestic demand channel.

[73] About 80 percent of equity trading is conducted on the Santiago Stock Exchange, while the remaining 20 percent is conducted on the Chilean Electronic Exchange, and the Valparaiso Stock Exchange.

[74] Note that directed lending is tightly regulated under the general banking law.

163. Foreign ownership in the corporate sector is significant, especially in the mining, electricity, and telecommunication sectors. Although it is difficult to aggregate information from company-by-company data to obtain a reliable summary indicator of such ownership, an indirect measure suggests that foreign ownership in the corporate sector might be around 30 percent: only two-thirds of the about 40 conglomerates mentioned above are classified as "national groups" in the local financial press based on company-by-company data from the SVS.[75]

Legal framework

164. Chile's corporate sector enjoys a sound legal framework, judged on the basis of international standards. According to a recent worldwide comparison—see Rafael La Porta and others (1996), from which this sub-section is largely based—Chile's legal framework provides for a relatively effective basic rule of law (in terms of well-defined property rights, enforceability of contracts, and avoidance of corruption) and very strong shareholder and creditor protection.

165. More specifically, according to this evidence, Chile's "rule of law" score is close to the worldwide average despite the fact that its legal system, as in most of Latin America, derives from French legal tradition, which in turn scores lowest among the four systems considered (the others being Scandinavian, German, and Anglo-Saxon, in decreasing order of performance). Chile's shareholder and creditor protection, however, is among the highest ranked in the world.[76] Corporate governance was strengthened further in the context of the capital market reform in 2001.

166. The broad characteristics of the legal framework describe above are reflected also in Chile's bankruptcy law, which guarantees strongly creditor rights while featuring some debtor protection mechanisms (Box 1). Guaranteeing creditor rights is necessary to foster financial development, while providing some debtor protection helps to minimize the economic dislocation and the social cost associated with firm failures. Other countries' experience has shown that an effective bankruptcy regime is a key ingredient of successful strategies aimed at minimizing social and economic costs in the event of a crisis.

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[75] Interestingly, the central bank estimates that *less than half*—indeed, only 43 percent—of the stock of medium and long-term external debt owed by the private sector is owed by companies controlled by Chilean residents.

[76] For instance, Chile is one of only 10 countries worldwide among the about 50 considered by Rafael La Porta and others (1996) requiring that ordinary shares carry one vote per share and scores very high on a combined index of "anti-director rights"; further, with only a few other countries worldwide, it scores the maximum in terms of creditor protection.

Box 1. Chile's Bankruptcy Law

An effective bankruptcy regime is conducive to financial development and may help minimize the costs of a hypothetical crisis. Chile's bankruptcy law (last revised in 1982 following a major financial crisis and a failed experiment with a regime more favorable to debtors) provides for strong creditor protection with some safeguard mechanisms for debtors. Overall, the law has functioned well thus far, and it appears adequate also from a vulnerability standpoint. Of course, its ability to handle a large number of cases in a situation of systemic financial distress has never been tested.

Several aspects of the law assure strong creditor protection. It is easy to initiate a bankruptcy proceeding (for instance, just one overdue commercial obligation is a sufficient cause to initiate the procedure in certain cases). Once initiated, the process is predictable, and creditors have strong assurances to realize their claims. It may take time to complete, though (up to three years in extreme cases). Finally, the majority quorums necessary to impose decisions on the minority take into account the interest of both large and small creditors.

Four main safeguard mechanisms protect debtors under the existing law, albeit less strongly than creditors. Before a bankruptcy declaration, a restructuring rather than a liquidation may be agreed upon between the debtor and the creditor through extra-judicial agreements ("*convenio extra-judicial*") or preventive judicial agreements ("*convenio judicial preventivo*"). After a bankruptcy declaration, it is possible to guarantee the continuing of activity ("*continuidad efectiva de giro*") and the liquidation of the firm as a on-going concern ("*venta como unidad operativa*"). However, all these mechanisms protect the debtor in the "private" interest of maximizing the recovery value of the creditor's claim rather than in the "public" interest of preserving the economic value of the firm.

The existing law has served Chile's economic system well over the past two decades by resolving predictably those cases of illiquidity and/or insolvency that arise in ordinary times. Past and recent highly publicized cases, as well as the worldwide comparison of legal frameworks mentioned in the text of this chapter, do not point to the existence of significant problems.

The existing law appears also adequate from a vulnerability perspective, as it limits the ability of a minority of creditors to veto a restructuring or a liquidation. A qualified majority of creditors can force restructuring or liquidation decisions upon the minority under the debtor protection mechanisms above (except under extra-judicial agreements, which perhaps is the reason why these agreements are rarely used in Chile). Nevertheless, the effectiveness of these mechanisms has never been "stress tested" in an actual crisis context.

Further indicating the absence of major problems with the existing bankruptcy law, a recent proposal for change (being discussed between the government and private sector entities) focuses on improving its functioning and application (to minimize the time needed to complete the process and remove the social stigma attached to it) rather than on introducing a radical overhaul of its basic principles.

Sources of financing

167. Chile's corporate sector has made significant use of foreign capital through syndicated loans and the issuance of bonds and equities, though use of such financing remains concentrated in a relatively small number of companies—the largest and highest-rated companies.[77] Foreign direct investment (FDI) remains the main source of foreign capital for most firms in the corporate sector; but even the distribution of FDI is relatively skewed toward the largest companies and concentrated in a few sectors (mining, utilities, telecommunication). Therefore, domestic financial markets have an important role to play to support private investments and growth in "good times" and help smooth adjustments to internal and external shocks in "bad times", as borne out by a large academic literature on finance and growth and finance and macroeconomic volatility—see, for instance, IDB (1996).

168. The pace of development of domestic credit and capital markets accelerated in the 1990s in Chile, assisted by continued liberalization and prudent regulation supervision, following two decades of intermittent growth. This is shown by a second recent study by Francisco Gallego and Norman Loayza (2000), from which most of the evidence quoted in this sub-section is drawn. As a result of good policies and a favorable legal environment, toward the end of the 1990s, domestic credit and capital markets had reached a development stage comparable with that of more advanced economies in terms of their size in relation to GDP. Moreover, according to this evidence, the local equity and bond markets had surpassed the credit market in terms of size at the end of the 1990s, supported by the presence of significant institutional investor base, including pension, mutual, and investment funds and life-insurance companies.[78]

169. In terms of liquidity and efficiency, however, domestic financial markets in Chile have not yet reached such a similar level of development and remain below world average. Furthermore, a broadly related study by Ricardo Caballero (2002) finds that only the largest companies (or those part of a conglomerate) maintained access to domestic financing during a recent "bad time", the period 1998-2000 after the Asian, Russian, and Brazilian crisis. This latter study too, however, does not consider data for 2001, when the local corporate bond market boomed, bringing the stock of bonds outstanding to US$6 billion (about 10 percent of

[77] About 15 companies had either ADRs or internationally placed bonds outstanding, as of end-2001. More companies, however, have access to international syndicated lending. This suggests that the size of a company is probably an important factor in gaining access to international bond and equity markets by assuring sufficient liquidity in secondary markets.

[78] The study by Gallego and Loayza (2000) includes tradable security issued by the public sector when measuring the size of the domestic bond market, but does not take into account the very large increase in the stock of corporate bond issued after 1997, when the sample period analyzed ends.

GDP) and the number of private sector issuers to more than 60, while the economy was coping with various external shocks. In addition, neither Caballero (2002) nor Gallego and Loayza (2000) consider recent important developments in local derivative markets: the local foreign exchange forward market, for instance, reportedly has now a daily turnover broadly comparable to the spot market, with maturities available up to three years.

170. As a result of these new developments, retained earnings, which had traditionally been the most important source of domestic financing along side bank credit became a less important source of investment financing in the 1990s. Nonetheless, the econometric evidence reported by Gallego and Loayza (2000) shows that only the largest firms (or those part of conglomerates) ceased to face a binding financing constraint in the 1990s; other companies continued to be sensitive to "cash-flow" variables, thus suggesting they continue to be financially-constrained.

171. In summary, by reviewing the sources of financing available to the corporate sectors, albeit briefly and in broad terms, we saw that only a limited number of companies—the largest and highest-rated—might in principle have been able to load their balance sheets with debt financing in such a way to become vulnerable to shocks. On those grounds, but also because of the difficulties of conducting a balance sheet and cash flow indicator analysis with a larger sample, in the next section we shall focus only on companies listed on the stock exchange and included in the IPSA index—the index comprising the 40 most actively traded stocks on the Santiago Exchange.

C. Balance Sheet and Cash Flow Indicators

172. Research on the role of the corporate sector as a potential source as well as transmission channel of financial crises points to the importance of specific balance sheet and cash flow information—most notably on *interest cover, leverage, liquidity, profitability*, and *foreign exchange exposure.*[79] According to this research, corporate sector-driven crises have tended to unfold in two stages. The first stage was a long build up of balance sheet fragilities rooted in poor governance, excessive credit expansion, accelerated capital inflows, and, in many cases, overheating of the economy. In the second stage, a shock, often external, triggered a sudden crisis, with the severity of the crisis directly associated with the degree of leverage, previous availability of financing, and weakness in corporate governance and in the general legal environment.

173. *Interest cover* (the ratio of earnings to interest expenses) is a cash flow indicator that measures the risk that a firm may not be able to service its debt on time, potentially signaling proximity to a situation of distress. *Leverage* indicators measure a firm's indebtedness

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[79] See, for instance, Sundararajan and others (2002), which summarizes both the academic literature and the empirical work done at the IMF in this area in recent years. The first part of this section draws mainly on this reference.

relative to its assets or net worth and quantify a firm's exposure to the risk that shocks to profitability may impair its repayment capacity pushing it into insolvency. *Corporate liquidity* indicators determine a company's ability to carry out its operations without endangering credit quality and thus the risk of facing a refinancing shock. Such liquidity indicators include (i) the "current ratio"—current assets (cash and accounts receivables) to current liabilities (debt and other liabilities coming due within a year)—(ii) the "quick or acid ratio"—current assets minus inventories to current liabilities—and (iii) the ratio of short term liabilities to total liabilities.

174. *Profitability* is naturally a crucial determinant of corporate strength, affecting capital growth, attraction of new equity, operating capacity, ability to withstand adverse shocks, and, ultimately, repayment capacity and survival. A sharp decline in corporate sector profitability (for instance, as a result of economic slowdown) may serve as leading indicator of financial system distress. However, care should be taken to distinguish between normal cyclical fluctuations in profitability from other more persistent tendencies. The most common indicators of profitability are (i) the return on equity (earnings to average equity), (ii) the return on assets (earnings to average assets) and (iii) or the operating margin (earnings to sales) that measures income in relation to costs, and reveals a firm's strength in maintaining a healthy margin and capital growth.

175. This literature emphasizes the difficulties in formulating vulnerability assessments based on these indicators including because of limitations on data availability, lack of uniform accounting practices across countries, and absence of established benchmarks against which to assess the indicators in individual cases, among other reasons. Despite these difficulties, this section attempts to assess the soundness of the Chile's core corporate sector against the yardstick of a small subset of standard balance sheet and cash flow indicators, chosen among those discussed above based mainly on data availability. To put indicators for Chile's corporate sector in some perspective, these are compared to those of about 600 companies drawn from eight other emerging markets and three industrial countries for which data comparable (at least in principle) are available through end-2000 (Tables 1-5).[80]

176. The information presented in Tables 1-5 suggests that Chile's largest companies have tended to be financially sound, when compared to companies in comparator countries. Moreover, there was no evident sign of vulnerability in the levels of the indicators considered at end-2000. Nonetheless, the overall picture at end-2000 was not as strong as it had been in the mid-1990s.[81]

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[80] This part of the analysis is based on the WORLDSCOPE database. For Chile, this includes about 30 companies, the majority of which are in the IPSA stock market index of the country's 40 most traded stocks. A complete set of data for end-2001 from this source is not yet available.

[81] Interestingly, similar conclusions are reached by Budenvich and Quiroz (2001), who look at indicators of *interest cover, leverage, liquidity and profitability* in a broader sample, based

(continued)

177. More specifically, the international comparison between Chile and other emerging and industrial countries during 1991-2000 shows:

- *Interest cover* (as measured by the ratio of earnings before interest, taxes and depreciation to interest on debt, Table 1), in 2000, was higher than in any other emerging market considered and comparable to Australia and New Zealand, though lower than in Canada and decreasing since mid-1990s.

- *Leverage* (as measured by total debt in percent of common equity; Table 2) was not high in absolute terms in 2000, but had increased markedly since the mid-1990s to levels comparable with other emerging markets and higher than in the three industrial countries considered.

- *Liquidity* (as measured by the ratio of current assets to current liabilities; Table 3) was higher than in most other countries in 1999-2000 and has been fairly stable over time. Refinancing risk seem limited also according to a second liquidity indicator, the share of short-term debt in total debt (Table 4) , which was better than in most emerging markets considered but less favorable than in industrial country comparators.

- *Profitability*, as measured by the ratio of earnings before interest to sales (Table 5) remained higher than in most other countries at the end of 2000, though the decline since mid-1990s had also been sharper than in most other countries.

178. Although a consistent set of data for 2001 is not yet available from the same source, the 2001 results reported by the Chilean financial press based on SVS data—which should be the primary source for WORLDSCOPE—indicate that the recent tendency of increasing leverage and decreasing profitability (netting out proceeds from the sale of assets) might have continued in 2001. However, these reports suggest also that the most leveraged sectors—telecommunications, commerce, and electricity—are also the most profitable ones. More specifically, the commerce and forestry sectors led the profitability rankings, while the food and beverage and the electric sectors came in third and fourth respectively.

D. Foreign Exchange Exposure

179. Exposure to foreign exchange risk in a country's corporate sector can be a significant source of financial distress or can result in a more costly adjustment process to external shocks. Several recent crises, including the Asian crisis, have been triggered or deepened by the balance sheet impact of sharp exchange rate depreciations; Chile' own response to contagion from the Asian and Russian crisis in 1997-1998, which included a sharp increase

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on SVS data for 150 Chilean firms from March 1995 to June 2001, excluding the largest and highest-rated companies operating in the telecommunication and electric sectors.

in interest rates, seems to have been in part motivated by the presence of foreign exchange exposure in the corporate sector.

180. Following that experience, a number of policy measures have been taken in Chile to improve the ability of the economy in general, and the corporate sector in particular, to absorb shocks through exchange rate adjustment. Chief among these was the adoption of a fully flexible exchange rate regime, which removed any perceived exchange rate "insurance" provided by a less flexible arrangement such as the former exchange rate band system. Important regulatory changes were also implemented: banks must take into account the foreign exchange exposure of their clients in risk classification, while non-financial incorporated companies must disclose their net open position and explicitly state their foreign exchange risk management policy.[82] Moreover, the recently implemented capital market reform package introduced normative changes to support further development of local capital markets, including particularly the derivative and bond markets, which helped companies reduce foreign exchange exposure significantly in 2001, both by substituting domestic-currency for foreign-currency denominated financing and by direct financial hedging.[83]

181. Today, the corporate sector's exposure to foreign exchange risk seems to be limited in Chile as evidenced by the relatively small *aggregate* balance sheet impact resulted from the large depreciation of the peso in 2001. Over the first three quarters of 2001, the accounting exchange rate depreciated by about 20 percent against the US dollar, the currency in which most foreign liabilities are denominated. Over the same period, the balance sheet loss as measured by the aggregate "diferencia de cambio" of all incorporated companies reporting to the SVS (including companies operating in the financial sector), was only US$1.3 billion (roughly 2 percent of GDP or only about 2 percent of the aggregate net worth of these companies).

182. In principle, of course, such aggregate information could hide important micro imbalances. Even within the non-financial corporate sector, individual companies or economic sectors could be much more heavily exposed than the average for the market and,

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[82] Disclosure requirements and practices for non-financial incorporated companies are still being fine tuned. At the moment, the net impact of foreign exchange fluctuations in the value of net financial assets is supposed to be reported in the income statement item "Diferencia de cambio" ("Nota 30"), while the position in derivative instruments (if any) and the firm's foreign exchange risk management policy are reported in separate supplementary notes ("Nota 34" and the "Analisis razondo"). Some companies, however, have reported the "diferencia de cambio" gross of the effect financial hedging. For those companies, therefore, the reported "diferencia de cambio" could overstate the actual extent of their exposure.

[83] For instance, prepayments of foreign bonds are reported at US$ 1,7 billion in 2001. At the same time, Chilean companies have issued bonds in domestic currency for the equivalent of about US$ 3 billion in 2001.

if the aggregate exposure were concentrated in a few companies with systemic importance, there could still be significant spillover risks through intra-firm linkages. In addition, within the aggregate figure just mentioned, the exposure of non-financial firms as a group would not be detected if it were being offset in part by the position of financial institutions that are long in dollars.[84]

183. An analysis of the available data, however, indicates that even though a few companies (operating mostly in the non-tradable sector) have significant foreign exchange exposure, the aggregate is not strongly skewed toward the non-financial corporate sector. In aggregate, the "diferencia de cambio" of the 33 non-financial firms in the IPSA stock market index was only US$670 million in January-September 2001, or 2.9 percent of their aggregate net-worth and 1 percent of total assets; figures broadly comparable to that for the universe of reporting firms discussed above. These losses were concentrated in seven companies, operating in the energy, retail, and construction sectors. Even these seven firms, however, were not affected severely: in all seven cases the loss was between 1 and 4 percent of total assets; only three companies had a loss larger than 6 percent of their own net worth, and no company had a loss larger than 10 percent of its net worth. It is also worth noting that companies in the electricity sector have an especially large share of foreign ownership, mitigating the direct effects of such losses on Chile national income and wealth.

184. These results may be seen as a sort of "real-life" stress test of the system, given the sharp deterioration of Chile's external environment in 2001, and they compare favorably with the results of standard (forward-looking) stress test exercises for other (investment grade) emerging market countries.[85] These findings are important because they suggest that Chile's flexible exchange rate regime may work without excessive "fear of floating". Nonetheless, it would be prudent to continue monitoring this specific source of potential vulnerability.

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[84] Note that Chile's public sector has a long net open position in foreign currency, and hence is not exposed to a depreciation of the Chilean peso.

[85] Unfortunately, the international comparison discussed in section C, which could provide a better benchmark, does not cover the foreign exchange exposure because of lack of comparable data.

Table 1. Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) To Interest Expense On Debt 1/

(Indicator of general financial soundness)

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
					Western Hemisphere						
1st Quartile	Canada	2	2	3	4	4	4	3	3	3	4
Mean	Canada	7	13	18	18	14	27	110	41	220	19
Median	Canada	4	4	5	6	6	7	8	6	7	7
3rd Quartile	Canada	7	8	12	12	13	17	16	11	11	13
No. of Firms	Canada	103	106	110	113	133	147	156	164	173	158
1st Quartile	Argentina	0	6	7	7	4	3	4	3	2	2
Mean	Argentina	9	56	13	25	20	-28	37	19	18	12
Median	Argentina	3	13	9	9	7	6	6	7	4	4
3rd Quartile	Argentina	5	27	17	30	10	11	16	13	7	11
No. of Firms	Argentina	9	13	15	20	17	23	26	29	31	31
1st Quartile	Brazil	0	1	1	3	4	2	2	2	1	2
Mean	Brazil	1	3	4	8	11	6	22	94	5	5
Median	Brazil	1	2	2	6	8	4	4	3	2	3
3rd Quartile	Brazil	2	3	7	12	10	8	11	5	4	5
No. of Firms	Brazil	20	20	23	23	29	35	46	48	53	56
1st Quartile	Chile	5	5	5	8	5	5	4	3	4	4
Mean	Chile	53	120	32	37	22	45	1321	331	57	84
Median	Chile	11	13	14	12	9	9	9	7	5	5
3rd Quartile	Chile	25	23	23	18	13	16	15	11	13	9
No. of Firms	Chile	20	21	24	25	26	28	33	32	34	31
1st Quartile	Mexico	3	3	3	1	2	3	3	2	4	3
Mean	Mexico	11	22	19	8	5	5	8	44	10	20
Median	Mexico	7	4	4	2	3	5	5	4	5	6
3rd Quartile	Mexico	13	11	6	6	5	6	7	10	13	17
No. of Firms	Mexico	19	28	30	33	35	35	38	42	50	49
					South East Asia						
1st Quartile	Australia	3	4	5	6	5	5	4	4	4	4
Mean	Australia	884	46	89	57	235	486	630	26	15	97
Median	Australia	5	6	8	8	8	8	7	7	6	6
3rd Quartile	Australia	13	11	17	16	17	15	14	11	11	11
No. of Firms	Australia	59	63	66	69	83	89	94	107	117	122
1st Quartile	New Zealand	2	2	3	3	6	4	4	4	4	4
Mean	New Zealand	4	7	12	4738	714	537	68	263	197	18
Median	New Zealand	3	4	8	10	11	6	7	6	6	6
3rd Quartile	New Zealand	5	11	13	17	19	12	13	12	12	9
No. of Firms	New Zealand	11	13	13	19	24	30	30	32	33	32
1st Quartile	Indonesia	5	4	4	4	3	3	0	1	3	1
Mean	Indonesia	151	8	9	24	15	12	14	206	16	14
Median	Indonesia	11	5	6	6	5	4	3	2	4	3
3rd Quartile	Indonesia	33	7	14	14	12	10	5	5	8	10
No. of Firms	Indonesia	8	8	10	14	22	25	25	26	24	21
1st Quartile	Malaysia	6	5	5	7	6	6	5	2	2	4
Mean	Malaysia	746	219	387	596	1691	1350	1501	940	642	73
Median	Malaysia	12	12	12	15	16	15	11	7	8	8
3rd Quartile	Malaysia	66	39	57	67	87	70	48	15	17	24
No. of Firms	Malaysia	37	39	43	46	54	56	58	59	59	60
1st Quartile	Philippines	4	5	4	5	6	4	3	3	4	2
Mean	Philippines	6	10	7	12	81	19	15	10	7	8
Median	Philippines	5	6	6	9	8	9	6	4	5	4
3rd Quartile	Philippines	7	13	9	12	24	15	11	7	8	9
No. of Firms	Philippines	7	7	10	11	15	17	20	19	20	25
1st Quartile	South Korea	2	2	2	2	2	1	1	1	2	1
Mean	South Korea	4	3	3	96	4	4	13	22	54	48
Median	South Korea	3	3	2	3	2	2	2	2	3	2
3rd Quartile	South Korea	4	3	4	4	4	3	2	3	4	8
No. of Firms	South Korea	7	8	18	18	43	49	56	55	64	69
1st Quartile	Thailand	4	4	3	3	3	2	1	2	1	1
Mean	Thailand	101	64	5	10	8	9	92	676	87	2128
Median	Thailand	7	11	4	5	5	4	2	3	3	3
3rd Quartile	Thailand	22	13	6	7	8	6	5	5	6	9
No. of Firms	Thailand	8	9	16	21	26	29	30	30	30	28

Sources: Worldscope database; and IMF staff calculations.

1/ Number of times.

Table 2. Total Debt to Common Equity 1/

(Indicator of leverage)

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
					Western Hemisphere						
1st Quartile	Canada	35	34	17	18	22	15	18	17	20	17
Median	Canada	75	73	66	57	59	46	49	58	52	55
3rd Quartile	Canada	145	134	123	116	115	103	94	103	113	117
No. of Firms	Canada	109	111	119	123	146	162	172	182	196	190
1st Quartile	Argentina	12	12	16	23	19	18	25	33	17	23
Median	Argentina	17	18	27	48	49	37	48	63	62	65
3rd Quartile	Argentina	22	28	58	55	70	55	69	80	95	91
No. of Firms	Argentina	11	15	18	21	20	26	29	33	36	33
1st Quartile	Brazil	16	17	13	11	13	27	15	19	25	30
Median	Brazil	32	32	22	20	25	41	37	42	57	58
3rd Quartile	Brazil	47	54	42	34	47	57	68	80	106	87
No. of Firms	Brazil	22	22	24	29	33	38	49	51	56	57
1st Quartile	Chile	12	12	17	12	10	8	18	26	21	41
Median	Chile	46	39	33	25	37	37	37	35	52	67
3rd Quartile	Chile	61	51	44	42	66	54	60	85	88	110
No. of Firms	Chile	20	21	24	25	27	30	34	33	36	33
1st Quartile	Mexico	9	18	17	29	26	17	17	13	15	14
Median	Mexico	45	51	41	48	43	34	43	45	45	43
3rd Quartile	Mexico	72	69	76	121	94	76	80	90	85	97
No. of Firms	Mexico	27	34	38	39	43	47	48	53	58	55
					South East Asia						
1st Quartile	Australia	9	8	12	14	9	10	15	19	18	22
Median	Australia	37	35	38	38	39	37	44	49	46	52
3rd Quartile	Australia	70	72	64	59	59	65	76	81	76	79
No. of Firms	Australia	65	70	72	77	92	101	104	120	128	130
1st Quartile	New Zealand	54	25	28	23	24	15	15	17	27	28
Median	New Zealand	61	78	55	53	39	34	40	55	49	56
3rd Quartile	New Zealand	136	109	100	89	73	95	73	71	68	108
No. of Firms	New Zealand	11	13	13	20	27	32	32	33	34	36
1st Quartile	Indonesia	26	35	52	17	43	50	41	1	1	2
Median	Indonesia	37	55	88	75	99	100	123	97	75	48
3rd Quartile	Indonesia	80	133	100	131	153	158	226	257	190	116
No. of Firms	Indonesia	10	10	13	14	22	25	26	27	27	26
1st Quartile	Malaysia	1	1	0	2	2	1	4	10	5	12
Median	Malaysia	20	16	19	21	26	32	48	42	32	45
3rd Quartile	Malaysia	62	57	47	68	77	85	102	158	160	167
No. of Firms	Malaysia	44	46	50	52	61	66	70	72	73	71
1st Quartile	Philippines	15	4	17	11	14	30	46	38	29	30
Median	Philippines	43	26	27	29	36	53	52	57	45	54
3rd Quartile	Philippines	91	77	78	54	62	78	103	80	88	107
No. of Firms	Philippines	10	11	13	17	26	28	28	28	28	30
1st Quartile	South Korea	129	135	119	118	135	119	146	127	58	47
Median	South Korea	233	242	188	200	218	253	345	196	112	113
3rd Quartile	South Korea	400	488	305	304	308	377	666	341	161	170
No. of Firms	South Korea	29	31	41	44	46	53	59	58	66	73
1st Quartile	Thailand	57	98	64	30	63	88	173	122	43	46
Median	Thailand	159	156	100	89	95	123	302	191	144	129
3rd Quartile	Thailand	192	210	177	146	166	171	522	304	336	272
No. of Firms	Thailand	9	12	19	22	27	30	30	30	30	29

Sources: Worldscope database; and IMF staff calculations.

1/ In percent.

Table 3. Short-Term Debt to Total Debt 1/

(Indicator of vulnerability to temporary cut-of from financing-in combination with leverage)

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
						Western Hemisphere					
1st Quartile	Canada	4.7	4.4	3.3	3.2	2.7	2.9	1.5	2.4	1.5	2.8
Median	Canada	15.3	15.2	9.9	12.1	13.9	11.0	10.8	9.4	8.8	11.5
3rd Quartile	Canada	27.1	24.5	25.0	26.4	28.9	33.1	27.4	25.3	25.1	31.9
No. of Firms	Canada	105	105	108	115	132	148	159	164	178	163
1st Quartile	Argentina	20.6	19.0	21.2	25.3	29.0	24.3	9.7	24.7	28.2	27.9
Median	Argentina	45.0	52.4	44.0	43.3	44.5	33.2	28.6	35.3	42.5	44.2
3rd Quartile	Argentina	79.3	73.1	78.5	75.1	78.9	87.2	66.7	72.1	70.6	62.9
No. of Firms	Argentina	11	14	17	21	20	26	29	31	33	30
1st Quartile	Brazil	37.2	29.0	32.0	23.6	23.4	27.2	23.3	26.3	26.7	19.4
Median	Brazil	47.9	49.5	40.1	35.8	45.4	43.0	38.3	42.4	42.6	34.9
3rd Quartile	Brazil	69.7	71.6	57.5	54.2	66.2	57.8	48.4	51.5	57.8	46.4
No. of Firms	Brazil	22	22	24	27	33	38	49	50	54	55
1st Quartile	Chile	13.5	13.7	14.3	13.9	10.8	13.2	14.5	10.0	10.3	12.8
Median	Chile	20.1	27.2	21.3	23.8	26.3	21.1	25.1	21.4	18.1	25.3
3rd Quartile	Chile	31.7	44.2	38.0	33.6	38.4	33.5	44.6	52.6	36.0	37.0
No. of Firms	Chile	19	20	24	25	26	29	33	32	36	32
1st Quartile	Mexico	32.4	21.4	20.4	17.6	22.3	12.5	9.4	9.1	11.7	17.0
Median	Mexico	57.4	36.7	41.4	39.8	38.9	26.6	24.4	24.4	26.6	26.5
3rd Quartile	Mexico	83.0	64.6	52.0	54.0	73.0	58.5	39.1	47.0	48.7	53.3
No. of Firms	Mexico	25	32	36	38	41	43	44	47	52	47
						South East Asia					
1st Quartile	Australia	7.6	5.1	5.7	3.2	2.7	1.4	0.3	0.5	0.7	0.9
Median	Australia	21.2	18.8	16.2	9.3	12.0	10.8	9.8	6.7	6.5	7.3
3rd Quartile	Australia	35.0	34.2	33.0	29.4	29.8	30.2	32.9	25.5	25.5	29.8
No. of Firms	Australia	60	67	66	71	79	91	96	113	120	122
1st Quartile	New Zealand	17.2	5.3	4.7	5.4	1.7	0.7	1.5	0.7	0.2	0.3
Median	New Zealand	26.1	23.5	22.8	9.3	10.4	5.4	7.9	9.9	5.2	4.2
3rd Quartile	New Zealand	30.2	75.7	53.9	41.2	34.0	27.5	22.7	21.1	37.4	46.7
No. of Firms	New Zealand	11	13	12	18	24	29	29	32	32	33
1st Quartile	Indonesia	42.2	33.3	18.2	27.5	15.7	16.1	21.0	20.2	25.0	18.3
Median	Indonesia	70.2	77.8	41.9	38.1	24.7	31.7	39.2	34.3	41.5	30.6
3rd Quartile	Indonesia	98.1	99.0	89.9	66.2	66.0	89.4	79.9	99.5	99.0	98.5
No. of Firms	Indonesia	10	10	13	14	22	25	26	25	23	23
1st Quartile	Malaysia	50.1	37.3	23.2	24.6	36.1	24.8	12.5	21.3	18.5	13.1
Median	Malaysia	70.8	72.0	68.8	74.2	75.8	51.4	37.8	44.3	48.9	41.9
3rd Quartile	Malaysia	98.7	97.5	94.6	99.5	99.3	94.7	86.9	84.4	88.2	82.8
No. of Firms	Malaysia	33	36	38	43	51	53	57	60	63	62
1st Quartile	Philippines	36.6	26.8	31.8	14.7	19.1	17.9	13.6	16.2	10.2	17.4
Median	Philippines	57.3	34.9	38.9	30.2	37.0	44.5	38.9	27.9	25.4	41.2
3rd Quartile	Philippines	72.5	43.6	55.4	60.1	81.7	65.9	55.0	54.4	56.7	60.5
No. of Firms	Philippines	9	9	12	15	23	26	26	27	26	26
1st Quartile	South Korea	42.2	45.9	44.9	44.4	49.5	40.3	44.4	38.4	37.0	40.2
Median	South Korea	53.6	54.0	52.4	53.6	58.5	56.1	55.3	51.5	49.1	54.4
3rd Quartile	South Korea	60.3	60.8	58.4	64.4	71.0	68.3	63.2	60.2	62.6	70.9
No. of Firms	South Korea	28	30	41	44	46	52	58	56	64	67
1st Quartile	Thailand	17.8	18.4	10.7	15.2	6.8	12.2	11.7	11.9	10.3	9.4
Median	Thailand	39.1	33.2	13.0	26.6	22.8	23.8	27.3	34.2	26.2	16.8
3rd Quartile	Thailand	68.5	56.0	37.9	58.8	37.8	45.8	42.8	57.9	55.3	57.0
No. of Firms	Thailand	9	12	18	22	27	30	29	30	29	27

Sources: Worldscope database; and IMF staff calculations.

1/ In percent.

Table 4. Current Assets To Current Liabilities (Current Ratio) 1/

(Indicator of liquidity)

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
					Western Hemisphere						
1st Quartile	Canada	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.0	1.0	1.0
Median	Canada	1.4	1.6	1.5	1.6	1.5	1.6	1.7	1.6	1.5	1.4
3rd Quartile	Canada	2.1	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.4	2.5
No. of Firms	Canada	105	107	115	119	138	150	160	169	182	174
1st Quartile	Argentina	1.2	0.9	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7
Median	Argentina	1.6	1.6	1.4	1.0	1.0	1.3	1.2	1.1	1.1	0.9
3rd Quartile	Argentina	1.9	2.1	1.6	1.8	1.5	1.7	2.1	1.9	1.6	1.6
No. of Firms	Argentina	11	14	17	20	19	25	27	30	32	32
1st Quartile	Brazil	0.5	0.5	0.8	0.9	0.8	0.7	0.7	0.7	0.7	0.9
Median	Brazil	0.9	0.8	1.1	1.2	1.2	1.0	1.1	1.0	1.0	1.2
3rd Quartile	Brazil	1.2	1.3	1.3	1.7	1.7	1.6	1.5	1.3	1.3	1.5
No. of Firms	Brazil	22	22	24	28	32	37	48	50	55	56
1st Quartile	Chile	1.5	1.2	1.3	1.3	1.0	1.2	1.2	0.9	1.0	1.1
Median	Chile	1.6	1.9	1.9	2.2	1.5	1.7	1.6	1.3	1.9	1.8
3rd Quartile	Chile	2.3	2.6	3.6	3.3	2.9	2.5	2.2	2.6	2.7	2.5
No. of Firms	Chile	20	21	24	25	26	28	31	31	34	33
1st Quartile	Mexico	1.1	1.2	1.2	1.0	0.9	1.2	1.3	1.2	1.2	1.1
Median	Mexico	1.7	1.6	1.6	1.4	1.3	1.6	1.8	1.6	1.7	1.5
3rd Quartile	Mexico	2.1	2.5	2.8	1.8	2.0	2.5	2.9	2.8	2.4	2.3
No. of Firms	Mexico	27	34	38	39	42	45	47	51	55	55
					South East Asia						
1st Quartile	Australia	1.1	1.2	1.0	1.1	1.1	1.1	1.0	1.0	1.1	1.0
Median	Australia	1.5	1.5	1.4	1.3	1.4	1.4	1.3	1.3	1.3	1.3
3rd Quartile	Australia	1.8	1.7	1.6	1.7	1.9	1.8	1.7	1.8	1.7	1.7
No. of Firms	Australia	53	58	60	63	74	79	81	93	98	101
1st Quartile	New Zealand	1.1	0.8	0.9	0.9	1.0	0.9	0.7	0.7	0.6	0.8
Median	New Zealand	1.2	1.1	1.1	1.1	1.2	1.1	0.9	1.0	1.0	1.1
3rd Quartile	New Zealand	1.9	1.5	1.9	1.7	2.0	1.6	1.4	1.6	1.6	1.6
No. of Firms	New Zealand	11	13	13	20	25	28	29	30	31	32
1st Quartile	Indonesia	1.2	1.0	0.8	1.2	1.3	1.1	0.9	0.8	1.1	1.3
Median	Indonesia	1.8	1.3	1.2	1.3	1.5	1.6	1.4	1.3	1.8	1.9
3rd Quartile	Indonesia	3.0	1.7	1.6	2.1	2.3	1.9	2.0	2.3	2.5	2.7
No. of Firms	Indonesia	10	10	13	14	21	24	25	26	26	25
1st Quartile	Malaysia	0.9	0.9	1.2	1.0	1.1	1.0	1.1	0.8	0.9	1.0
Median	Malaysia	1.2	1.2	1.4	1.4	1.4	1.4	1.5	1.3	1.5	1.5
3rd Quartile	Malaysia	1.6	1.9	1.8	1.9	2.0	2.3	2.3	2.1	2.4	2.5
No. of Firms	Malaysia	40	42	44	46	56	58	62	65	66	65
1st Quartile	Philippines	1.2	1.4	1.3	1.5	1.3	1.0	1.0	1.0	1.0	1.1
Median	Philippines	1.4	1.8	1.7	2.2	1.7	1.5	1.3	1.2	1.2	1.2
3rd Quartile	Philippines	1.5	2.2	1.7	3.1	3.0	2.4	1.8	1.6	1.9	1.5
No. of Firms	Philippines	7	8	9	12	19	21	21	20	20	23
1st Quartile	South Korea	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6
Median	South Korea	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
3rd Quartile	South Korea	1.0	1.0	1.1	1.0	1.1	1.1	1.0	1.1	1.3	1.3
No. of Firms	South Korea	28	29	39	41	42	48	54	53	61	67
1st Quartile	Thailand	1.0	0.8	0.8	0.9	1.0	0.8	0.6	0.5	0.7	0.9
Median	Thailand	1.2	0.9	1.2	1.4	1.3	1.4	0.9	0.8	1.0	1.3
3rd Quartile	Thailand	2.4	1.2	1.9	1.7	2.0	2.1	1.5	1.4	1.8	2.3
No. of Firms	Thailand	8	11	18	21	26	29	29	29	29	28

Sources: Worldscope database; and IMF staff calculations.

1/ Number of times.

Table 5. Earnings Before Interest and Taxes (EBIT) minus Income Taxes and Other Taxes To Sales 1/

(Indicator of profitability)

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
						Western Hemisphere					
1st Quartile	Canada	0.03	0.03	0.03	0.05	0.05	0.04	0.04	0.03	0.05	0.04
Median	Canada	0.05	0.06	0.06	0.09	0.09	0.10	0.08	0.08	0.09	0.09
3rd Quartile	Canada	0.15	0.16	0.16	0.15	0.16	0.18	0.18	0.15	0.17	0.17
No. of Firms	Canada	107	109	116	121	146	160	169	176	192	177
1st Quartile	Argentina	-0.05	0.04	0.05	0.08	0.08	0.09	0.10	0.09	0.05	0.04
Median	Argentina	0.09	0.10	0.12	0.11	0.14	0.15	0.17	0.15	0.14	0.11
3rd Quartile	Argentina	0.17	0.15	0.20	0.16	0.22	0.26	0.23	0.24	0.22	0.19
No. of Firms	Argentina	10	14	18	21	18	25	28	32	34	32
1st Quartile	Brazil	-0.14	0.06	0.09	0.07	0.05	0.08	0.11	0.08	0.05	0.10
Median	Brazil	0.13	0.11	0.12	0.10	0.10	0.13	0.21	0.17	0.12	0.16
3rd Quartile	Brazil	0.35	0.23	0.19	0.19	0.15	0.18	0.28	0.26	0.23	0.23
No. of Firms	Brazil	20	20	23	23	29	35	47	50	54	55
1st Quartile	Chile	0.16	0.18	0.16	0.16	0.15	0.14	0.12	0.12	0.08	0.09
Median	Chile	0.23	0.23	0.26	0.22	0.25	0.24	0.15	0.18	0.16	0.16
3rd Quartile	Chile	0.38	0.42	0.34	0.36	0.35	0.36	0.34	0.31	0.22	0.26
No. of Firms	Chile	20	21	24	25	27	30	34	33	36	33
1st Quartile	Mexico	0.06	0.10	0.10	-0.02	0.10	0.12	0.10	0.08	0.08	0.06
Median	Mexico	0.17	0.16	0.14	0.04	0.15	0.21	0.17	0.11	0.14	0.10
3rd Quartile	Mexico	0.22	0.22	0.19	0.11	0.22	0.27	0.24	0.18	0.20	0.18
No. of Firms	Mexico	21	29	31	34	35	36	39	44	50	54
						South East Asia					
1st Quartile	Australia	0.06	0.05	0.06	0.05	0.06	0.06	0.06	0.04	0.05	0.05
Median	Australia	0.10	0.10	0.10	0.10	0.11	0.13	0.12	0.10	0.12	0.13
3rd Quartile	Australia	0.19	0.16	0.19	0.24	0.24	0.31	0.33	0.29	0.28	0.33
No. of Firms	Australia	60	67	70	74	86	93	97	115	124	124
1st Quartile	New Zealand	0.07	0.06	0.06	0.07	0.09	0.08	0.09	0.07	0.06	0.07
Median	New Zealand	0.10	0.09	0.10	0.12	0.15	0.15	0.14	0.13	0.13	0.14
3rd Quartile	New Zealand	0.15	0.13	0.13	0.24	0.26	0.26	0.26	0.25	0.30	0.31
No. of Firms	New Zealand	11	13	13	20	26	32	32	33	35	35
1st Quartile	Indonesia	0.10	0.10	0.08	0.08	0.13	0.17	0.10	-0.03	0.11	0.02
Median	Indonesia	0.19	0.16	0.18	0.19	0.24	0.24	0.20	0.13	0.18	0.11
3rd Quartile	Indonesia	0.36	0.26	0.22	0.23	0.27	0.29	0.29	0.31	0.28	0.21
No. of Firms	Indonesia	9	9	11	14	22	25	26	26	25	21
1st Quartile	Malaysia	0.09	0.08	0.07	0.09	0.08	0.09	0.08	0.04	0.06	0.07
Median	Malaysia	0.11	0.13	0.12	0.13	0.12	0.14	0.15	0.13	0.20	0.14
3rd Quartile	Malaysia	0.16	0.18	0.18	0.21	0.21	0.22	0.25	0.25	0.32	0.28
No. of Firms	Malaysia	41	43	48	50	57	62	66	68	70	68
1st Quartile	Philippines	0.11	0.09	0.07	0.10	0.13	0.16	0.12	0.11	0.11	0.09
Median	Philippines	0.25	0.19	0.22	0.28	0.27	0.33	0.23	0.20	0.18	0.17
3rd Quartile	Philippines	0.34	0.35	0.36	0.40	0.38	0.45	0.39	0.33	0.32	0.26
No. of Firms	Philippines	9	10	11	15	24	27	24	22	23	27
1st Quartile	South Korea	0.06	0.06	0.05	0.05	0.05	0.04	0.03	0.06	0.06	0.03
Median	South Korea	0.07	0.08	0.07	0.08	0.08	0.06	0.05	0.09	0.10	0.07
3rd Quartile	South Korea	0.09	0.09	0.10	0.11	0.10	0.09	0.07	0.13	0.14	0.13
No. of Firms	South Korea	25	27	40	42	44	50	56	55	65	72
1st Quartile	Thailand	0.14	0.12	0.06	0.11	0.13	0.11	0.04	0.09	0.03	0.05
Median	Thailand	0.15	0.14	0.12	0.16	0.22	0.17	0.16	0.40	0.11	0.13
3rd Quartile	Thailand	0.31	0.18	0.22	0.27	0.39	0.30	0.25	0.71	0.28	0.27
No. of Firms	Thailand	8	10	17	22	27	30	30	30	30	29

Sources: Worldscope database; and IMF staff calculations.

1/ Number of times.

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(All amounts in Chilean pesos)

Tax	Nature of Tax	Exemptions and Deductions	Rates
I. Central Government			
1. Taxes on net income and profits			
1.1 Tax on corporations			
1.1.1 Corporate income tax	A tax on earned income by corporations called First Category Tax. Paid on income from manufacturing, commerce, mining and other extractive activities, real estate, services and activity of agricultural enterprises. In agriculture, income of farmers whose annual sales do not exceed 8,000 UTM and who own the land they work, is presumed to be 10 percent of the value of fixed capital. For those farming land that they do not own, income is presumed to be 4 percent of the fixed capital. Income from nonagricultural real estate is presumed to be 7 percent of its value. Companies whose average monthly income over the latest three years was less than 250 UTM can opt for a simplified system according to which they pay the tax on the sum of distributed profits and the differences in company's own capital between the beginning and the end of the year.	Companies that declare this tax on the basis of detailed accounts can take credit of 4 percent on investment in fixed capital, up to a total of 500 UTM. 1/ **Exempt:** General government, municipalities, savings, social security and mutual-assistance associations, central bank, charitable institutions. Companies in Region 12XMagellan and Antarctic, and companies in Duty Free Zones.	15 percent. Rate will increase to 16 percent for the 2003 tax year, and then to 16.5 percent and 17 percent for the 2004 and 2005 tax years, respectively.
1.1.2 Tax on indirect distributions (Article 21 DL 824)	A tax on cash payments by corporations and payers of the tax referred to in (1.5) for expenses not considered necessary. Also taxable are loans made by partnerships to their individual partners.		35 percent.
1.2 Tax on financial income (Article 20, No. 2, DL 824)	A tax on resident individuals, applicable to income generated by the ownership of shares of foreign corporations.	None.	15 percent. Rate will increase to 16 percent for the 2003 tax year, and then to 16.5 percent and 17 percent for the 2004 and 2005 tax years, respectively.
1.3 Special taxes on small business			
1.3.1 Tax on small artisan miners	A tax on miners who have at most five employees, and on partnerships or cooperatives of at most six miners. The base is the net sales of minerals.	None.	A variable rate between 1 percent and 4 percent which depends on the world price of minerals.
1.3.2 Tax on street vendors	A fixed tax on street vendors	None.	Market vendors, half UTM per year. Stationed vendors, half UTM per year.
1.3.3 Tax on newsstands	A tax on vendors of newspapers, magazines, and related printed material.	None.	0.5 percent of the value of the sales. If also selling cigarettes, lotteries, etc., add 1/4 UTM per year.

(All amounts in Chilean pesos)

Tax	Nature of Tax	Exemptions and Deductions	Rates
1.3.4 Tax on small workshops	A tax on sole proprietors of small workshops.	None.	3 percent of gross revenue (1.5 percent if predominant source of income is production of goods), due monthly. Annual make-up payment required if sum of inflation-adjusted payments fall short of two December UTMs.
1.3.5 Tax on small fishing enterprises	A tax on small fishing enterprises operating one or two boats.	None.	0.5 UTM if gross tare is under 4 tons; 1 UTM if gross tare is between 4 and 8 tons; 2 UTM if gross tare is between 8 and 15 tons.
1.4 Taxes on income of mining and transportation companies			
1.4.1 Tax on income of miners	When not determined according to (1.1.1) or (1.3.1), for miners with annual sales not exceeding 36,000 tons of nonferrous minerals and/or 6,000 UTA (2,000 UTA beginning with the 2003 tax year) the income is imputed by applying a factor on net sales. For copper, gold and silver the factor varies between 4 percent and 20 percent, depending on the world price of these metals. For other minerals the factor is 6 percent. The scheme includes the sales of processed minerals, provided they are mostly of own extraction.	None.	16 percent of net income.
1.4.2 Tax on income of transportation companies	Net income of city or road transportation companies (either passengers or cargo) whose annual sales do not exceed 3,000 UTM is imputed as 10 percent of the value of the vehicle.	None.	16 percent of net income.
1.5 Additional tax on foreign residents	A tax on the income from Chilean sources made available to nonresidents. Tax base includes royalties, technical assistance, interest paid by nonfinancial entities, insurance premia, earnings of Chileans living abroad, and remittances of foreign investors under the Foreign Investment Statute (DL 600).	**Exempt:** new equity originated from taxed profits; return of capital; interest on debt of government, central bank, CODELCO, and on Latin American Banking Acceptances; payments abroad for freight insurance services (not premia), telecommunications, and processing of Chilean products.	35 percent general. 30 percent on amounts paid to nonresidents for the use of trademarks, patents, formulas and advisory services. 20 percent on personal work in scientific, cultural and sport activities; on engineering services performed abroad; and on movie and television rights. 5 percent on gross value of foreign participation on ship freights, to and from Chile, granted exemption on the basis of reciprocity. 4 percent on interest earned on deposits in authorized financial institutions, loans granted by foreign banks, bonds and debentures denominated in foreign currency, and bonds, debentures and other paper denominated in foreign currency issued by the Government of Chile or the Central Bank of Chile. Foreign investors under the Foreign Investment Statute (DL 600) may opt, when signing the initial investment contract, for a 42 percent tax rate that is guaranteed for a period of 10 years. **Tax credit** of 0, 10 or 15 percent of the amount remitted, according to the rate at which it was taxed.

(All amounts in Chilean pesos)

Tax	Nature of Tax	Exemptions and Deductions	Rates
1.6 Tax on state-owned enterprises (Decree-law 2,398)	A surtax applies to state enterprises	**Exempt**: the central bank, enterprises organized as stock corporations, and enterprises belonging in part to the private sector.	40 percent on the share of the state in profits.
1.7 Taxes on individuals			
1.7.1 Personal income tax (Decree-law 824)	The personal income tax, called Second Category Tax, paid on income from wages, salaries, bonuses, and all other revenue ratios for personal services, pensions, and income obtained through representation expenditures. For farm workers, income base is the same as that used for Social Security Contributions. All income earned by individuals is subject to a Global Complementary Tax at the same rates as the Second Category Tax. All taxes paid before on the same income (First Category, fees, etc.) are netted out to determine the Net Complementary Tax due.	**Exemptions**: Income up to 13.5 UTM. **Deductibles**: 20 percent of investment in shares if by December 31, the investment took place more than 360 days ago; up to 50 UTA, 50 percent, and then 20 percent, of dividends from corporations and capital gains or losses from sale of equity; for taxpayers covered by Art. 57 bis b), average effective rate applied to the year's net savings; if net savings is less than zero, tax must be paid.	**Income Classes 2/** **Percent Rate for 2002** 10–30 UTM 5 30–50 UTM 10 50–70 UTM 15 70–90 UTM 25 90–120 UTM 33 120–150UTM 39 Over 150 UTM 43 Income of farm workers in excess of 10 UTM 3.5
1.7.2 Tax on taxi-drivers	Instead of the tax referred in (1.7.1) taxi drivers who do not own the car pay a fixed monthly tax.	None.	3.5 percent on the value of two UTMs.
2. Social security contributions	Private social security system is funded by a levy on all civilian wages and salaries. Additional levy required to purchase invalidity and survival insurance. There are various differentiated rates for persons still in the public security system. There is no tax on employers.	**Exempt**: military personnel; remuneration in excess of 60 UF. 3/	10 percent for pensions and 3.5 percent for insurance.
	Health insurance	**Exempt**: remuneration in excess of 60 UF.	7 percent.
3. Property taxes			
3.1 Net wealth tax	None.		
3.2 Additional real estate tax	A surtax to the municipal real estate tax (II.1) is imposed by the General Government. The surtax applies to nonfarm real estate. It is collected together with the municipal tax.		
	(i) For municipalities that have agreed to the reappraisal of real estate:	**Exempt**: houses valued at less than Ch$36.5 million (2002 prices).	0.025 percent of municipal real estate tax.
	(ii) For other municipalities, until December 31, 1999 or the date municipal authorities agree to the reappraisal of real estate, whichever is earlier:	**Exempt**: houses valued at less than Ch$20.4 million (2002 prices).	30 percent of municipal real estate tax.
3.3 Tax on gifts and inheritance	A progressive tax on net wealth obtained through gift or	**Excluded from the base**: low-valued houses and	**Value of Inheritance**

(All amounts in Chilean pesos)

Tax	Nature of Tax	Exemptions and Deductions	Rates
(Law 16,271)	rights of inheritance. The tax is to be paid within two years from the date the transfer was effective.	forests. **Exemptions**: spouses, parents, children up to 50 UTA for inheritance, up to 5 UTA for gifts; relatives up to fourth degree up to 5 UTA for gift and inheritance.	**of Gift** — **Percent Rate** Up to 80 UTA — 1.0 From 80 to 160 UTA — 2.5 From 160 to 320 UTA — 5.0 From 320 to 480 UTA — 7.5 From 480 to 640 UTA — 10.0 From 640 to 800 UTA — 15.0 From 800 to 1,200 UTA — 20.0 More than 1,200 UTA — 25.0 **Surcharge**: spouses, parents, children exempt; relative up to fourth degree, 20 percent; other relatives, 40 percent.
4. Taxes on goods and services			
4.1 Value-added tax (Tit. II of DL 825)			
4.1.1 General value-added tax	A comprehensive and uniform tax on sales of goods and services. Includes construction industry (Law 18,630), sales to government, and importation.	**Exempt sales**: in-kind payments to employees, food provided on premises to employees and students, nonadvertisement income of television and radio stations, news services, mass transportation, schooling, charges by state hospitals and health institutions, sales by Casa de Moneda, state lottery, used cars (see 4.1.3). **Exempt imports**: defense and police weaponry and supplies, effects belonging to diplomats and employees of international organizations, donations to qualified institutions, tourists effects, in-transit items, inputs to be used in production for exportation, capital goods for qualified projects, artistic, cultural and sport performances and awards, international freight and travel, some international insurance premia, receipts subject to the income tax (such as interest, rents, personal services). **Deductions from the base**: rebates granted to buyers after sale, and refunds, net of canceled purchases. Tax credit granted for the tax paid on purchases of goods and services. **Exports not taxed**; reimbursement still granted for tax paid on purchases of inputs for exports. Advance tax credits can be granted on purchases related to qualified export-oriented projects, deductible from VAT credits on actual exports when the project comes on stream.	18 percent.
4.1.2 Additional value-added tax on luxuries	Besides being subject to the general VAT tax, some goods are subject to an additional tax with a structure similar to the general VAT.	Tax credit granted for the additional tax paid on purchases of goods subject to the additional tax.	15 percent for jewelry, precious stones, fine furs, and tapestry, trailers, caviar, fireworks, airguns. 15 percent on wine, and 13 percent on nonalcoholic beverages. Liquors, pisco, raw brandy, and distillates: from March

I. Summary of Tax System as of May 2002

(All amounts in Chilean pesos)

Tax	Nature of Tax	Exemptions and Deductions	Rates
			2003, a single rate of 27 percent will apply to all these products, but as of May 2002 the rate for liquors was 28 percent and that for distillates 33 percent.
4.1.3 Tax on sales of used automobiles	A tax on the sales of used motor vehicles, which excludes the VAT (but VAT is due if vehicle is bought abroad).	**Exempt**: mass transportation vehicles, trucks, vans, and pickups (provided driver and cargo compartments are not the same).	0.5 percent of the transaction price. Starting on January 1999 this tax started to be levied by municipalities.
4.1.4 Tax on imported cars (I)	The importation of motor vehicles, assembled or not, is subject to this addition to VAT. The base of the tax is the import value.	**Exempt**: passenger vehicles with 15 or more seats, tractors, trailers, other classified in position 87.03 of tariff, automobiles of less than 1,500 cc. Tax rate is lower for small pickup trucks.	Applciable to small trucks and buses. Rate =(cc x 0.03 - 45), where cc stands for number of cubic cm of piston displacement, with a 75 percent rebate on the tax rate, with a maximum effective rate of 15 percent.
4.1.5 Tax on imported cars (II)	In addition to the tax (4.1.4), the importation of motor vehicles, assembled or not, for passengers or cargo, which can carry up to 2,000 kg is subject to this addition to VAT. The base is the import value in excess of US$15,740.21	The exemption list is the same as for (4.1.4).	85 percent.
4.2 Selective excises			
4.2.1 Tax on tobacco	A tax on sales of cigarettes, cigars and processed tobacco. The tax base is the consumer price (with the inclusion of the tax itself).	**Exempt**: small amounts brought by passengers for self-consumption; exports.	45.4 percent on cigarettes, 42.9 percent on tobacco products, 46 percent on cigars. Starting in January 1999 these rates changed respectively to 50.4 percent, 47.9 percent and 51 percent.
4.2.2 Surcharge on tobacco	A surcharge on sales of tobacco.	**Exempt**: small amounts brought by passengers for self-consumption; exports.	10 percent.
4.2.3 Tax on gasoline and diesel	A tax on the first sale or importation of gasoline and diesel oil.	In the case of diesel oil, a tax credit is given against the VAT if the vehicle is not used for transportation.	4.4084 UTM per cubic meter of gasoline. 1.5 UTM per m3 of diesel oil. The rate on gasoline increased to 5.2 on January 2000 and will increase to 6 on January 2001.
5. Taxes on international transactions			
5.1 Import duties			
5.1.1 General tariff	A general and uniform tariff. The base is the customs value; if unknown, the c.i.f. value. The tax is assessed in U.S. dollars.	**Exempt**: boat engines and worktools for small fishery and imports for use in Region XII (for South) enjoying preferential treatment. **Reduced rate**: special vehicles for the handicapped pay half the normal rate.	7 percent normal, 3.8 percent on imports to free zone (rate valid from April 1, 2001 to March 31, 2002). In 2003 the normal rate will be reduced to 6 percent. Surtaxes ranging from 5 percent to 24 percent and countervailing duties can be imposed on import prices intended to seriously harm domestic industry. If imported goods are used as input of export goods, the exporter can claim return of the tax paid. The tax on the import of capital goods can be deferred up to seven years.
5.1.2 Fee on exempt imports (Article 221 Law 16,840)	A charge ("tasa de despacho") imposed on all goods exempt of custom duties.	None.	5 percent on c.i.f. value.
5.1.3 Equalization duties	Duties on the importation of certain commodities adjusted	None.	Rates fluctuate in response to the changing prices of each

(All amounts in Chilean pesos)

Tax	Nature of Tax	Exemptions and Deductions	Rates
(Article 12 Law 18,525)	so as to keep the domestic prices of wheat, oilseeds, cooking oil and sugar within a band related to past world prices. These price bands are revised annually.		commodity in world markets.
5.2 Export duties	None.		
5.3 Other customs duties	Chile also has the following customs revenues, not detailed here: extension of provisional admissions of foreigners (DEC.Hac.175/74), charge for storage in private warehouses prior to payment of duties (Article 140 ss. Ord), consular rights on ships and airplanes, balance of insurance policies, outturn of customs actions.		
6. Other taxes			
6.1 Stamp duties (see also 5.1.2)			
6.1.1 Tax on credit instruments	A tax on financial papers. The specific amounts, expressed in Chilean pesos, are revised twice a year according to inflation.	None.	Per check drawn on domestic banks Ch$132. Per check issued without enough provision, or per unpaid draft of promissory note: 1 percent of value, minimum Ch$2,201. For checks only, a maximum of one UTM. Credit instruments: 0.1 percent of value, per month, maximum 1.2 percent. Starting on January 2002 these rates will change respectively to 0.134 percent and 1.608 percent. Contracts at call: 0.5 percent. Starting on January 2002 this rate will increase to 0.67 percent.
6.2 Fee on mining licenses (Law 18,248)	A tax on rights of exploration and mining concessions.	None.	Rights of exploration: one-time payment of 2 percent of one UTM depending on extension of land. Mining concessions: 10 percent of one UTM per hectare per year.
6.3 Taxes on gambling	Three taxes are imposed on games of chance: (i) a tax on the selling price of the sport lottery (Sistema de Pronosticos Deportivos), not including the tax itself; and on the tickets of the national lottery system (Polla Chilena de Beneficiencia and the Concepcion lottery). (ii) a specific tax on each individual admission at casinos; (iii) an ad-valorem tax on horse racing bets.		15 percent on lotteries. 0.07 x 1 UTM per casino admissions. 3 percent on horse racing bets.
6.4 Taxes on civil registration	A tax on the issuance of certificates of birth, marriage, residence of aliens, criminal records, police ID, family data, passportsX details not available.		
II. Municipalities			
1. Real estate tax	Annual tax on value of real estate land. 40 percent of the proceeds is distributed to the municipality of origin and 60 percent goes to a common fund, which in turn is distributed according to social criteria.	**Exempt**: houses valued at less than Ch$10.2 million (2002 prices).	Once reappraised, 1.4 percent if value exceeds Ch$36.5 million; and 1.2 percent if value is below Ch$36.5 million.

I. Summary of Tax System as of May 2002

(All amounts in Chilean pesos)

Tax	Nature of Tax	Exemptions and Deductions	Rates
2. Motor vehicle duties	Two fees are imposed on motor vehicles: (i) a fee on motor vehicle permits, paid annually. (50 percent of proceeds goes to the municipalities' common fund.)	None.	On a progressive scale according to the vehicle's value.
	(ii) a fee on motor vehicles transactions (50 percent of proceeds goes to the municipalities' common fund).		1 percent of the vehicle's value.
3. Business duties	A fee charged for vehicle permits, paid annually. (100 percent of proceeds goes to the municipalities' common funds).	None.	

Sources: Ministry of finance, *Dirección de Presupuestos, Cálculo de Ingresos Generales de la Nación Correspondiente al Año 2002*, Santiago: November 2001 and information provided by the Chilean authorities.

1/ UTA stands for *Unidad Tributaria Anual* (annual tax unit), and corresponds to 12 times the value of a December's UTM (*Unidad Tributaria Mensual*) or monthly tax unit. The UTM is adjusted each month according to the change in average price level in the second-past month. In December 2001 one UTM was worth Ch$28,624 and reflected changes in the price level as per December 31, 2001.

2/ The monthly withheld tax on labor income is computed using the same progressive schedule, but using UTM instead of UTA. Beginning with the 2003 tax year, these rates will be effectively lowered, as the brackets will refer to income in excess of the 13.5 UTM exemption, and the marginal rates for the top 3 brackets will be lowered by 1, 2, and 3 percentage points, respectively.

3/ UF stands for *Unidad de Fomento*, a price reference unit widely used in financial contracts which is adjusted daily. A schedule from the 10th of each month to the 9th of the subsequent month reflects changes in the price level in the previous month. On December 31, 2001, one UF was worth Ch$16,262.66 and reflected changes in the price level as per December 31, 2001.

CHILE: MAIN MONETARY AND BANKING MEASURES IN 2001

January

18

At its monthly monetary policy meeting, the Board of the central bank decided to reduce the policy interest rate by 25 basis points from UF+5.0 percent to UF+4.75 percent. The liquidity credit line rates were also adjusted by 25 basis points, to UF+4.75 percent, UF+6.75 percent and UF+8.75 percent. Similarly, the liquidity deposit rate was lowered to UF+3.75 percent.

18

Law No. 19,705 (law on takeover bids) included amendments to Decree Law No. 3,500 on Pension Funds, which made it necessary to coordinate the central bank's regulations in this area with the legislation. The main amendments were: to authorize pension fund administrators (AFPs) to invest up to 5 percent of a Type 1 fund in mutual fund shares; to eliminate the distinctions between different types of investment fund shares, authorizing AFPs to invest up to 25 percent of a Type 1 fund in investment fund shares and mutual fund shares; and to increase the limit on investment of Type 1 funds in shares of open corporations from 37 percent to 40 percent, and the limit on investment of Type 1 funds in shares of open real estate corporations from 10 percent to 40 percent.

February

20

Institutions with a deficit on their current account for purposes of No. 8 of Title II of Chapter III.H.2 of the Compendium of Financial Regulations that have been so informed by the central bank by 5:10 p.m. of the day in question are permitted to seek interbank loans and funds from the Monetary Operations Department between 4:50 p.m. and 5:10 p.m. for the sole purpose of covering said deficit. The special financing facilities will be charged against the liquidity credit line and will bear a rate equivalent to the rate on the third tranche. Alternatively, such institutions may approach the Monetary Operations Department during the same time frame to enter into a repo through the central bank's promissory note window, the rate on said operation being the rate on the second tranche of the liquidity credit line. These measures form part of a gradual move toward the establishment of a Real-Time Gross Settlement System (RTGS).

At its monthly monetary policy meeting, the Board of the central bank decided to reduce the policy interest rate by 25 basis points from UF+4.75 percent to UF+4.50 percent. The liquidity credit line rates were also adjusted by 25 basis points, to UF+ 4.50 percent, UF+6.50 percent and UF+8.50 percent. Similarly, the liquidity deposit rate was lowered to UF+3.50 percent.

March

02

In a special session, the Board of the central bank decided to reduce the policy interest rate by 50 basis points from UF+4.50 percent to UF+4.00 percent. The liquidity credit line rates were also adjusted by 50 basis points, to UF+4.00 percent, UF+6.00 percent and UF+8.00 percent. Similarly, the liquidity deposit rate was lowered to UF+3.00 percent.

20

Savings and loan cooperatives supervised by the Superintendency of Banks and Financial Institutions were authorized to open and maintain housing savings accounts as long as they met the following requirements: risk-based capital ratio of at least 10 percent and basic capital ratio of at least 5 percent; legal reserves exceeding the equivalent of UF 400,000; compliance with the mismatch limits (*normas de calce*); and authorization of the Superintendency of Banks and Financial Institutions.

April

10

At its monthly monetary policy meeting, the Board of the central bank decided to reduce the policy interest rate by 25 basis points from UF+4.00 percent to UF+3.75 percent. The liquidity credit line rates were also adjusted by 25 basis points, to UF+3.75 percent, UF+5.75 percent and UF+7.75 percent. Similarly, the liquidity deposit rate was lowered to UF+2.75 percent.

June

12

At its monthly monetary policy meeting, the Board of the central bank decided to reduce the policy interest rate by 25 basis points from UF+3.75 percent to UF+3.50 percent. The liquidity credit line rates were also adjusted by 25 basis points, to UF+3.50 percent, UF+5.50 percent and UF+7.50 percent. Similarly, the liquidity deposit rate was lowered to UF+2.50 percent.

13

The requirement that loans originating in repo operations between banking institutions established in Chile and involving instruments denominated, indexed or payable in foreign currencies must be denominated in the same currency as the original loan, was eliminated. The purpose of this measure is to broaden this type of operations without increasing the risk involved, which remains covered by the mismatch limits.

July

06

Owing to the additional auction of US$1 billion in PRDs (dollar-indexed promissory notes), the Board of the central bank decided that, in the case of long-term instruments (PRCs—indexed promissory notes payable in coupons), auctions for terms of 10, 12, and 14 years would be suspended and only auctions for terms of 8 and 20 years would be maintained.

26

The Board of the central bank decided that as of the reserve requirement period beginning August 9, 2001, the monetary policy interest rate would be defined in nominal terms, that is, as a percentage of a value in pesos rather than in UFs. The same would apply to rates for liquidity lines of credit and deposits. The annual nominal interest rate corresponding to the annual monetary policy rate of UF+3.5 percent was set at 6.5 percent. This takes into consideration a real interest rate target of 3.5 percent and a projected inflation target of 3 percent, equal to the center of the target range for inflation.

August

13

With a view to facilitating the financial system's transition to the new nominalized monetary policy rate, the Board of the central bank decided to raise the maturity mismatch threshold for asset and liability operations in domestic currency temporarily, i.e., for 270 days.

25

The frequency of adjustment of the annual interest rate payable on the indexed principal of Term Savings Accounts and Term Savings Accounts with Deferred Withdrawal was increased from once per quarter to monthly, and the prior notice for rate changes was reduced from ten to five days. The aim in making this regulation more flexible was to adjust these savings products to the new monetary policy implemented by the central bank, thus allowing financial institutions to better deal with the increased volatility of rates on deposit instruments denominated in UF, owing to the need to coordinate them with nominal deposit rates, which fluctuate in line with the changes in the policy rate.

September

01

The Central Bank of Chile was integrated into Chile's Formal Secondary Market for transactions in pension fund securities when it offered to purchase securities through a system in which bidders participated simultaneously in determining the prices of the

securities they were trading, as long as these operations were regulated by general regulations and there was timely reporting of the date of purchase of the securities and the volume and price of the transactions (open market operations).

07

The interest rate on deposits of banks and finance companies in the Technical Reserve Deposit Account was adjusted, and it was specified that the rate would be equivalent to the interest rate on the first tranche of the liquidity credit line less 200 basis points.

10

The regulation governing indexation payments on Term Savings Accounts and Term Savings Accounts with Deferred Withdrawal was tightened, establishing that such deposits had to be held for a minimum of 90 days to be eligible for indexing and, regarding the calculation and payment of indexation amounts, that withdrawals had to be charged to the deposit(s) in reverse chronological order. It was decided that this restriction would apply only to those deposits made as of the date of publication of this measure, and financial institutions were granted the option of continuing to apply the regulation in force prior to that date during the twelve months following that date. The aim of this measure was to adjust these savings products to the new monetary policy implemented by the central bank by restricting the use of these accounts for hedging purposes.

Similarly, the time frame allowed financial institutions to change the interest rate payable on the balances maintained in said savings accounts in order to adjust it to the change in the CPI in the previous month was increased from one to ten days.

October

13

It was decided to conduct foreign currency swaps with banks and finance companies. This provided a new monetary regulation instrument that enabled the bank to conduct forex buying or selling operations on the spot market while simultaneously executing reverse operations on the forward market, thus injecting or withdrawing domestic currency resources for the duration of the operation.

November

06

With the start-up of the open market operations system, via electronic mail, the regulations governing window sales and auctions of all promissory notes issued by the central bank for monetary regulation purposes were amended to adjust them to this new method of executing transactions, ending with the receipt of bids on special forms designed for that purpose.

CHILE: MAIN EXCHANGE AND FOREIGN TRADE MEASURES IN 2001

April

19

During the 1990s, the Central Bank of Chile began a process of gradual exchange liberalization that culminated on April 19 with the elimination of the remaining exchange restrictions and entry into force of a new Compendium of International Exchange Regulations. The new regulations eliminated foreign exchange restrictions that had hitherto affected investment and financing decisions, giving full application to the principle of exchange rate liberalization set out in the Organic Constitutional Law of the Central Bank of Chile (LOC) for international exchange transactions. The most important of these include:

1. The prior authorization requirement for external loans obtained directly or through the issuance of bonds placed abroad, as well as for deposits from abroad, and the obligation to surrender foreign exchange received from abroad and brought into the country for purposes of investment or capital contributions.

2. The system of accreditation and control on the right of access to the Formal Exchange Market granted by the Central Bank, in compliance with the afore-mentioned requirements for prior authorization or surrender (as appropriate), for the payment or transfer abroad of the foreign exchange corresponding to capital, interest, indexation adjustments or profits obtained on credit operations, deposits, capital contributions or investments from abroad.

3. The requirements to be met before residents could make foreign currency remittances for the purpose of foreign investment, capital contributions, loans or deposits, further amending the regulations applicable to the return of foreign exchange associated with such operations, for purpose of capital, interest, indexation adjustments or profits received.

4. The requirements to be met for the recording and authorization of special clauses in foreign loan contracts containing foreign payment or remittance obligations different from those contemplated in the pertinent regulations, which, upon approval, would generate the corresponding right to access the Formal Exchange Market in the event the recorded conditions materialized, making it possible to fulfill the respective payment or remittance obligation.

5. The minimum weighted risk classification and maturity restrictions for the issuance of bonds.

6. The limitations on the currency in which external debt may be issued or contracted.

7. The regulations applicable to the agreements referred to in Article 47 of the LOC on the entry of foreign exchange into the country, with a view to establishing the exchange

regime applicable to the purchase of shares in open corporations or shares in investment funds governed by Law 18,815 through the issuance of securities representing said shares for trading on official exchanges abroad or other trading. Henceforth, the operations described are considered investments from abroad and are governed by the regular provisions applicable to said investments.

8. The reserve requirement on foreign capital (previously set at zero).

Despite the elimination of the exchange restrictions, for information purposes, the central bank has maintained the requirement that certain transactions be made through the Formal Exchange Market. The exception to this is payments related to foreign trade, for which all transactions may be made through the Informal Exchange Market, in which case the information should be reported directly to the central bank. The reporting requirements are set out in the Manual of Reporting Procedures and Forms which should be used in conjunction with the new Compendium of International Exchange Regulations.

July

06

In light of the growing instability of the international financial markets, which has led to greater volatility in the value of the Chilean peso and other currencies in the region, resulting in greater demand for exchange risk hedging instruments, the Central Bank of Chile considered it useful to increase the issuance of PRDs during the second half of the year with a view to satisfying said demand. It, therefore, announced the auction of an additional approximate US$1 billion. Similarly, during the second half of the year, the central bank decided to offer an early swap option for paper that was near maturity.

August

16

To enhance the stability of the country's financial markets, in light of persistent negative external conditions, the Board of the central bank adopted the following measures:

1. Increase the supply of PRDs during the rest of the year for a total of up to US$2 billion over and above the amounts previously announced.

2. Target up to US$2 billion in international reserves to finance foreign exchange sale operations, which could be carried out on the exchange market.

Table 1. Chile: Aggregate Demand and Supply

	1996 1/	1997	1998	1999	2000	2001
	I. Annual Percentage Change (At current prices)					
Aggregate demand	...	11.4	5.5	0.1	11.3	6.2
Domestic expenditure	...	11.6	6.4	-3.3	9.3	3.7
Private sector	...	11.9	6.0	-3.8	8.5	5.6
Consumption	...	11.1	7.9	1.0	7.7	5.6
Investment	...	14.4	0.7	-18.4	11.7	5.4
Public sector	...	12.9	7.4	1.8	5.3	8.7
Consumption 2/	...	12.7	8.7	9.3	8.6	8.0
Investment	...	13.4	4.4	-16.0	-5.1	11.1
Change in inventories 3/	...	-0.3	0.2	-0.5	1.4	-2.3
Exports 4/	...	10.4	2.2	13.4	17.8	14.0
Aggregate supply	...	11.4	5.5	0.1	11.3	6.2
Gross domestic product	...	11.2	5.2	1.7	8.8	4.3
Imports 4/	...	12.1	6.5	-5.6	20.2	12.4
Memorandum items:						
GNP at market prices	...	11.3	6.1	1.4	7.5	4.3
GDP deflator	...	4.3	1.9	2.7	4.2	1.5
	(At constant 1996 prices)					
Aggregate demand	...	8.1	4.1	-3.0	6.2	1.8
Domestic expenditure	...	7.2	3.7	-5.7	5.9	-0.7
Private sector	...	7.6	3.8	-5.6	5.3	1.3
Consumption	...	6.6	4.7	-1.0	3.5	1.4
Investment	...	10.7	1.2	-18.8	11.6	1.1
Public sector	...	7.0	3.1	-3.4	0.7	3.7
Consumption 2/	...	5.8	2.2	2.5	2.8	2.7
Investment	...	9.7	4.9	-16.4	-5.1	6.5
Change in inventories 3/	...	-0.2	0.1	-0.5	1.3	-2.3
Exports 4/	...	11.2	5.2	6.6	7.5	9.7
Aggregate supply	...	8.1	4.1	-3.0	6.2	1.8
Gross domestic product	...	6.6	3.2	-1.0	4.4	2.8
Imports 4/	...	13.2	6.7	-9.3	12.6	-1.3
Memorandum items:						
GNP at market prices	...	6.6	4.1	-1.3	3.1	3.4
GNP adjusted for terms of trade effects	...	6.6	3.3	-0.7	4.0	0.5
	II. Percent of Nominal GDP					
Aggregate demand and supply	129.0	129.2	129.6	127.4	130.3	132.7
Domestic expenditure	101.7	102.1	103.3	98.1	98.6	98.0
Consumption	74.3	74.4	76.4	76.8	76.1	77.3
Private sector	63.3	63.3	64.9	64.4	63.8	64.5
General government	11.0	11.1	11.5	12.3	12.3	12.7
Fixed capital formation	26.4	27.1	26.1	21.1	21.0	21.4
Private sector	21.6	22.3	21.3	17.1	17.6	17.8
Public sector	4.7	4.8	4.8	4.0	3.5	3.7
Change in inventories	1.0	0.6	0.8	0.3	1.5	-0.7
Exports 4/	27.3	27.1	26.3	29.3	31.7	34.7
Imports 4/	29.0	29.2	29.6	27.4	30.3	32.7
External resource gap (-)	-1.7	-2.1	-3.3	1.9	1.4	2.0

Sources: Central Bank of Chile; and Fund staff estimates.

1/ Due to a change in the base year for national accounts data, rates of growth are unavailable for 1996.

2/ General government.

3/ Weighted by the contribution to domestic expenditure in the previous year.

4/ Goods and nonfactor services.

Table 2. Chile: Savings and Investment

(As percent of nominal GDP)

	1996	1997	1998	1999	2000	2001
Gross domestic investment	27.4	27.7	26.9	21.3	22.5	20.7
Private investment 1/	22.6	22.9	22.1	17.4	19.0	17.0
Public investment	4.7	4.8	4.8	4.0	3.5	3.7
External savings	4.1	4.4	5.1	0.4	1.4	1.9
Gross national savings	23.2	23.3	21.8	20.9	21.1	18.8
Private savings	17.4	18.4	18.8	19.7	19.1	16.1
Public savings 2/	5.8	4.9	3.1	1.2	2.0	2.7
Gross domestic savings	25.7	25.6	23.6	23.2	23.9	22.7
Net transfers from abroad	0.7	0.6	0.6	0.6	0.6	0.6

Sources: Central Bank of Chile; and Fund staff estimates.

1/ Includes changes in stocks.

2/ Includes central bank losses.

Table 3. Chile: Sectoral Origin of GDP

(At constant 1996 market prices)

	1996 1/	1997	1998	1999	2000	2001
	(Billions of Chilean pesos)					
GDP at market prices	31,237.3	33,300.7	34,376.6	34,040.6	35,533.4	36,533.0
Agriculture and forestry	1,323.5	1,345.5	1,412.5	1,387.2	1,456.3	1,524.4
Fishing	382.9	419.4	393.5	418.7	471.2	528.5
Mining	2,089.4	2,325.1	2,517.7	2,798.1	2,944.4	3,050.7
Manufacturing	5,468.3	5,727.1	5,595.4	5,521.4	5,740.3	5,722.1
Electricity, gas, and water	889.4	963.0	1,005.5	988.3	1,132.0	1,214.8
Construction	2,911.7	3,094.2	3,152.3	2,838.2	2,844.8	2,952.5
Commerce	3,477.2	3,739.9	3,872.6	3,679.7	3,790.4	3,904.1
Transport, storage, and communications	2,004.2	2,222.0	2,369.6	2,384.9	2,576.5	2,727.9
Financial services	3,785.8	4,054.5	4,296.4	4,269.2	4,440.0	4,557.2
Other services 2/	8,904.9	9,410.1	9,761.2	9,754.9	10,137.6	10,350.8
	(Annual percentage change)					
GDP at market prices	...	6.6	3.2	-1.0	4.4	2.8
Agriculture and forestry	...	1.7	5.0	-1.8	5.0	4.7
Fishing	...	9.5	-6.2	6.4	12.5	12.2
Mining	...	11.3	8.3	11.1	5.2	3.6
Manufacturing	...	4.7	-2.3	-1.3	4.0	-0.3
Electricity, gas, and water	...	8.3	4.4	-1.7	14.5	7.3
Construction	...	6.3	1.9	-10.0	0.2	3.8
Commerce	...	7.6	3.5	-5.0	3.0	3.0
Transport, storage, and communications	...	10.9	6.6	0.6	8.0	5.9
Financial services	...	7.1	6.0	-0.6	4.0	2.6
Other services 2/	...	5.7	3.7	-0.1	3.9	2.1
	(As percent of total)					
GDP at market prices	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture and forestry	4.2	4.0	4.1	4.1	4.1	4.2
Fishing	1.2	1.3	1.1	1.2	1.3	1.4
Mining	6.7	7.0	7.3	8.2	8.3	8.4
Manufacturing	17.5	17.2	16.3	16.2	16.2	15.7
Electricity, gas, and water	2.8	2.9	2.9	2.9	3.2	3.3
Construction	9.3	9.3	9.2	8.3	8.0	8.1
Commerce	11.1	11.2	11.3	10.8	10.7	10.7
Transport, storage, and communications	6.4	6.7	6.9	7.0	7.3	7.5
Financial services	12.1	12.2	12.5	12.5	12.5	12.5
Other services 2/	28.5	28.3	28.4	28.7	28.5	28.3

Sources: Central Bank of Chile; and Fund staff estimates.

1/ Due to a change in the base year for national accounts data, rates of growth are unavailable for 1996.

2/ Includes imputed banking charges, import duties, and value-added tax on imports.

Table 4. Chile: National Accounts at Current Prices

	1996	1997	1998	1999	2000	2001
Consumption expenditure	23,211.1	25,832.5	27,900.7	28,535.6	30,767.0	32,611.8
General government	3,426.1	3,860.5	4,197.1	4,587.0	4,981.7	5,379.2
Private sector	19,785.0	21,972.0	23,703.6	23,948.6	25,785.2	27,232.5
Gross domestic investment	8,553.6	9,626.0	9,827.4	7,931.5	9,093.8	8,727.8
Fixed capital formation	8,240.7	9,414.2	9,545.7	7,832.1	8,499.9	9,041.3
Public sector	1,478.4	1,676.5	1,750.1	1,470.1	1,395.1	1,549.7
Private sector	6,762.4	7,737.7	7,795.6	6,362.0	7,104.9	7,491.6
Change in stocks	312.9	211.8	281.7	99.4	593.8	-313.5
Domestic expenditure	31,764.7	35,458.5	37,728.1	36,467.1	39,860.7	41,339.5
External sector 1/	-527.4	-735.9	-1,193.3	697.3	575.5	852.2
Exports	8,520.5	9,404.2	9,608.6	10,897.2	12,837.8	14,630.6
Imports	-9,047.9	-10,140.1	-10,801.9	-10,199.9	-12,262.3	-13,778.4
GDP at market prices	31,237.3	34,722.6	36,534.9	37,164.4	40,436.2	42,191.8
Less: Net factor payments abroad	-1,033.0	-1,104.5	-869.6	-994.1	-1,548.4	-1,618.0
GNP at market prices	30,204.3	33,618.1	35,665.3	36,170.3	38,887.9	40,573.7
Less: Indirect taxes net of subsidies	-3,986.0	-4,346.4	-4,878.6	-4,836.9	-5,293.3	-5,480.0
GNP at factor cost	26,218.2	29,271.7	30,786.6	31,333.5	33,594.6	35,093.7
Less: Provision for consumption of fixed capital	-4,122.4	-4,424.2	-4,644.6	-5,061.7	-5,189.7	-5,657.0
NNP at factor cost = national income	22,095.8	24,847.4	26,142.1	26,271.8	28,404.9	29,436.7

Sources: Central Bank of Chile; and Fund staff estimates.

1/ Goods and nonfactor services.

Table 5. Chile: National Accounts at Constant (1996) Prices

	1996	1997	1998	1999	2000	2001
Consumption expenditure	23,211.1	24,712.8	25,779.5	25,642.3	26,513.1	26,928.6
General government	3,426.1	3,623.8	3,705.3	3,798.6	3,906.6	4,011.8
Private sector	19,785.0	21,089.1	22,074.2	21,843.7	22,606.5	22,916.9
Gross domestic investment	8,553.6	9,353.9	9,555.7	7,678.2	8,756.8	8,095.6
Fixed capital formation	8,240.7	9,109.9	9,280.7	7,575.5	8,217.7	8,379.1
Public sector	1,478.4	1,622.4	1,701.5	1,422.0	1,348.7	1,436.2
Private sector	6,762.4	7,487.6	7,579.2	6,153.6	6,869.0	6,942.8
Changes in inventories	312.9	244.0	275.0	102.6	539.1	-283.4
Domestic expenditure	31,764.7	34,066.7	35,335.2	33,320.4	35,269.9	35,024.3
External sector 1/	-527.4	-766.0	-958.6	720.2	263.5	1,508.7
Exports	8,520.5	9,474.8	9,970.4	10,631.4	11,428.3	12,531.2
Imports	-9,047.9	-10,240.9	-10,929.0	-9,911.3	-11,164.8	-11,022.4
GDP at market prices	31,237.3	33,300.7	34,376.6	34,040.6	35,533.4	36,533.0
Less: Net factor payments abroad	-1,033.0	-1,104.8	-861.5	-972.6	-1,424.2	-1,251.2
GNP at market prices	30,204.3	32,195.9	33,515.1	33,068.0	34,109.2	35,281.8
Less: Indirect taxes net of subsidies	-3,986.0	-4,168.5	-4,590.4	-4,430.3	-4,651.5	-4,745.0
GNP at factor cost	26,218.2	28,027.4	28,924.7	28,637.7	29,457.8	30,536.8
Less: Provision for consumption of fixed capital	-4,122.4	-4,281.3	-4,515.6	-4,895.9	-5,017.4	-5,242.6
Plus: Terms of trade effect	0.0	-1.1	-242.9	-19.3	266.5	-761.2
NNP at factor cost = national income	22,095.8	23,745.0	24,166.2	23,722.5	24,706.9	24,532.9

Sources: Central Bank of Chile; and Fund staff estimates.

1/ Goods and nonfactor services.

Table 6. Chile: Indicators of Mining Output

	1996	1997	1998	1999	2000	2001
	(Index, 1990 = 100)					
Total	177.6	197.1	208.3	240.6	253.9	257.3
Metallic minerals	189.8	209.4	222.9	259.3	273.5	277.7
Copper	194.5	212.6	229.3	274.4	287.5	295.3
Molybdenum	125.9	154.8	184.5	197.2	243.2	242.2
Lead	122.7	71.8	29.9	15.2	70.1	44.9
Zinc	143.2	136.6	64.3	128.3	124.9	130.3
Gold	193.1	173.9	159.3	166.0	196.8	148.8
Silver	175.2	166.2	204.2	210.8	190.2	207.4
Iron	110.1	105.9	110.5	103.5	105.8	107.1
Manganese	158.4	158.1	121.3	102.2	105.1	78.1
Nonmetallic minerals 1/	78.9	97.1	89.8	89.8	95.4	91.9
Limestone	170.7	160.4	175.1	150.0	153.5	158.6
Coal	52.6	50.2	11.6	17.1	18.4	17.6
Petroleum	46.8	43.0	41.2	39.2	34.5	33.8
	(Thousands of metric tons)					
Copper	3,115.8	3,392.0	3,686.9	4,391.2	4,602.0	4,739.0
CODELCO	1,246.7	1,326.3	1,501.0	1,615.0	1,516.0	1,592.0
Private sector	1,869.1	2,065.7	2,185.9	2,776.2	3,086.0	3,147.0
By product						
Refined copper	1,748.2	2,116.6	2,334.9	2,666.4	2,668.3	2,882.2
Blister	243.1	154.0	176.3	169.6	164.4	159.2
Other	1,124.5	1,121.4	1,175.7	1,555.2	1,769.3	1,697.6
	(Annual percentage changes)					
Total	21.5	11.0	5.7	15.5	5.5	1.3
Metallic minerals	23.3	10.3	6.4	16.3	5.5	1.5
Copper	25.2	9.3	7.9	19.7	4.8	2.7
Molybdenum	-2.7	23.0	19.2	6.9	23.3	-0.4
Lead	45.6	-41.5	-58.4	-49.2	361.2	-35.9
Zinc	1.7	-4.6	-52.9	99.5	-2.7	4.3
Gold	19.1	-9.9	-8.4	4.2	18.6	-24.4
Silver	10.1	-5.1	22.9	3.2	-9.8	9.0
Iron	7.7	-3.8	4.3	-6.3	2.2	1.2
Manganese	-10.8	-0.2	-23.3	-15.7	2.8	-25.7
Nonmetallic minerals 1/	-5.7	23.1	-7.5	0.0	6.2	-3.7
Limestone	4.0	-6.0	9.2	-14.3	2.3	3.3
Coal	-2.8	-4.6	-76.9	47.4	7.6	-4.3
Petroleum	-12.0	-8.1	-4.2	-4.9	-12.0	-2.0

Source: National Bureau of Statistics, as reported in the Monthly Bulletin of the Central Bank of Chile.

1/ Includes iodine and nitrate.

Table 7. Chile: Indicators of the Manufacturing Sector

(Annual percentage changes)

	1996	1997	1998	1999	2000	2001
Production						
Consumer goods						
Nondurables	5.8	0.3	6.8	-5.3	7.2	3.0
Durables	-1.7	0.0	-16.0	-20.2	6.7	-3.7
Transport equipment	-1.3	19.9	-17.0	-15.2	31.1	-11.5
Capital goods	7.0	18.1	4.0	-18.0	-18.0	40.0
Intermediate goods						
For industry	1.5	6.2	-1.8	7.2	6.0	1.1
For construction	8.3	6.6	2.1	-10.2	5.9	1.7
For mining	10.4	8.9	1.8	9.6	44.2	4.1
For agriculture	-18.8	-1.0	-48.8	47.8	-1.6	6.0
Packaging and accessories	12.8	0.3	2.6	3.7	6.9	4.7
Energy, fuels, and lubricants	1.0	4.4	6.3	5.3	-0.5	0.5
Office furniture	2.5	9.0	-0.3	-7.8	1.3	3.6
Sales						
Consumer goods						
Nondurables	4.2	3.7	3.0	-2.4	4.3	2.9
Durables	0.5	-2.7	-12.6	-18.1	0.8	2.1
Transport equipment	-3.4	32.2	-15.3	-12.1	20.4	-3.4
Capital goods	4.1	24.8	1.1	-16.6	-6.8	-28.0
Intermediate goods						
For industry	5.2	7.4	-1.9	10.8	-0.8	9.4
For construction	9.9	5.6	1.1	-8.0	1.0	4.5
For mining	8.8	9.9	7.9	8.7	19.3	14.5
For agriculture	-22.6	5.3	-44.5	27.2	0.3	22.0
Packaging and accessories	6.7	-1.0	5.5	4.1	3.7	7.1
Energy, fuels, and lubricants	4.9	0.2	5.9	8.6	1.0	-2.7
Office furniture	5.6	3.8	1.2	-3.2	-6.4	1.9

Source: Chilean Association of Manufacturers (SOFOFA).

Table 8. Chile: Population, Labor Force, and Employment

	1996	1997	1998	1999	2000	2001
	(In thousands of persons)					
Total population 1/	14,418.9	14,622.4	14,821.7	15,017.8	15,211.3	15,402.0
Population 15 years and older 1/	10,199.7	10,375.7	10,564.8	10,728.1	10,898.0	11,080.2
Labor force 2/	5,521.9	5,625.4	5,738.5	5,826.9	5,846.8	5,861.4
Employed 2/	5,164.0	5,281.3	5,374.8	5,255.1	5,311.1	5,326.4
Unemployed 2/	357.9	344.1	363.6	571.8	535.7	535.0
	(In percent)					
Unemployed (as percentage of the labor force)						
Total	6.5	6.1	6.2	9.7	9.2	9.1
Metropolitan Santiago Region	7.1	7.1	6.9	10.8	9.8	8.7
Participation rates						
Labor force as percentage of total population	38.4	38.5	38.3	38.6	38.5	38.4
Labor force as percentage of population over 15 years of age	54.2	54.2	53.8	54.0	53.7	52.9
	(Annual percentage change)					
Total population	1.5	1.4	1.4	1.3	1.3	1.3
Labor force	0.5	1.9	2.0	1.5	0.3	0.2
Employment	1.4	2.3	1.8	-2.2	1.1	0.3
Unemployment	-11.7	-3.9	5.7	57.3	-6.3	-0.1

Sources: National Bureau of Statistics (INE); and Fund staff estimates.

1/ Estimated level on June 30 of each year.
2/ Annual averages.

Table 9. Chile: Index of Nominal Wages

	1996	1997	1998	1999	2000	2001
	(Annual averages)					
Overall	156.3	169.9	183.3	194.0	204.2	215.0
Mining	135.7	146.5	155.7	166.9	174.5	184.3
Manufacturing	156.6	170.1	180.9	187.5	195.5	205.1
Electricity, gas, and water	145.7	155.5	166.2	176.5	182.0	191.2
Construction	148.0	150.3	156.7	150.9	160.6	167.8
Trade, restaurants, and hotels	157.9	171.5	185.9	195.5	203.6	211.9
Transportation and communications	157.6	171.8	189.1	207.1	218.8	228.7
Financial services and insurance	142.1	152.8	166.5	183.9	194.7	208.4
Social services	166.9	184.4	202.2	217.4	231.6	245.4
	(Annual percentage changes)					
Overall	11.3	8.7	7.9	5.8	5.3	5.3
Mining	11.3	8.0	6.3	7.2	4.6	5.6
Manufacturing	11.1	8.6	6.4	3.7	4.2	4.9
Electricity, gas, and water	13.5	6.7	6.9	6.2	3.1	5.1
Construction	7.1	1.6	4.2	-3.6	6.4	4.5
Trade, restaurants and hotels	10.4	8.6	8.4	5.1	4.2	4.1
Transportation and communications	8.0	9.0	10.1	9.5	5.7	4.5
Financial services and insurance	9.8	7.5	9.0	10.4	5.9	7.0
Social services	14.0	10.4	9.7	7.5	6.5	6.0
Memorandum items:						
Consumer price inflation (annual average)	7.4	6.1	5.1	3.3	3.8	3.6
Minimum wage	11.9	11.2	12.7	12.4	11.2	7.5
Real wages	4.1	2.4	2.7	2.4	1.4	1.6

Source: National Bureau of Statistics (INE).

Table 10. Chile: Consumer Price Index

(Base: December 1998 = 100)

		All Items	Food	Housing	Housing Equipment	Clothing	Trans-portation	Health	Education and Recreation	Others	Underlying Inflation Index 1/
					(Period averages, annual percentage change)						
1997		6.1	7.1	5.9		-4.7	4.9			8.5	5.5
1998		5.1	3.8	4.6	4.6	-4.0	5.5	8.4	11.7	8.9	5.8
1999		3.3	0.3	2.5	1.0	-3.2	9.0	6.1	5.7	13.7	4.0
2000		3.8	1.4	6.2	-2.4	-6.7	16.2	4.9	4.4	-2.9	2.9
2001		3.6	0.8	6.1	-0.9	-5.7	11.5	4.5	4.6	-0.1	3.1
					(End of period, annual percentage change)						
1996	December	6.6	4.1	8.6	4.6	-4.7	9.6	9.5	13.1	7.2	7.4
1997	December	6.0	9.2	4.6	4.7	-8.4	2.3	8.8	12.8	1.9	5.4
1998	December	4.7	0.6	4.4	4.0	-0.1	7.7	8.1	7.8	21.8	6.3
1999	March	4.1	-0.3	3.4	2.5	-1.8	9.9	8.0	6.2	18.6	5.5
	June	3.8	1.2	2.5	1.0	-3.5	7.4	6.8	5.7	15.6	4.2
	September	2.9	0.2	1.5	0.1	-0.9	9.6	5.1	4.6	11.9	3.2
	December	2.3	1.0	1.5	-1.1	-4.0	9.8	4.9	4.3	0.6	2.1
2000	March	3.4	1.5	3.5	-2.0	-4.4	16.0	4.7	4.3	-3.1	2.9
	June	3.7	1.8	6.1	-2.6	-8.5	15.7	4.9	4.5	-1.7	2.7
	September	4.2	1.1	7.8	-2.7	-7.7	17.3	4.8	4.7	-1.4	3.0
	December	4.5	-0.1	9.9	-2.6	-8.3	19.5	5.1	4.3	-4.6	3.4
2001	March	3.5	0.2	7.4	-1.7	-6.5	12.1	3.8	4.4	0.5	2.5
	June	3.6	0.7	5.7	-0.8	-6.3	12.9	4.0	4.4	-0.1	2.7
	September	3.9	2.2	5.4	-0.6	-5.2	11.2	5.0	4.6	-1.0	3.6
	December	2.6	2.0	3.5	0.1	-4.8	4.4	4.9	4.9	0.0	3.2
2002	March	2.6	1.6	3.2	0.5	-4.0	1.6	7.5	4.2	1.5	3.3

Source: National Bureau of Statistics (INE).

1/ Excludes fuel and fresh fruits and vegetables.

Table 11. Chile: Social Indicators

	1990	1992	1994	1996	1998	2000
Incidence of poverty 1/						
Indigent						
Total	12.9	8.8	7.6	5.8	5.6	5.7
Urban	12.4	8.6	7.1	5.0	5.1	5.3
Rural	15.2	9.8	9.8	9.4	8.7	8.3
Poor, but not indigent						
Total	25.7	23.8	19.9	17.4	16.1	14.9
Urban	26.0	23.8	19.8	16.8	15.6	14.8
Rural	24.3	23.6	21.1	21.2	18.9	15.5
Total poor						
Total	38.6	32.6	27.5	23.2	21.7	20.6
Urban	38.4	32.4	26.9	21.8	20.7	20.1
Rural	39.5	33.4	30.9	30.6	27.6	23.8
Income distribution 2/						
First quintile	4.4	4.6	4.5	4.2	4.1	3.7
Fifth quintile	56.9	56.3	55.5	56.6	56.9	57.5
Ratio of income of fifth quintile to income of first quintile	12.9	12.2	13.2	13.8	13.9	15.5
Other indicators of social welfare						
Illiteracy 3/	6.3	5.7	4.9	4.8	4.6	...
School enrollment 4/						
Elementary school (6-13 years of age)	96.8	97.4	97.6	98.2	98.3	...
Secondary school (14-17 years of age)	80.5	82.2	83.9	85.9	86.9	...
Post secondary (18-24 years of age)	24.7	26.5	29.6	33.8	...	...
Life expectancy at birth 5/ 6/	72.0	74.3	74.6	75.2	75.2	75.2
Infant mortality rate 7/	16.0	14.3	12.0	11.1	10.3	...

Source: Ministry of Cooperation and Planning (MIDEPLAN).

1/ Percent of population.
2/ Distribution of national income by quintiles of households.
3/ Percent of population over 15 years of age.
4/ Percent of the age group enrolled.
5/ Years.
6/ Estimate for 1995-2000.
7/ Per 1,000 live births.

Table 12. Chile: Summary Operations of the Central Government

	1996	1997	1998	1999	2000	2001
	(In billions of Chilean pesos)					
Total revenue	6,835.8	7,541.8	7,696.0	7,576.4	8,731.4	9,537.2
Current revenue	6,812.2	7,504.1	7,650.9	7,549.5	8,703.0	9,507.7
Tax	5,202.6	5,672.8	5,952.3	5,805.8	6,616.1	7,267.0
Nontax	1,609.6	1,831.2	1,698.6	1,743.7	2,087.0	2,240.7
Capital revenue	23.6	37.7	45.2	26.9	28.3	29.5
Total expenditure	6,100.1	6,875.5	7,729.6	8,391.1	9,106.9	9,932.2
Current expenditure	5,081.8	5,694.0	6,426.5	7,000.7	7,721.6	8,438.9
Wages	1,159.3	1,325.1	1,491.1	1,645.7	1,778.5	1,891.9
Pensions	1,698.3	1,897.7	2,144.7	2,442.0	2,684.0	2,925.5
Interest	165.9	140.6	236.2	121.3	184.6	208.0
Other	2,058.2	2,330.6	2,554.5	2,791.8	3,074.5	3,413.5
Capital expenditure	1,018.4	1,181.5	1,303.1	1,390.3	1,385.4	1,493.3
Overall surplus or deficit (-)	735.6	666.3	-33.6	-814.7	-375.6	-395.0
Current account	1,730.5	1,810.1	1,224.4	548.7	981.5	1,068.8
Capital account	-994.8	-1,143.8	-1,257.9	-1,363.4	-1,357.0	-1,463.8
	(In percent of GDP)					
Total revenue	21.9	21.7	21.1	20.4	21.6	22.6
Current revenue	21.8	21.6	20.9	20.3	21.5	22.5
Tax	16.7	16.3	16.3	15.6	16.4	17.2
Nontax	5.2	5.3	4.6	4.7	5.2	5.3
Capital revenue	0.1	0.1	0.1	0.1	0.1	0.1
Total expenditure	19.5	19.8	21.2	22.6	22.5	23.5
Current expenditure	16.3	16.4	17.6	18.8	19.1	20.0
Wages	3.7	3.8	4.1	4.4	4.4	4.5
Pensions	5.4	5.5	5.9	6.6	6.6	6.9
Interest	0.5	0.4	0.6	0.3	0.5	0.5
Other	6.6	6.7	7.0	7.5	7.6	8.1
Capital expenditure	3.3	3.4	3.6	3.7	3.4	3.5
Overall surplus or deficit(-)	2.4	1.9	-0.1	-2.2	-0.9	-0.9
Current account	5.5	5.2	3.4	1.5	2.4	2.5
Capital account	-3.2	-3.3	-3.4	-3.7	-3.4	-3.5

Sources: Ministry of Finance; and Fund staff estimates.

Table 13. Chile: Central Government Revenue

	1996	1997	1998	1999	2000	2001
	(In billions of Chilean pesos)					
Total revenue	6,835.8	7,541.8	7,696.0	7,576.4	8,731.4	9,537.2
Current revenue	6,812.2	7,504.1	7,650.9	7,549.5	8,703.0	9,507.7
Taxes	5,202.6	5,672.8	5,952.3	5,805.8	6,616.1	7,267.0
Personal and business income tax (excluding Codelco)	1,227.5	1,302.4	1,431.4	1,312.2	1,651.5	1,952.7
Value-added tax (net) 1/	2,492.1	2,726.8	2,845.4	2,811.6	3,205.9	3,423.8
Excise tax	574.3	669.0	740.1	817.8	907.7	998.1
Stamp tax	197.7	234.3	229.4	245.4	240.9	298.3
Taxes on international trade	616.7	615.7	612.8	535.5	548.6	510.2
Other taxes	94.3	124.7	93.2	83.3	61.5	83.8
Copper income (Codelco) 2/	400.6	467.5	145.2	134.4	373.8	224.3
Other current revenue	1,209.0	1,363.8	1,553.3	1,609.2	1,713.2	2,016.4
Pension contributions	403.1	449.5	496.8	527.0	576.8	628.1
Sales of goods and services	367.0	401.1	559.4	574.7	552.3	652.6
Other revenue	438.9	513.2	497.1	507.5	584.1	735.7
Capital revenue	23.6	37.7	45.2	26.9	28.3	29.5
	(In percent of GDP)					
Total revenue	21.9	21.7	21.1	20.4	21.6	22.6
Current revenue	21.8	21.6	20.9	20.3	21.5	22.5
Taxes	16.7	16.3	16.3	15.6	16.4	17.2
Personal and business income tax (excluding Codelco)	3.9	3.8	3.9	3.5	4.1	4.6
Value-added tax (net) 1/	8.0	7.9	7.8	7.6	7.9	8.1
Excise tax	1.8	1.9	2.0	2.2	2.2	2.4
Stamp tax	0.6	0.7	0.6	0.7	0.6	0.7
Taxes on international trade	2.0	1.8	1.7	1.4	1.4	1.2
Other taxes	0.3	0.4	0.3	0.2	0.2	0.2
Copper income (Codelco) 2/	1.3	1.3	0.4	0.4	0.9	0.5
Other current revenue	3.9	3.9	4.3	4.3	4.2	4.8
Pension contributions	1.3	1.3	1.4	1.4	1.4	1.5
Sales of goods and services	1.2	1.2	1.5	1.5	1.4	1.5
Other revenue	1.4	1.5	1.4	1.4	1.4	1.7
Capital revenue	0.1	0.1	0.1	0.1	0.1	0.1

Sources: Ministry of Finance; and Fund staff estimates.

1/ Net of rebates.
2/ Including deposits by CODELCO for military purchases under Law 13,196.

Table 14. Chile: Central Government Expenditure

	1996	1997	1998	1999	2000	2001
	(In billions of Chilean pesos)					
Total expenditure	6,100.1	6,875.5	7,729.6	8,391.1	9,106.9	9,932.2
Current expenditure	5,081.8	5,694.0	6,426.5	7,000.7	7,721.6	8,438.9
Wages and salaries 1/	1,159.3	1,325.1	1,491.1	1,645.7	1,778.5	1,891.9
Purchases of goods and services 2/	625.4	687.1	731.7	695.3	795.7	834.1
Pension payments 3/	1,698.3	1,897.7	2,144.7	2,442.0	2,684.0	2,925.5
Other transfers and subsidies to private recipients	1,390.3	1,593.8	1,757.1	2,039.8	2,210.5	2,498.3
Interest on public debt	165.9	140.6	236.2	121.3	184.6	208.0
Other	42.4	49.6	65.8	56.7	68.3	81.0
Capital expenditure	1,018.4	1,181.5	1,303.1	1,390.3	1,385.4	1,493.3
Fixed investment	884.5	992.7	1,074.9	1,039.7	907.5	979.8
Financial investment	155.2	214.6	205.6	187.9	212.2	174.4
Capital transfers	126.2	127.4	176.8	315.2	391.8	485.0
Capital transfers and net lending	133.9	188.8	228.2	350.6	477.8	623.2
Memorandum items:						
Transfers under Law 13,196	109.7	117.9	98.6	117.5	160.1	162.3
Social spending	4,043.0	4,531.0	5,126.0	5,710.0	6,292.0	6,927.0
	(In percent of GDP)					
Total expenditure	19.5	19.8	21.2	22.6	22.5	23.5
Current expenditure	16.3	16.4	17.6	18.8	19.1	20.0
Wages and salaries 1/	3.7	3.8	4.1	4.4	4.4	4.5
Purchases of goods and services 2/	2.0	2.0	2.0	1.9	2.0	2.0
Pension payments 3/	5.4	5.5	5.9	6.6	6.6	6.9
Other transfers and subsidies to private recipients	4.5	4.6	4.8	5.5	5.5	5.9
Interest on public debt	0.5	0.4	0.6	0.3	0.5	0.5
Other	0.1	0.1	0.2	0.2	0.2	0.2
Capital expenditure	3.3	3.4	3.6	3.7	3.4	3.5
Fixed investment	2.8	2.9	2.9	2.8	2.2	2.3
Financial investment	0.5	0.6	0.6	0.5	0.5	0.4
Capital transfers and net lending	0.4	0.5	0.6	0.9	1.2	1.5
Memorandum items:						
Transfers under Law 13,196	0.4	0.3	0.3	0.3	0.4	0.4
Social spending	12.9	13.0	14.0	15.4	15.6	16.4

Sources: Ministry of Finance; and Fund staff estimates.

1/ Includes employer contributions to the social security system.

2/ Assumes that funds transferred under Law 13,196 by CODELCO to an account for military purchases are spent in the same year.

3/ Includes "recognition bonds," cash transfers of accumulated contributions of currently retired persons who in the past had moved to a private system.

Table 15. Chile: Operations of the Public Enterprises

	1996	1997	1998	1999	2000	2001
	(In billions of Chilean pesos)					
	I. All Public Enterprises					
Operating surplus before taxes and transfers	1,514.6	1,437.4	1,160.3	1,286.4	1,589.6	1,857.2
Taxes and net transfers	1,143.5	1,180.7	841.3	884.7	1,355.9	1,343.8
Current account surplus	371.1	256.7	319.0	401.7	233.7	513.4
Capital revenue	262.8	93.9	35.5	34.3	18.0	25.2
Capital expenditure	783.5	710.7	713.2	486.5	532.8	700.6
Overall surplus or deficit (-)	-149.6	-360.0	-358.7	-50.5	-281.1	-162.0
	II. CODELCO					
Operating surplus before taxes and transfers	568.2	585.0	313.7	384.5	649.9	494.0
Taxes and net transfers	411.5	443.0	132.1	131.1	378.3	251.2
Current account surplus	156.6	141.9	181.6	253.4	271.5	242.8
Capital revenue	239.6	72.5	10.7	2.1	2.0	7.0
Capital expenditure	455.2	416.2	359.6	233.9	316.4	344.0
Overall surplus or deficit (-)	-59.0	-201.8	-167.3	21.6	-42.9	-94.1
	III. Other Public Enterprises					
Operating surplus before taxes and transfers	946.4	852.5	846.6	901.9	939.8	1,363.1
Taxes and net transfers	732.0	737.6	709.2	753.6	977.6	1,092.6
Current account surplus	214.5	114.8	137.4	148.3	-37.8	270.6
Capital revenue	23.2	21.5	24.9	32.2	16.0	18.2
Capital expenditure	328.3	294.5	353.6	252.6	216.4	356.7
Overall surplus or deficit (-)	-113.8	-179.7	-216.3	-104.3	-254.2	-86.1
	(In percent of GDP)					
	I. All Public Enterprises					
Operating surplus before taxes and transfers	4.8	4.1	3.2	3.5	3.9	4.4
Taxes and net transfers	3.7	3.4	2.3	2.4	3.4	3.2
Current account surplus	1.2	0.7	0.9	1.1	0.6	1.2
Capital revenues	0.8	0.3	0.1	0.1	0.0	0.1
Capital expenditure	2.5	2.0	2.0	1.3	1.3	1.7
Overall surplus or deficit (-)	-0.5	-1.0	-1.0	-0.1	-0.7	-0.4
	II. CODELCO					
Operating surplus before taxes and transfers	1.8	1.7	0.9	1.0	1.6	1.2
Taxes and net transfers	1.3	1.3	0.4	0.4	0.9	0.6
Current account surplus	0.5	0.4	0.5	0.7	0.7	0.6
Capital revenues	0.8	0.2	0.0	0.0	0.0	0.0
Capital expenditure	1.5	1.2	1.0	0.6	0.8	0.8
Overall surplus or deficit (-)	-0.2	-0.6	-0.5	0.1	-0.1	-0.2
	III. Other Public Enterprises					
Operating surplus before taxes and transfers	3.0	2.5	2.3	2.4	2.3	3.2
Taxes and net transfers	2.3	2.1	1.9	2.0	2.4	2.6
Current account surplus	0.7	0.3	0.4	0.4	-0.1	0.6
Capital revenues	0.1	0.1	0.1	0.1	0.0	0.0
Capital expenditure	1.1	0.8	1.0	0.7	0.5	0.8
Overall surplus or deficit (-)	-0.4	-0.5	-0.6	-0.3	-0.6	-0.2

Source: Ministry of Finance.

Table 16. Chile: Summary Operations of CODELCO

	1996	1997	1998	1999	2000	2001
	(In billions of Chilean pesos)					
Current revenue	1,354.7	1,540.2	1,333.6	1,520.0	1,982.6	2,132.1
Sales of goods and services	1,289.8	1,470.2	1,296.4	1,463.7	1,928.7	2,051.4
Other	64.9	70.0	37.3	56.2	53.9	80.8
Current expenditure	786.6	955.2	1,019.9	1,135.4	1,332.7	1,638.1
Wages and salaries 1/	269.1	282.1	274.9	298.5	289.8	354.2
Purchases of goods and services	493.9	642.8	708.3	789.5	990.2	1,222.8
Interest payments	23.5	30.2	36.6	47.5	52.8	61.0
Operating surplus	568.2	585.0	313.7	384.5	649.9	494.0
Less: taxes and transfer payments	-498.9	-590.9	-278.8	-255.3	-550.0	-441.2
Plus: transfer receipts	87.4	147.8	146.7	124.2	171.7	190.0
Current account surplus or deficit (-)	156.6	141.9	181.6	253.4	271.5	242.8
Capital revenue	239.6	72.5	10.7	2.1	2.0	7.0
Capital expenditure	455.2	416.2	359.6	233.9	316.4	344.0
Overall surplus or deficit (-)	-59.0	-201.8	-167.3	21.6	-42.9	-94.1
Financing	59.0	201.8	167.3	-21.6	42.9	94.1
Foreign	1.8	91.8	228.2	-43.2	-27.0	85.7
Domestic	57.2	110.0	-60.9	21.7	69.8	8.4
Memorandum items:						
Average price of copper at the London Metal Exchange 2/	104.2	103.2	75.0	71.3	82.3	71.7
Copper Stabilization Fund: deposits(+) /withdrawals(-) 3/	0.2	0.1	-0.4	-0.6	-0.2	-0.7
Transfers to the military under Law 13,196 3/	0.4	0.3	0.3	0.3	0.4	0.4

Sources: Ministry of Finance; and Fund staff estimates.

1/ Includes employer contributions to the social security system.
2/ U.S. cents per pound.
3/ In percent of GDP.

Table 17. Chile: Real Interest Rates on Central Bank Notes and Operations of the Financial System

(In percent per annum)

	Central Bank Notes			Financial System Operations 90 to 365 Days	
	Interbank 1/	90 Days	8 Years	Loans	Deposits
1996	7.3	7.3	6.3	9.3	6.9
1997	6.9	6.8	6.5	8.8	6.4
1998	12.8	9.6	7.5	11.9	9.5
1999	5.8	6.0	6.5	8.2	5.9
2000	5.2	5.4	6.4	7.5	5.2
January	5.0	5.3	6.6	7.3	5.1
February	5.3	5.7	6.7	7.6	5.2
March	5.4	5.6	6.7	7.9	5.4
April	5.5	5.6	6.5	7.6	5.4
May	5.5	5.8	6.7	7.7	5.4
June	5.5	5.8	6.6	7.6	5.5
July	5.5	5.6	6.3	7.5	5.4
August	5.4	5.4	6.2	7.4	5.2
September	5.0	5.0	6.2	7.6	4.9
October	5.0	5.0	6.1	7.4	4.9
November	5.0	5.0	6.0	7.2	4.8
December	5.0	4.9	5.9	7.0	4.8
2001	4.0	3.9	5.1	6.3	3.7
January	4.8	4.7	5.6	6.9	4.5
February	4.6	4.4	5.2	6.8	4.2
March	4.1	3.8	4.9	6.2	4.0
April	3.9	3.7	5.0	5.9	3.8
May	3.6	3.6	5.1	6.0	3.6
June	3.6	3.6	5.1	5.8	3.5
July	3.4	3.7	5.1	6.0	3.7
August	.. 2/	.. 2/	5.5	7.1	4.4
September	..	..	5.2	5.2	0.8
October	..	..	4.9	5.3	2.4
November	..	..	4.8	7.3	4.7
December	..	..	4.9	7.5	5.2
2002					
January	..	..	4.5	7.6	5.8
February	..	..	4.3	7.0	4.7
March	..	..	4.0	5.0	2.1
April	..	..	4.0	3.8	0.6

Sources: Central Bank of Chile; and Fund staff estimates.

1/ Since May 29, 1995 the interest rate on overnight operations between the central bank and commercial banks has been the main operating target of monetary policy. The values reported here are the equivalent real rate in annual terms. The central bank targets this rate.

2/ Since August 2001 the monetary policy rate is quoted in nominal terms.

Table 18. Chile: Private Sector Holdings of Financial Assets

	1996	1997	1998	1999	2000	2001
I. Annual Rates of Growth in Percent						
(In nominal terms)						
Total liabilities (private sector) 1/	16.9	16.3	9.7	15.7	9.5	10.1
Currency	9.5	14.6	-0.9	21.7	-4.9	9.3
Demand and sight deposits	10.9	17.4	-7.5	19.8	13.7	7.6
Narrow money (M1A)	10.5	16.6	-5.5	20.4	7.9	8.1
Savings and time deposits	26.2	11.9	13.1	0.9	4.2	4.5
Broad money (M3)	22.0	13.0	8.5	5.1	5.1	5.4
Pension fund liabilities	13.0	15.9	8.6	24.3	12.5	12.7
Letters of credit	29.0	62.3	1.8	15.0	7.3	15.6
Foreign currency deposits 2/	-16.1	1.5	86.4	38.5	18.2	13.8
(In real terms) 3/						
Total liabilities (private sector) 1/	9.6	9.7	4.8	13.1	4.8	7.3
Currency	2.7	8.0	-5.3	18.9	-9.0	6.5
Demand and sight deposits	4.0	10.7	-11.6	17.1	8.7	4.8
Narrow money (M1A)	3.6	9.9	-9.7	17.7	3.2	5.3
Savings and time deposits	18.4	5.5	8.0	-1.4	-0.3	1.8
Broad money (M3)	14.5	6.6	3.6	2.7	0.6	2.7
Pension fund liabilities	6.0	9.3	3.7	21.5	7.7	9.8
Letters of credit	20.9	53.0	-2.7	12.4	2.7	12.6
Foreign currency deposits 2/	-21.3	-4.3	78.1	35.4	13.1	10.8
II. Distribution						
By issuer	100.0	100.0	100.0	100.0	100.0	100.0
Central bank 4/	3.4	3.3	3.0	3.2	2.7	2.7
Bank and nonbank	50.3	50.5	51.4	48.0	47.3	46.6
Pension funds	46.3	46.1	45.6	48.8	50.0	50.7
By asset	100.0	100.0	100.0	100.0	100.0	100.0
Currency	3.4	3.3	3.0	3.2	2.7	2.7
Demand and sight deposits	7.9	8.0	6.7	7.0	7.2	7.0
Narrow money (M1A)	11.3	11.3	9.8	10.1	9.9	9.7
Savings and time deposits	35.8	34.4	35.5	30.8	29.2	27.5
Broad money (M3)	47.1	45.8	45.2	40.9	39.1	37.2
Pension fund liabilities	46.3	46.1	45.6	48.8	50.0	50.7
Letters of credit	4.4	6.1	5.7	5.6	5.5	5.7
Foreign currency deposits 2/	2.1	1.9	3.5	4.6	5.4	6.3

Sources: Central Bank of Chile; and Fund staff estimates.

1/ Includes liabilities of pension funds to the private sector, but excludes intrafinancial flows as well as central bank notes and treasury notes in hands of the private sector.
2/ Foreign deposits are valued at end-of-period exchange rates.
3/ Nominal changes deflated by changes in the consumer price index.
4/ Excludes central bank promissory notes.

Table 19. Chile: Operations of the Financial System

(Percentage change with respect to liabilities to the private sector at the beginning of the period) 1/

	1996	1997	1998	1999	2000	2001
Net international reserves	6.6	16.6	-6.2	2.8	-0.9	-3.5
Central bank	5.5	12.7	-7.0	-2.1	0.5	-1.0
Rest of the financial system	1.1	3.9	0.8	4.9	-1.5	-2.6
Net domestic assets	7.4	-0.5	13.0	7.0	10.8	12.5
Nonfinancial public sector (net)	-0.2	-2.0	2.1	2.6	1.5	1.4
Private sector	12.6	11.7	4.1	2.0	6.5	4.8
Central bank promissory notes	-2.3	-3.7	2.5	0.2	-0.7	1.0
Other assets (net)	-2.7	-6.6	4.3	2.2	3.5	5.3
Net medium- and long-term foreign liabilities	-2.9	-0.3	-2.9	-5.9	0.3	-1.1
Central bank	-2.9	0.0	0.0	0.0	0.0	0.0
Rest of the financial system	0.0	-0.3	-2.9	-5.9	0.3	-1.1
Liabilities to the private sector	16.9	16.3	9.7	15.7	9.5	10.1
Narrow money	1.3	1.9	-0.6	2.0	0.8	0.8
Savings and time deposits	8.7	4.3	4.5	0.3	1.3	1.3
Other liabilities 2/	6.9	10.1	5.8	13.4	7.4	8.0
Memorandum items:						
Growth of banking system credit to private sector 3/	20.8	18.0	11.2	3.0	10.7	6.7
Medium- and long-term foreign liabilities of the central bank (in millions of U.S. dollars)	3.4	3.1	2.9	2.4	2.1	1.8
Medium- and long-term foreign liabilities of commercial banks (in millions of U.S. dollars)	1,215.3	1,257.3	868.7	73.4	-445.6	-329.0
Narrow money/GDP ratio	9.2	9.6	8.6	10.2	10.1	10.5
Broad money/GDP ratio 4/	38.1	38.7	39.9	41.3	39.9	40.3
Total liabilities to private sector/GDP ratio	80.8	84.6	88.3	100.8	101.9	108.3
Inflation rate (CPI; 12-month percentage change, end-of-period)	6.6	6.0	4.7	2.3	4.5	2.6

Sources: Central Bank of Chile; Superintendency of Pension Funds Administrators; and Fund staff estimates.

1/ Flows measured at constant end-of-period exchange rates.
2/ Includes dollar deposits, mortgage bonds, and deposits with pension funds.
3/ Annual percentage change. Excludes pension funds.
4/ Broad money includes narrow money (M1A) plus savings and time deposits.

Table 20. Chile: Operations of the Central Bank

(Percentage change with respect to liabilities to the private sector at the beginning of the period) 1/

	1996	1997	1998	1999	2000	2001
Net international reserves	150.8	374.3	-210.3	-70.2	16.7	-36.1
Net domestic credit	-222.1	-359.8	209.4	91.9	-21.6	45.4
Net credit to the nonfinancial public sector 2/	-24.1	-40.7	30.6	82.2	20.1	34.6
Net credit to financial intermediaries	-67.0	-116.5	-29.7	-66.0	-90.3	-35.3
Central bank promissory notes	-62.9	-108.5	73.7	5.2	-23.7	37.7
Credit to the private sector	-5.6	-30.6	29.1	13.6	0.0	0.0
Capital and reserves	52.0	64.9	36.2	-5.8	-26.2	-61.2
Other	-114.6	-128.4	69.5	62.5	98.6	69.6
Net medium- and long-term foreign liabilities	-190.1	0.0	0.0	-0.1	0.0	0.0
Liabilities to the private sector	9.5	14.6	-0.9	21.7	-4.9	9.3
Currency	9.5	14.6	-0.9	21.7	-4.9	9.3
Memorandum items:						
Annual flows of net international reserves (in millions of U.S. dollars)	1,180.8	3,209.0	-2,066.1	-683.3	197.9	-406.9
Change in medium- and long-term foreign liabilities (in millions of U.S. dollars)	-1,488.2	-0.3	-0.2	-0.5	-0.3	0.0
Inflation rate (CPI; 12-month percentage change, end-of-period)	6.6	6.0	4.7	2.3	4.5	2.6

Sources: Central Bank of Chile; and Fund staff estimates.

1/ Flows measured at constant end-of-period exchange rates.

2/ Excludes holdings of treasury notes on account of the 1983-86 capitalization of the central bank, which are included in other net domestic assets.

Table 21. Chile: Operations of Banks, Nonbanks, and Pension Funds

(Percentage change with respect to liabilities to the private sector at the beginning of the period) 1/

	1996	1997	1998	1999	2000	2001
I. Bank and Nonbank Financial Intermediaries						
Net international reserves	2.2	7.7	1.6	9.5	-3.1	-5.4
Net domestic assets	19.4	9.2	8.6	-4.3	8.8	13.2
Nonfinancial public sector	-0.4	-1.6	1.5	-0.7	1.1	-0.9
Net credit to financial intermediaries	-6.4	-7.4	-5.0	-4.2	-6.0	-3.5
Credit to the private sector	26.5	24.7	11.7	1.7	12.0	6.6
Capital and reserves	-2.4	-2.7	-2.3	-1.5	-1.6	-0.6
Other	2.1	-3.7	2.7	0.5	3.3	11.5
Net medium- and long-term foreign liabilities	0.4	0.1	-1.2	-2.5	-1.6	0.4
Liabilities to the private sector 2/	21.2	16.7	11.4	7.7	-0.2	-0.4
II. Pension Funds 3/						
Net international reserves	0.0	0.0	0.0	0.0	0.0	0.0
Net domestic assets	12.6	15.1	3.6	14.1	14.8	10.1
Nonfinancial public sector	1.8	0.4	0.6	1.0	0.7	1.9
Net credit to financial intermediaries 4/	10.8	13.8	9.0	10.8	11.5	3.4
Credit to the private sector	-0.2	0.8	-6.0	1.5	1.5	3.3
Capital, reserves, and other	0.0	0.2	0.0	-0.1	0.2	-0.1
Net medium- and long-term foreign liabilities	-0.4	-0.8	-5.0	-10.2	2.2	-2.6
Liabilities to the private sector	13.0	15.9	8.6	24.3	12.5	12.7

Sources: Central Bank of Chile; Superintendency of Pension Funds Administrators; and Fund staff estimates.

1/ Flows measured at constant end-of-period exchange rates.
2/ Excludes deposits of pension funds.
3/ Since June 2000, figures include the Pension Fund Type 2 which had 65 affiliates at end-December 2000.
4/ Consists mostly of holdings of central bank promissory notes, commercial bank letters of credit, and time and savings deposits.

Table 22. Chile: Summary Accounts of the Financial System

(End-of-period stocks; in billions of Chilean pesos)

	1996	1997	1997	1998	1998	1999	1999	2000	2000	2001
	(Ch$439.81=US$1)		(Ch$473.8=US$1)		(Ch$527.7=US$1)		(Ch$572.68=US$1)		(Ch$654.79=US$1)	
Net international reserves	5,999.1	8,021.1	8,625.5	8,003.9	8,899.8	9,819.6	10,644.7	10,120.4	11,570.3	10,168.2
Central bank	6,797.3	7,846.6	8,437.6	7,576.9	8,424.3	7,762.6	8,412.3	8,442.1	9,651.3	9,315.0
Rest of the financial system 1/	-798.3	174.5	188.0	427.0	475.5	2,057.1	2,232.4	1,678.3	1,919.0	853.2
Net domestic assets	20,208.4	22,162.4	21,632.2	24,105.1	23,288.4	25,537.1	24,655.4	28,643.1	27,155.3	32,265.3
Nonfinancial public sector (net) 2/	-2,003.4	-2,513.2	-2,675.3	-2,068.3	-2,290.3	-1,458.2	-1,573.0	-1,011.7	-1,169.2	-579.1
Private sector	20,179.5	23,144.6	23,267.2	24,484.2	24,705.5	25,350.0	25,511.2	27,974.2	28,304.4	30,293.6
Central bank promissory notes	-2,245.0	-3,174.9	-3,174.9	-2,451.0	-2,451.0	-2,400.1	-2,400.1	-2,680.7	-2,680.7	-2,255.5
Other assets (net)	4,277.3	4,705.8	4,215.1	4,140.2	3,324.3	4,045.4	3,117.3	4,361.3	2,700.9	4,806.2
Net medium- and long-term foreign liabilities	536.0	554.3	597.2	413.0	459.9	40.0	43.4	-254.0	-290.4	-214.2
Central bank	1.5	1.3	1.4	1.4	1.5	1.3	1.4	1.2	1.4	1.2
Rest of the financial system	534.5	553.0	595.7	411.6	458.4	38.7	42.0	-255.2	-291.8	-215.4
Liabilities to the private sector	25,259.1	29,373.0	29,416.3	32,270.1	32,398.3	37,473.8	37,622.0	41,201.6	41,521.3	45,714.7
Narrow money	2,859.6	3,333.6	3,333.6	3,149.0	3,149.0	3,791.9	3,791.9	4,090.3	4,090.3	4,420.3
Savings and time deposits	9,040.3	10,118.7	10,118.7	11,442.3	11,442.3	11,540.5	11,540.5	12,030.9	12,030.9	12,570.3
Other liabilities 3/	13,359.2	15,920.7	15,964.1	17,678.8	17,807.0	22,141.5	22,289.7	25,080.4	25,400.1	28,724.1

Sources: Central Bank of Chile; Superintendency of Pension Funds Administrators; and Fund staff estimates.

1/ Consists of commercial banks, including the *Banco del Estado*, insurance companies, and the pension funds.
2/ Excludes holdings of treasury notes on account of the 1983-85 capitalization of the central bank. These notes are included in other assets.
3/ Includes mortgage bonds, U.S. dollar deposits, and deposits with pension funds.

Table 23. Chile: Summary Accounts of the Central Bank

(End-of-period stocks; in billions of Chilean pesos)

	1996	1997	1997	1998	1998	1999	1999	2000	2000	2001
	(Ch$439.81=US$1)		(Ch$473.8=US$1)		(Ch$527.7=US$1)		(Ch$572.68=US$1)		(Ch$654.79=US$1)	
Net international reserves	6,797.3	7,846.6	8,437.6	7,576.9	8,424.3	7,762.6	8,412.3	8,442.1	9,651.3	9,315.0
In millions of U.S. dollars	15,474.0	17,840.9	17,840.9	15,991.8	15,991.8	14,710.2	14,710.2	14,741.4	14,741.4	14,225.9
Net domestic assets	-5,463.5	-6,463.2	-7,054.1	-6,346.1	-7,193.3	-6,296.8	-6,946.4	-7,297.2	-8,506.3	-8,061.5
Net credit to the nonfinancial public sector 1/	-1,615.0	-1,964.3	-2,125.3	-1,825.0	-2,045.5	-1,245.1	-1,363.4	-1,125.6	-1,281.9	-891.6
Net credit to financial intermediaries	-7,198.0	-8,196.9	-8,196.9	-8,488.8	-8,488.8	-9,130.7	-9,130.7	-10,200.9	-10,200.9	-10,599.1
Central bank promissory notes	-2,245.0	-3,174.9	-3,174.9	-2,451.0	-2,451.0	-2,400.1	-2,400.1	-2,680.7	-2,680.7	-2,255.5
Credit to the private sector	-113.9	-376.1	-405.1	-118.9	-132.5	0.0	0.0	0.0	0.0	0.0
Capital and reserves	127.1	683.8	646.7	1,002.6	943.4	886.9	854.4	544.1	439.3	-250.1
Other	5,581.2	6,565.1	6,201.4	5,535.0	4,981.1	5,592.2	5,093.4	6,165.9	5,217.9	5,934.7
Net medium- and long-term foreign liabilities	1.5	1.3	1.4	1.4	1.5	1.3	1.4	1.2	1.4	1.2
In millions of U.S. dollars	3.4	3.1	3.1	2.9	2.9	2.4	2.4	2.1	2.1	1.8
Liabilities to the private sector	857.3	982.2	982.2	973.3	973.3	1,184.5	1,184.5	1,126.7	1,126.7	1,232.0
Currency in circulation	857.3	982.2	982.2	973.3	973.3	1,184.5	1,184.5	1,126.7	1,126.7	1,232.0

Sources: Central Bank of Chile; and Fund staff estimates.

1/ Excludes holdings of treasury notes on account of the 1983-86 capitalization of the central bank, which are included in other net domestic assets.

Table 24. Chile: Summary Accounts of Banks and Nonbank Financial Intermediaries 1/

(End-of-period stocks; in billions of Chilean pesos)

	1996	1997	1997	1998	1998	1999	1999	2000	2000	2001
	(Ch$439.81=US$1)		(Ch$473.8=US$1)		(Ch$527.7=US$1)		(Ch$572.68=US$1)		(Ch$654.79=US$1)	
Net international reserves	-798.3	174.5	188.0	427.0	475.5	2,057.1	2,232.4	1,678.3	1,919.0	853.2
In millions of U.S. dollars	-1,815.0	396.7	396.7	901.1	901.1	3,898.1	3,898.1	2,930.7	2,930.7	1,303.0
Net domestic assets	14,040.8	15,214.9	15,287.5	16,567.9	16,694.4	15,983.2	15,959.3	17,560.8	17,603.3	20,214.0
Nonfinancial public sector	-772.9	-977.6	-978.6	-748.5	-750.0	-869.0	-865.5	-674.4	-675.5	-857.6
Net credit to financial intermediaries	-233.2	-1,175.0	-1,175.0	-1,921.4	-1,921.4	-2,627.8	-2,627.8	-3,710.8	-3,710.8	-4,403.5
Credit to the private sector	16,460.9	19,596.0	19,747.6	21,488.6	21,723.3	22,010.9	22,172.2	24,357.5	24,687.7	26,000.8
Capital and reserves	-1,863.2	-2,204.7	-2,204.7	-2,551.6	-2,551.6	-2,808.5	-2,808.5	-3,094.0	-3,094.0	-3,209.1
Other	449.2	-23.7	-101.7	300.8	194.1	277.5	88.9	682.4	395.9	2,683.5
Net medium- and long-term foreign liabilities	534.5	553.0	595.7	411.6	458.4	38.7	42.0	-255.2	-291.8	-215.4
In millions of U.S. dollars	1,215.3	1,257.3	1,257.3	868.7	868.7	73.4	73.4	-445.6	-445.6	-329.0
Liabilities to the private sector	12,708.0	14,836.4	14,879.7	16,583.3	16,711.5	18,001.5	18,149.7	19,494.3	19,814.0	21,282.7

Sources: Central Bank of Chile; and Fund staff estimates.

1/ Excludes the pension funds.

Table 25. Chile: Summary Accounts of Pension Funds 1/

(End-of-period stocks; in billions of Chilean pesos)

	1996	1997	1997	1998	1998	1999	1999	2000	2000	2001
	(Ch$439.81=US$1)		(Ch$473.8=US$1)		(Ch$527.7=US$1)		(Ch$572.68=US$1)		(Ch$654.79=US$1)	
Net international reserves	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
In millions of U.S. dollars	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net domestic assets	11,628.5	13,399.9	13,387.9	13,870.3	13,774.4	15,845.4	15,637.2	18,340.2	18,019.0	20,099.7
Nonfinancial public sector	384.5	428.7	428.7	505.2	505.2	655.9	655.9	788.2	788.2	1,170.1
Net credit to financial intermediaries	7,413.7	9,031.7	9,031.7	10,250.6	10,250.6	11,839.5	11,839.5	13,935.2	13,935.2	14,627.6
Credit to the private sector	3,832.4	3,924.8	3,924.8	3,114.6	3,114.6	3,339.1	3,339.1	3,616.7	3,616.7	4,292.9
Capital and reserves	2.7	10.8	10.8	12.9	12.9	5.2	5.2	39.3	39.3	13.1
Other	-2.2	14.7	2.7	-0.1	-96.0	11.0	-197.2	0.0	-321.2	9.0
Net medium- and long-term foreign liabilities	-65.3	-154.5	-166.5	-843.2	-939.1	-2,442.5	-2,650.7	-2,240.3	-2,561.5	-3,100.4
Liabilities to the private sector	11,693.8	13,554.4	13,554.4	14,713.5	14,713.5	18,287.9	18,287.9	20,580.5	20,580.5	23,200.1

Sources: Central Bank of Chile; Superintendency of Pension Funds Administrators; and Fund staff estimates.

1/ Since June 2000, figures include the Pension Fund Type 2 which had 65 affiliates at end-December 2000.

Table 26. Chile: Pension Funds—Selected Indicators 1/

(End-of-period values; unless otherwise indicated)

	1996	1997	1998	1999	2000	2001
	(In thousands of persons)					
Number of affiliates	5,571.5	5,780.4	5,966.1	6,105.7	6,280.2	6,427.7
Contributors (*cotizantes*) 2/	3,121.1	3,296.4	3,149.8	3,262.3	3,197.0	3,449.8
	(In percent per annum)					
Real rate of return of pension funds	3.5	4.7	-1.1	16.3	4.4	6.7
	(As a percentage of annual GDP)					
Total assets of pension funds	37.4	39.0	40.3	49.2	50.9	55.0
	(As a percentage of total assets)					
Pension funds portfolio composition						
Total assets	100.0	100.0	100.0	100.0	100.0	100.0
Government securities	42.1	39.6	41.0	34.6	35.7	35.0
Financial institutions instruments	24.6	30.1	32.1	33.7	35.6	33.0
Firms shares and debentures	32.8	29.0	21.2	18.3	17.6	18.5
Foreign assets 3/	0.5	1.2	5.7	13.4	10.9	13.4
Other	0.0	0.1	0.1	0.0	0.2	0.1

Sources: Central Bank of Chile; Superintendency of the AFPs; and Fund staff estimates.

1/ Since June 2000, figures include the Pension Fund Type 2 which had 65 affiliates at end-December 2000.

2/ Includes all workers affiliated to an AFP that during the specified month pay, or declare and do not pay, the contributions to the pension fund.

3/ Until May 1993 pension funds were not allowed to invest in foreign assets. Currently, they can invest up to 16 percent of the value of the fund.

Table 27. Chile: Export and Import Values, Volumes, and Prices

	1996	1997	1998	1999	2000	2001
	(Annual percentage changes)					
Export values (f.o.b.)	...	7.5	-8.7	5.1	11.9	-3.9
Volumes	...	10.3	7.7	5.4	4.8	8.6
Prices	...	-2.6	-15.2	-0.3	6.8	-11.5
Import values (c.i.f.)	...	...	-4.6	-19.6	15.7	-3.8
Volumes	...	...	6.9	-14.9	14.6	0.2
Prices	...	...	-10.8	-5.5	0.9	-4.0
Memorandum items:						
Copper exports	...	10.3	-21.8	16.0	20.9	-7.4
Volumes	...	16.8	7.5	15.4	5.3	4.3
Prices	...	-5.6	-27.3	0.5	14.8	-11.2
Noncopper exports	...	5.9	-0.9	0.1	7.1	-1.7
Volumes	...	6.6	7.8	0.8	4.5	11.2
Prices	...	-0.7	-8.1	-0.7	2.4	-11.6

Source: Central Bank of Chile.

Table 28. Chile: Exports (f.o.b.) by Main Categories

	1996	1997	1998	1999	2000	2001
	(In millions of U.S. dollars)					
Total	16,657	17,902	16,353	17,193	19,246	18,505
General regime	14,816	15,955	14,457	15,663	17,682	17,032
Mining products	6,843	7,486	6,052	6,778	8,021	7,470
Copper	6,029	6,647	5,197	6,026	7,285	6,746
Other	815	839	855	752	736	724
Agricultural, forestry, and fishing products	1,594	1,630	1,709	1,720	1,693	1,510
Fresh fruit	1,205	1,192	1,267	1,242	1,241	1,116
Other	389	437	442	478	452	395
Semi-industrial and industrial products	6,379	6,840	6,696	7,165	7,968	8,052
Food products	2,730	2,680	2,537	2,598	2,604	2,656
Wood products	729	837	733	919	934	1,004
Woodpulp, paper, and related goods	1,009	966	950	1,121	1,405	1,197
Chemical products	582	812	749	798	1,217	1,379
Other	1,329	1,545	1,727	1,729	1,808	1,814
Free zone exports	1,236	1,370	1,456	1,072	997	957
Goods sold in port to foreign transport companies	124	159	161	155	224	246
Nonmonetary gold	481	418	279	304	343	270
	(In percent of total exports)					
Total	100.0	100.0	100.0	100.0	100.0	100.0
General regime	88.9	89.1	88.4	91.1	91.9	92.0
Mining products	41.1	41.8	37.0	39.4	41.7	40.4
Copper	36.2	37.1	31.8	35.1	37.9	36.5
Other	4.9	4.7	5.2	4.4	3.8	3.9
Agricultural, forestry, and fishing products	9.6	9.1	10.5	10.0	8.8	8.2
Fresh fruit	7.2	6.7	7.7	7.2	6.4	6.0
Other	2.3	2.4	2.7	2.8	2.3	2.1
Semi-industrial and industrial products	38.3	38.2	40.9	41.7	41.4	43.5
Food products	16.4	15.0	15.5	15.1	13.5	14.4
Wood products	4.4	4.7	4.5	5.3	4.9	5.4
Woodpulp, paper, and related goods	6.1	5.4	5.8	6.5	7.3	6.5
Chemical products	3.5	4.5	4.6	4.6	6.3	7.5
Other	8.0	8.6	10.6	10.1	9.4	9.8
Free zone exports	7.4	7.7	8.9	6.2	5.2	5.2
Goods sold in port to foreign transport companies	0.7	0.9	1.0	0.9	1.2	1.3
Nonmonetary gold	2.9	2.3	1.7	1.8	1.8	1.5
	(In percent of GDP)					
Total	24.3	21.7	20.6	23.6	25.7	27.8
Copper	8.8	8.1	6.6	8.3	9.7	10.2

Source: Central Bank of Chile.

Table 29. Chile: Imports (c.i.f.) by Type of Goods

	1996	1997	1998	1999	2000	2001
	(In millions of U.S. dollars)					
Total imports	19,097	20,800	19,852	15,962	18,465	17,781
General regime imports	17,273	18,610	17,526	14,439	17,026	16,380
Consumer goods	3,148	3,356	3,124	2,587	3,076	2,900
Intermediate goods	9,460	10,070	9,593	8,776	10,520	10,061
Crude oil	1,187	1,169	861	1,248	1,994	1,727
Petroleum products	595	595	566	682	871	862
Other	7,678	8,307	8,166	6,846	7,655	7,473
Capital goods	4,666	5,184	4,808	3,076	3,430	3,418
Other imports 1/	1,824	2,190	2,327	1,523	1,439	1,401
	(In percent of total imports)					
Total imports	100.0	100.0	100.0	100.0	100.0	100.0
General regime imports	90.4	89.5	88.3	90.5	92.2	92.1
Consumer goods	16.5	16.1	15.7	16.2	16.7	16.3
Intermediate goods	49.5	48.4	48.3	55.0	57.0	56.6
Crude oil	6.2	5.6	4.3	7.8	10.8	9.7
Petroleum products	3.1	2.9	2.9	4.3	4.7	4.8
Other	40.2	39.9	41.1	42.9	41.5	42.0
Capital goods	24.4	24.9	24.2	19.3	18.6	19.2
Other imports 1/	9.6	10.5	11.7	9.5	7.8	7.9
	(In percent of GDP)					
Total imports	27.9	25.2	25.0	21.9	24.6	26.8
General regime imports	25.2	22.5	22.1	19.8	22.7	24.6
Consumer goods	4.6	4.1	3.9	3.5	4.1	4.4
Intermediate goods	13.8	12.2	12.1	12.0	14.0	15.1
Crude oil	1.7	1.4	1.1	1.7	2.7	2.6
Petroleum products	0.9	0.7	0.7	0.9	1.2	1.3
Other	11.2	10.1	10.3	9.4	10.2	11.2
Capital goods	6.8	6.3	6.1	4.2	4.6	5.1
Other imports 1/	2.7	2.7	2.9	2.1	1.9	2.1

Source: Central Bank of Chile.

1/ Includes free zone imports and goods aquired in foreign ports by shipping companies (e.g., fuel, food supplies).

Table 30. Chile: Direction of Trade

(In percent)

	1996	1997	1998	1999	2000	2001
Exports	100.0	100.0	100.0	100.0	100.0	100.0
Europe	25.9	25.6	29.0	27.5	25.9	27.8
European Union	23.9	24.2	27.9	26.0	24.1	25.7
Belgium and Luxembourg	1.6	1.6	2.3	1.9	1.9	1.3
France	2.6	2.7	3.0	3.1	3.4	3.4
Germany	4.8	4.3	3.7	3.6	2.4	2.9
Italy	3.1	3.0	4.5	4.0	4.3	4.6
Netherlands	2.6	2.5	2.8	3.2	2.4	3.0
Spain	1.8	2.0	1.9	2.1	2.1	1.9
Sweden	0.5	0.6	0.7	0.4	0.7	0.5
United Kingdom	5.8	6.3	7.8	6.7	5.7	7.0
Other 1/	1.2	1.4	1.2	1.0	1.1	1.1
Other	1.5	0.7	0.4	1.0	1.2	1.6
Western Hemisphere	37.3	37.7	41.8	41.7	39.9	43.2
Canada	0.9	0.8	1.0	1.2	1.3	1.5
LAIA countries	18.9	19.8	22.3	19.9	20.0	21.0
Andean Pact countries 2/	6.6	6.7	7.9	6.5	6.6	7.8
Argentina	4.6	4.7	4.9	4.5	3.4	3.1
Brazil	6.1	5.6	5.4	4.3	5.1	4.8
Mexico	1.0	2.1	3.3	3.9	4.4	4.7
Other	0.8	0.8	0.8	0.6	0.6	0.6
United States	16.6	16.2	17.4	19.3	17.3	19.2
Other	0.9	0.9	1.1	1.3	1.3	1.5
Rest of the world	36.8	36.7	29.2	30.9	34.2	29.0
China, People's Republic of	3.0	3.5	3.9	3.5	5.1	6.0
Japan	16.2	15.5	13.7	14.5	13.6	12.0
South Korea	5.6	5.8	2.7	4.3	4.2	3.1
Taiwan, Province of China	4.1	4.6	3.6	3.2	3.2	2.0
Other	7.8	7.4	5.3	5.3	8.0	5.9
Imports 3/	100.0	100.0	100.0	100.0	100.0	100.0
Europe	22.4	22.6	23.7	22.0	18.7	20.5
European Union	20.4	21.2	21.9	19.9	16.9	18.7
Belgium and Luxembourg	0.8	0.7	0.6	0.7	0.6	0.7
France	3.4	2.7	3.9	2.9	2.6	3.5
Germany	4.2	4.5	4.6	4.4	3.6	4.2
Italy	3.2	3.7	3.9	3.6	2.5	2.7
Spain	3.1	3.3	3.7	2.8	2.5	2.8
Sweden	1.6	1.9	1.4	1.9	1.7	1.1
United Kingdom	1.6	1.7	1.5	1.3	1.0	1.2
Other 1/	2.6	2.6	2.3	2.3	2.3	2.4
Switzerland	0.7	0.6	0.7	1.1	0.7	0.7
Other	1.4	0.8	1.1	1.0	1.1	1.2
Western Hemisphere	53.8	54.0	53.1	55.6	57.9	57.2
Canada	2.4	2.3	2.8	2.9	3.0	2.6
LAIA countries	26.8	27.7	26.8	31.2	34.9	36.9
Andean Pact countries 2/	5.3	4.9	4.1	5.6	5.8	4.9
Argentina	9.4	9.8	10.8	14.1	16.9	18.7
Brazil	6.1	6.7	6.2	6.8	7.8	9.1
Mexico	5.3	5.8	4.8	4.0	3.6	3.2
Other	0.7	0.6	0.8	0.7	0.7	0.9
United States	23.7	23.2	22.9	21.1	19.6	17.6
Other	0.9	0.8	0.6	0.4	0.5	0.1
Rest of the world	23.8	23.4	23.2	22.3	23.3	22.3
China, People's Republic of	3.7	3.9	4.3	5.0	5.9	6.4
Japan	5.5	5.6	5.7	4.4	4.2	3.4
South Korea	3.2	3.2	3.1	2.8	3.1	3.3
Taiwan, Province of China	1.3	1.2	1.1	1.1	1.1	1.1
Other	10.1	9.5	9.0	9.0	9.1	8.1

Source: Central Bank of Chile.

1/ Austria, Denmark, Finland, Greece, Ireland, and Portugal as of 1995.
2/ Bolivia, Colombia, Ecuador, Peru, and Venezuela.
3/ Excludes imports through Free Trade Zones.

Table 31. Chile: Net International Reserves of the Financial System

(In millions of U.S. dollars)

	1996	1997	1998	1999	2000	2001
Central bank	15,474	17,841	15,992	14,710	14,741	14,226
Assets	15,474	17,841	15,992	14,710	14,741	14,226
Gold 1/	637	533	322	317	18	19
SDRs 2/	2	1	8	19	25	29
Reserve position at the Fund	50	313	602	403	318	298
Foreign exchange	14,781	16,991	15,049	13,977	14,381	13,882
Payment agreements (net)	4	2	11	-5	0	-1
Liabilities (-)	0	0	0	0	0	0
Short-term liabilities	0	0	0	0	0	0
Liabilities to the IMF	0	0	0	0	0	0
Commercial banks 3/	-1,814	398	902	3,899	2,932	1,303
Assets	587	1,153	1,783	4,172	3,372	2,279
Gold 1/	2	1	1	2	2	0
Foreign exchange	585	1,152	1,781	4,170	3,371	2,279
Liabilities (-)	-2,400	-755	-880	-273	-440	-976
Short-term loans	-2,384	-747	-870	-260	-428	-976
Foreign bank deposits	-16	-9	-11	-13	-12	0
Financial system	13,660	18,239	16,894	18,610	17,673	15,529
Assets	16,061	18,994	17,774	18,882	18,114	16,505
Liabilities	-2,400	-755	-880	-273	-440	-976
Memorandum item:						
Medium- and long-term financial system liabilities (-)	-1,070	-909	908	4,553	4,355	5,062
Central bank	-3	-3	-3	-2	-2	-2
Assets	0	0	0	0	0	0
Liabilities	3	3	3	2	2	2
Commercial banks	-1,215	-1,257	-869	-73	446	329
Assets	19	104	444	1,103	1,172	1,035
Liabilities	1,234	1,361	1,313	1,176	726	706
Pension funds	148	351	1,780	4,629	3,912	4,735
Assets	148	351	1,780	4,629	3,912	4,735

Sources: Central Bank of Chile; and Fund staff estimates.

1/ Valued at end-of-period market price
2/ SDRs are valued at end-of-period rates with respect to the U.S. dollar.
3/ Includes *Banco del Estado*.