

Foreign exchange market intervention in Colombia

José Darío Uribe¹ and Jorge Toro²

Introduction

The use and efficacy of intervention in the foreign exchange market has been a controversial topic. Some think that this type of intervention is ineffective in influencing the level of the exchange rate, and can also be damaging, because it can increase the volatility of the rate. Others argue that intervention operations can influence the level of the exchange rate, and can help to calm disorderly markets. Yet, others argue that intervention operations are inconsequential, since they affect neither the level nor the volatility of exchange rates (Dominguez, 1998). No doubt, the observed disparate range of intervention policies between central banks, and within individual central banks over time, can in part be attributed to the different views concerning the effectiveness and consequences of central bank interventions.

In this regard, the Central Bank of Colombia (Banco de la República) offers an interesting example of a variety of intervention policies that can be adopted according to changing market conditions and policy priorities. Following the introduction of a floating exchange rate regime and the adoption of an inflation targeting scheme for monetary policy, the central bank put in place in November 1999 an option-based foreign exchange intervention mechanism aimed at two objectives: firstly, accumulating foreign reserves and secondly, controlling the volatility of the exchange rate. Two years later, the central bank extended the option-intervention mechanism to also include reduction of foreign reserves, thus making the existing option mechanism fully symmetrical. More recently, in September 2004, facing an escalating appreciation of the currency, the Colombian central bank announced its decision to introduce direct and discretionary intervention operations.

1. The use of options for foreign exchange market intervention

To our knowledge, the systematic use of options as a way of intervention in the foreign exchange market has only been used by the central banks of Colombia and Mexico. Currently, the central bank of Colombia might be the only one to maintain such a scheme.³ The main characteristic of this mechanism is its transparency and reliance on an auction system. The intervention is carried out in an open manner and with rules that are public knowledge. The benefit of using options arises mostly from the associated hedging operations related to the risk management of option portfolios.

By law, the Board of Governors of the central bank is directly responsible for exchange rate policy. However, through the Finance Minister - as one of the seven members of the Board - the government participates in intervention decisions. The central bank executes intervention in an independent manner and both the Treasury and the Colombian oil company are treated in the same way as any other market agent.

The objectives of intervention are:

- To avoid excessive movements of the nominal exchange rate in a manner consistent with achieving the inflation target;

¹ Deputy Governor, Banco de la República.

² Senior Research Economist, Banco de la República.

³ The central bank of Mexico in May 2001, in light of the significant accumulation of reserves achieved under the option scheme, decided to suspend the use of that mechanism.

- To strengthen the international liquidity position of the country by accumulating foreign reserves without compromising the achievement of the quantitative inflation target or causing the exchange rate to deviate from its fundamental values;
- To moderate excessive and abrupt movements in the exchange rate from its recent trend. This is in order to avoid creating expectations of appreciation or depreciation that can result in a significant deviation of the exchange rate from its fundamentals.

Currently, the Banco de la República has four types of options: two of them are intended for accumulating or decumulating international reserves and two for dampening excessive exchange rate volatility. Agents have access to these options only through auctions held by the central bank.

- *Put options (call options) for accumulating (decreasing) international reserves.* These options give the holder the right to sell (buy) foreign exchange to (from) the central bank. The amount of the options to be auctioned is set by the Board of Directors at its own discretion. The options are valid between the first and the last working day of the month immediately following the day of the auction (they have usually coincided with calendar months) or in the period specified in the announcement. The options can be exercised, partially or totally, during this period, as long as the condition for exercise is in place. The exercise condition for the put (call) option is that the representative market exchange rate (TRM, certified by the Banking Superintendence) be below (above) its 20 working day (arithmetic) moving average. The strike price of the option is the TRM of the exercise day. In the event that the put (call) options are totally exercised before their expiration date, the board of directors could announce new auctions.
- *Put (call) options for controlling volatility of the exchange rate.* These options can be held by the central bank the same day that the nominal exchange rate (TRM) is 4% or more below (above) its last 20 working day moving average. This condition also applies for the exercise of the option. The amount of the auction is set by the Board of Directors at its own discretion (it is currently set at US\$ 180 million). The strike price of the option is the market exchange rate (TRM) of the exercise day. The options expire one month after the day of the auction. The central bank could call a new auction whenever the exercise condition is met (even if the options that were auctioned have not expired). The amount of these new volatility options is announced at the same time that the auctions are called.

Dutch auctions are used for all interventions through options. Premiums are ordered from the highest to the lowest. Bids equal to or higher than the premium at which the amount offered is covered are granted at this premium. Each participant may include up to five bids with the restriction that, in aggregate, these may not exceed the total offered amount. The institutions that are allowed to participate in the auctions include the Treasury and the “foreign exchange market intermediaries”, the latter excluding brokers and retail currency exchange houses (*bureau de change*). On some occasions the Board of Directors announces auctions for put options, to accumulate foreign reserves, months in advance.

The use of public auctions of options enhances the visibility and openness of the foreign exchange intervention mechanisms for markets. It also gives Banco de la República the discretion to choose the timing and amount of foreign reserve adjustment. These decisions are usually taken at the monthly meeting where the Board of Directors analyses the inflation report. In auctions for volatility control, Banco de la República’s discretion is limited to fixing *ex-ante* the amount offered per auction and the tolerated deviation of the exchange rate from its 20-day moving average. After these parameters have been set, the auctioned call and put options to control foreign exchange volatility are triggered automatically.

Banco de la República also has the discretion to announce the amounts awarded in the auctions. In all cases, the intervention amount is announced to the public the same day that the option is executed by any of its holders. No entity or individual outside the central bank is supposed to have access to privileged information. Only two types of information are not disclosed: the name of the institution that exercised the option and the nature of the intervention (whether or not it has been sterilised). However, information on the level of reserves and the monetary base is published weekly on the central bank’s website with a delay of eight days. This allows market participants to infer the amount and nature of the intervention. Afterwards, information on whether the intervention was sterilised is revealed.

Annex Table A shows the frequency of intervention in the foreign exchange market. Overall, since the introduction of the option mechanism, the central bank has intervened 51 times, 45 of them to build up international reserves through put options.

Put options

As can be seen from Annex Table A, between November 1999 and September 2002, auctions of put options were performed on a monthly basis, with amounts that ranged between US\$ 30 million and US\$ 200 million. The regularity in the use of this type of options throughout this initial period responded to the need to build up international reserves, following the reduction that took place during the defence of the currency band in 1998 and the first three quarters of 1999. By using put options, the central bank of Colombia was able to meet the targets of international reserves established in the programme with the IMF approved in late 1999. Between its creation and the end of 2002, auctions of put options amounted to US\$ 1,879.7 million, of which US\$ 1,399.3 million (74.4 %) were exercised.

The ample volume of capital flows to emerging markets since mid-2003 and the sharp fall of spreads on sovereign debts translated into an appreciating trend of the exchange rates of these economies. The Colombian monetary authorities considered this as a temporary phenomenon, since a rise in US rates was anticipated. This view was reinforced by local factors, such as an expected decrease in both the volume of oil exports and the external financing of the public sector. In this context, the Central Bank decided in December 2003 to reinstate a sustained intervention through auctions of put options to accumulate international reserves. As a result, between December 2003 and August 2004 US\$ 1.75 billion of put options were auctioned, of which US\$ 1.5 billion were exercised (a 13.7% increase over the level of international reserves at the end of 2003). The objective of this substantial intervention was to further strengthen the liquidity foreign position of the central bank, as well as to prevent an abrupt and temporary appreciation of the exchange rate. Such continued intervention was not considered incompatible with the monetary policy stance, since inflation forecasts at the beginning of 2004 showed an undershooting of the inflation target for 2004 and 2005. In any case, to assure monetary consistency, the central bank sterilised about 50% of the monetary expansion through the selling of Treasury bills in the secondary market.

Call options

Between July and September of 2002 the Colombian currency depreciated 15% in real terms. This was not an isolated event, but part of a generalised phenomenon in Latin America associated with the so called "Lula effect" and perhaps with the corporate scandals in the US that induced international investors to move toward safer assets. These changes were also reflected in the evolution of the sovereign spreads (the EMBI Plus raised by 400 basis points). Although the pass-through in Colombia was relatively low (of around 0.04), it was large enough to jeopardise the achievement of inflation targets, despite an estimated negative output gap of around 2.5% (Ramírez, 2004).

In these circumstances, the Board announced in February 2003 its decision to decumulate up to US\$ 1 billion (9.2% of total international reserves), without specifying any period of time. From this amount, the Central Bank effectively auctioned call options by a total of US\$ 600 million during March, April and May 2003, with an offered sum of US\$ 200 million each month. Only US\$ 345 million of that total was exercised. These interventions were aimed at curbing the increasing depreciation trend, which was judged to be incompatible with the achievement of the inflation target. It has been considered that the most important effect of this intervention on the exchange rate was associated with the announcement rather than with the intervention itself.

Volatility options

The volatility control mechanism through call options was automatically activated in July, August and October 2002, by an amount of US\$ 180 million each time. From a total auction of US\$ 540 million, US\$ 414 million was exercised.

2. Effectiveness of the foreign exchange intervention

The option-intervention mechanism was not designed to target any specific level of the exchange rate. In the case of put options for instance, their amounts auctioned in the market have usually been below one third of the average daily turnover. The central bank buys dollars at the official exchange rate determined by market transactions of the day before. These options have a one month maturity and they can only be exercised when the exchange rate falls (appreciates) below its 20-day moving average. With all these features, the exchange rate can substantially appreciate in periods in which put options are operating.

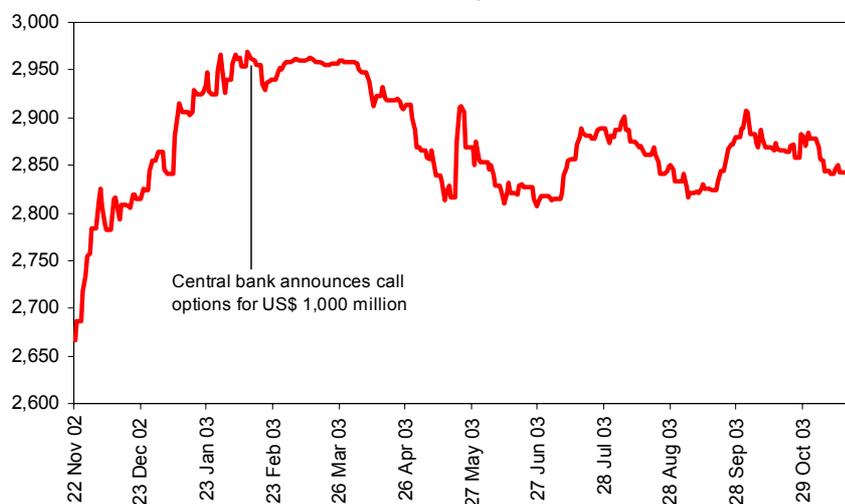
Thus, put options must not be judged for their effects on the exchange rate, but rather for their performance as a mechanism for reserve accumulation. From this point of view, the objective of this type of intervention has largely been achieved. As is shown in Annex Table A, nearly US\$ 3.2 billion in reserves have been bought since put options were introduced. The use of this mechanism and the returns obtained from central bank investments have allowed Colombia to substantially increase its foreign reserves, up to a level that comfortably conforms to international precautionary standards. At no point have the central bank or the markets deemed that this reserve accumulation could jeopardise the achievement of the inflation target.

Call options to sell international reserves have been oriented towards influencing the exchange rate (although not necessarily pursuing any specific exchange rate level). In fact, as discussed above, these options were intended to bring under control an increasing depreciation trend that was deemed at the time to be jeopardising the achievement of the inflation target. Accordingly, the success of these interventions must be assessed in terms of their ability to stop the depreciation trend.

As can be seen in Figure 1, the nominal exchange rate stabilised immediately after the announcement of the call auction in mid February 2003 and then it began to appreciate slowly. The auction for foreign reserve deployment was made public jointly with the decision of the Board of Governors to sell up to US\$ 1,000 million through this mechanism. These announcements came after a 100 basis point hike in the Bank's interest rate in January 2003 that was followed by another one of the same magnitude in April 2003.

With a stable exchange rate and with food prices falling, inflation and inflation expectations slowed down and then started to fall. In view of this behaviour, the Board suspended call options in June 2003. Total inflation at the end of 2003 was 6.49 percent, just 49 basis points above the upper limit of the target range (5-6%). This was achieved in a year in which the value added tax of some products was increased and during which there was a large increase in utilities and gas prices. In this way, intervention in the foreign exchange market served as a complement, not as a substitute, of the monetary policy tools of the central bank. In fact, in conjunction with foreign exchange intervention, the central bank raised interest rates 200 basis points during the first half of 2003.

Figure 1
Nominal Exchange Rate



On the other hand, the central bank's volatility options prevented abrupt and excessive deviations of the exchange rate, once they were automatically triggered. To illustrate this, Annex Table B shows the daily representative exchange rate (TRM), and its deviation from its 20-day moving average between July and August 2002. As can be seen, the exchange rate did not deviate more than 4.3% from its moving average, subsequently appreciated 0.5% six days after the second volatility option was exercised, and then remained within 2.5% of its moving average during the following weeks. A similar phenomenon was observed in October 2003 (not shown). In that sense, volatility options achieved the purpose for which they were designed. Nonetheless, there are doubts about the efficiency of the mechanism (as it can be very expensive if there is a strong devaluation of the peso) and whether they should or could be substituted with the options to accumulate and sell reserves.

An alternative way of assessing the effectiveness of foreign exchange intervention is by using the event analysis approach, as applied for Colombia by Ramírez (2004), following Edison et al (2003) and Mandeng (2003). Event studies rest on the actual observation of asset prices over relatively short time periods and are particularly helpful when, due to small samples, the use of more sophisticated techniques such as GARCH models is not feasible. The event window is set as the depreciation of the currency 20 days before intervention, during it, and 20 days after intervention. An intervention is said to be successful in the short term if the change in the exchange rate in the episode of intervention reverses the trend in the exchange rate from the previous 20 days. An intervention is said to be successful in the long run if the change in the exchange rate 20 days after intervention reverses the trend in the exchange rate prior to the intervention. An intervention fails (both in the short and long run) if there is no reversal in the trend of the exchange rate. Two intervention episodes are examined: call options (decumulation of international reserves) and call volatility options.

The results are shown in Table 1. According to the criteria mentioned above, it can be said that call options to decumulate international reserves and call volatility options were successful both in the short and in the long run, which confirms the observation made before. Strictly speaking the performance of call volatility options should be assessed on the basis of a measure of *volatility*, rather than simply the trend of the exchange rate. Such an assessment was made by Mandeng (2003). It was found that the volatility options sold in July and October 2002 were moderately successful in meeting the objective, while those sold in August 2002 were unsuccessful.

| Dates | Intervention (US\$ mill) | Level exch. rate | Change 21 days before intervention | Change during intervention | Change 21 days after intervention | Short-term success ¹ | Long-term success ² |
|---|--------------------------|------------------|------------------------------------|----------------------------|-----------------------------------|---------------------------------|--------------------------------|
| Call options (decumulation of international reserves) | | | | | | | |
| 03/03/2003 - 03-10-2003 | 65.0 | 2958 | 1.07 | 0.06 | -0.72 | yes | yes |
| 03/19/03 | 79.6 | 2956 | 0.72 | -0.02 | -1.21 | yes | yes |
| 05/20/03 | 199.9 | 2875 | -1.53 | 2.07 | -1.58 | no | yes |
| Call (volatility) | | | | | | | |
| 07/29/2002 - 03/10/2003 | 289.5 | 2596 | 8.53 | 3.24 | 1.91 | yes | yes |
| 10/02/2002 | 124.5 | 2885 | 7.69 | 1.22 | -3.70 | yes | yes |

¹ Short-term effectiveness determined by whether direction of change in exchange rate on day of intervention reverses trend in exchange rate from previous 21 days. ² Long-term effectiveness determined by whether direction of change in exchange rate 21 days after intervention reverses trend in exchange rate from previous 21 days.

Source : Ramírez (2004).

3. Consistency of foreign exchange interventions with inflation targeting

The consistency of foreign exchange interventions with inflation targeting (IT) depends on whether or not the intervention is supportive of policies for achieving the goals of IT. Accordingly, IT-consistent interventions should loosen/tighten monetary conditions when the inflation forecast is below/above the inflation target, and/or the output gap is negative/positive. Moreover, the interest rate has to be the principal instrument of monetary policy and possible interventions in the foreign exchange market

ought to be only a complementary tool, and just in exceptional circumstances (high volatility, serious misalignments and/or disorderly market conditions).

On this basis, Ramírez (2004) shows that interventions in Colombia have been “target and regime consistent”. Most of the time policy interest rates moved in the same direction, and changes in the monetary policy stance came first through changes in interest rates and then through interventions in the foreign exchange market (Table 2).

Table 2
Consistency of foreign exchange interventions

| Month at which forecast was made: | | Deviation from target | Ex-post deviation | Output gap | Interest rate trend | Target consistency |
|--|------|-----------------------|-------------------|------------|---------------------|--------------------|
| <i>Interventions to decumulate int. reserves</i> | | | | | | |
| 03/2003 | 2003 | +122bp | 50 bp | -2.42% | Up | Yes |
| | 2004 | +68bp | | -1.45% | | |
| 05/2003 | 2003 | +56bp | 50 bp | -2.30% | Flat | Yes |
| | 2004 | -36bp | | -1.22% | | |
| <i>Interventions to accumulate int. reserves</i> | | | | | | |
| 10/2002 | 2003 | -65bp | 150/50 bp | -1.64% | Flat | Yes |
| 12/2003 | 2004 | -77bp | | -0.36% | Down | Yes |
| 01/2004 | 2005 | -46bp | | -0.78% | | |
| 04/2004 | 2004 | -15bp | | -1.12% | Down | Yes |
| | 2005 | -10bp | | -0.86% | | |
| <i>Interventions for volatility reasons</i> | | | | | | |
| 06/2002 | 2003 | -46bp | | -2.43% | Flat | ? |
| 10/2002 | 2003 | -65bp | | -2.34% | Flat | ? |

Source: Ramírez (2004).

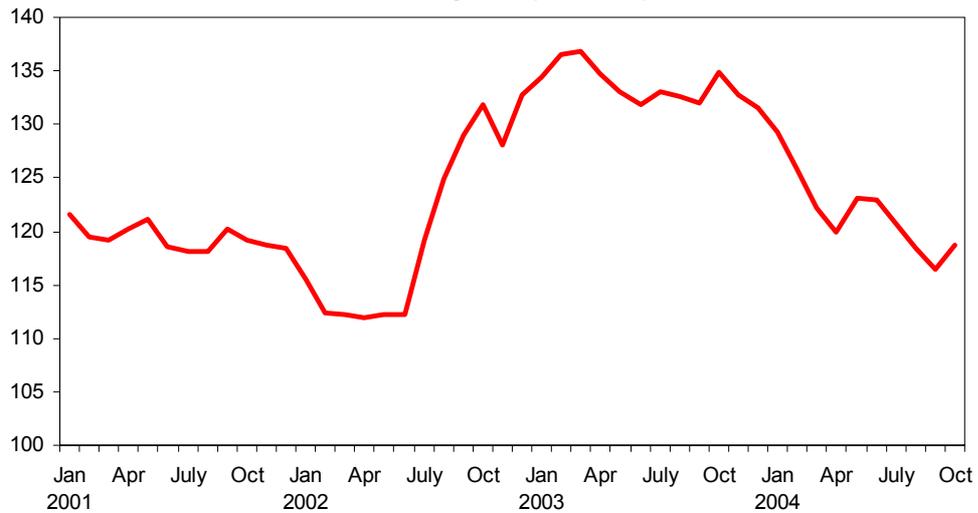
Interventions to accumulate international reserves were carried out when the inflation forecasts pointed below target, and interventions to decumulate international reserves occurred in the opposite situation. Moreover, in each episode the Inflation Reports explicitly identified the exchange rate movements as one of the direct causes for target under or overshooting. The only exception was the case of intervention through volatility call options in 2002. However, the purpose of these interventions was different and cannot be judged with the same criteria.

4. Direct intervention

On 29 September 2004, the Board of the Banco de la República announced its intention of buying up to US\$ 1,000 million in the foreign exchange market during the last quarter of this year. It was decided to perform this intervention in a discretionary way - that is to say - not necessarily using the put options mechanism. This decision was motivated by the continuing real appreciation of the exchange rate over the last year and a half (between April 2003 and October 2004 the real exchange rate appreciated 13.3 percent, Figure 2). The central bank of Colombia is aware that periods of prolonged appreciation in the past have resulted in a sharp deceleration of economic activity (1982-84) or even in an economic crisis (1998-99).

For this reason, even if the Banco de la República does not have a specific target for the exchange rate, the Board decided to perform a direct intervention, in order to try to moderate the effects that this appreciation cycle could have on the tradable sector. The Board considered that given the lengthy appreciation process, put options were not the best suited mechanism for reserve accumulation, as that is an instrument better designed for offering a short term hedging, than for facing a sustained appreciation. An assessment of the effects of this intervention will be made in due course.

Figure 2
Real exchange rate (1994 = 100)



5. Conclusions

The Colombian experience with option-based exchange market interventions has fulfilled its objectives. The scheme has offered economic agents a practical instrument of risk coverage against unexpected exchange rate fluctuations. By using put options it has been possible to accumulate international reserves for about US\$ 3.2 million without compromising the inflation target or affecting the trend of the exchange rate. Call options to sell reserves have been an important support for the implementation of monetary policy and the stability of the local currency. Finally, call-volatility options have contributed to curb acute exchange rate deviations, thus helping to reduce market uncertainty.

Annex

Table A
Foreign exchange market intervention*

| Month | Put options to accumulate reserves | | Call options to sell reserves | | Call volatility options | |
|-------------------|------------------------------------|-------------------|-------------------------------|-------------------|-------------------------|-------------------|
| | Auction amount | Auction exercises | Auction amount | Auction exercises | Auction amount | Auction exercises |
| November | 200.0 | 200.0 | | | | |
| December | 80.0 | | | | | |
| Total 2000 | 280.0 | 200.0 | | | | |
| January | 80.0 | 12.0 | | | | |
| February | 80.0 | | | | | |
| March | 100.0 | 74.0 | | | | |
| April | 55.0 | | | | | |
| May | 100.0 | | | | | |
| June | 100.0 | 15.5 | | | | |
| July | 100.0 | | | | | |
| August | 99.9 | 17.1 | | | | |
| September | 100.0 | 100.0 | | | | |
| October | 100.0 | 100.0 | | | | |
| November | 100.0 | | | | | |
| December | 100.0 | 80.0 | | | | |
| Total 2001 | 1,114.9 | 398.6 | | | | |
| January | 75.0 | 69.3 | | | | |
| February | 50.0 | | | | | |
| March | 50.0 | | | | | |
| April | 30.0 | 30.0 | | | | |
| May | 30.0 | 30.0 | | | | |
| June | 30.0 | 30.0 | | | | |
| July | 30.0 | 30.0 | | | | |
| August | 80.0 | | | | | |
| September | 100.0 | 100.0 | | | | |
| October | 140.0 | 140.0 | | | | |
| November | 119.9 | 119.9 | | | | |
| December | 50.0 | 50.0 | | | | |
| Total 2002 | 784.9 | 599.2 | | | | |
| January | 49.9 | 1.5 | | | | |
| February | 50.0 | 50.0 | | | | |
| March | 100.0 | 100.0 | | | | |
| April | 100.0 | | | | | |
| May | 100.0 | | | | | |
| June | 100.0 | | | | | |
| July | 50.0 | | | | 180.0 | 180.0 |
| August | 50.0 | | | | 180.0 | 109.5 |
| September | 50.0 | 50.0 | | | | |
| October | | | | | 180.0 | 124.5 |
| November | | | | | | |
| December | 50.0 | | | | | |
| Total 2003 | 699.9 | 201.5 | | | 540.0 | 414.0 |
| January | | | | | | |
| February | | | | | | |
| March | | | 200.00 | 144.66 | | |
| April | | | 200.00 | | | |
| May | | | 199.9 | 199.9 | | |
| June | | | | | | |

Table A (cont)

Foreign exchange market intervention*

| Month | Put options to accumulate reserves | | Call options to sell reserves | | Call volatility options | |
|--------------------------|------------------------------------|-------------------|-------------------------------|-------------------|-------------------------|-------------------|
| | Auction amount | Auction exercises | Auction amount | Auction exercises | Auction amount | Auction exercises |
| July | 50.00 | 6.2 | | | | |
| August | | | | | | |
| September | | | | | | |
| October | | | | | | |
| November | | | | | | |
| December | 300.0 | 300.0 | | | | |
| Total 2004 | 350.00 | 306.2 | 599.9 | 344.55 | | |
| January | 200.0 | 200.0 | | | | |
| February | | | | | | |
| March | 200.0 | 200.0 | | | | |
| April | 250.0 | | | | | |
| May | 200.0 | 200.0 | | | | |
| June | 199.9 | 199.9 | | | | |
| July | 199.8 | 199.8 | | | | |
| August | 200.0 | 200.0 | | | | |
| September | | | | | | |
| October | | | | | | |
| Total | 1,449.6 | 1,449.6 | | | | |
| Accumulated total | 3,679.3 | 3,155.1 | 599.9 | 344.5 | 540.0 | 414.0 |

* US\$ millions.

Table B
Call volatility options

| Date | Exchange rate | Exchange rate TRM moving average % | Auction amount (USD m) | Option exercised (USD m) |
|-----------|---------------|------------------------------------|------------------------|--------------------------|
| 02-Jul-02 | 2398.80 | 1.5 | | |
| 03-Jul-02 | 2410.50 | 1.8 | | |
| 04-Jul-02 | 2425.40 | 2.2 | | |
| 05-Jul-02 | 2426.40 | 2.0 | | |
| 08-Jul-02 | 2434.30 | 2.1 | | |
| 09-Jul-02 | 2457.40 | 2.8 | | |
| 10-Jul-02 | 2462.20 | 2.8 | | |
| 11-Jul-02 | 2482.20 | 3.3 | | |
| 12-Jul-02 | 2506.80 | 4.0 | | |
| 15-Jul-02 | 2514.00 | 3.9 | | |
| 16-Jul-02 | 2507.20 | 3.4 | | |
| 17-Jul-02 | 2499.90 | 2.8 | | |
| 18-Jul-02 | 2524.80 | 3.5 | | |
| 19-Jul-02 | 2538.50 | 3.8 | | |
| 22-Jul-02 | 2529.60 | 3.1 | | |
| 23-Jul-02 | 2517.40 | 2.3 | | |
| 24-Jul-02 | 2539.00 | 2.9 | | |
| 25-Jul-02 | 2572.40 | 3.9 | | |
| 26-Jul-02 | 2580.20 | 3.8 | | |
| 29-Jul-02 | 2596.30 | 4.0 | 180 | 117 |
| 30-Jul-02 | 2599.60 | 3.7 | | |
| 31-Jul-02 | 2625.10 | 4.3 | | 63 |
| 01/Aug/02 | 2636.30 | 4.3 | 180 | 69 |
| 02/Aug/02 | 2640.40 | 4.0 | | 17 |
| 05/Aug/02 | 2643.00 | 3.7 | | |
| 06/Aug/02 | 2663.80 | 4.1 | | |
| 08/Aug/02 | 2670.60 | 3.9 | | 23.5 |
| 09/Aug/02 | 2649.30 | 2.8 | | |
| 12/Aug/02 | 2568.80 | -0.5 | | |
| 13/Aug/02 | 2595.80 | 0.4 | | |
| 14/Aug/02 | 2658.00 | 2.5 | | |
| 15/Aug/02 | 2635.90 | 1.4 | | |
| 16/Aug/02 | 2648.80 | 1.7 | | |
| 20/Aug/02 | 2663.60 | 2.0 | | |
| 21/Aug/02 | 2620.90 | 0.2 | | |
| 22/Aug/02 | 2626.20 | 0.2 | | |
| 23/Aug/02 | 2653.00 | 1.0 | | |
| 26/Aug/02 | 2643.40 | 0.5 | | |
| 27/Aug/02 | 2653.30 | 0.7 | | |
| 28/Aug/02 | 2672.30 | 1.3 | | |
| 29/Aug/02 | 2688.60 | 1.7 | | |
| 30/Aug/02 | 2712.50 | 2.5 | | |

References

Canales-Kriljenko, J I, R Guimarães and C Karacadağ (2003): "Official intervention in the foreign exchange market: elements of best practice", *IMF Working Paper*, 03/152, July.

Domínguez, K M E (1998): "The market microstructure of market intervention", *Journal of International Economics*, vol 59, no 1, January.

Edison, H, P Cashin and H Liang (2003): "Foreign exchange intervention and the Australian dollar: has it mattered?", *IMF Working Paper*, 03/99, May.

Mandeng, O (2003): "Central bank foreign exchange market intervention and option contract specification: the case of Colombia", *IMF Working Paper*, 03/135.

Ramírez, J M (2004): "Foreign exchange market intervention through options: the case of Colombia", forthcoming in the proceedings of a conference held at the Czech National Bank in May 2004 on *Practical aspects of inflation targeting*.