Macroeconomic implications of capital inflows: Peru 1991–2007[1]

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I. Introduction

During the early 1990s, many emerging market economies in Asia and Latin America experienced massive capital inflows, favoured by structural reforms and improvements in macroeconomic management. Although the higher degree of financial integration brought many benefits, the capital inflows resulted in overheating and increased vulnerability to financial crises, which led in some cases to sudden reversals of capital flows.

In recent years, the high level of global liquidity and favourable economic conditions achieved via improved macroeconomic management have generated massive capital inflows to emerging market economies. Peru has also experienced significant capital inflows, especially in foreign direct investment (FDI), contributing to economic growth and development possibilities, but also creating downward pressures on the exchange rate. The strength of the fiscal position, with sustained primary surpluses and the de-dollarisation of the financial system, has helped neutralise the side effects of capital inflows and allowed the monetary authorities to respond through sterilised interventions without endangering the inflation targeting regime.

This paper analyses the macroeconomic effects of the 2000s episode of capital inflows and compares it with the episode of the 1990s. It also evaluates policy measures implemented in order to reduce the impact of abrupt reversals of capital flows.

II. Capital flows in Peru

Emerging market economies in general, and Peru in particular, were recently experiencing significant capital inflows, due to high levels of global liquidity and favourable economic conditions reflecting better macroeconomic management and the stimulus of previously implemented structural reforms. However, this episode of capital inflows is different to the one experienced during the 1990s, as it was spread across a larger number of countries with solid current account positions, in a context of a higher degree of financial integration.

However, along with the benefits of increased financing, capital inflows can also cause negative effects resulting in an overheated economy, exchange rate pressures and greater vulnerability to financial crisis. European emerging market economies have received large capital inflows in recent years. These flows were initially made up mainly by foreign direct investment; however, portfolio inflows, especially those oriented towards the acquisition of

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[1] The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Central Reserve Bank of Peru (BCRP). We are indebted to Adrian Armas and Fernando Vasquez for valuable comments and suggestions.

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debt securities, have become more important over time. These large inflows were stimulated by country-specific factors such as large interest rate differentials, large-scale privatisation programmes, sound and credible macroeconomic policies and enhanced economic prospects, as mentioned by Ötker-Robe et al (2007). Even though capital inflows provide economic benefits, large portfolio inflows may challenge macroeconomic management through their effects on exchange rates and liquidity; therefore, authorities need to make careful use of interest rate and intervention policies to avoid disorderly exchange rate adjustments and preserve the credibility of their monetary policy regimes.

Structural reforms and capital inflows: 1993–96

Improvements in macroeconomic management achieved through stabilisation programmes and structural reforms implemented during the early 1990s generated a massive flow of foreign capital to emerging market economies, and especially to Asia and Latin America. Despite their benefits, capital inflows overheated the expansion of aggregate demand in these economies and increased their vulnerability to a financial crisis. International volatility in a context of fragile domestic financial systems led to a fast reversal of capital flows in the late 1990s, which generated sharp depreciations and contractionary effects in these economies.

Similarly, Peru also experienced a rapid increase in capital inflows in the early 1990s, after a series of structural reforms implemented together with a stabilisation programme. This experience is described by Castillo and Barco (2008).

After a decade of high inflation and persistent output contractions, in 1990 the Peruvian government implemented a drastic stabilisation programme and structural reforms to attain macroeconomic stability and to encourage sustainable economic growth. The improved institutional arrangements set a new legal framework with price stability as the only monetary policy objective and established central bank autonomy in order to achieve it. These measures helped to lower inflation from 7,482% in 1990 to 6.5% in 1997. Structural reforms associated with the deregulation of the financial system and capital liberalisation also allowed the economy to access the international financial markets and generate fresh capital inflows which helped to increase the economy's productive capacity. The output growth rate increased from –5.1% in 1990 to 5.3% in 1997.

The environment of increasing monetary stability and sustainable output growth after the implementation of the structural reforms attracted capital inflows. Between 1991 and 1997, net private capital inflows were, on average, 5.8% of GDP, concentrated mainly on the long-term segment.

Capital outflows after the Russian crisis

Macroeconomic impact

The Peruvian economy experienced two main shocks during the late 1990s. The first one was a reduction in the terms of trade, after the decrease in worldwide demand for commodities following the Asian crisis. Even though this shock did not have a significant effect on investment or consumption, there was a sharp reduction in short-term capital flows.

However, the Russian and Brazilian crises of 1998 and 1999 caused significant outflows of short-term capital from emerging economies, including Peru. The EMBI indicator for Latin America jumped from 657 to 967 basis points between August and September 1998, while in the case of Peru, it rose from 680 to 914 basis points. The outflows quickly impacted the financial system and the foreign exchange market.

Short-term capital flows switched from an inflow of USD 649 million in 1998 to an outflow of USD 808 million after the financial crises, while FDI slightly increased from USD 1,582 million

to USD 1,812 million during the same period. Similarly, other Latin American countries also showed a sharp decrease in short-term capital flows, while long-term capital inflows remained relatively steady.

Table 1

Private capital flows

As a percentage of GDP

	1998			1999		
	FDI	Portfolio, net	Other, net	FDI	Portfolio, net	Other, net
Argentina	1.7	2.9	1.1	7.8	–2.4	–0.2
Bolivia	11.1	–0.9	2.5	12.2	–0.7	–2.2
Brazil	3.5	2.2	–3.3	4.6	0.6	–3.9
Chile	4.0	–3.1	1.8	8.5	–4.4	–3.6
Colombia	2.1	1.2	–0.2	1.6	–0.7	–2.5
Paraguay	4.2	0.1	1.0	1.2	–0.1	–0.7
Peru	2.8	–0.7	1.1	3.5	–0.7	–1.6
Uruguay	0.7	1.9	–0.7	1.1	0.4	–1.4

Source: IMF, *International Financial Statistics*.

The wave of capital outflows put the exchange rate and money markets under pressure. The pressures were absorbed through a sharp increase in interest rates.

Financial conditions deteriorated with the reversal in short-term capital flows. The increase in interest rates and the nominal exchange rate depreciation generated a decrease in credit growth, accompanied by a decline in economic activity. The growth rate of credit from the banking system to the private sector dropped from 24% in 1997 to 14% in 1998, while output growth decreased from 6.9% in 1997 to –0.7% in 1998.

Even though the pattern of capital flows was similar to those observed in other South American economies, Peru experienced a lower reduction in output growth as well as a smaller real foreign exchange depreciation. Peru had a high level of international reserves, which helped to provide the banking sector with foreign currency liquidity during the liquidity shortage period. The lower reduction in GDP growth was also related to some extent to countercyclical fiscal policy, as the overall fiscal balance deteriorated from a surplus in 1997 to a deficit of 3% of GDP in 2000, and the investment in the tradable sector during the pre-crisis period allowed for increases in production capacity, especially in the mining and agricultural sectors.

Policy responses to capital outflows

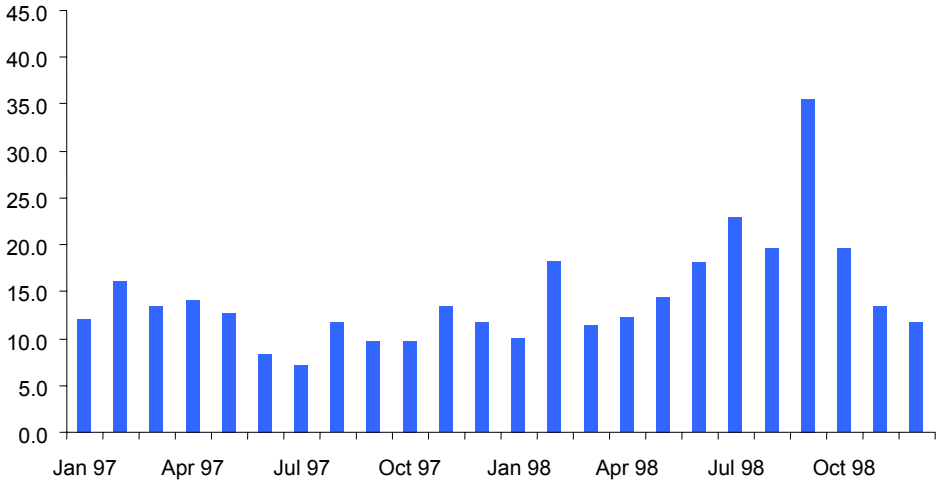
This episode of financial turmoil and increases in country risk led to a USD 987 million outflow of short-term capital in the fourth quarter of 1998, which generated interest rate and exchange rate variability. The initial policy response was to avoid a sharp depreciation of the domestic currency because of the balance sheet effects of a large depreciation in highly dollarised economies like Peru. As mentioned initially, the central bank allowed an increase in the short-term interest rate from 25% in July 1998 to 39% two months later. In the medium

term, the shock was absorbed through a 20% nominal depreciation of the exchange rate, while the interest rate fell back to 16.9% (Graph 1). After a short time, the authorities reoriented their policies towards the provision of foreign currency liquidity to the banking system.

Graph 1

Interbank interest rate, 1997–98

In per cent



Source: Central Reserve Bank of Peru.

Some of the policy measures implemented were:

Monetary policy measures

a. Credit facilities in foreign currency. The central bank opened a window for short-term credit in foreign currency as from 2 September 1998, in order to offset the short-run foreign currency liquidity restriction.

b. Reduction of the average and marginal reserve requirements on foreign currency deposits. Starting on 8 September 1998, the average reserve requirement on foreign currency deposits was reduced by 4.5 percentage points, through a series of 1.5 percentage point monthly reductions. This measure allowed the provision of foreign currency liquidity for USD 420 million. In addition, the marginal reserve requirement on foreign currency deposits was reduced from 35% to 20% in December 1998.

c. Foreign exchange interventions.

Against a backdrop of devaluation expectations and higher exchange rate volatility, the central bank restricted its purchases of foreign currency. Net purchases, including operations with the public sector, fell from USD 1,191 million in 1997 to a negative value of USD 639 million in 1998, considering the sale of USD 83 million in the foreign exchange market in September 1998.

Government and supervisory measures

d. Conversion of foreign currency public deposits to domestic currency. This measure provided foreign currency liquidity to the private sector, while also increasing the domestic currency resources of banks. These resources were used to increase the credit of the banking system in domestic currency by PEN 790 million in the fourth

quarter of 1998, partially offsetting the reduction in credit in foreign currency of USD 303 million.

e. Temporary purchases of banks' portfolios. There were two programmes for temporary purchases of banks' asset portfolios, for a total of USD 427 million, where banks were required to repurchase their portfolios at a discount rate of 20% in the following five years. They also committed to a net worth strengthening programme through the injection of new capital.

After the macroeconomic adjustment had taken place, the Peruvian authorities implemented several policy measures to guarantee the solvency of the banking system, including:

a. A net worth consolidation programme (creation of a fund for temporary capitalisation of banks);

b. A financial system consolidation programme (incentives for mergers);

c. A programme for financial rescue of agricultural companies and a programme for net worth consolidation of commercial companies;

d. Provision requirements (provisions based on the risk quality of banks' assets);

e. Limits to banks' global positions in foreign currency (a 100% limit (of capital?) on the overbought position and a 2.5% limit (of capital?) on the oversold position).

Between 1998 and 2001 the number of banks in Peru decreased from 25 to 15 due to the liquidation of nine banks and the merger of three, while two new banks started operations in 1998 and 1999, respectively. The total fiscal cost of the banking crisis is estimated at 2.1% of GDP.[5]

Policy measures adopted to confront the reversal of capital flows allowed for a quick reversal of the banking sector liquidity shortage. The low depreciation of the real exchange rate, compared to other Latin American countries, limited the deterioration of banks' assets in Peru's highly dollarised economy, and helped to neutralise the drop in GDP growth.

Countercyclical fiscal policy helped the economy by reducing the government deficit during the period of large capital inflows and by using these resources to increase public expenditure after the sudden stop. As a result, there was less overheating in GDP growth during the capital inflow period and a soft landing was possible after the reversal of capital flows.

Another feature that bolstered the resilience of the Peruvian economy's long-term macroeconomic prospects was the persistence of FDI during the financial crisis, which maintained an average value of 2.7% of GDP between 1998 and 2002.

Macroeconomic stability and capital inflows: 2002–07

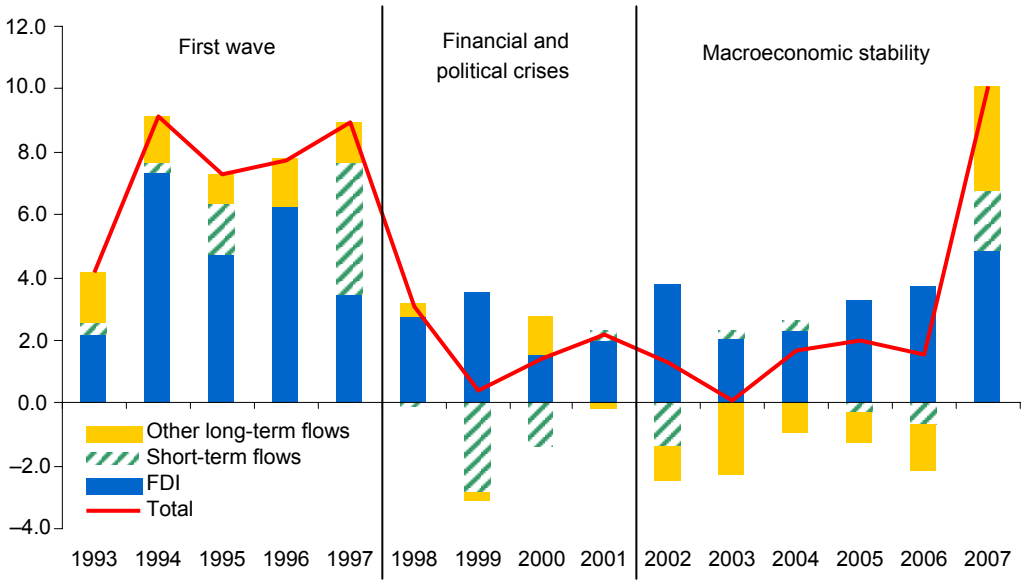
During the last few years there has been a gradual recovery in private capital inflows since the minimum reached in 2003, mainly in the form of FDI, favoured by the stable macroeconomic environment of price stability, fiscal discipline and financial solvency (Graph 2).

[5] This indicator includes the programme for the exchange of treasury bonds for non-performing loans, the bank restructuring programme, the financial consolidation programme and the corporate debt restructuring programme.

Graph 2

Net private capital inflows

As a percentage of GDP



Source: Central Reserve Bank of Peru.

Table 2

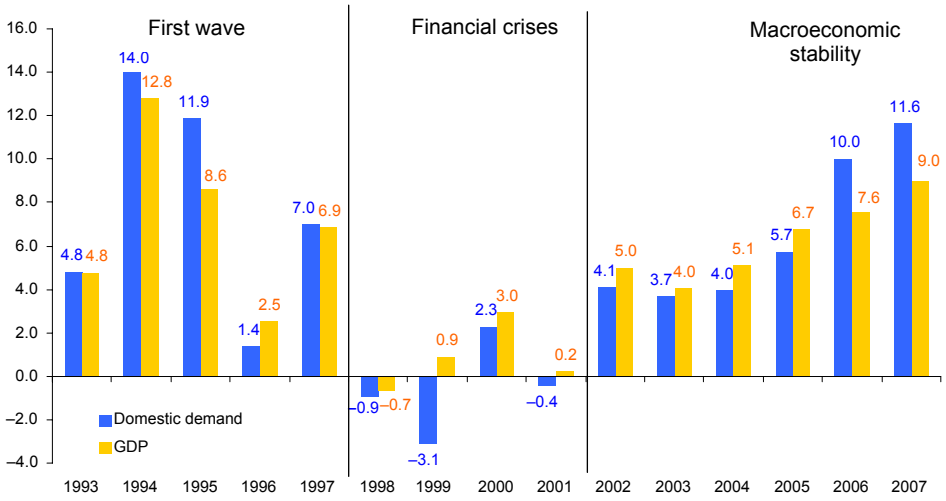
	1993–97		1998–2001		2002–07	
	Average	**Volatility**	**Average**	**Volatility**	**Average**	**Volatility**
FDI	4.8	0.43	2.5	0.36	3.3	0.31
Other long-term	1.4	0.17	0.3	2.26	–0.6	3.39
Short-term	1.3	1.34	–1.0	1.43	0.0	...
Total	**7.5**	**0.27**	**1.8**	**0.65**	**2.8**	**1.32**

Source: Central Reserve Bank of Peru.

During the last five years, the Peruvian economy has been experiencing a sustained expansion of economic activity, reaching GDP growth rates of 7.6% in 2006 and 9.0% in 2007, accompanied by a similar trend of domestic demand. In particular, private consumption and private investment have shown a faster pace of growth, reflecting consumer and business optimism in a context of increased disposable income due to higher terms of trade and employment growth. Since 2002, output growth has been much more stable than during the first wave of capital inflows of the mid-1990s. In fact, the volatility of GDP growth decreased from 49% (measured by the ratio of the standard deviation to its average) during 1993–97 to 27% during 2002–07 (Table 3).

Graph 3

Domestic demand and GDP



Source: Central Reserve Bank of Peru.

Table 3

GDP growth volatility

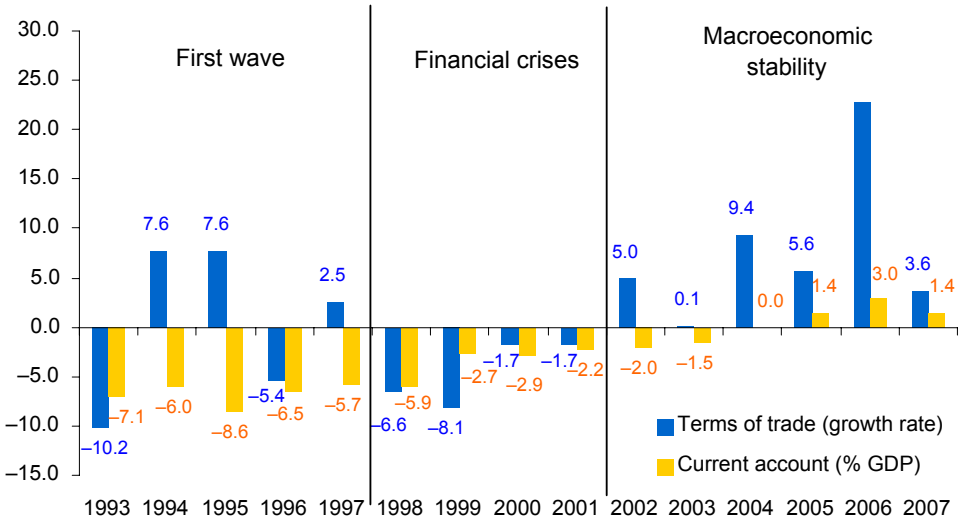
	1993–97	1998–2001	2002–07
Average GDP growth	7.12	0.86	6.24
Variability	0.49	1.56	0.27

Source: Central Reserve Bank of Peru calculations, author calculations.

Another characteristic of the current scenario is the important increase in the terms of trade, which has been translated into a progressive improvement in the current account, reaching surpluses in the last two years. The favourable evolution in the price of exports has led to an increase in profits and reinvestments, giving an extra impulse to FDI during the last few years (Graph 4).

Graph 4

Current account and terms of trade



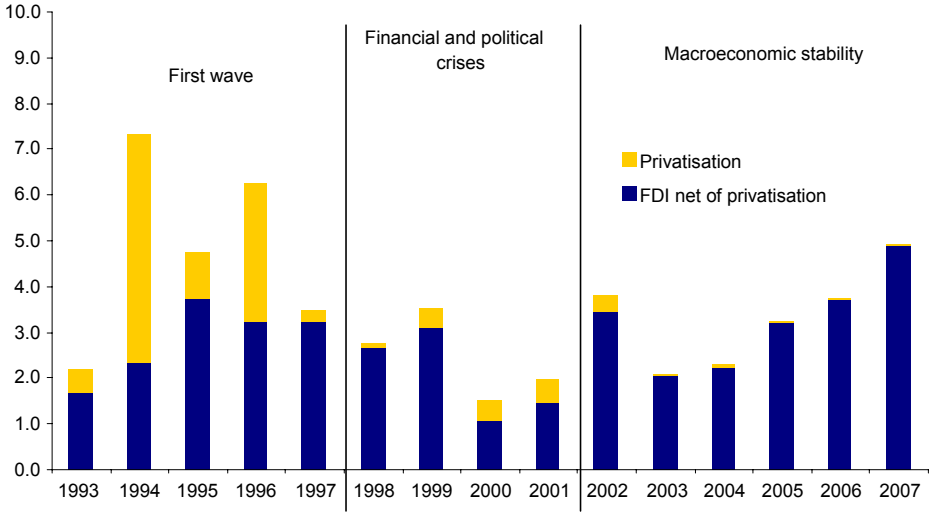
Source: Central Reserve Bank of Peru.

The first wave of capital inflows (1993–97) coincided with the privatisation process, stimulating FDI inflows; thus during this period FDI averaged 4.8% of GDP, 2.0% of which represented privatisation inflows. FDI then declined during the period of financial and political crisis, mainly due to the end of the privatisation process, but to a much lesser extent than other flows (2.5% on average). During 2002–07 FDI recovered its pace, reaching an average of 3.3% of GDP (Graph 5).

Graph 5

Foreign direct investment

As a percentage of GDP



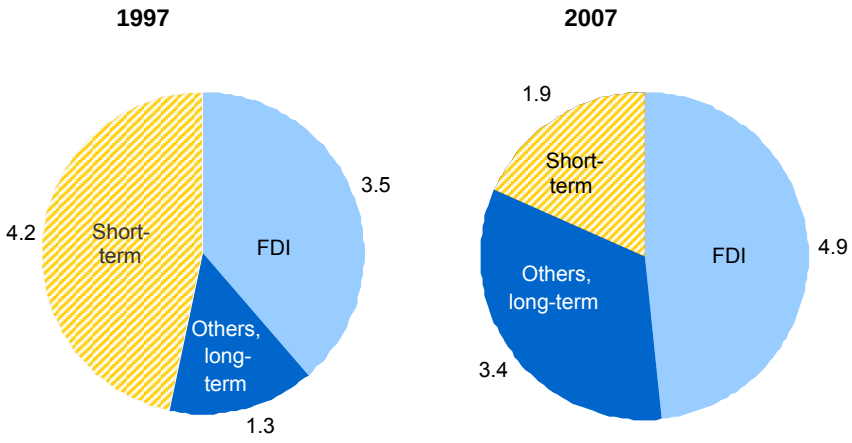
Source: Central Reserve Bank of Peru.

Capital inflows show a hike in 2007, again due mainly to FDI flows, accompanied also by long- and short-term debt, reversing the negative pattern shown since the end of the last decade. The current figures are different from those of 1997 since the current share of non-FDI inflows is low. In 1997 short-term flows were the largest component, reaching 4.2% of GDP (FDI accounted for only 3.5% of GDP), while in 2007 they represented only 1.9% of GDP (FDI: 4.9%, Graph 6). Therefore, financial and macroeconomic vulnerability due to capital inflows is much lower than in previous episodes.

Graph 6

Net capital inflows

As a percentage of GDP



Source: Central Reserve Bank of Peru.

Identifying the determinants of capital inflows

In the literature on capital inflows, researchers have examined the determinants of particular types of capital flows, distinguishing between short- and long-term flows. Most of the work on this topic analyses the presence of country-specific and external determinants. Some earlier approaches suggested that capital inflows to developing countries depend mostly on the business cycle of the developed world, with a decline in investment returns in developed countries causing investors to seek higher returns in emerging market economies. However, as shown by Montiel and Reinhart (1999), the distribution of capital inflows between emerging economies depends on country-specific factors.

In these approaches, the arbitrage factor, measured by the difference in returns between domestic and foreign currency assets, is expected to have a positive relationship with capital inflows. In the specific case of long-term capital inflows, indicators associated with macroeconomic stability will encourage an increase in capital inflows, especially of longer terms. Therefore, proper economic institutional arrangements associated with price stability, fiscal discipline and a sound financial system should attract longer-term capital inflows, principally foreign direct investment.

In order to identify the determinants of capital inflows in Peru, we first use a cointegration analysis on capital inflows following the work done by Ocampo and Tovar (2003). They examine the effect of regulation of capital flows in Colombia. The estimation is based on a ortfolio framework model, which considers the interest rate parity condition, controlling for reserve requirements in foreign currency. We then extend this approach by including indicators of macroeconomic stability.

For the first estimation we consider two types of interest rate differentials: (1) the spread between the domestic interbank interest rate and the US federal funds rate, and (2) the arbitrage factor, as represented by the spread of equivalent term deposit rates in Peru and the United States. The estimate takes into account reserve requirements on foreign borrowing implemented since October 2004 and the variation in the nominal exchange rate. The maturities considered for the arbitrage factor are one, two and three years.

In addition, we include an economic activity variable, proxied for by imports of capital goods, and control for the effect on total volume of reversals of capital flows during the Asian, Russian and Brazilian crises. In the case of Peru, although there is a ceiling on the foreign investments of private pension funds (set as a percentage of the total value of the fund), foreign investment by these funds accounts for a significant proportion of capital outflows from this country. Therefore, the value of these funds is considered in the regression analysis.

Using Johansen's maximum likelihood cointegration analysis, we estimate the following relationship:

$$\Delta Z_t = \mu + \Gamma_1 \Delta Z_{t-1} + \Pi Z_{t-1} + \Psi D_t + \varepsilon_t$$

where Z_t considers the two indicators on interest rate differentials, imports of capital goods and the value of the private pension funds, and D_t includes the dummies for financial crises.

The equilibrium relationship shows that, for all the maturities considered in the analysis, there is a high response of net capital inflows to the arbitrage factor. In the case of short-term interest rate differentials, although we obtain the expected positive sign, it is statistically insignificant in the estimation.

Table 4

Dependent variable: Private capital flows

Sample: 1994.01–2007.02

	Equation 1	Equation 2	Equation 3
Import of capital goods	2.31	2.23	0.69
S.D.	0.471	0.469	0.316
P_value	0.0001	0.0001	0.0332
Arbitrage factor			
12 months	7,181.1		
S.D.	1,984.1		
P_value	0.0007		
24 months		6,490.0	
S.D.		1,816.5	
P_value		0.0008	
36 months			5,019.7
S.D.			1,207.4
P_value			0.0001
Pension fund foreign investment	–1.26	–1.31	–1.39
S.D.	0.247	0.244	0.170
P_value	0.0001	0.0001	0.0001
Short-term interest rate differential	2,893.7	2,559.4	1,707.7
S.D.	1,657.7	1,617.2	1,451.40
P_value	0.0869	0.1197	0.2448
Adjustment coefficient	–0.56	–0.58	–0.42
S.D.	0.163	0.166	0.16
P_value	0.0011	0.0009	0.0102

The cointegration analysis proves the existence of one long-term equilibrium relationship between net private capital flows, interest rate differentials, imports of capital goods and the foreign investment of the country's private pension funds. The error correction term indicates a rise in the speed of adjustment of any disequilibria by capital flows as the maturity of the arbitrage factor increases.

In the second set of estimations we centre our attention on the determinants of long-term capital flows, incorporating as explanatory variables indicators that assess Peru's macroeconomic performance in terms of monetary policy soundness, fiscal discipline and financial sector health.

The primary balance of the fiscal sector is used as an indicator of the fiscal position, the inflation rate as an indicator of monetary policy soundness and the non-performing loans ratio as an inverse indicator of financial sector strength. Decreasing inflation, a lower ratio of non-performing loans and an improving overall balance of the public sector provided an environment of macroeconomic stability that contributed to lower short-term capital flows to Peru and instead attracted foreign direct investment. The three equations differ from each other in that they include a different maturity for the arbitrage factor, for 12, 24 and 36 months, respectively. The results for the three equations are similar, in both sign and magnitude; however, the ratio of non-performing loans is not statistically at all. The estimations excluding the non-performing loans ratio show similar results to those shown in Table 5.

Table 5

Dependent variable: Long-term private capital flows

Sample: 1994.01–2007.02

	Equation 1	Equation 2	Equation 3
Primary result NFPS	319.9	350.8	336.9
S.D.	26.1	26.76	27.18
P_value	0.0001	0.0001	0.0001
Arbitrage factor			
12 months	4,842.1		
S.D.	1,503.6		
P_value	0.0022		
24 months		4,913.2	
S.D.		1,478.1	
P_value		0.0016	
36 months			4,662.3
S.D.			1,482.9
P_value			0.0028
Pension fund foreign investment	–1.47	–1.52	–1.53
S.D.	0.280	0.296	0.290
P_value	0.0001	0.0001	0.0001
Inflation	–40.81	–39.55	–40.56
S.D.	15.58	16.48	16.30
P_value	0.0115	0.0200	0.0161
Non-performing loans	–6.22	12.65	6.20
S.D.	31.33	33.03	32.65
P_value	0.8433	0.7033	0.8502
Adjustment coefficient	–0.34	–0.28	–0.31
S.D.	0.11	0.10	0.10
P_value	0.0032	0.0072	0.0039

The results suggest that sound institutional economic arrangements enhance longer-term capital inflows such as foreign direct investment. This may explain the relative persistence of such flows to Peru over the whole estimation period.

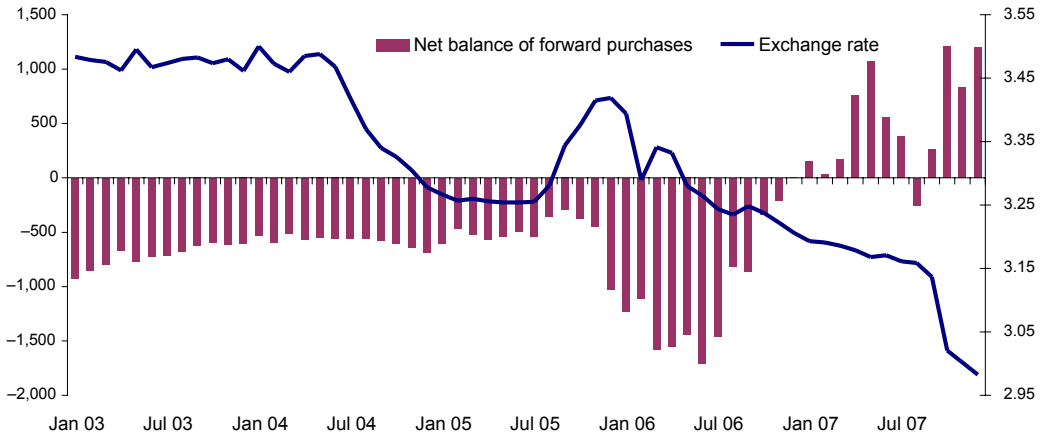
Recent experience with the derivatives market

The derivatives market has also gone through important developments during the last few years in Peru. The forward foreign exchange market is actually the most important market, where non-resident investors (the main players in this market) make non-deliverable contracts.

Since 2006 the forward market has shown a high degree of volatility (Graph 7). From 2003 to 2005 the net balance of forward purchases was around USD –700 million, covering the risk of new sol depreciation (future purchases of dollars at a predetermined exchange rate). Political uncertainty as presidential elections approached at the end of 2005 was reflected in financial markets, in particular in the foreign exchange market. The net balance of forward purchases more than doubled from its normal levels, to USD –1,700 by mid-2006. As the forward market is not organised, banks hedged the forward contract risk in the spot market by buying dollars, reinforcing the depreciation pressures on the new sol.

Graph 7

Net balance of forward purchases and the exchange rate



Source: Central Reserve Bank of Peru.

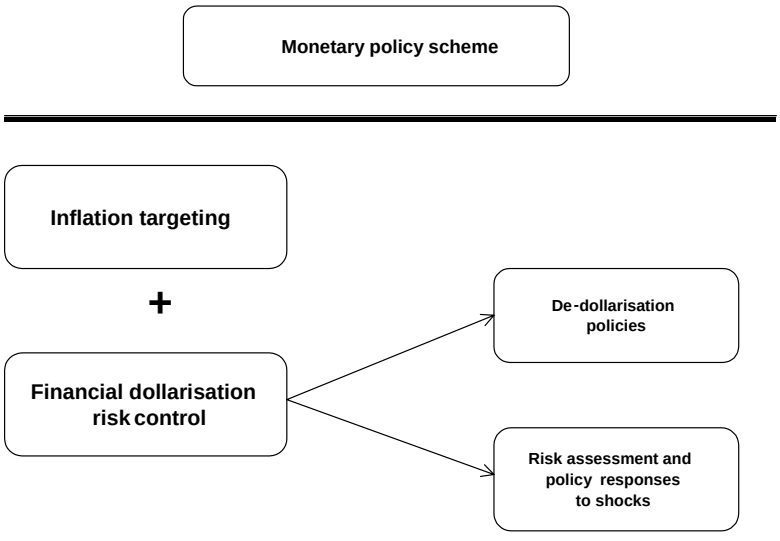
After the political uncertainty was resolved, the forward market changed rapidly, switching from reflecting the risk of depreciation to reflecting the risk of appreciation (future purchases of new soles at a predetermined exchange rate). Thus the net balance of forward purchases amounted to USD 1,075 million in May 2007, a swing of USD 2,700 million over the preceding 12 months; this amount represents more than 10% of the central bank's net international reserves (NIR). These drastic changes introduced more volatility into the exchange market.

III. Policy responses to capital inflows

Rationale for international reserve accumulation in dollarised economies

The Central Reserve Bank of Peru has a fully fledged inflation targeting regime with a point target of 2% and a tolerance range of ±1%. This target reflects the central bank's commitment to monetary stability. In order to attain this objective, the central bank constantly evaluates indicators of inflationary pressure, and based on its quarterly forecasting model decides the level of the reference rate for the interbank money market that brings the inflation forecasts to the inflation target over the monetary policy horizon.

Table 6



Over the first five years of implementation of inflation targeting, the average annual inflation rate has been 2.0%, with a standard deviation of 1.3 percentage points, which shows that inflation has been within the target range (between 1.5 and 3.5%) in this period. Moreover, inflation has been within the target range in 73% of the last 50 months under the inflation targeting regime (November 2002–December 2006, excluding the initial convergence from a 0% inflation rate towards the target range during January–October 2002).

The second pillar of the monetary policy framework consists of measures to control the risks associated with financial dollarisation. The main risks of a dollarised economy are related to the liquidity and solvency of the financial system:[6]

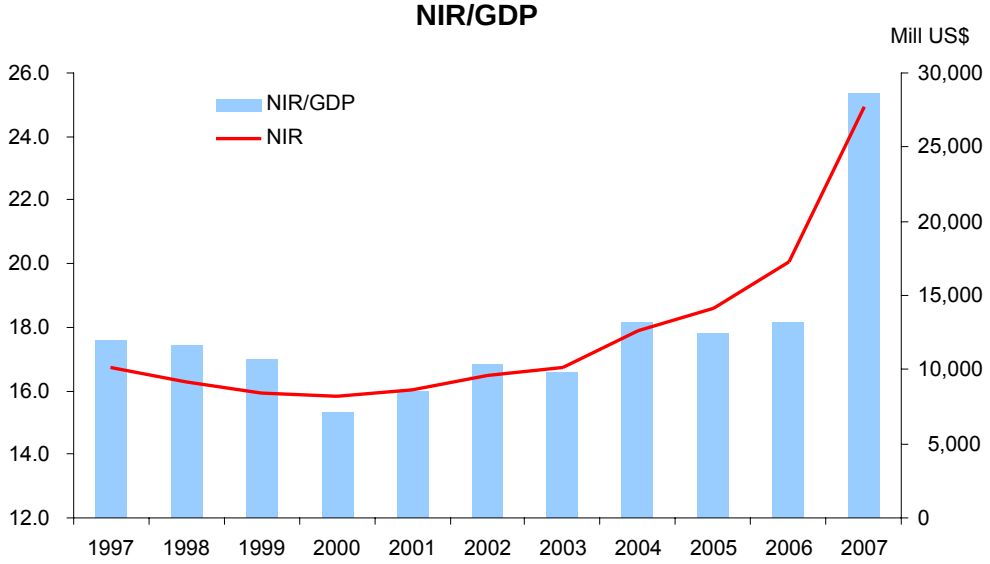
- Liquidity risks are associated with maturity mismatches, considering the short-term liabilities and long-term assets that characterise commercial banks' balance sheets. Even though this is common to any banking system, in an economy with financial dollarisation the maturity mismatch generated in foreign currency introduces higher liquidity risks considering that the central bank does not issue that currency.
- Solvency risks occur because economic agents' income is denominated in domestic currency, while debts are dollar-denominated. This generates a currency-related credit risk because a sharp depreciation of the domestic currency reduces the repayment capacity of agents.

To deal with these risks, the BCRP limits balance sheet effects by pre-emptive accumulation of reserves and by moderating the volatility of the exchange rate. To avoid moral hazard it also requires that commercial banks hold large liquid reserves against their foreign currency liabilities. In addition, it promotes voluntary financial de-dollarisation and encourages economic agents to internalise financial dollarisation risks.

In line with this framework, international reserves increased from USD 9,598 million in 2002 to USD 27,689 million in 2007 (Graph 8).

Graph 8

NIR/GDP



Source: Central Reserve Bank of Peru.

[6] See Gulde et al (2004).

Indicators of international liquidity

In general, foreign exchange accumulation must be consistent with prudent levels of international reserves. One of the most used indicators is the Guidotti-Greenspan indicator, which takes into account a sudden stop of capital inflows into the economy, so foreign reserves should at least cover the short-term liabilities. Currently, international reserves represent 3.5 times Peru's short-term external liabilities.

Table 7

International liquidity indicators

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
NIR/short-term external liabilities	1.29	1.15	1.25	1.50	1.46	2.11	2.14	1.97	2.77	3.55	3.46
NIR/short-term external liabilities + foreign currency broad money	0.60	0.54	0.53	0.56	0.60	0.74	0.78	0.83	0.95	1.08	1.31

Source: Central Reserve Bank of Peru.

However, this indicator does not take into account the risks facing a dollarised economy, as foreign currency deposits show a higher volatility than domestic currency deposits during turmoil periods. A modified Guidotti-Greenspan indicator can be built by adding domestic deposits in foreign currency and the short-term liabilities. The new indicator shows that net international reserves have been roughly in line during the last three years.

Assessing the effectiveness of foreign exchange intervention

Sterilised intervention affects the exchange rate through the portfolio channel and the signalling channel. As domestic and foreign assets are imperfect substitutes, sterilised interventions will alter the relative supply of domestic assets, and therefore the composition of investors' portfolios. This will generate an increase in the return of domestic assets, which will lead to a depreciation of the exchange rate. The second channel, which works through the signalling process, operates if foreign exchange intervention signals the future direction of monetary policy. For the signalling channel to be strong, central bank intervention must be consistent with changes in the stance of monetary policy.

In order to analyse the effect of foreign exchange intervention on the exchange rate, we performed a volatility analysis, through generalised autoregressive conditional hetero-skedasticity (GARCH) models with daily data for the period between 2004 and 2007, when the Central Reserve Bank of Peru actively intervened in the foreign exchange market. This model considers the effect of intervention on both exchange rate returns and volatility. Previous work on exchange rate volatility has been done by Dominguez (1998) to analyse the effect of interventions by the Deutsche Bundesbank and the Bank of Japan on the volatility of the mark and the yen respectively.

In the mean level estimation, we consider the variation between the exchange rate at the opening of the exchange rate market and the closing level of the previous day, as an indicator of appreciatory or depreciatory pressures in the market. In addition, we include an asymmetric effect of the conditional exchange rate volatility, measured by a variability coefficient that has been constructed using conditional variability.

In the variance estimation, we consider a GARCH (1,1) specification. The Exponential-GARCH (E-GARCH) model was also tested, but there was no evidence of an asymmetric effect in the variance equation for the period under analysis.

Table 8

Dependent variable: VNER_CLOSE

Method: ML - ARCH (Marquardt) – Normal distribution

	Coefficient	**Std error**	**z-statistic**	**Prob**
C	7.36E-05	6.56E-05	1.120978	0.2623
VNER_OPEN	0.440730	0.040133	10.98177	0.0000
INT	–1.07E-05	6.23E-05	–0.170853	0.8643
VEMBI(–1)	0.002466	0.000459	5.371341	0.0000
VNER_CLOSE(–1)	–0.188469	0.033618	–5.606130	0.0000
APREC*CV	–0.023741	0.001598	–14.85839	0.0000
DEPREC*CV	0.018136	0.001961	9.247301	0.0000
		Variance equation		
C	8.50E-07	4.92E-08	17.27792	0.0000
RESID(–1)^2	0.149999	0.046262	3.242358	0.0012
GARCH(–1)	0.599987	0.023065	26.01239	0.0000
INT	–6.74E-07	4.88E-08	–13.82739	0.0000
VEMBI(–1)	5.49E-06	1.81E-08	303.9510	0.0000
R-squared	0.647856	Mean dependent var		–0.000146
Adjusted R-squared	0.643636	SD dependent var		0.001911
F-statistic	153.5350	Durbin-Watson stat		2.223919
Prob(F-statistic)	0.000000			

Bollerslev-Wooldridge robust standard errors and covariance.

In both equations, we include the interest rate differential to account for arbitrage opportunities that will generate pressures on the exchange rate, and the investor's risk perception of the domestic economy, measured through the EMBI index. In order to test for the effectiveness of intervention, the estimation contains a variable that takes three values (–1, 0 or 1) if the central bank sells dollars, does not intervene on the market or purchases dollars, respectively.

By examining the results for the exchange rate mean level equation, it can be observed that there is no significant effect of a decision to intervene in the foreign exchange market in terms of either appreciation or depreciation of the currency, suggesting that intervention does not change the path of the exchange rate. However, intervention decisions do have a significant impact in terms of reducing extreme exchange rate volatility. This result supports a credible commitment by the central bank to reducing excessive volatility through foreign exchange interventions.

Challenges for monetary control and sterilisation

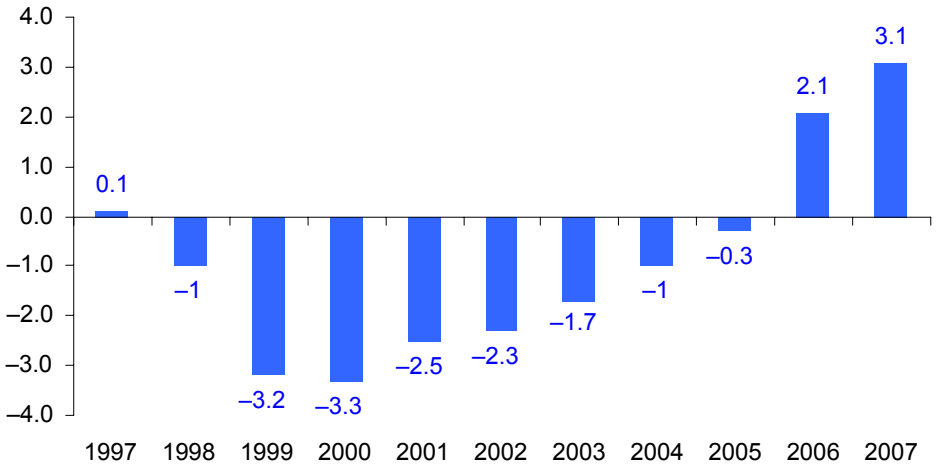
Two factors have contributed to the monetary and macroeconomic management of reserves:

- Fiscal policy. In a context of strong growth of private consumption and private investment, the improvement observed in the fiscal stance has helped to offset potential demand pressures on inflation. The increase in tax revenues, due to higher export prices and the dynamism of economic activity and complemented by prudent public spending management, has allowed an increase in the public sector surplus to 3.1% of GDP in 2007 (Graph 9).

Graph 9

Overall balance of the public sector

As a percentage of GDP



Source: Ministry of Finance and Central Reserve Bank of Peru.

Moreover, the accumulation of resources has given the authorities scope to respond effectively, without affecting credibility, in the case of a reversal of capital inflows to smooth the cost in economic activity.

The improvement in the fiscal stance has also helped to reduce exchange rate appreciation pressures linked to current account surpluses and capital inflows. On the one hand, disciplined fiscal expenditure reduces demand in non-tradable sectors, curbing real exchange rate appreciation. On the other, the resources coming from an increase in the surplus of the government's overall balance are being deposited at the central bank, reducing the need to sterilise foreign exchange market intervention.

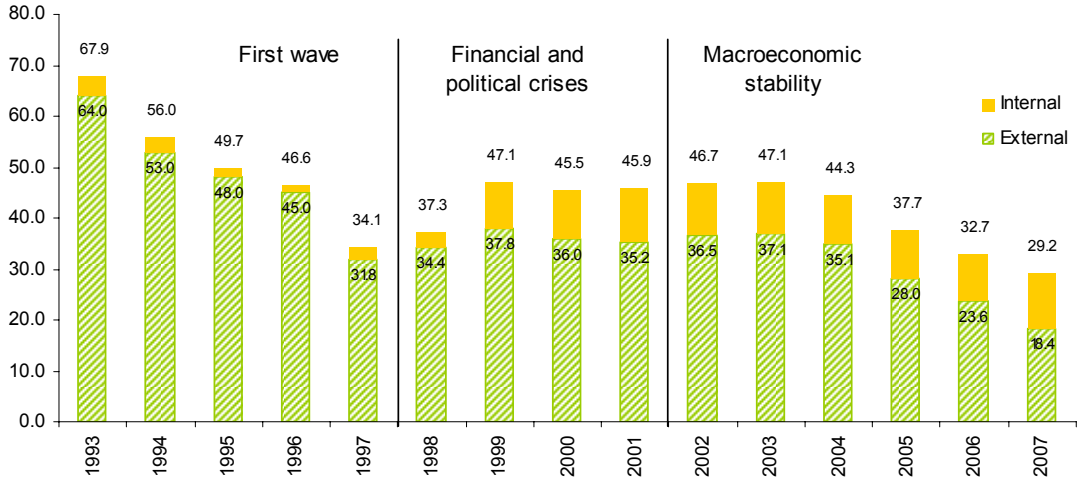
The government has also made efforts to improve its external position by prepaying and replacing external debt with domestic debt, helping to recycle foreign inflows.

Public debt as a percentage of GDP has been reduced from 46.7% in 2002 to 29.2% in 2007. This is mostly explained by the reduction in the public external debt from 36.5% of GDP in 2002 to 18.4% in 2007 (Graph 10).

Graph 10

Public debt

As a percentage of GDP



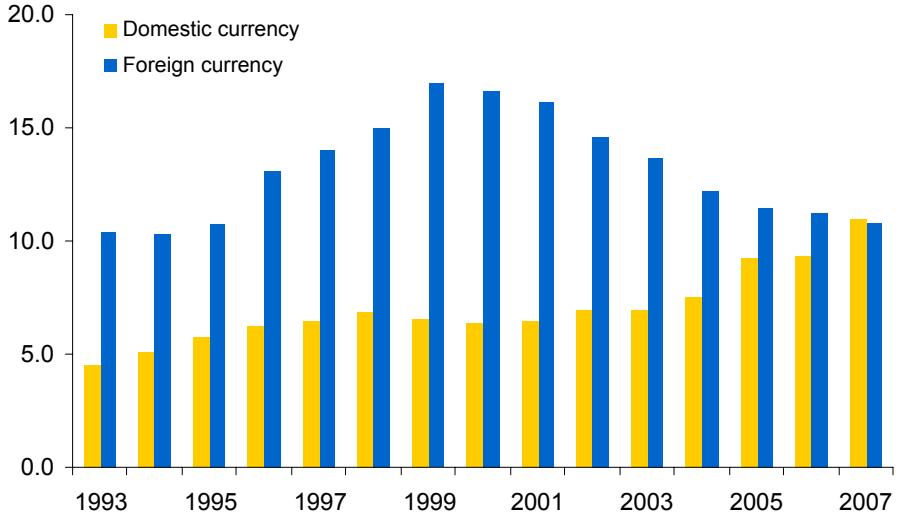
Source: Ministry of Finance and Central Reserve Bank of Peru.

- De-dollarisation. The de-dollarisation process has contributed to the central bank's monetary policy management. The resulting increase in the demand for domestic currency has reduced the necessity for sterilisation. During the last five years, the financial dollarisation ratio has been reduced from 65% in 2002 to 46% in 2007. In terms of GDP, the private sector broad money in domestic currency has maintained an increasing tendency while foreign currency broad money has been decreasing relative to GDP (Graph 11).

Graph 11

Broad money

As a percentage of GDP



Source: Central Reserve Bank of Peru.

Table 9

Dollarisation ratios

Year	Broad money of the banking system	Credit of the banking system to the private sector	Credit of the financial system to the private sector
1993	69	76	77
1994	64	74	74
1995	63	71	72
1996	67	74	72
1997	65	77	75
1998	69	80	79
1999	70	82	82
2000	70	82	81
2001	67	80	78
2002	65	79	76
2003	62	77	73
2004	55	74	71
2005	55	70	67
2006	51	63	60
2007	46	60	57

Source: Central Reserve Bank of Peru.

The injections of liquidity related to foreign exchange purchases by the central bank are sterilised through the issuance of central bank CDs (CDBCRPs). However, intervention, even when sterilised, can generate some challenges in terms of monetary management.[7] In particular the central bank needs to monitor the functioning of the transmission channels, control of the operating targets and sterilisation costs.

- Operating target. The central bank formally adopted the inflation targeting framework in 2002, and uses the interbank interest rate as an operating target. Since then, interest rate volatility has fallen dramatically, to one third of the volatility of the three previous years (Graph 12). This lower volatility will be transmitted to the other interest rates in the economy, reducing uncertainty of the returns in domestic assets, and thus reinforcing the de-dollarisation process.

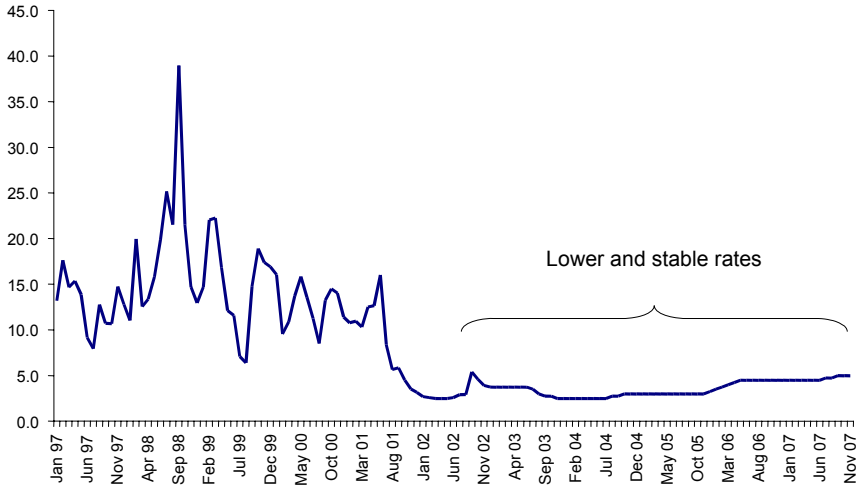
  Thus sterilisation operations have allowed the interbank rate to become permanently aligned to the policy reference rate (Graph 13).

[7] See Mohanty and Turner (2006) and Alberola and Serena (2007).

Graph 12

Interbank interest rate

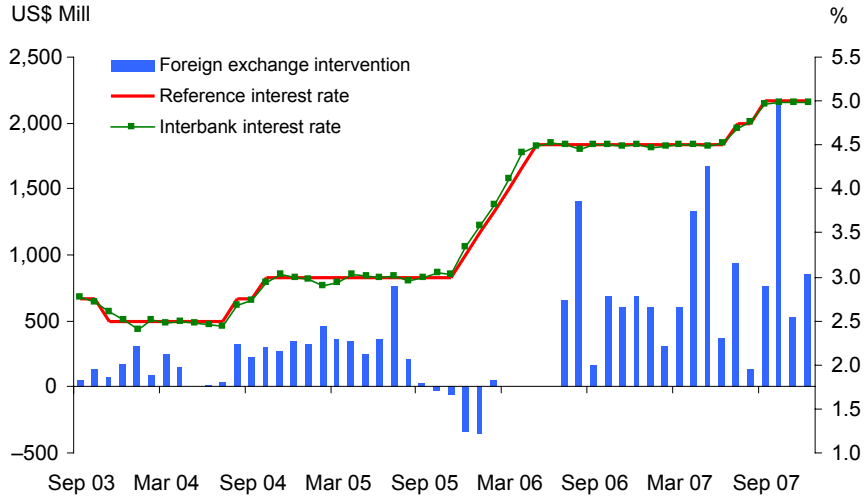
In per cent



Source: Central Reserve Bank of Peru.

Graph 13

Foreign exchange interventions, reference and interbank interest rates



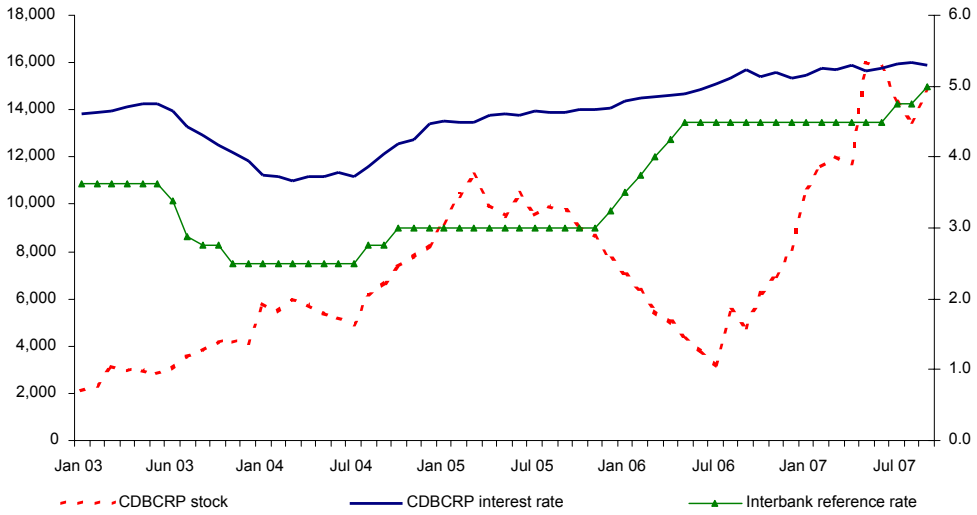
Source: Central Reserve Bank of Peru.

- Interest rate transmission channel. Massive sterilisation through market instruments may cause upward pressures on the interest rate, as economic agents ask for a higher return for central bank CDs. In this case the yield curve will lose its connection with the monetary policy stance reflected in the reference rate, weakening the transmission channels.

  The evolution of the short- and medium term interest rates reveals that this risk has not materialised in Peru. The average rate of the CDBCRPs has followed the reference rate during sterilisation episodes, so upward pressures do not seem significant (Graph 14).

Graph 14

CDBCRP balances and average interest rate, 2003–07

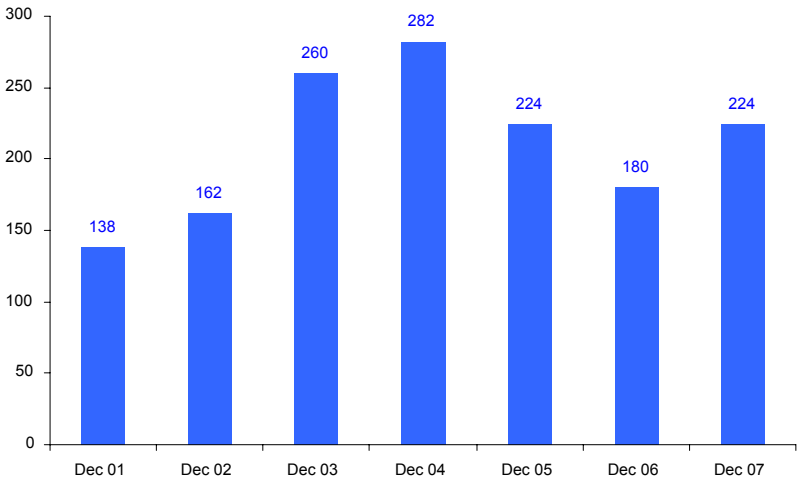


Source: Central Reserve Bank of Peru.

- Crowding out. The issuance of central bank CDs to sterilise liquidity injections due to foreign exchange interventions could reduce the resources for securities issued by the private sector. However, central bank issuance of CDBCRPs has not been an obstacle to the development of the domestic capital market. Private bond issuance, even though still small, has been continuously increasing during the last few years. Thus, the stock of bonds of the private sector has grown around 20% during the last two years (2004–06), and 41% in domestic currency.
- Rollover risk. In order to reduce refinancing risk, average maturity has been increasing. Up to 2001 there were no maturities higher than one year; now maturities go up to three years (central government bonds have maturities up to 30 years); thus, maturity has increased from 138 to 224 days between 2001 and 2007 (Graph 15). Furthermore, there has been a diversification of maturities to encourage the development of a short-run yield curve (Graph 16).

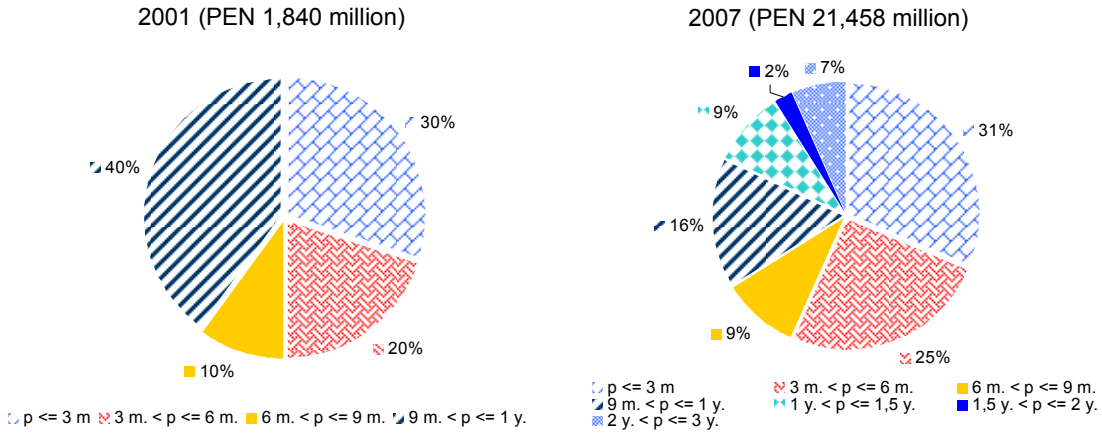
Graph 15

Average maturity of CDBCRP securities



Source: Central Reserve Bank of Peru.

Graph 16

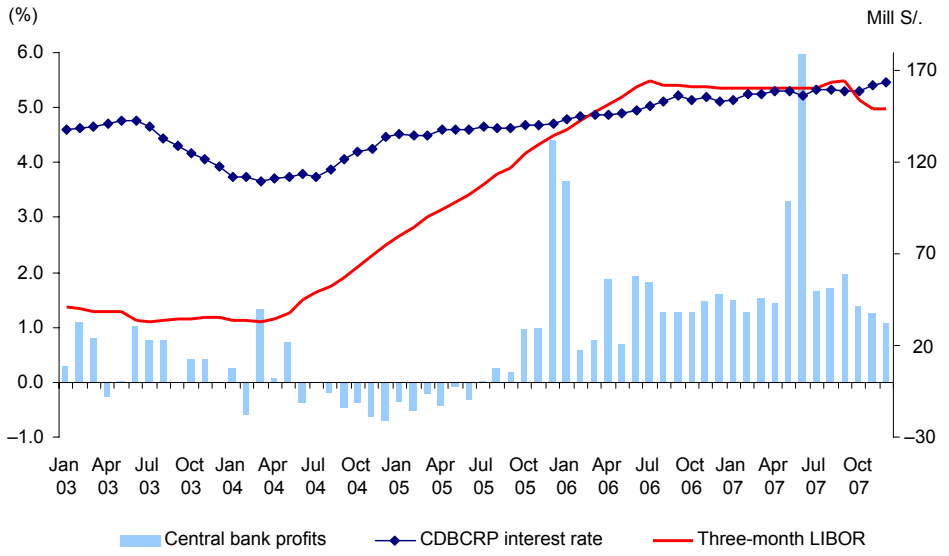


Source: Central Reserve Bank of Peru.

- Sterilisation costs. If there is a positive differential between the interest rates associated with the liabilities and assets of its balance sheet, the central bank will incur quasi-fiscal costs. However, during the recent inflows episode, there have been no significant differences between international rates and the returns on CDBCRPs; thus, the financial position of the central bank has not been at stake (Graph 17).

Graph 17

CDBCRP interest rate, three-month Libor and central bank profits



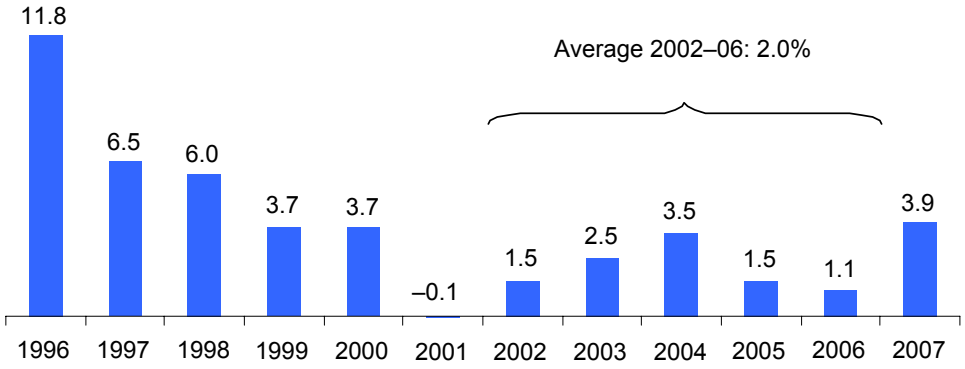
Source: Central Reserve Bank of Peru.

In general, foreign exchange intervention and international reserve accumulation have been consistent with the inflation targeting scheme, considering that the inflation target has been achieved, foreign exchange interventions have been sterilised to keep the interbank interest rate at its reference level, and there is no commitment to maintain a specific level or range of

the exchange rate (Graph 18). However, it is important to continuously assess the risks related to foreign exchange intervention and specifically the impact on inflation expectations, interest rates and financial costs.

Graph 18

Inflation



Source: National Institute of Statistics.

The role of reserve requirements

The Central Reserve Bank of Peru communicates its monetary policy stance using its "Nuevos Soles" policy rate, targeting the interbank overnight interest rate through open market operations. However, as previously mentioned, the second pillar of this monetary policy framework comprises policies implemented in order to reduce the vulnerabilities related to large speculative capital inflows or shortages linked to international financial crises by controlling the liquidity and solvency risks associated with financial dollarisation. These measures complement and preserve the sound management of the inflation target-oriented monetary policy.

To deal with these risks, the BCRP limits balance sheet effects by pre-emptive accumulation of international reserves and by moderating the volatility of the exchange rate. However, high levels of international reserves could induce moral hazard behaviour among economic agents given that they may assign higher probabilities to the central bank's use of reserves to provide liquidity during critical situations, and the financial system may fail to internalise dollarisation risks.

Consequently, in Peru, from the beginning of the 1990s[8] the use of higher reserve requirements as a tool for managing foreign currency monetary aggregates, compared to the reserve requirement ratio for domestic currency at the minimum level, allowed the central bank to sterilise large capital inflows and to control the availability of lending funds of the financial system, helping to preserve appropriate levels of loans to the private sector in a way compatible with macroeconomic stability and sustainable economic growth. Additionally, the raising of bank liabilities in foreign currency required increasing holdings of liquid assets at appropriate levels to confront sudden reversals of capital inflows.

Reserve requirements on foreign currency deposits, and the interest rate paid on these reserves, are also used as instruments to prevent the expansion of monetary aggregates

[8] As summarised in Quispe (2000).

denominated in foreign currency. The foreign currency reserve ratio is important because Peru is subject to large capital inflows. Although approximately 75% of these capital flows are estimated to be long-term, the scale of inflows is still large enough to threaten monetary stability.

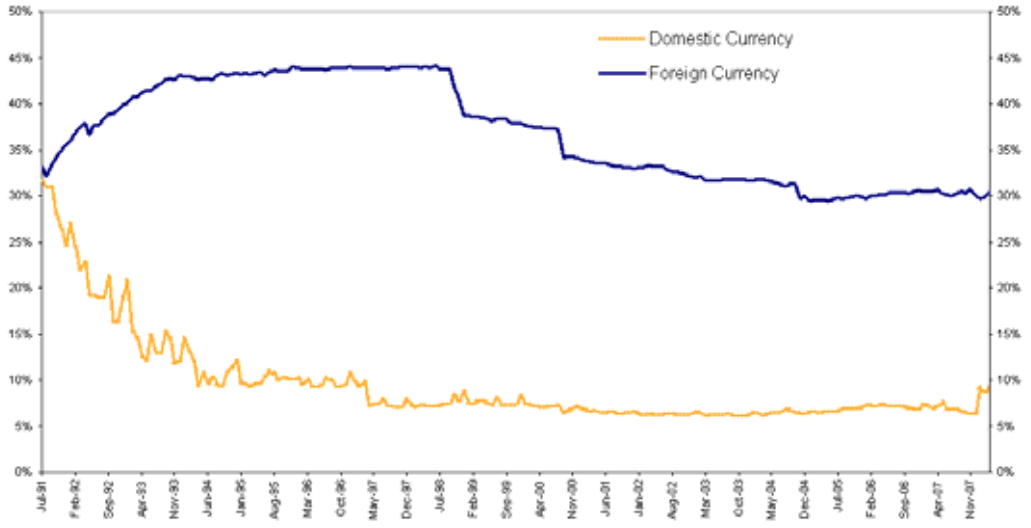
The foreign currency reserve ratio can also act as a buffer against a sudden reversal of these inflows and can encourage the public to hold domestic currency. However, the ratio is not changed systematically for monetary policy purposes and remains a supplementary device. In 1993, the marginal reserve requirement for foreign currency deposits was 45%; it was reduced to 35% and 20% in October and December 1998, respectively; and increased to 30% in November 2004. Additionally, since April 2004 the reserve requirements in foreign currency have been extended to the credit lines received by domestic banks from overseas financial institutions. At the beginning of 2008, due to significant short-term capital inflows, the central bank strengthened its position by increasing reserve requirements. As of May 2008, the minimum reserve requirement ratio was 8.5% for both domestic and foreign currency bank liabilities, and the marginal reserve requirement ratio was 25% for domestic currencies and 45% for foreign currencies. Furthermore, the BCRP established a 120% marginal reserve requirement for non-resident deposit holdings in the domestic financial system.

Required reserves are remunerated at an interest rate related to Libor and are computed on the basis of monthly averages. These reserves comprise banks' vault cash holdings and demand deposits at the central bank. The combined effects of the marginal and the minimum legal requirements implied, by the end of 1993, effective reserve requirement ratios of 43% and 12.1% for foreign and domestic deposits, respectively; this had decreased to 30.1% and 6.4% respectively by December 2007 (Graph 19).

Graph 19

Commercial banks: effective reserve requirement ratio in domestic and foreign currencies

In percentage points



Source: Central Reserve Bank of Peru.

Peru and the current global financial crisis

Since August 2007, triggered by the subprime crisis in the United States, the global financial system has been facing a financial turmoil. The turmoil deepened from mid-September 2008 due to the generalised liquidity squeeze and stoppage of credit lines, pushing the industrial economies into recession, and implying greater uncertainty regarding commodity prices, interest rates and exchange rates. This crisis is also affecting the developing economies, with downward growth pressures on China, India, the Middle East and Southeast Asia, and the transition economies. Although Latin America has actually shown a dynamic economic activity, the continent's economies have begun to face tight financial conditions. Peru has maintained its dynamic pace with high growth rates (9.3% forecast for 2008), and the inflation rate, although one of the lowest in Latin America (6.7% projected for 2008), has been addressed by the central bank, with gradual adjustments of its monetary policy stance – six 25 basis point increases of the policy rate from 5.0% in December 2007 to 6.5% in September 2008, aiming for a gradual return to the inflation target level of 2% in 2010, according to the central bank's Inflation Report of September 2008.

However, in October and November 2008 the Central Reserve Bank of Peru paused its adjustment process, reorienting its efforts to ensure liquidity in the domestic financial system and to reduce the extreme volatility of the exchange rate in order to offset possible negative balance sheet effects in a partially dollarised economy. Strong macroeconomic fundamentals and the preventive accumulation of international reserves allowed the central bank a high capacity of response to face situations of international turbulence. In the actual context of tight international liquidity, Peru observed a reversal of foreign investors' positions in domestic currency, and the central bank intervened in the exchange market, selling dollars in order to prevent any perverse effects. Furthermore, the central bank expanded its range of monetary operations in order to provide financial entities with greater flexibility to manage their liquidity in new soles and dollars. In addition, since October 2008 the reserve requirement rates in soles and dollars have been reduced, and credit lines from abroad have been exempted from reserve requirements.

Conclusions

Recent capital inflows to Peru are mainly explained by an increase in foreign direct investment and long-term debt. This behaviour has been strongly related to structural reforms and better macroeconomic management, which accounts for stable inflows of long-term capital, even during periods of financial crises. In this sense, our estimations show the high importance of macroeconomic stability as a determinant of long-term capital inflows, through indicators of fiscal and monetary discipline and financial stability.

Even though sterilised intervention may generate several risks to monetary control, foreign exchange intervention and international reserve accumulation have been consistent with the inflation targeting scheme.

The Central Reserve Bank of Peru has successfully met its inflation goals in this environment of capital inflows. The yearly inflation average was 2.0% from the implementation of the inflation targeting scheme in 2002 until 2006, and during 2007 it was among the lowest rates in the region.

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