Financial implications of capital outflows in Chile: 1998–2008[1]

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I.   Introduction

Over the past decade, the Chilean economy has continued with a gradual process of increasing financial integration with the world, reflected in increased stocks of both foreign assets and foreign liabilities held by domestic residents. This, along with a significant reduction in net foreign liabilities, is probably the main structural external financial development of the past decade (Graph 1).

Graph 1

Net international investment position, by institutional sector

As a percentage of GDP[1]
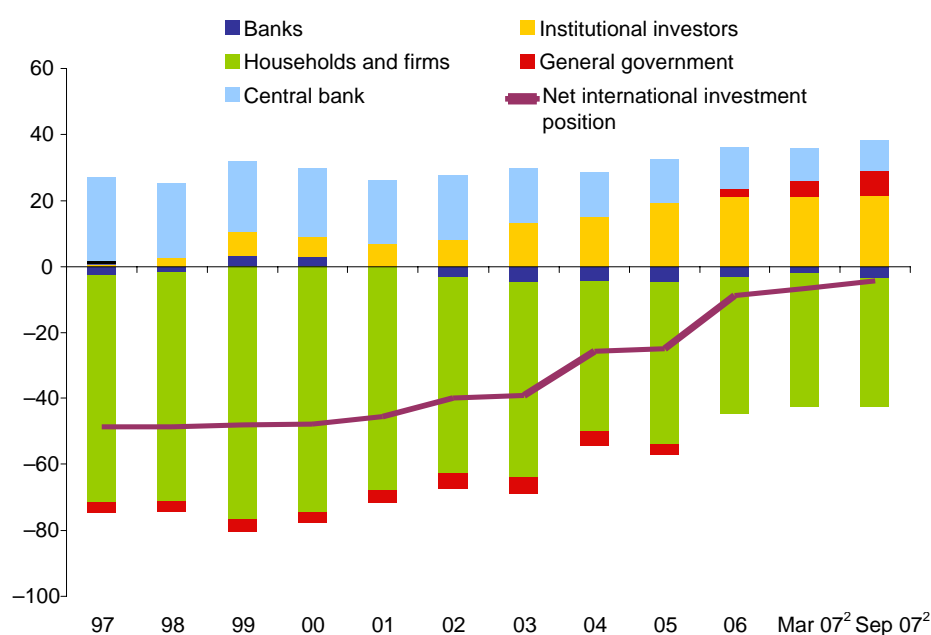
[1] GDP at a constant real exchange rate (base index December 2005 = 100).
[2] Estimated from capital account flows.

Source: Central Bank of Chile.

This process has been driven by several factors. Regulatory, normative and legal/tax changes have reduced the wedges that used to constrain the financial relationships between residents and non-residents. The adoption of an inflation targeting framework with flexible exchange rates and a solid commitment to fiscal prudence has helped import the great

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moderation in inflation and interest rates we have observed in the global economy in the last 20 years. A system of prudential regulation has been a key factor for the development of a sound and stable banking and financial system.

This paper focuses on certain specific issues associated with this process, namely the financial implications arising from increasing holdings of foreign assets by pension funds and the evolving correlation of local and external financial asset prices. Section II of the paper presents the main policy changes implemented in the past 10 years and briefly discusses the issue of capital controls. Section III addresses the role of pension funds in the development of the market for hedging instruments, while Section IV shows the evolving links between local and external interest rates and equity prices. Section V concludes with an exploration of some of the challenges that lie ahead with regard to achieving deeper financial integration with the rest of the world.

II.   Structural policy measures since 1999

The outcome of the turbulent period between 1997 and 1998 led to a substantial revision of the policy framework in practically all the relevant dimensions. One of the most important lessons derived from the management of the consequences of the Asian and Russian crises was that there was a need for a significant upgrade in the coordination of macroeconomic policies and a clarification of the relative importance of the different objectives that had been pursued in the previous period.

A list of the measures undertaken since then contains the following:

Suspension of the exchange rate band and adoption of inflation targeting

In September 1999, the exchange rate band was finally suspended in favour of a free float after a brief period in which it was quickly widened. The central bank, however, announced that it still held the right to intervene in forex markets, but would do so only under exceptional circumstances, making a public statement regarding the characteristics of the intervention. Later, in 2005, it actually stated that the norm in these circumstances (which coincided with the actual episodes in 2001 and 2002) would be sterilised intervention. This can be understood as the intention by the central bank to sharply distinguish between the use of an extraordinary instrument, intervention, and monetary policy, in such a way as to further shield the inflation targeting regime from the suspicion that it could have an implicit exchange rate target.

Increased financial integration

During the first half of this decade the central bank and the government implemented a number of measures that can be interpreted as aiming to strengthen the credibility of the floating exchange rate regime. These consisted in the reduction to 0% of the unremunerated reserve requirement and its subsequent elimination, along with the free trade agreement with the United States (with some restrictive provisions). Additionally, the central bank revamped its whole regulatory framework for foreign exchange rate transactions, in essence eliminating all regulatory burdens except for the information required for balance of payments statistics. The minimum holding period for profits from foreign investment was also lifted, while non-residents were exempted from capital gains taxes in the local stock market as long as they invested in liquid shares.

These measures were also complemented by a gradual but significant increase in the foreign exposure allowed for pension funds. Pension funds in Chile currently hold more than USD 100 billion in assets (around two thirds of GDP), and have a cap on investments abroad of 40%. This is up from a legal limit of 10% in the mid-1990s, which nevertheless was not

binding, given the more profitable investment opportunities offered by the domestic market, which was one of the overall implications of the policy framework in place at that time. The current cap in the law is set to be extended to 45% by April 2007, while the authorities have pledged to further increase this figure to 60% by September 2007 and 80% by September 2008.[2]

Fiscal policy reforms and statistical consolidation

The institutional backing for a floating exchange rate regime, with fully fledged inflation targeting and a widely open capital account, resides in prudent fiscal policy management. Since 2000, fiscal policy has been anchored by a commitment to set annual budgetary expenses in line with long-term fiscal revenues, targeting a small structural surplus. Thus, current fiscal revenues are cyclically adjusted and copper-related earnings are adjusted for deviations from long-term copper prices. As a result, the government was able to run moderate deficits in the early part of this decade (from 2000 to 2003), which then turned into significant surpluses from 2004 onwards, thanks to a large increase in copper prices. The commitment to a fiscal rule was further enhanced in 2005 after a Fiscal Responsibility Law was enacted, detailing the requirements for the annual calculation of the structural surplus implicit in the budget, and also creating specific sovereign wealth funds to save the significant resources accumulated in recent years. It moreover earmarked part of the surplus (in case the fiscal situation allows for it) for the capitalisation of the central bank, by up to 0.5% of GDP per year and up to a cumulative total of 2.5% of GDP by 2010.

Capital controls since 1990

The discussion about capital controls – being understood as specific restrictions on capital inflows or outflows – is part of a long theoretical and empirical debate about the optimal level of openness of the capital account. On one hand, capital account openness should promote economic growth, help to smooth consumption, foment technological spillovers, and even discipline domestic economic players.[3] On the other, it may increase output and consumption volatility because of major exposure to an international financial crisis, or because of a loss of independence of monetary policy.[4] The optimal level of capital account openness, ie the optimal degree of capital controls, will depend on the estimated magnitude of these potential gains and costs.

This complex debate is influenced by how gains and costs of capital controls are affected by: (i) the type of restriction under consideration (quantitative restrictions, taxes, restrictions on inflows or outflows) and the expected horizon of application; (ii) the interactions between capital flows and the rest of the country's macroeconomic policies, regulatory policies (especially those related to the financial system) and degree of institutional development; (iii) the degree of commitment, credibility and severity of the implementation process by the authorities.[5]

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[2] It should be noted that the law that governs pension fund investments determines maximum and minimum limits for foreign exposure, giving the central bank the mandate to determine the specific limit within these ranges. In the past few years the central bank has always chosen a limit equal to the maximum stated in the law.

[3] For a detailed account of the effects of capital account openness on economic growth see Eichengreen (2001), Edison et al (2002) and Klein (2005). A complete discussion about the effects of capital account openness on financial integration and consumption smoothing is presented in Sheffrin and Woo (1990), Montiel and Reinhart (1999) and Cashin and McDermott (2002).

[4] See Krugman (1998), Rodrick (1998), Stiglitz (2000). For a recent and opposite view see Edwards (2005) and Glick et al (2006).

[5] Another complication arises from the empirical difficulty of incorporating the endogeneity of decisions about capital account openness or lack thereof (for example the imposition of outflow controls during a crisis).

Table 1

Evolution of capital controls in the world in the 1990s

	Characteristics	Declared policy objectives	Countries	Effects of capital controls
Ex ante controls	Gradual, focused and indirect controls (or market controls).	To limit the instability that short-term capital flows may cause. To change capital flows' composition to achieve more stable flows, avoiding volatile flows that exacerbate the vulnerability of the domestic financial system. To preserve monetary policy independence.	Brazil (1993–97) Chile (1991–98) Colombia (1993–98) Malaysia (1994) Thailand (1995–97)	Some initial effects were accomplished, but no country fulfilled all objectives. Almost all the countries were able to maintain a spread between local and foreign interest rates. An appreciation of the local currency was observed in all countries, with different impacts on their current accounts. Only Malaysia and Thailand were able to reduce the magnitude of capital inflows. All countries had to resort to sterilisation. Some evidence indicates that Chile and Colombia were able to reduce short-term capital inflows, and to introduce a wedge between local and international financial markets. Capital controls in Brazil seem to have been ineffective.[1]
Ex ante controls	Widespread, and combined with administrative and indirect controls.	To reduce financial vulnerability by imposing extensive and long-term restrictions on international financial transactions.	China (since 1990) India (since 1990)	These restrictions seem to have limited the exposure of these economies to the Asian crisis, and helped to change the composition of capital inflows in favour of long-term flows. Other factors that explain these results may be: strong foreign financial position, large size of domestic markets, fewer commercial and financial links with the rest of the world, weak financial development (low financial intermediation of banks); floating exchange rate (India); good management of capital controls.[2]
Ex post controls	Focused on outflows, combined with administrative and indirect controls.	To limit capital outflows during banking and/or currency crises. To encourage a more flexible and less contractionary monetary policy.	Malaysia (1998–2001) Spain (1992) Thailand (1997–98)	Ideally, capital controls must be employed as a transitory measure while reforms are being implemented (Malaysia), and not as a substitute for reforms. If the incentive to evade capital controls is high (high yield spread) or if controls are less restrictive (Thailand), the capital controls may be less durable and effective (Krugman (1998)).
Ex post controls	Widespread, combined with administrative and indirect controls.	To impose massive currency restrictions on current and capital account transactions.	Romania (1996–97) Russia (1998–2001) Venezuela (1994–96)	Controls provided transitory alleviation of pressures on the current account, but did not protect against the fundamental causes of the imbalances. Controls seem to have reduced access to international financial markets, and this eventually forced the removal of restrictions and persuaded authorities to focus on solutions to the macroeconomic and financial imbalances (Romania and Venezuela).
Extensive liberalisation of capital account		To rapidly suppress capital controls, as a sign of commitment with the implementation of structural reforms and to correct domestic imbalances. To stimulate favourable conditions for capital inflows.	Argentina (1991) Kenya (1991–95) Peru (1990–91)	Foreign investment increased in Argentina and Peru, while in Kenya the effect was practically nil. Timely complementary reforms in Argentina and Peru helped to prevent a recession. When adequate macroeconomic and financial policies are not implemented, rapid liberalisation of the capital account may increase domestic vulnerabilities to international shocks (Kenya).

[1] Cardoso and Goldfajn (1997). [2] Cardoso and Goldfajn (1997).

Source: Table prepared by authors

International experiences of capital controls since 1990

During the 1990s, a set of countries employed capital controls in spite of the global tendency towards greater capital account openness.[6] Table 1 describes those episodes, distinguishing between ex ante and ex post restrictions. The experience of three countries where a rapid opening-up of the capital account was implemented as a response to an internal crisis is also included in Table 1.

Capital controls in Chile in the 1990s

The unremunerated reserve requirement (URR) imposed by the Central Bank of Chile on selective (mostly short-term or financial) capital inflows during 1991–98 represented a tax on inflows. The objectives of the URR were: (i) to avoid currency appreciation; (ii) to enhance the independence of monetary policy; and (iii) to reduce the vulnerability that an increase in external indebtedness – particularly in the short term – might cause.

Empirical evidence suggests that the effects of the URR on the interest rate differential, the appreciating trend, and total capital inflows were limited.[7] Additionally, there is no consensus about the role that capital controls played in insulating the economy from external shocks, such as the Asian crisis. Baghwati (1998) argues that capital controls may help prevent contagion, while Cowan and De Gregorio (2006) hold that it is difficult to argue that the URR was an important element behind the relative resiliency of the Chilean economy in the late 1990s. Moreover, Edwards (1998) points out that Chile also had capital controls during the late 1970s and early 1980s and the country could not avoid a deep crisis.

Finally, a large number of studies have emphasised the microeconomic costs of the URR on the Chilean economy. Edwards (1998) argues that the URR affected the domestic financial services industry, and discriminated against small and medium-sized firms, which were not able to access long-term financing to reduce the burden of the tax.[8] Cowan and De Gregorio (2006) maintain that the URR may have had some influence on the low intermediation of foreign capital observed by domestic banks.

III. Pension funds' financial outflows and their financial implications

Graphs 2 and 3 present capital account flows to emerging market economies and to Chile in particular.[9] A cursory glance at the main shapes of these flows shows a high degree of coincidence. The pre-Asian crisis situation was characterised by a striking absence of outflows, and hence the current account, the net inflows and gross inflows all coincided. This has changed dramatically in the present decade. Outflows are of the same order of magnitude as inflows, and therefore a sharp fall in the availability of financing to the current account cannot necessarily be attributed to capital flow reversals. Moreover, Chile has not shown a qualitatively different pattern of net inflows, or larger outflows and inflows, when compared to other emerging economies.
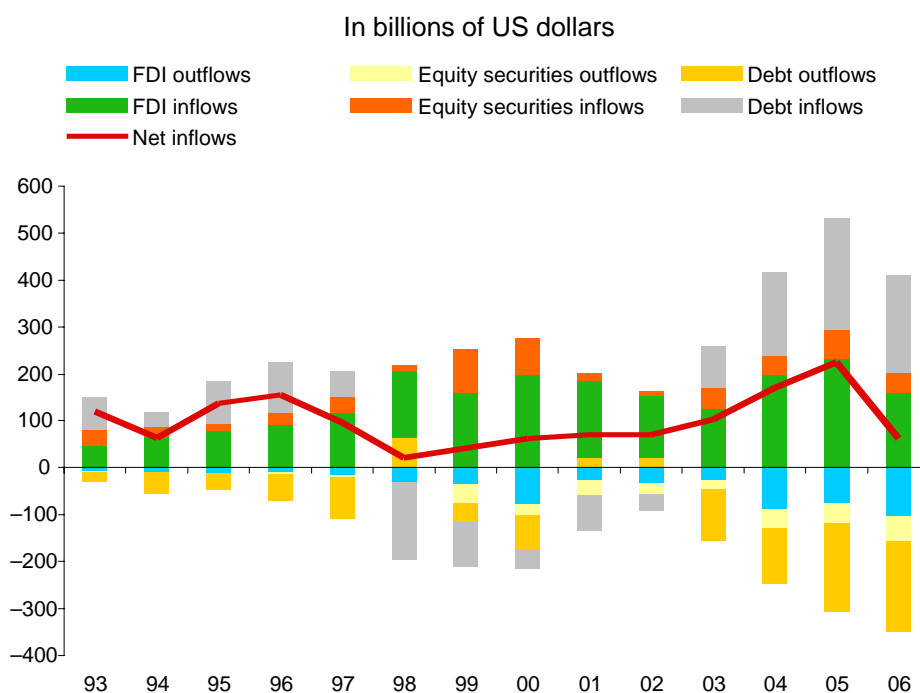
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[6] See Edwards (2005) and Miniane (2004).

[7] See Valdés-Prieto and Soto (1996), Larraín et al (1997), Edwards (1999), Gallego et al (1999) and De Gregorio et al (2000).

[8] Forbes (2007) measures this point.

[9] See Ahumada et al (2006b) for a detailed look at these patterns.

Graph 2

Capital account flows to emerging market economies[1]

In billions of US dollars

[1] By convention, inflows are registered with a positive sign and outflows with a negative sign. A positive (negative) inflow indicates an increase (decrease) of inflows, while a positive (negative) outflow indicates a decrease (increase) of outflows. Countries included in the sample are Brazil, Chile, China, the Czech Republic, Hungary, India, Korea, Malaysia, Mexico, Poland, Russia, South Africa, Thailand and Turkey.

Source: Authors' calculations, based on Ahumada et al (2006b).

Graph 3

Capital account flows to Chile

In billions of US dollars
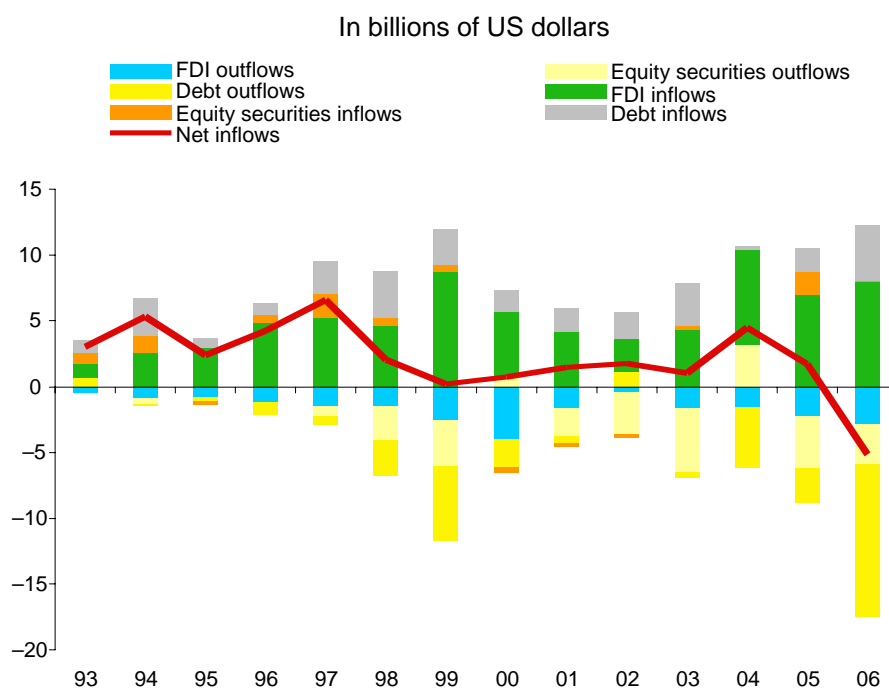
Source: Authors' calculations, based on Ahumada et al (2006b).

In the case of Chile this point was forcefully made by Cowan et al (2007), by showing that the usual interpretation of a *sudden stop* in capital inflows was an inadequate rendering of the Chilean balance of payments evolution in 1997 and 1998. Indeed, the reduction in net inflows from 1997 to 1999 was driven by a *sudden start* (their expression) in outflows, mostly in debt but also on equity instruments. This stands in sharp contrast with the overall experience of emerging economies which did suffer a dramatic reversal in capital account debt inflows over this period.

What were the drivers of this sharp increase in outflows in Chile in 1998 and 1999? It is readily apparent from official data (including both the balance of payments and the international investment position) that local banks as well as pension funds played a large role in shifting the capital account situation.

Graph 4 presents the foreign exposure of pension funds since the mid-1990s. As noted previously, early on pension funds did not hold many foreign assets, given that the policy mix of an exchange rate band and high local interest rates made local investment opportunities more attractive. However, starting with the turmoil that the Asian crisis provoked in 1997 and 1998, and following the relaxation of controls on capital flows and the floating of the peso from 1998 to 2001, pension funds rapidly reached their regulatory limit. This amounted to a substantial capital outflow, reaching a cumulative total of USD 3,325.3 million in the period from 1997 to 2000.

Graph 4

Net foreign currency exposure of pension funds, 1996–2007[1]

As a percentage of total assets
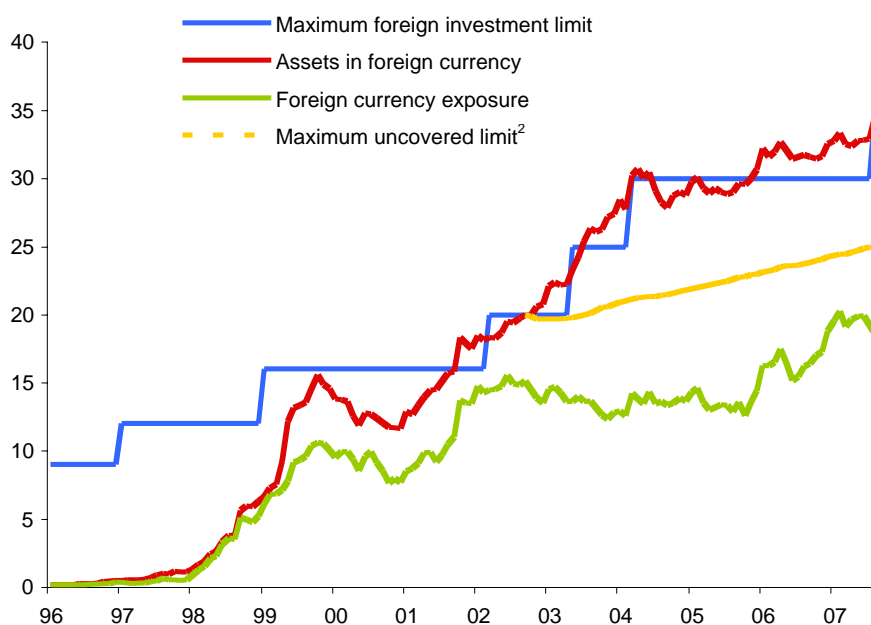
[1] As of August 2007.   [2] Each fund's limit is weighted by size.

Source: Authors' calculations, based on data from the Superintendencia de Administradoras de Fondos de Pensiones.

The second source of capital outflows was the banking system. Graph 5 shows foreign currency assets and liabilities of the banking sector. Some patterns can also be related to the changing macroeconomic policy framework of these years. A reduction in both foreign assets and liabilities under the exchange rate band regime was followed by a rapid increase in the foreign asset position from 1997 to 2000, which coincided with the Asian and Russian crises

and the regime shift. The cumulative net change in the foreign exchange position held by the financial sector reached around USD 1,700 million between 1997 and 2000.

Graph 5

Bank assets and liabilities in foreign currency, 1989–2007[1]

As a percentage of total assets
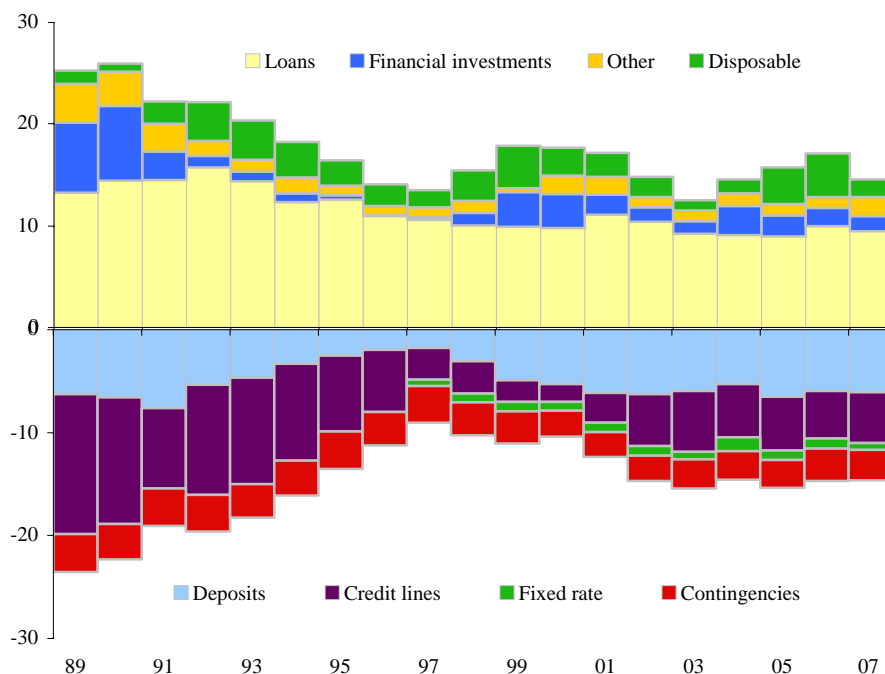
[1] As of October 2007.

Source: Superintendencia de Bancos e Instituciones Financieras.

Therefore, a case could be made that the policy regime changes led to some stress-inducing capital outflows from the last part of the 1990s to the early part of this decade. However, a full appraisal has to take into account more recent developments and the structural implications of the new circumstances.

Prominent among these is the sustained increase in the holdings of external assets by pension funds. From 2001 to 2007, the share of the portfolio that could be allocated abroad rose from a little over 15% to 40%. The central bank moved in tandem with these shifts and pension funds also quickly kept pace with the new regulatory limits.

A significant change occurred in 2002, when foreign asset exposure was legally separated from foreign currency exposure, while also introducing a multi-fund structure to pension funds' portfolios that allows contributors to the system to decide the overall risk profile of their pension allocation. In macroeconomic terms, the first modification has had significant implications. As Graph 4 shows, although pension funds have diversified their exposure to foreign assets up to the legal limit, they have not fully hedged their currency exposure. The latter has increased but has remained well below the legal limit.[10] A rough calculation shows that on average the unhedged foreign currency exposure of pension funds is only 20% of the maximum allowed by law.

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[10] The legal limit allows pension funds to hold up to 25% of their foreign currency exposure unhedged.

What are the financial implications of this situation? On the one hand, pension funds are hedging a substantial part of their exposure to foreign exchange rate risk, although in the future the degree to which they undertake this will be determined by the actual portfolio decisions of pension contributors. How much exchange rate fluctuations affect the perceived wealth of contributors and therefore their current financial and real decisions is open to question. Pension funds are in this sense the proper vehicle to bear market risk, and are not subject to liquidity risk. On the other hand, one important structural implication of pension funds hedging their exchange rate risk, ie selling long forward positions in foreign exchange to the local banking system, is that local banks, by aiming to keep their foreign exchange exposure close to zero, intermediate this position by also selling long forward positions in foreign exchange to their clients. Thus, the clients of the banking system (most notably corporations faced with future foreign exchange commitments, for instance related to external debt) find a ready counterpart to buy long forward positions in foreign exchange in the banking system and thus hedge their balance sheet exposure to exchange rate risk.

Regulations in place imply that pension funds have to hedge their foreign exchange exposure locally. Thus, there is a significant *stock* supply of foreign currency which is sold forward and intermediated in the over-the-counter (OTC) market by banks.[11] Concurrently, market and liquidity risk regulations put in place by the central bank in 2004 and 2005 have further increased the role of banks in the intermediation of this hedging supply, as the capital requirements for bank holdings of unhedged foreign currency positions have remained high. This explains why the net foreign currency exposure of banks is very low, as shown in Graph 5.

Graph 6 shows the counterparties for banks' foreign currency derivatives transactions, as of June 2007. As can be readily seen, pension funds are a large participant in the long forward forex positions of banks. The counterpart to this situation is a substantial short forward forex position held by banks with firms and non-residents. Thus, pension funds are indirectly providing forex hedging opportunities to Chilean firms.

Table 2 shows a view of the demand for hedging from manufacturing firms. Clearly only large and very large firms are important players in this market, although this might be related to the fact that small firms are not prominent in the export sector.

From the financial sector side, it is also the case that the hedging supply from pension funds is intermediated through specific banks. Table 3 displays the foreign exchange section of the balance sheet of specific groups of banks.[12] Over time, it shows that the notional size of derivatives only increased after 1999, coinciding with the policy measures mentioned earlier. Moreover, the net mismatch is low in all groupings, and has remained so over time, reflecting the fact that the pattern in Graph 5 is relevant to different groups of banks. However, the most striking feature of recent developments is the disproportionate participation of "treasury banks", essentially branches of large international investment banks. Although they only represent 3.6% of total assets and 9.6% of total capital of the banking sector, as of September 2007 they provided 37.3% of the total notional forward short position in forex currency.
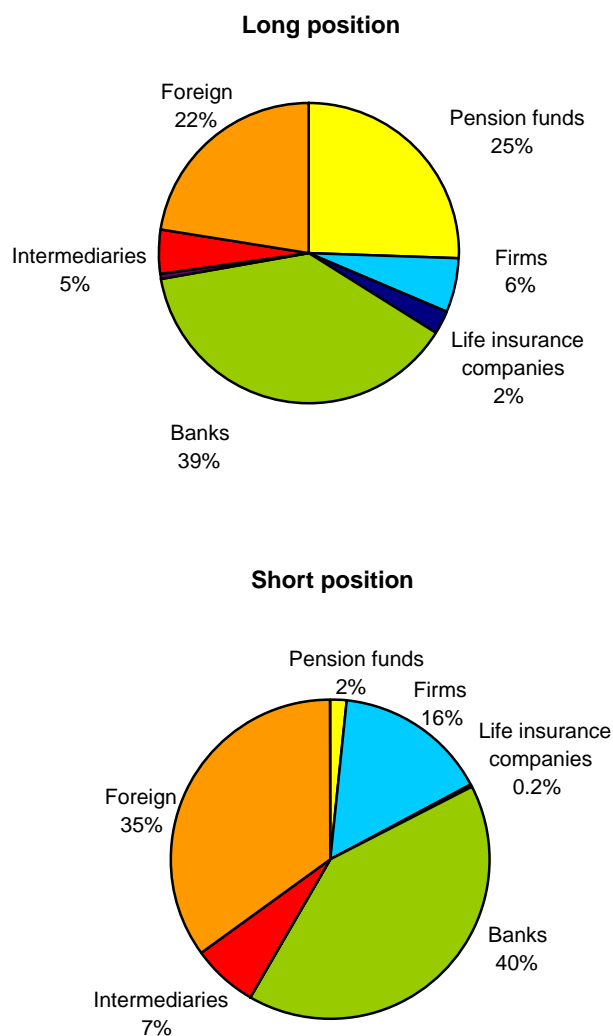
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[11] Due to a number of issues, exchange-traded derivatives are very scarce, if not inexistent.

[12] Due to the size of the economy, the Chilean banking sector comprises only 26 banks.

Graph 6

**Counterparties in banks' foreign currency
derivatives operations**[1]

As a percentage of notional value

Long position

Short position

[1] As of June 2007.

Source: Central Bank of Chile.

The significant size of pension funds has also implied that large shifts in their demand for foreign exchange hedging have had a significant impact on inshore dollar markets. Due probably to tax wedges and the small size of the market, pension fund portfolio shifts have led to significant changes in the premia in the forward market. However, from an overall macroeconomic perspective, the implications of pension funds' portfolio shifts for the main financial prices, such as the exchange rate, stock prices, or long-term interest rates, have been muted, small and transitory at best. As the next section shows, these have broadly moved in tandem with global and local macroeconomic developments.

Table 2

Financial debt and use of derivatives

Size[1]	Units[2] [USD thousands]	Small[3] (0,960]	Medium (92,960]	Large (960, 3.839]	Mega (3.839, 23.032]	Total [0, °)
Total domestic bank debt[4]						
Firms	[number]	1,713	1,113	688	330	3,844
	[% of the group]	72.3%	83.7%	87.4%	90.4%	79.3%
Amount of debt	[% of the total]	2.6%	5.8%	19.4%	72.2%	100.0%
	[% of group sales]	17.4%	15.4%	17.6%	8.7%	10.1%
Domestic debt in foreign currency						
Firms	[number]	110	326	421	265	1,122
	[% of the group]	4.6%	24.5%	53.5%	72.6%	23.1%
Amount of debt	[% of the total]	0.4%	1.6%	14.0%	84.0%	100.0%
	[% of group sales]	1.2%	2.0%	5.9%	4.7%	4.7%
External debt						
Firms	[number]	8	16	41	76	141
	[% of the group]	0.3%	1.2%	5.2%	20.8%	2.9%
Amount of debt	[% of the total]	0.1%	0.3%	1.7%	98.0%	100.0%
	[% of group sales]	0.3%	0.4%	0.8%	6.6%	5.6%
Currency derivatives market (long and short positions)						
Firms	[number]	2	15	81	65	163
	[% of the group]	0.1%	1.1%	10.3%	17.8%	3.4%
Notional amount[5]	[% of the total]	0.6%	0.3%	11.6%	87.5%	100.0%
	[% of group sales]	0.5%	0.1%	1.4%	1.4%	1.3%

[1] Of the firms in the ENIA manufacturing survey, 67 have FECUs (standardised financial statements), and 55 of these are "mega firms".   [2] [% of total] refers to the percentage that the size group represents in the total. [% of group] is the fraction of firms in the size group presenting values different from zero for the variable in question. [% of group sales] is the percentage that the variable in question represents in the total sales of the group.   [3] Small firms include 134 "micro firms" (sales < USD 92,000).   [4] The simple average of bank debt over sales for the FECU firms in the sample is 18%. The same average, using bank liabilities and operating income of the FECU firms, is 20%. For this same group of firms, the simple average of the ratio of the notional amount of derivatives (short and long positions) and the sales reported in the ENIA is 3.6%. The same ratio using operating income from the FECUs is 3.6%, and it falls to 1.8% if total assets from the FECUs are used instead of operating income.   [5] The value of the notional amount over total sales for small firms is determined by a firm that has a ratio of the notional amount to sales of 600%.

Source: Cowan et al (2006).

Table 3

Foreign currency mismatches, by type of bank, 1989–2007[1]

As a percentage of total assets

	Private multibanks[2]			State-owned bank			Medium-sized banks[3]			Treasury banks[4]		
	Pre-1999	1999–2004	Post-2004	Pre-1999	1999–2004	Post-2004	Pre-1999	1999–2004	Post-2004	Pre-1999	1999–2004	Post-2004
Assets	19	17	19	14	4	11	17	13	15	33	29	25
Loans	14	11	11	8	4	4	13	10	11	19	14	9
Financial investments	2	3	2	3	2	2	1	2	1	3	2	3
Liabilities	19	17	20	11	6	12	18	14	14	27	27	25
Fixed-term deposits	4	5	6	0	1	6	3	5	4	6	9	11
Credit lines	9	4	7	8	2	2	8	4	4	11	4	1
Gross mismatch	–1	0	–1	2	–3	–1	0	–2	1	6	2	0
Long position	3	13	10	2	11	6	8	23	9	24	213	159
Short position	4	16	9	2	15	6	9	29	10	25	226	163
Net mismatch	1	2	–3	2	1	–2	1	4	1	6	15	4

[1] As of October 2007. [2] Private multibanks include: Banco de Chile, Santander Santiago and BCI. [3] Medium-sized banks include: BBVA, Corpbanca, Banco BICE, Itaú, Citibank, Banco Internacional, Security, Rabobank, Scotiabank, Banco del Desarrollo, Falabella, Ripley and Paris. [4] Treasury banks include: JPMorgan Chase, HSBC, ABN Amro, Deutsche Bank, Tokyo, Banco Nación Argentina, Banco do Brasil, Monex and Penta.

Source: Authors' calculations, based on Figueroa and Jara (2006).

IV.   Asset prices over the period of higher financial integration

Following Cifuentes and Desormeaux (2003), we look at various measures of financial integration in the Chilean economy, in order to asses its extent and evolution since the early 1990s. We analyse the case of the stock and fixed income markets, correlating the returns of domestic and US instruments. In order to capture the evolution of financial integration over time, two-year moving windows were used for the estimations.

Stock exchange

Graph 7 shows the domestic stock market index (IPSA) compared with the Dow Jones index from January 1990 to October 2007.

Graph 7

**Stock market indexes**

In local currency
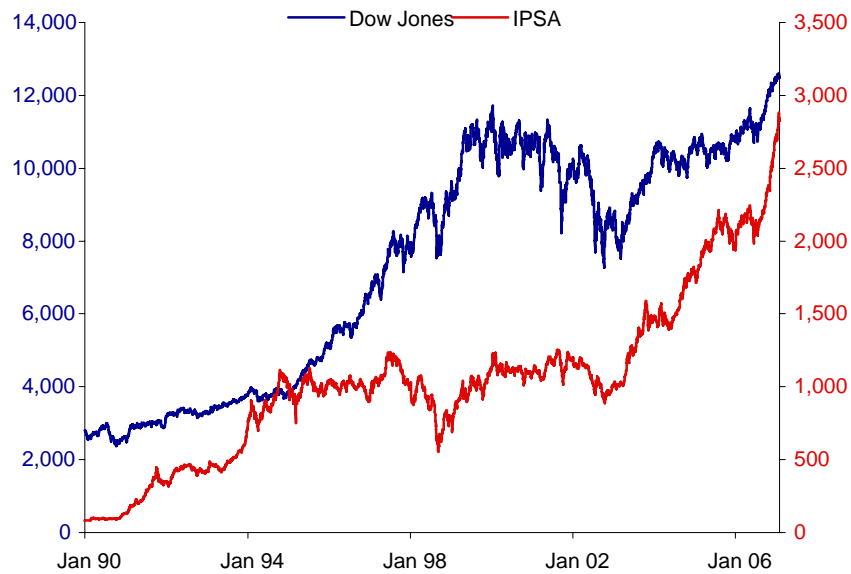
Source: Bloomberg.

Since the data series are stationary, we can estimate the following equation on returns:

$$d\log(IPSA) = c + \alpha \; d\log(DowJones) + \beta \; d\log(IPSA(-1))$$

where the log differences correspond to the returns of the series. Coefficient α measures the degree of correlation between the IPSA and Dow Jones returns in US dollars, and coefficient β captures the importance of returns in the previous period in explaining today's return.

Graph 8

**Correlation of daily returns between IPSA and Dow Jones**
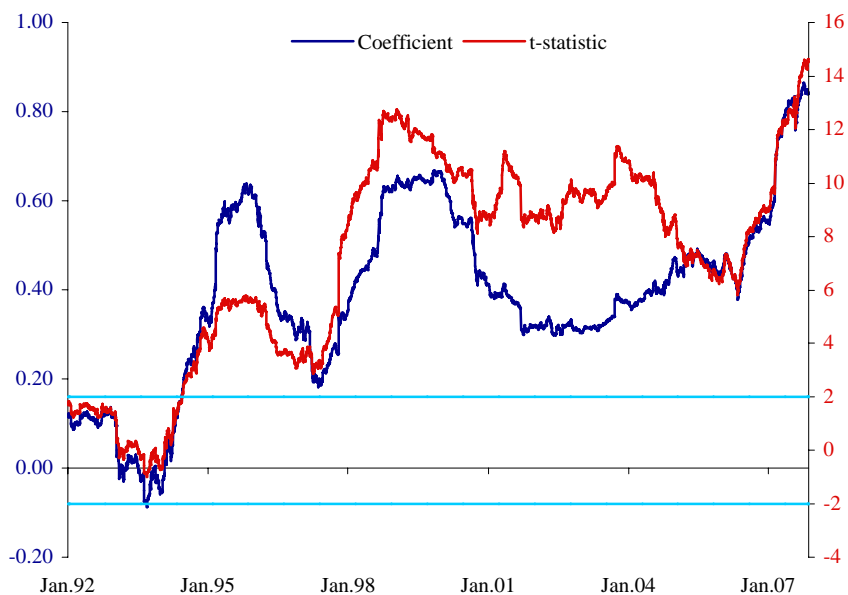
Source: Authors' calculations, based on data from Bloomberg.

Graph 8 shows the values of the coefficient α in the left-hand axis and its significance on the right-hand axis. A band between the values –2 and 2 shows the area where the estimated coefficient is not significantly different from zero. Correlation between the domestic and foreign stock markets became significant by mid-1994 and has remained so throughout the sample. Given our two-year windows, this suggests that financial integration at the level of stock markets became a significant phenomenon by mid-1992. The estimated values of α fluctuate between 0.2 and 0.8, reaching peaks in 2000 and 2007. These correspond to episodes of strong co-movements across markets that are captured by the moving window. The first episode corresponds to the bursting of the technology bubble in 2000 and the second to the recent turbulence in financial markets derived from the subprime crisis.

Stock market volatility, measured in Graph 9 by the standard deviation of a two-year window of daily returns, shows a decreasing trend, particularly after the bursting of the dotcom bubble in 2000, with a small reversal at the end of the sample period, when the turbulence derived from the subprime crisis ensued. In theory, integration should lead to lower volatility, as a larger investor base and more liquid markets should help to diffuse the effect of local shocks. But at the same time, external shocks will be transmitted more easily to the domestic market, which is also clear in Graph 9 for the 1995–97 and 1998–2000 periods.

Graph 9

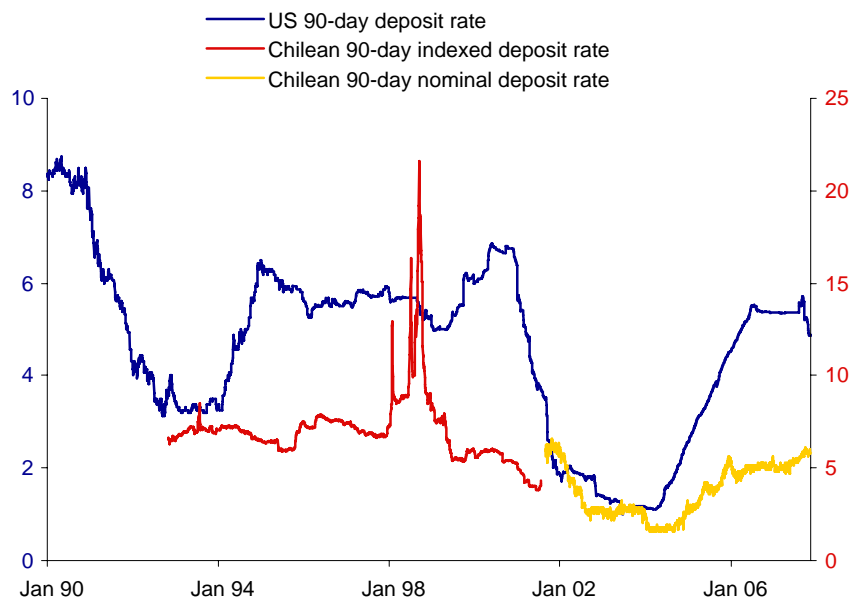**Daily IPSA returns: average and standard deviation**

In per cent
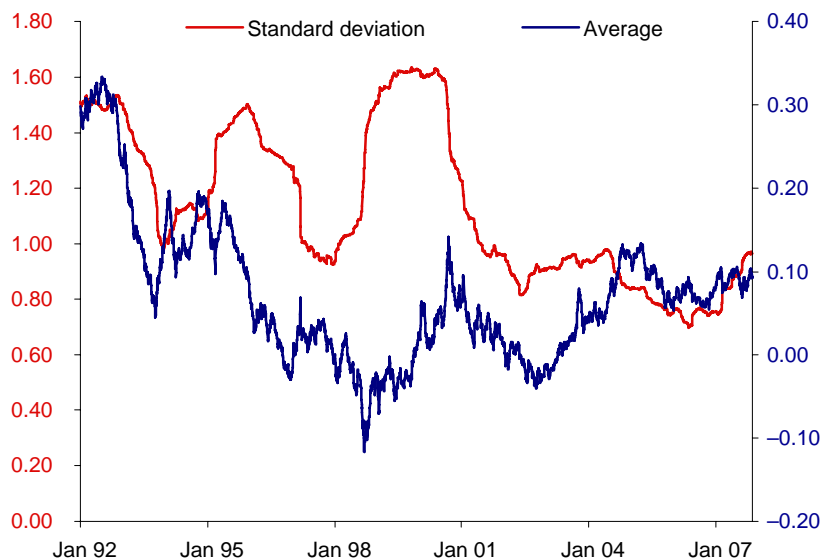
Source: Authors' calculations, based on data from Bloomberg.

Interest rates

For fixed income instruments we explore evidence about financial integration on the money market and the market for long-term bonds (see Graphs 10 and 11). As in Cifuentes and Desormeaux (2003), we use the money market as our test of monetary independence, as it is the market used by the central bank to target interest rates.

Graph 10

Short-term domestic and foreign interest rates

In per cent

- US 90-day deposit rate
- Chilean 90-day indexed deposit rate
- Chilean 90-day nominal deposit rate

Sources: Central Bank of Chile; Bloomberg.

Graph 11

Correlation between domestic (inflation-adjusted) and foreign short-term rates

- Coefficient
- t-statistic
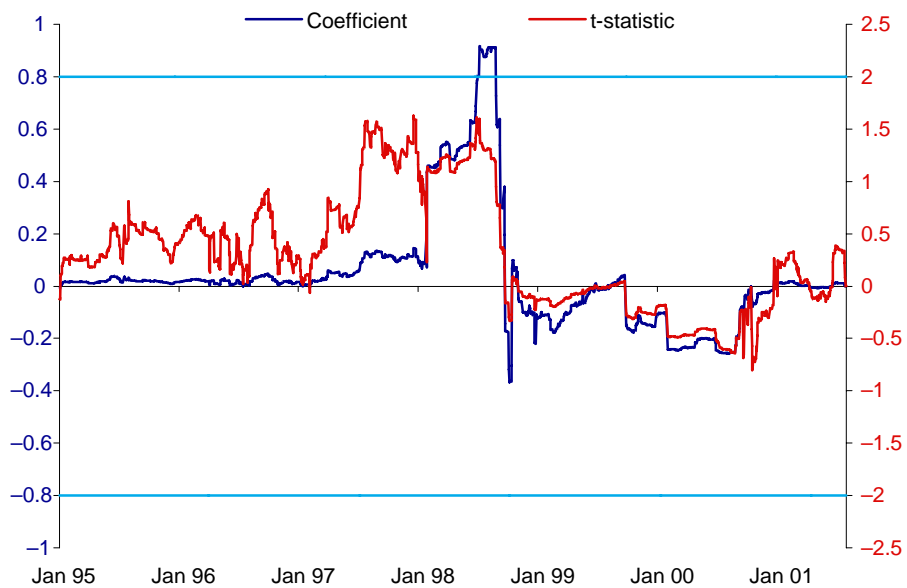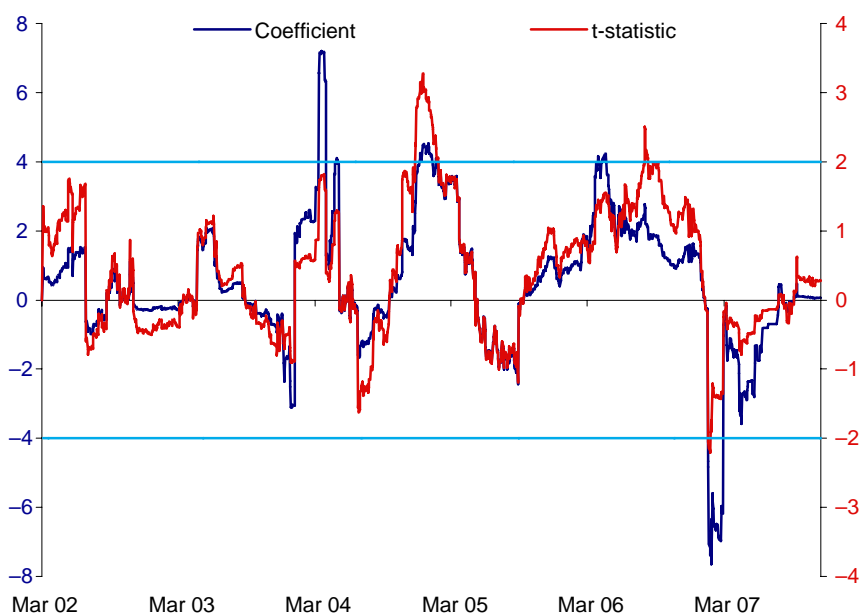

Source: Authors' calculations.

The estimated equation[13] uses the expected depreciation of the peso against the US dollar and sovereign risk premium as controls, specifically:

$$i = c + \alpha i^* + \beta_1 \log\left(\frac{E_{t+1}^e}{E_t}\right) + \beta_2 \rho$$

where coefficient α measures the partial correlation between the domestic and foreign interest rates, and coefficients β_1 and β_2 capture the importance of the expected depreciation of the peso and the sovereign risk premium, respectively, in explaining the level of the domestic interest rate. The real exchange rate is employed in the estimation for inflation-adjusted interest rates.

First we compare the US three-month deposit rate with the domestic 90-day indexed deposit rate, using two-year moving windows. After July 2001, when the Central Bank of Chile started targeting nominal interest rates, we compare nominal rates over a six-month moving window, because we have a smaller number of observations.

Graph 12

**Correlation between nominal domestic and
foreign short-term rates**

Source: Authors' calculations.

When indexed domestic rates are employed, the coefficient that captures the partial correlation between domestic and foreign short-term rates is not significant in any period (Graph 11). This can be interpreted as evidence of independence of monetary policy, an expected result. The same result applies when nominal short-term rates are used to test financial integration, after July 2001. However, during two brief periods, at the end of 2004 and in mid-2006, the correlation between domestic and foreign short-term rates becomes significant, positive in the first episode and negative in the second (Graph 12). This may be

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[13] This is a first-order approximation of the uncovered interest rate parity equation.

the result of similar shocks that affected short-term rates or their determinants both domestically and abroad. We have no clear explanation for the first episode, but the second (mid-2006) corresponds with the financial market turbulence of May–June 2006, which gave rise to a flight to quality and an increase in sovereign spreads. As a result, domestic and foreign short-term rates moved in opposite directions. Except for these two brief episodes, our results suggest that domestic and foreign short-term nominal rates are not correlated, which confirms our previous result in favour of monetary independence.

The longer-term market will give us a better idea of financial integration, since it is less influenced by monetary policy. In Graph 13 we compare the rates on a five-year US TIP bond with those of a five-year bullet and eight-year coupon bond issued by the Central Bank of Chile (CBCh), which have similar durations. Next, in Graph 14 we compare five-year nominal bond rates. We used daily data for domestic and foreign interest rates, using six-month moving windows to evaluate the evidence due to the small number of observations. When we employed inflation-adjusted rates, the estimated coefficient, in Graph 15, does not differ significantly from zero for most of the sample. This result is not surprising, as the rates on inflation-adjusted instruments seem to be affected mostly by idiosyncratic elements, such as the capital gains associated with changes in expected future inflation, and are held almost exclusively by domestic institutional investors. However, when nominal rates are employed, correlation is significant for most of the sample, and pass-through coefficients show an upward trend, an unequivocal sign of an increasing degree of financial integration (Graph 16).
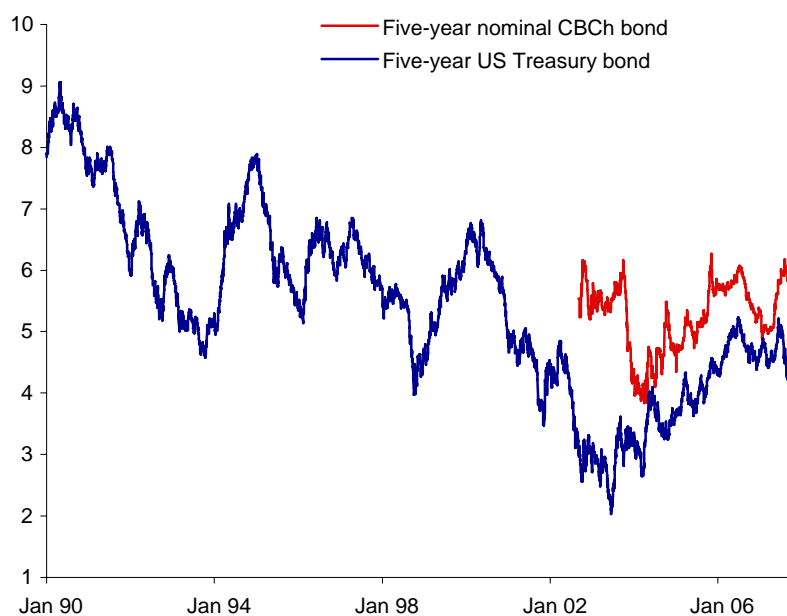
Graph 13

**Long-term domestic and foreign
inflation-adjusted interest rates**

In per cent
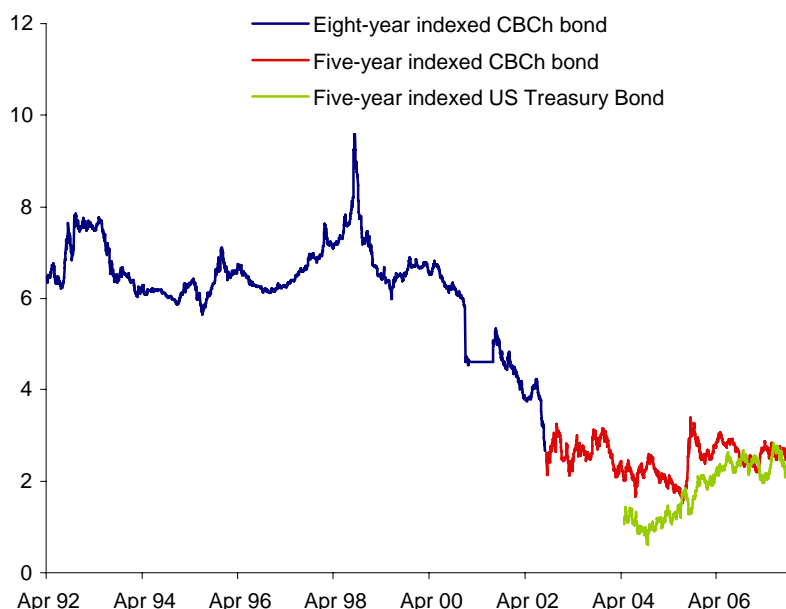
Sources: Central Bank of Chile; Bloomberg.

Graph 14

Long-term domestic and foreign nominal interest rates

In per cent

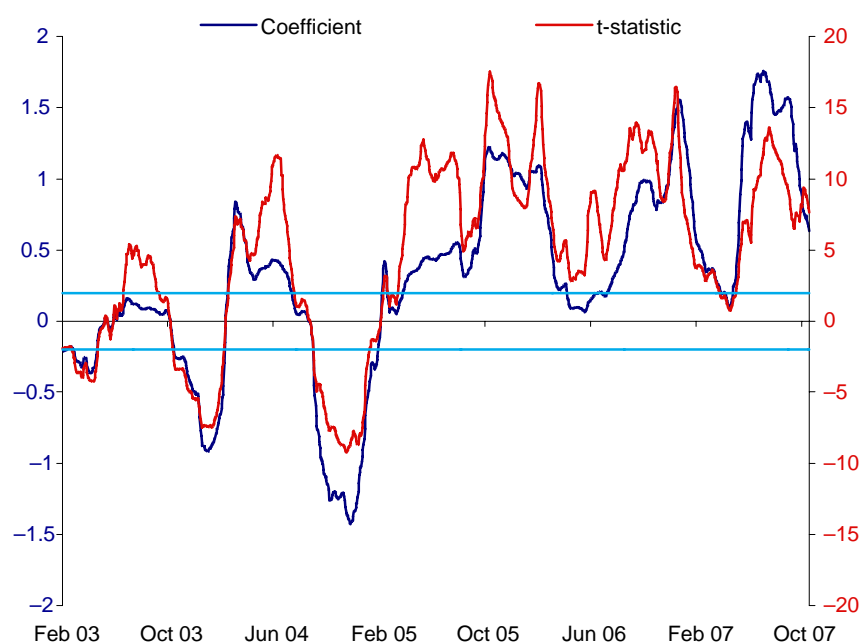Five-year nominal CBCh bond
Five-year US Treasury bond

Sources: Central Bank of Chile; Bloomberg.

Graph 15

**Correlation between local and foreign
inflation-adjusted long-term rates**

Coefficient — t-statistic
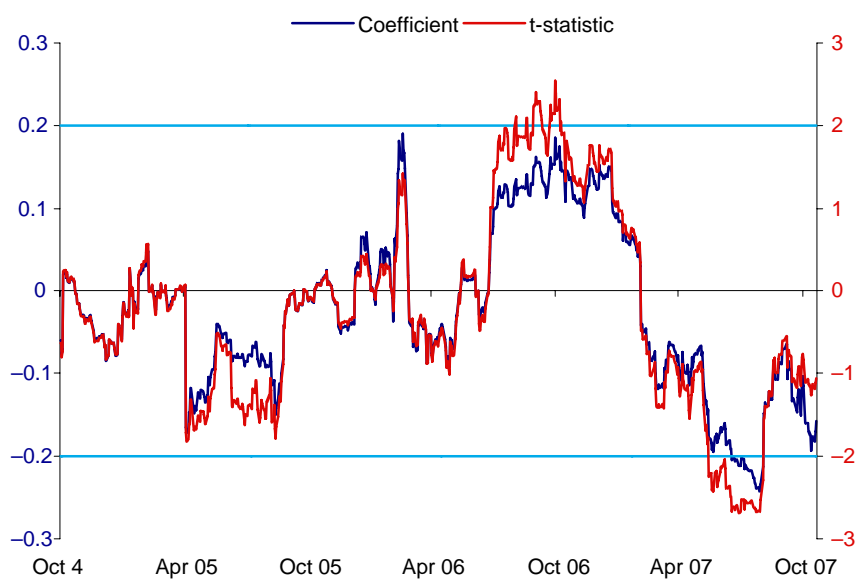
Source: Authors' calculations.

Graph 16

**Correlation between local and foreign
nominal long-term rates**

Source: Authors' calculations.

**Impact of changes in foreign investment limits of pension funds**

There is evidence that shifts in foreign investment limits of pension funds have a limited impact on asset prices. Using a monthly stock return model, Silva (2007) finds no evidence that pension fund stock transactions affect aggregate market returns in Chile. The author proposes that Chile's growing integration with international financial markets reduces the effect of pension funds on local stock market prices. Additionally, there is evidence that changes in investment limits of pension funds have a limited effect on interest and exchange rates. On the one hand, Silva and Selaive (2008) find that a rise of 5% in the foreign investment limit causes an increase of only 1 basis point on inflation-adjusted interest rates. On the other hand, Cowan et al (2008) demonstrate that an increase of 10% in investment limits is associated with an accumulated depreciation of 2% of the Chilean peso against the US dollar.

V.   Conclusions and challenges ahead

The process of financial integration undergone by the Chilean economy in the past decade has not involved a significant increase in financial volatility, has allowed enhanced risk-sharing for domestic investors, and has contributed to the development of the local derivatives market (Graph 17).

Graph 17

Spot and derivatives transactions in Chile[1]

In billions of US dollars

■ External derivatives market   ■ Local derivatives market   ■ Local spot market
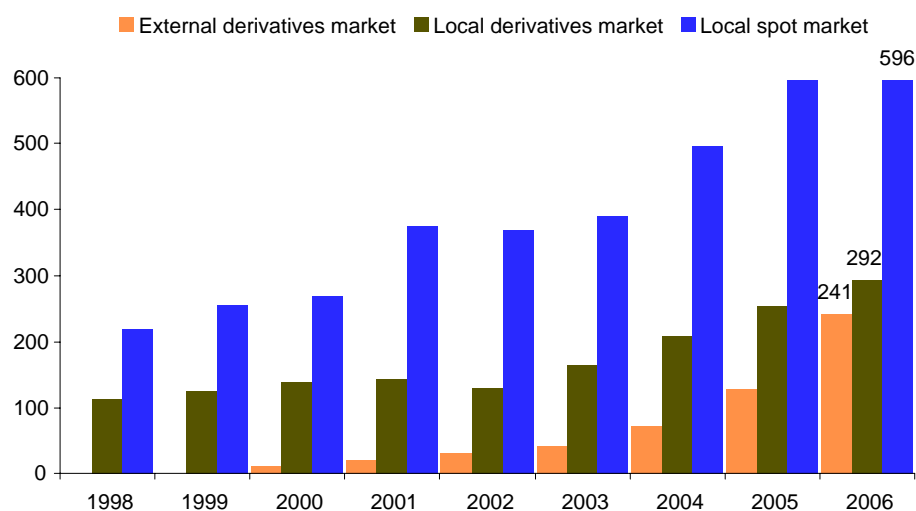
[1] Corresponds to the total actual buy and sell transactions realised in the calendar year.

Source: Central Bank of Chile.

Although this process of integration has been impressive, some challenges and developments remain for a further deepening of the financial links between Chile and the rest of the world. We tentatively explore some of these avenues below.

First, cross-border flows of spot peso transactions are practically non-existent. This explains the significant role of the non-deliverable forward market as the derivatives market of choice for non-residents aiming to shift their exposure to the Chilean peso. This is probably linked to several aspects. Although participation by non-residents in local equity markets has been widespread after the waiver of capital gains tax in the case of transactions in liquid stocks, this has not been implemented in practice for fixed income transactions. Other related tax initiatives that could help in this direction are the administration of the withholding tax of 4% on interest income and enhanced clarity in the legal treatment of derivatives. Most of these aspects are currently under consideration by the Ministry of Finance.

Second, although our payment and settlement infrastructure for securities has been sharply revamped thanks to the adoption of real-time gross settlement for central bank money, steps need to be undertaken to reduce settlement risk in foreign currency payments, as well as in local securities. Both the Ministry of Finance and the central bank are currently actively looking into these issues.

Finally, the main challenge when aiming at further financial integration with the world is to closely monitor the financial stability implications of this integration. The tension between efficiency and security is probably the sharpest for an emerging economy in the area of external integration. Even financial systems where regulatory best practices and a generally sound macroeconomic framework are in place have been recently subject to sharp bouts of financial turbulence. Avoiding costly and disruptive financial crises, by timely policy actions and proper coordination, is probably the main challenge ahead for the Chilean economy, as well as for other emerging economies around the world.

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