

S E R I E

financiamiento del desarrollo

**P**rice-based capital account  
regulations: the Colombian  
experience

José Antonio Ocampo and Camilo Ernesto Tovar



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NACIONES UNIDAS



**Development Finance Unit**

**International Trade and Development  
Finance Division**

**Santiago, Chile, October 1999**

This document was prepared by Mr. José Antonio Ocampo, Executive Secretary of the Economic Commission for Latin America and the Caribbean (ECLAC) and Mr. Camilo Ernesto Tovar, Advisor to the Executive Secretary.

The opinions expressed herein are those of the authors and do not necessarily reflect the views of the Organization.

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United Nations Publication

LC/L.1243-P

ISBN: 92-1-121245-6

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Sales No. E.99.II.G.41

Printed in United Nations, Santiago, Chile

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## **Abstract**

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The Chilean experience with price-based capital account regulations (i.e., deposits or reserve requirements on capital inflows) has been subject to extensive discussion in the recent literature. This paper presents evidence on the effectiveness of similar regulations in Colombia since September 1993, when traditional exchange controls were replaced by price-based regulations. It is important to emphasize that the Tobin tax equivalent of such regulations in Colombia has been quite high (13.6% and 6.4% tax for 12 and 36 months loans, respectively, in 1994-1998), and, as in Chile, it is certainly much higher than the rates suggested for an international Tobin tax. The econometric evidence presented indicates that these regulations have been effective in Colombia, both in terms of reducing the volume of flows and in improving the term structure of external borrowing. This indicates that price-based regulations give the authorities some room for maneuver to adopt restrictive monetary policies during international capital market booms. They have also been effective in improving the debt profile of the country, a crucial determinant of macroeconomic risks in the face of busts in the international capital market.

## I. Introduction

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The East Asian crisis has raised an intense debate regarding the policy options that emerging markets can use to maintain macroeconomic stability and to avoid financial crises when opening their capital accounts. There is now widespread agreement on the fact that the abrupt or premature liberalization of capital markets is inappropriate for emerging economies, in particular if they are not complemented by strong prudential regulation and supervision of domestic financial systems. Liberalizing the capital account creates incentives for domestic agents to expand foreign financial transactions without adequately assessing the risks involved in these operations. These risks are exacerbated by the fact that capital markets are imperfect, which in turn induces a highly volatile behavior of capital flows to developing countries. Boom-bust cycles impose a severe threat to both macroeconomic stability and the stability of domestic financial systems.<sup>1</sup>

The Asian crisis, as well as the “tequila crisis” and previous events, have thus made evident the need for developing and transition economies to adopt a set of policies that can help them maintain macroeconomic stability while opening their capital accounts. When experiencing a surge in capital inflows, developing countries have reacted with a wide spectrum of policies, such as fiscal austerity measures, discrete revaluations of the nominal exchange rate, greater exchange rate flexibility, measures to curb consumer credit and consumption activity, sterilized intervention, trade liberalization or the liberalization of capital outflows. However, many of these policies

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<sup>1</sup> See ECLAC (1995), IMF (1998), UNCTAD (1998), World Bank (1998), Akyüz and Cornford (1999), Dornbush (1998), Eatwell and Taylor (1999), Eichengreen (1999), Furman and Stiglitz (1998), Griffith-Jones (1998), Helleiner (1997), Ocampo (1999a, 1999b), Reinhart and Dunaway (1996), Rodrik (1998), Rodrik and Velasco (1999), Taylor (1998), and Wyplosz (1999).

have proved to be ineffective for managing the pressures imposed by capital inflows. This has called attention to the use of capital account regulations on inflows as a potentially effective mechanism for managing capital surges.

It has been argued that price-based controls or regulations on capital inflows, known in the recent debate as Chilean-type capital-inflow taxes, help to reduce the destabilizing effects of surges in capital inflows.<sup>2</sup> These arguments are based on the assumption that such regulations improve the term structure of external liabilities by strongly discouraging short-term capital inflows, which are more volatile than long-term flows and are a major source of instability for the financial system. Whether such a tax on capital inflows reduces net global capital flows, and thus alleviates exchange rate pressures, is a matter of debate.

The Chilean experience has been widely analysed in the recent literature.<sup>3</sup> The Colombian experience, in contrast, has not received much attention. This paper provides further empirical evidence of the effectiveness of price-based regulation on capital inflows, based on the Colombian experience since 1993. Using alternative methods, the paper demonstrates that Colombia's regulations have not only created a more sound term structure of external liabilities, but have also reduced the volume of capital inflows.

The paper is organized in six sections, the first of which is this introduction. Section II briefly discusses the supporting arguments for the use of price-based regulations on capital inflows. Section III describes such regulations in Colombia during the 1990s. Section IV presents an econometric evidence on the determinants of the magnitude of capital flows, aimed at analyzing the effectiveness of such regulations in Colombia. The fifth section presents evidence of their effect on the term structure of external liabilities. The final section draws conclusions.

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<sup>2</sup> Eichengreen and Rose (1998), Furman and Stiglitz (1998) and Williamson and Mahar (1998).

<sup>3</sup> Agosin (1998), Agosin and Ffrench-Davis (1996 and 1999), Edwards (1998), Le Fort and Budnevich (1977), Valdés-Prieto and Soto (1998).

## **II. What role for price-based capital account regulations?**

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Many developing and transition countries have now liberalized their capital accounts. This process offers potential benefits, but experience indicates that it also poses major risks. Indeed, the threat of macroeconomic and domestic financial crises following the liberalization of the capital account appears to be a major drawback of the process. In this regard, developing countries have become increasingly interested in the policy options available to adequately manage surges in capital flows. The lessons from recent financial crises suggest that the successful management of capital flows during boom periods requires the adoption of policy measures in three main areas. First, policy makers must adopt consistent and flexible macroeconomic management. Second, developing countries will have to improve prudential regulation and supervision of their domestic financial systems. Third, as the recent and previous crises have demonstrated, they must adopt strong “liability policies” aimed at inducing good public and private debt profiles, for both domestic and external commitments.

This general prescription is not easily attainable. The traditional instruments of macroeconomic management are deficient when dealing with large capital inflows. Such is the case for fiscal, monetary and exchange rate policies. Fiscal policies are difficult to fine tune: tax reforms must be passed by Congress; active expenditure policies take time to implement and may generate inefficiencies (e.g., increased costs associated with the uneven rate of execution of public investment projects). Furthermore, in an open economic environment, monetary and exchange rate policies pose large dilemmas



for policy makers, related to the “eternal triangle”, i.e., the fact that in an open economy it is not possible to achieve monetary control and exchange rate control at the same time. Sterilized intervention tends to be partially self-defeating in this context, and excessive appreciation during booms may generate “Dutch disease” effects and increase the likelihood of speculative attacks on the domestic currency.<sup>4</sup>

Microeconomic policies, such as improved prudential regulations and supervision of domestic financial systems, also play an important role in avoiding the destabilizing effects of capital flows and, more generally, of financial booms. Although desirable and necessary, such policies have important shortcomings.<sup>5</sup> It is widely recognized that financial markets are imperfect and are exposed to information asymmetries. They are therefore intrinsically prone to financial crises, even if governed by refined regulatory and supervision systems.<sup>6</sup> The development of an adequate regulatory framework is not an easy task; it usually takes time to develop and requires advanced information systems. Even when such frameworks are available, they normally lag behind financial innovations. The close association between financial risks and macroeconomic variables, such as interest and exchange rates, indicates that even well-designed systems of prudential regulation and supervision may prove powerless in the face of major macroeconomic shocks.<sup>7</sup> Finally, prudential regulation and supervision generally have pro-cyclical effects associated with the fact that bad debts only become evident during crises, when capital-adequacy requirements induce a strong contraction of credit which may increase rather than reduce credit risks.<sup>8</sup>

Finally, the experience of many developing countries indicates that crises are associated not only with high debt ratios but also with inadequate debt profiles.<sup>9</sup> Under severe uncertainty, such as that which characterizes financial busts, markets respond to *gross* and not to net financing requirements. In other words, the rollover of short-term debt is not neutral in financial terms. This gives an essential role to liability policies aimed at improving debt profiles. Although such policies should aim to improve external debt profiles, there is a strong complementarity between good external and domestic debt profiles. Indeed, the consequences of excessive domestic short-term borrowing can be serious: a government trying to roll over the domestic debt during a crisis may be forced to raise interest rates in order to avoid capital flight by (direct or indirect) foreign investors in government bonds. Also, excessively high private short-term liabilities increase the risks perceived by foreign lenders during crises, a fact that may cause a stronger contraction of external lending.

It is in this context that regulating capital inflows may play a complementary and preventive role when dealing with the destabilizing effects of capital surges. In the case of the public sector, direct controls by the Ministry of Finance are probably the adequate instrument of a liability policy. In the case of the private sector, however, direct controls are more debatable because of the distortions (or corruption) that they may generate. In this regard, indirect price-based policy tools, such as the reserve requirements on capital inflows used by Colombia and Chile during the 1990s, appear to be an interesting option. Reserve requirements or price-based capital regulations may be considered particular types of Tobin taxes (and also of interest equalization taxes), as they can be substituted for a payment to the central bank which is equivalent to the opportunity cost of the reserve requirement. Nonetheless, the equivalent tax level (3% for a 12-month credit in the case of Chile and, as we will see, an even higher rate in Colombia) is much higher than that proposed for an international Tobin tax.

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<sup>4</sup> See Krugman (1998), Ocampo (1999a), and World Bank (1998).

<sup>5</sup> For a more detailed survey see Furman and Stiglitz (1998).

<sup>6</sup> This fact has become evident as banks have begun to operate in derivatives, which means that a bank's exposures can vary hourly as a result of changes in both the market position and market prices of the assets in which it trades. See Williamson and Mahar (1998).

<sup>7</sup> Akyüz and Cornford (1999), Ocampo (1999b).

<sup>8</sup> Ocampo (1999b).

<sup>9</sup> For a theoretical approach on the role of debt profile as a factor behind financial crises, see Rodrik and Velasco (1999).

Such regulations have positive effects on debt profiles, as there is a strong incentive to spread the additional costs of reserve requirement over a longer period. The effect of this system on the magnitude of flows has been the subject of a more heated controversy. In any case, to the extent that short-term and long-term borrowing are not perfect substitutes, and that evasion and elusion are costly (e.g., the derivative operations used for that purpose are costly), the *volume* of capital flows is also affected.<sup>10</sup> In this case, the system operates both as a liability policy and a macroeconomic policy tool. It reduces the pressures on monetary aggregates and on real and nominal exchange rates, which in turn allows policy makers to gain monetary and exchange control when experiencing capital surges, thereby reducing the destabilizing effects of a sudden reversal in capital flows.

A major advantage of this instrument is that it is targeted at capital inflows, and it is thus a preventive policy tool. It also has specific advantages over prudential regulations and supervision practices which could have similar effects: it affects both financial and non-financial agents, and it uses a non-discretionary price instrument, whereas prudential regulations affect only financial intermediaries and are usually quantitative in their character, and supervision is essentially discretionary in its operation.<sup>11</sup> Given the strong externalities that large non-financial agents can have on the domestic financial system during crises, controlling them is a substantial advantage.

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<sup>10</sup> Agosin (1998), Agosin and Ffrench Davis (1999) and Ocampo and Tovar (1998).

<sup>11</sup> Ocampo (1999a, 1999b).

### III. Colombian capital account regulations

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An important liberalization of foreign exchange transactions occurred in Colombia in the 1990s along with a fairly complete liberalization of foreign direct investment (FDI),<sup>12</sup> but significant regulations on capital flows remain. The liberalization of foreign exchange regulations took place in two stages. The first stage was associated with Law 9 of 1991 and its related Resolution 57, which the Monetary Board issued in June 1991. Both made major changes to the exchange control system that had been established by Decree 444 of 1967, which regulated foreign exchange transactions in Colombia for a quarter of a century. The major innovation was a decentralization of foreign exchange transactions: financial intermediaries could manage such transactions without prior controls by the central bank; the reform also allowed firms a fairly general use of bank accounts abroad to manage foreign exchange revenues and expenditures. However, most transactions continued to be highly regulated, including the obligation to channel them through intermediaries legally allowed to operate in the market. With respect to capital transactions, Resolution 57 established a minimum maturity of one year for foreign loans, except for some commercial credits; it also maintained strong regulations on the final use of external lending (investment, exports and imports) and some sectoral discriminations. In all these respects, the 1991 regulations maintained great continuity with those that had existed since 1967. The major innovation in this area was probably Resolution 7, issued by the new independent central bank board in February 1992, which for the first time allowed firms to contract foreign credits for short-term working capital.

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<sup>12</sup> Since 1991, prior approval is only required for foreign direct investment in utilities, large mining activities, investment funds and banking; in the latter case, it is also required for domestic investors. Remittances by foreign companies are not subject to restrictions. In 1994, some restrictions were introduced on the purchase of real estate by foreigners.

The second stage stemmed from the central bank board's Resolution 21 of September 1993. This reform made a more important change with respect to capital transactions: it transformed a system of regulations of capital flows based on their *final use* into a system based on their *maturity*. Most importantly, domestic financial intermediaries could for the first time lend in foreign currency to domestic firms and residents with no regard for the final use of those credits. This was accompanied by an extension of the requirement that all debts in foreign currency must be registered in the central bank (*Banco de la República*); this requirement did not exist for short-term commercial debts prior to that date. Resolution 21 also allowed domestic financial intermediaries to lend to foreigners in international currencies and to invest abroad in liquid assets.

Specifically, the new system required that all loans of less than certain maturity—which we will call the minimum maturity—keep a dollar-denominated deposit in the central bank at a pre-specified rate and holding period. This deposit resembles a reserve requirement, an interest equalization tax or a Tobin tax; the latter interpretation is highlighted by the fact that the deposit could be immediately redeemed at preestablished discount rates. As table 1 indicates, minimum maturities and deposit requirements varied over time: they became more restrictive in March and August 1994, were lessened in February and March 1996, and became more restrictive again in March 1997.

In January 1997, the Government established an explicit Tobin tax on all capital inflows, in addition to the reserve requirement. In March 1997, the Tobin tax was decreed unconstitutional, but reserve requirements were tightened. In May 1997, the central bank introduced a simpler system, more similar to that used by Chile. A flat deposit in local currency with an 18-month maturity was decreed for all loans. For the sake of simplicity in administration, the principle of a minimum maturity was thus abandoned, and dollar deposits were substituted for peso-denominated ones. In January and September 1998, the deposit rate and holding periods were reduced in response to pressures from the world financial crises (see table 1).

Under the price-based deposit system, incentives to borrow in foreign currencies depend on both the differential between the domestic and the external interest rate (cum expected devaluation) and the opportunity costs of the deposits. As shown in the Appendix, the tax equivalent of the deposits depends on three factors: (a) the deposit rate; (b) the relation between the maturity of the loan and that of the deposit; and (c) between September 1993 and May 1997, when deposits were dollar-denominated, their opportunity cost increased (decreased) if domestic interest rates rose (fell) or if the rate of devaluation decreased (increased). It should be emphasized that the last effect was contrary to the direct effect of devaluation on the costs of foreign borrowing. In this sense, the tax had a (partial) stabilizing effect on the costs of foreign borrowing: it increased when the direct costs of such borrowing were reduced due to a slow rate of devaluation, but had the opposite effect when devaluation accelerated. However, this stabilizing feature was lost after May 1997, when the dollar deposit system was replaced by the peso deposit system.

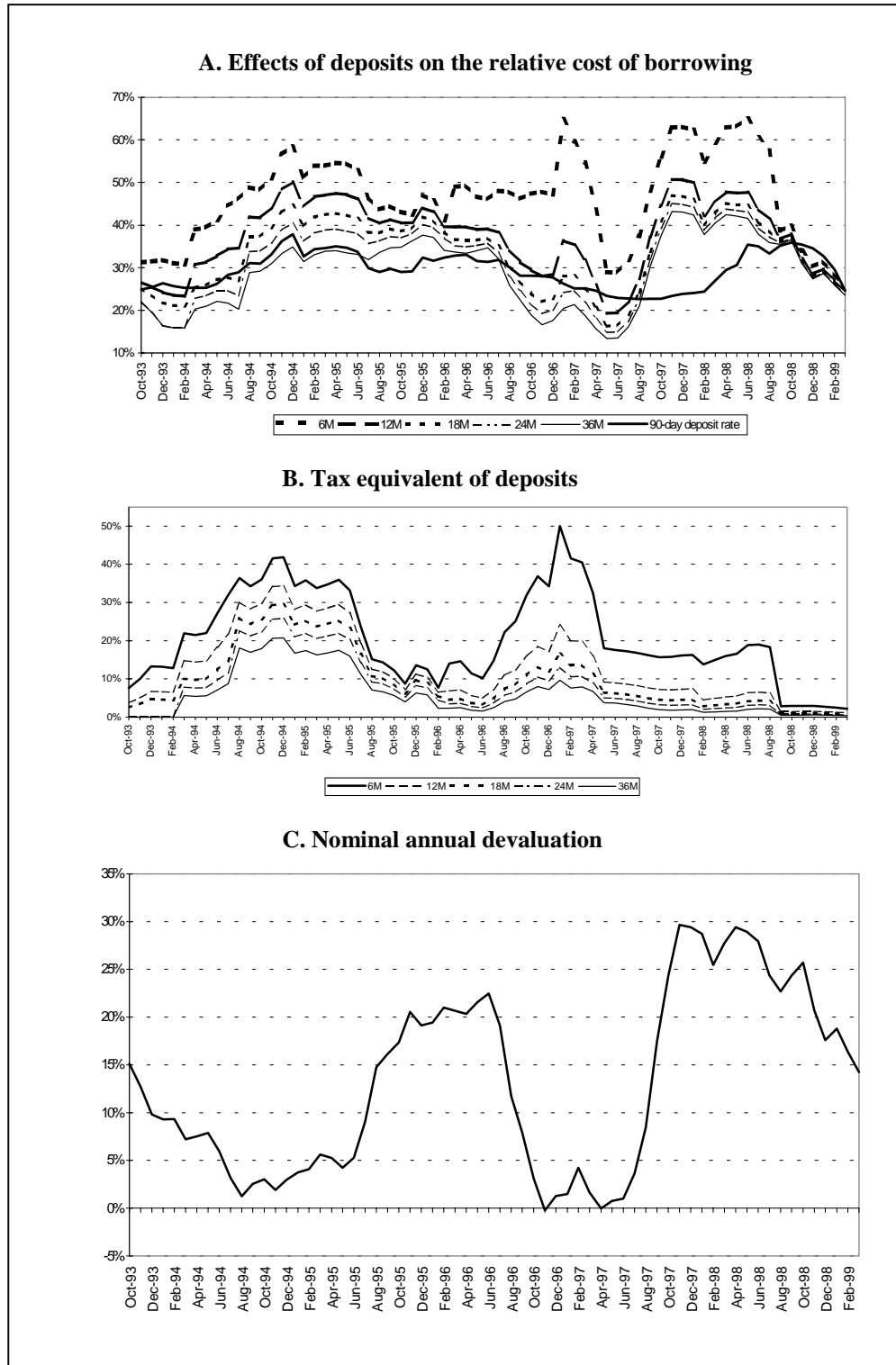
Panel A of figure 1 shows the total costs of loans with maturities of 6, 12, 18, 24 and 36 months, compared to the typical 90-day deposit rate. Panel B shows the tax equivalent of deposits for the same maturities. Regulations were not very restrictive prior to August 1994, except for short-term debts (6 and 12 months). After August 1994, the cost of borrowing in foreign currency increased significantly for all maturities, a tendency which the acceleration of devaluation in the second semester of 1995 reinforced. Nonetheless, as noted, the tax equivalent of deposits actually declined when devaluation accelerated. The new rules established in February and March 1996 reduced the relative costs of borrowing in external markets, but kept them high for short-term maturities. In January 1997, the cost of foreign borrowing became very restrictive for short-term capital inflows due to the introduction of the explicit Tobin tax and to revaluation. The return to the previous system in March contributed to its decline, however. By mid-1997, the costs of foreign borrowing rapidly increased again as devaluation rose. Some moderation of devaluation pressures, together with the significant easing of capital account regulations in September 1998, led to a gradual reduction of the costs of external borrowing since then.

**Table 1**  
**REGULATIONS ON EXTERNAL BORROWING**

Year	Month	System	Loans subject to deposits	Deposit	Maturity of deposit	Deposit denomination	
1991	January	based on the final use of the loan					
1993	September		with maturity under 18 months	47%	12 months	US dollars	
1994	March		with maturity under 36 months according to a table	93%	less than 12 months	12 months	US dollars
				64%	between 12 and 24 months		
				50%	between 24 and 36 months		
	August	based on the maturity of the loan	with maturity under 60 months according to a table	maximum 140% minimum 42.8%	30 days 60 months	12 months	US dollars
1996	February		with maturity under 48 months according to a table				US dollars
	March		with maturity under 36 months	50%		18 months	US dollars
1997	January	explicit Tobin tax (additional to the deposit)	all	variable according to interest rate differential			
	March	based on the maturity of the loan	With maturity under 60 months	50%		18 months	US dollars
	May		all	30%		18 months	Colombian pesos
1998	January	Flat	all	25%		12 months	Colombian pesos
	September		all	10%		6 months	Colombian pesos

Figure 1

TOTAL COSTS OF EXTERNAL BORROWING WITH DEPOSIT SYSTEM



Source: Authors' estimates based on Banco de la República data.  
 Definitions: See text.

Aside from reserve requirements, capital inflows in Colombia have been subject to four additional types of regulation.<sup>13</sup> (1) Restrictions on commercial debts include rules on maximum payment periods for imports of consumer and intermediate goods, which set a maximum maturity for the related commercial credits. Export prefinancing is subject to special quotas for the Foreign Trade Bank (Bancoldex) and coffee exporters, which have been subject to smaller deposit requirements and, in some periods, have been free from them. (2) Controls on the net foreign exchange assets of financial intermediaries (*posición propia*) have banned the holding of negative net foreign exchange assets, thus prohibiting intermediaries from using external funds to lend in pesos. By forcing intermediaries to hold positive net foreign assets during some periods of expected exchange rate appreciation, the authorities have increased the costs of intermediating foreign exchange loans and the demand for foreign exchange. (3) Complementary regulations also affect capital flows. Foreign investment funds operating in Colombia are subject to direct approval by the Superintendency of Securities (*Superintendencia de Valores*), and several taxes and explicit controls serve to reduce interest arbitrage which may be filtered through service transactions. (4) Direct controls on illegal flows of funds.

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<sup>13</sup> For details, see Ocampo and Tovar (1998).

## **IV. Magnitude and determinants of capital flows**

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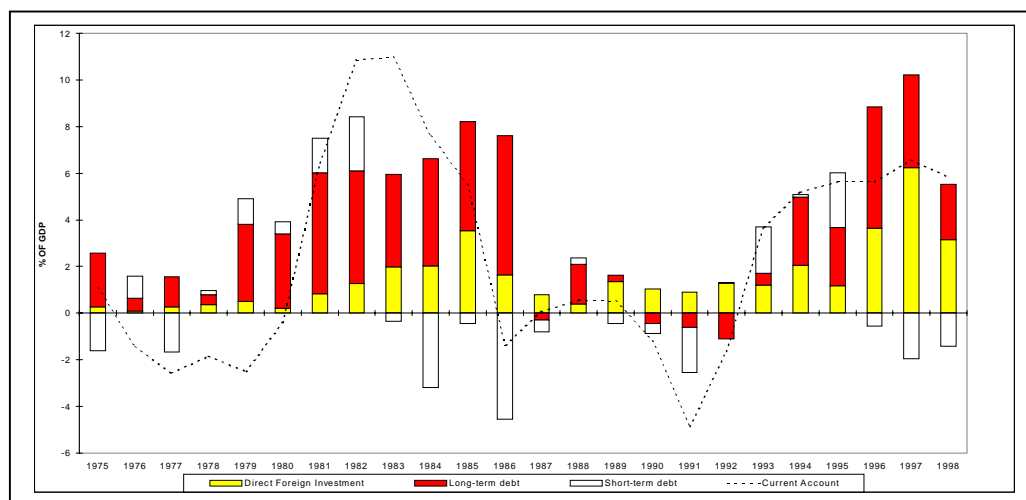
Figure 2 and table 2 summarize the evolution of Colombia's external financing and foreign debt. Figure 2 contains three noticeable features. First, annual financing requirements during the 1990s, as measured by the current account deficit as a proportion of gross domestic product (GDP) (estimated at 1994 parity exchange rates), are smaller than the peak level of the early 1980s, but they have remained high for a longer time period. Second, FDI has become a major stable source of financing, covering about half of the total financing requirements in recent years. The boom in oil investments is part of the story, but equally important is the FDI boom in non-tradable activities, primarily those which were liberalized in the early 1990s (e.g., domestic commerce, public utilities, domestic financing). Third, net short-term capital flows have played a secondary role; indeed, in many years, they have been negative. Thus, for practical purposes, the current account deficit has been financed by long-term funds, including FDI.



Figure 2

## EXTERNAL FINANCING

(Percentage of GDP at 1994 parity exchange rate)



Source: Authors' estimates based on Banco de la República data.

As table 2 indicates, the decline of the (moderate) debt ratios of Colombia that had characterized the second half of the 1980s continued in the early 1990s. Since 1992, however, they have experienced an increasing trend. Private and public external debts evolved differently. Most of the increase in the external debt of Colombia throughout the 1990s has been related to private sector borrowing. Whereas public sector debt ratios have declined throughout the decade, those of the private sector have increased and since 1996 have more than doubled the levels reached in 1986, at the end of the debt boom that started in the late 1970s.

Important changes have also occurred in the composition of both private and public foreign debts. In the case of the private sector, the ratio of short-term to total external liabilities has remained low. The ratio of short-term debt to international reserves has also stayed at moderate levels by international standards.<sup>14</sup> The latter ratio experienced a short but sharp deterioration as a result of the capital-account liberalization in 1993, and both ratios improved as a result of the active use of price-based regulations. In the case of the public sector, long-term liabilities have been dominant throughout the decade. Major changes include the rise of bond financing and the relative decline of bilateral debt; among multilateral lenders, the Inter-American Development Bank has replaced the World Bank as the major source of financing.

The determinants of private capital flows have been the focus of much attention in the 1990s. However, most of the literature covers periods under which the exchange controls prevailed.<sup>15</sup> Cárdenas and Barrera (1997) provide one of the few studies to incorporate the period following the liberalization adopted in September 1993. Using monthly data for 1985 through mid-1996, they analyse the effectiveness of price-based capital account regulations. Their results show that these regulations have been effective in changing the composition of capital inflows for long-term maturities. However, the authors question their effectiveness in reducing the volume of flows, based on three different statistical results: (1) flows are not dependent on interest rate differentials when those differentials are estimated using the tax equivalent for shorter-term deposits

<sup>14</sup> This is particularly true if compared with Asia, where the ratio easily exceeded 100%. See Rodrik and Velasco (1999).

<sup>15</sup> A central issue in the discussion has therefore involved whether interest arbitrage filtered through exchange controls. In general, evidence supports the presence of interest arbitrage and the sensitivity of capital flows to interest rate differentials. See Cárdenas and Barrera (1994), Correa (1984), Steiner et al. (1993), Herrera (1993) and O'Byrne and Reina (1993).

**Table 2**  
**COLOMBIA: EXTERNAL DEBT**  
*(Millions of US dollars)*

	1978	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998 <sup>a</sup>
<b>Private debt</b>	1584	3318	3027	2532	3256	5056	7122	9372	13262	15591	15725
<b>Short-term</b>	1221	1711	1914	1551	2006	3009	3218	3819	3793	3831	3979
<b>Long-term</b>	363	1607	1113	981	1250	2046	3904	5553	9469	11760	11746
<b>Public sector debt</b>	2896	12463	14586	14464	13487	13886	14718	15540	16251	16424	17140
<b>Multilateral</b>	1108	4596	6021	6174	5886	5728	5614	5649	5053	4448	4661
<b>Bilateral</b>	992	2357	2707	2571	2165	1803	1496	1747	1738	1591	1478
<b>Commercial banks</b>	523	4865	4719	4536	4304	4293	4574	4307	4430	4613	4697
<b>Bonds</b>	45	46	275	359	419	776	1333	1733	3410	4441	5863
<b>Suppliers</b>	228	599	864	824	713	659	537	516	451	427	441
<b>Total</b>	4480	15781	17613	16996	16743	18315	21157	24912	29513	32015	32865
<b>Debt as % of exports of goods and services</b>	125.4	251.5	207.8	190.6	188.4	194.8	192.1	192.3	211.8	211.6	235.0
<b>Private</b>	39.3	51.8	35.0	27.8	35.5	52.1	66.7	76.6	95.3	103.0	109.6
<b>Public</b>	86.0	199.7	172.8	162.7	152.9	142.7	125.4	115.7	116.5	108.5	125.5
<b>Private short-term debt as % of total private debt</b>	77.1	51.6	63.2	61.3	61.6	59.5	48.5	44.1	28.6	24.6	25.3
<b>Private short-term debt as % of international reserves</b>	49.2	49.2	42.5	24.2	26.0	38.2	46.0	52.5	38.3	38.8	45.5

Source: Banco de la República.  
<sup>a</sup> Data as of September.

(18 and 24 months);<sup>16</sup> (2) the market showed signs of speculative behavior prior to and after the adoption of policy decisions, which is reflected in an unexpected increase in inflows as captured by specific dummy variables; and (3) control measures had no permanent effect, as reflected in the lack of significance of the coefficients for dummy variables which cover the whole period for which specific control measures were in place. The exception to the last rule is a dummy covering the period January 1995-June 1996, which the authors interpret as a “tequila” effect. Some of these results are open to different interpretations, however, as shown below.

Ocampo and Tovar (1998) offer an alternative study on the effectiveness of price-based capital account regulations. Using monthly data from January 1990 to December 1996, they found that the regulations were effective in reducing the volume of capital flows as well as in altering their term structure. Contrary to Cárdenas and Barrera (1997), they found evidence of interest arbitrage when including the tax equivalent for short-term deposits (18 and 36 months). Furthermore, tests for the temporary effects of different policy decisions, using dummy variables, indicated that stock adjustments occurred following the February 1992 and September 1993 liberalizations. They also found evidence of a strong speculative wave prior to the adoption of the August 1994 restrictions. Nonetheless, the August 1994 measure had a delayed direct effect, which reduced capital inflows by a larger volume than additional inflows related to the speculative wave. This result supports a different interpretation from Cárdenas and Barrera’s “tequila effect”. Indeed, the spreads on sovereign bonds suggest that the tequila crisis had a minor effect on Colombia, and aggregate net flows to Latin America indicate that the contagion effects of the crisis only covered the first quarter of 1995.

Ocampo and Tovar (1998) also suggest that controls have been effective in determining the term structure of private debt. They show that debt maturities clearly increased as a result of the March and August 1994 regulations, which raised the minimum maturity for deposit-free loans from 18 months to three years and then to five years. The return to a three-year minimum maturity in March 1996 had the opposite effect.

Cárdenas and Barrera (1997) and Ocampo and Tovar (1998) also examined whether interest rate arbitrage filtered through the service and trade accounts. Cárdenas and Barrera used the residuals of the correlation between the service account and activity variables as a proxy for capital flows, which were then explained by interest rate differentials and the black market premium. This methodology yielded evidence of interest arbitrage for the service account, but not for trade financing. However, this result was only obtained for regressions incorporating the cost of deposits for medium- and long-term loans, as well as for a global measure of capital flows including cash flows, transfers and the temporary component of the non-financial services balance. Cárdenas and Barrera (1994) found similar results in an earlier study.

In contrast, Ocampo and Tovar (1998) followed a procedure previously used by Correa (1984), in which interest rate differentials are used as a determinant of capital flows together with other “fundamental” determinants of the service account (i.e., domestic activity variables, the real exchange rate and the ratio of the official to the black market exchange rate, which captures foreign exchange arbitrage between the black and the official markets). In Ocampo and Tovar’s analysis, activity variables emerged as the major determinants of trade financing and of the non-financial services balance. Interest rate differentials did not appear to be relevant for any of these accounts. Furthermore, dummy variables did not produce evidence of either a reduction of hidden transactions after the September 1993 liberalization or an increase in such flows following the August 1994 controls.

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<sup>16</sup> The formula used by Cárdenas and Barrera to measure the tax equivalent is different to that proposed in the Appendix to this paper, and is thus imprecise. See also footnote 18 below.

The analysis developed in this paper will center exclusively on the determinants of private cash capital flows ( $K$ ), as measured by the balance of cash foreign exchange flows (*balanza cambiaria*).<sup>17</sup> The analysis uses two basic econometric methodologies: a Johansen framework and a Kalman filter. In the first case, the basic relation estimated and the expected signs are as follows:

$$(1) \quad K = K(m, a, R)$$

where imports of capital goods ( $m$ ) is assumed to be the main activity variable,  $a$  is interest-arbitrage factor, including the effects of deposits, and  $R$  stands for regulations (see below).  $K$ ,  $m$  and  $a$  are the main variables in the long-run cointegration relationship. In the absence of deposits:

$$(2) \quad a = \frac{(1+i)}{(1+i^*)(1+d^e)} - 1$$

where  $i$  is the domestic deposit rate,  $i^*$  the United States deposit rate and  $d^e$  the expected nominal devaluation; for simplicity, it is assumed that expected devaluation equals the annualized devaluation of the past 12 months.<sup>18</sup> When deposits are in place, the arbitrage factor includes the total costs of borrowing, including deposits ( $\varphi$ ):

$$(3) \quad a = \frac{(1+i)}{(1+\varphi)} - 1$$

The precise expression for  $\varphi$  is derived in the Appendix. The regressions use values of  $\varphi$  for credits with maturities of 18 and 36 months.

$R$  stands for dummy variables used to test for the discrete effects of changes in capital account regulation. The interpretation of these dummies depends on whether the regulations liberalized the capital account (e.g., February 1992, September 1993, February-March 1996, March 1997, January and September 1998) or increased controls (e.g., March and August 1994, January 1997, and May 1997). In the first case, a positive coefficient can be interpreted as a stock adjustment induced by the liberalization measure. In the second case, the coefficient reflects either speculative attacks against controls (if positive) or the discrete effects of controls (if negative). Two different dummies are used to capture the restrictive regulations of the August 1994-February 1996 period. There were significant debt registrations in the weeks prior to the introduction of the August 1994 regulations (Banco de la República, 1995), which were associated with expectations that the incoming Samper Administration would propose stronger regulations to the central bank. These registrations reduced the effects of controls for some months after regulations were introduced. A temporary dummy for September-December 1994 thus captures this speculative effect, whereas the actual dummy variable used to capture the effects of the August 1994 regulations only starts in January 1995. As mentioned above, this dummy variable cannot be interpreted as a tequila effect, which was short and had no major effect on spreads on Colombian bonds in international markets. Additional dummies were used to test for temporary effects from the tequila, Asian and Russian crises, but they were not statistically significant in the estimations. Finally, a particular dummy was

<sup>17</sup> This balance differs from normal balance of payment accounts in that trade financing, which does not involve cash flows, is not registered in the capital account. Rather, exports and imports are registered at the time at which they are effectively paid for.

<sup>18</sup> Shorter time spans yield similar results.

used for December 1996, an outlier in the series, which may be interpreted as a speculative attack on the floor of the exchange rate band (see below).

The procedure used to capture the effects of regulations involves two different channels: the additional cost of borrowing, which affects capital flows through the arbitrage factor,<sup>19</sup> and a discrete effect of regulations, estimated with dummy variables. As pointed out in Section II, the latter may be interpreted as evidence of imperfect substitution between loans of different maturities, due to risk factors on the supply side that affect their relative availability. It may also be interpreted as the effect of the additional costs of circumventing regulations (e.g., the costs of the derivative operations used for that purpose, or the risks of exchange control supervision and penalties if they are hidden in trade transactions). The first of these interpretations is preferred in the analysis below.

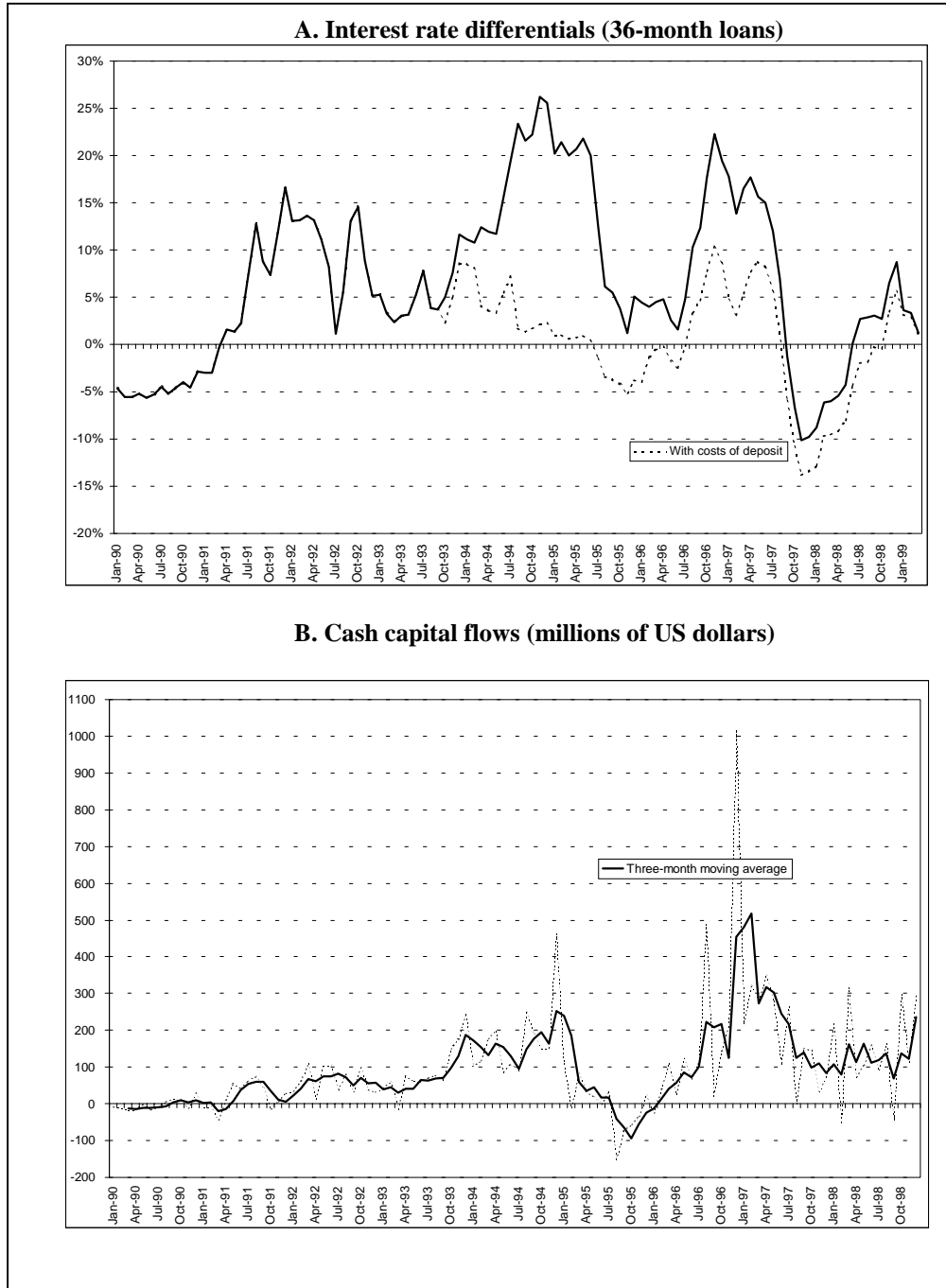
Figure 3 presents the basic data for interest rate differentials and private cash capital flows. Major incentives for inflows were present from the second quarter of 1991 through mid-1992, from the third quarter of 1993 through the second quarter of 1995 and from mid-1996 to the third quarter of 1997 (see figure 3, panel A). The deposit system was quite effective in reducing incentives to borrow in foreign currencies after March 1994 and in eliminating them altogether after the August 1994 regulations were introduced. Global incentives to borrow abroad actually turned negative when devaluation accelerated in the third quarter of 1995. The joint effect of regulations and faster devaluation explains the sharp interruption of cash capital flows in 1995 (see figure 3, panel B). Liberalization of controls in February-March 1996, together with revaluation, led to a new wave of capital inflows in the second semester of 1996. By late 1996, the economy faced large capital inflows, which threatened to destabilize the economy. Indeed, high interest rate differentials in the second half of the year contributed to build a speculative attack on the floor of the exchange rate band. In January 1997, the Government adopted explicit Tobin taxes to contain capital inflows, which were followed by the March and May capital account regulations adopted by the central bank. These policy decisions contributed to reducing interest rate differentials and reversing the speculative pressures on the exchange rate band. Capital flows fell rapidly. By mid-1997, prior to the Asian crisis, the regulations seemed to have been effective in inducing an important devaluation. As a result, interest rate differentials rapidly turned negative and capital flows were stabilized at moderate levels.

Tables 3 and 4 summarize econometric results using monthly data for 1990-1998. To avoid the possible effects of capital flows on the exchange rate and, thus, on interest rate differentials, the latter variable is always included with a one-month lag. Table 3 presents the rank test for cointegration vectors for equations reported in table 4. As shown, cash capital flows, interest rate differentials and imports of capital goods are cointegrated. The long-term cointegration vectors reported in table 4 were calculated using the effective costs of borrowing at maturities of 18 and 36 months. These results strongly indicate that private cash capital flows are sensitive to interest rate differentials. The parameters of the error correction mechanism suggest that disequilibria in the long-term relationship among the three variables are rapidly and exclusively adjusted by cash capital flows. This implies that price-based capital account regulations which alter the long-term relationship will have a rapid effect on the dynamics of cash capital flows, and that pressures on fundamental macroeconomic variables can therefore be effectively reduced by policies aimed at altering the interest rate differentials.

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<sup>19</sup> This effect is not included in the interpretation of the regression results in Cárdenas and Barrera (1997), and thus leads them to underestimate the effects of capital account regulations on the volume of flows.

**Figure 3**  
**INTEREST RATE DIFFERENTIALS AND CASH CAPITAL FLOWS**



**Source:** Authors' estimates based on Banco de la República data.  
**Definitions:** See text.

Table 3  
RANK TEST FOR COINTEGRATION VECTORS

Eigen value	L-max	Trace	Ho: r	N-r
<b>Equation 1</b>				
0.47	66.6 *	82.6 *	0	3
0.10	11.2	15.3	1	2
0.04	4.8	4.8	2	1
<b>Equation 2</b>				
0.47	67.3 *	83.2 *	0	3
0.10	11.5	15.4	1	2
0.04	4.4	4.4	2	1
<b>Equation 3</b>				
0.46	65.1 *	81.0 *	0	3
0.09	10.0	15.4	1	2
0.05	6.0	6.0	2	1
<b>Equation 4</b>				
0.46	64.8 *	81.5 *	0	3
0.10	11.6	15.5	1	2
0.04	5.2	5.2	2	1

**Note:** Cointegration vectors are presented in Table 4.

Lags in all Var-models : 2.

No. Observations: 106.

\* Indicates statistical significance at 5% levels.

Table 5 presents the estimated effects of interest rate differentials on capital flows and the net effect generated by the deposit system for representative phases in the history of capital account regulations. In their absence, cash capital flows would have increased during the period in which price-based capital controls have been in place, particularly in September 1994-January 1996 (US\$74 million per month), as well as in April-August 1994 (US\$56 million per month) and in January-March 1997 (US\$54 million per month).

**Table 4**  
**DETERMINANTS OF CAPITAL FLOWS**  
*(January 1990 - December 1998)*

<b>Johansen cointegration analysis</b>									
<b>Endogenous variables</b>	<b>Equation 1</b>		<b>Equation 2</b>		<b>Equation 3</b>		<b>Equation 4</b>		
	Normalized cointegration vector		Normalized cointegration vector		Normalized cointegration vector		Normalized cointegration vector		
Cash Capital Flows	1.00		1.00		1.00		1.00		
Interest rate differential (36 months loans)	-393.16		-463.04						
(18 months loans)					-300.93		-362.55		
Imports of capital goods	-0.52		-0.53		-0.55		-0.53		
<b>Error correction term</b>	Alpha values	t-stat	Alpha values	t-stat	Alpha values	t-stat	Alpha values	t-stat	
Cash Capital Flows	-0.73	-8.7	-0.74	-8.7	-0.69	-8.7	-0.69	-8.7	
Interest rate differential (36 months loans)	0.00	-0.3	0.00	-0.3	0.00	-0.3	0.00	-0.3	
Imports of capital goods	0.03	0.6	0.04	0.7	0.04	0.6	0.04	0.7	
<b>Exogenous dummies</b>	t-stat		t-stat		t-stat		t-stat		
March 1992 - June 1992	27.94	0.7			34.17	0.8			
October 1993 - January 1994	46.27	1.1			53.82	1.3	51.95	1.3	
April 1994 - July 1994					-2.56	-0.1			
September 1994 - December 1994	75.80	1.9	69.79	1.7	82.42	2.0	83.49	2.0	
January 1995 - January 1996	-118.02	-4.5	-123.04	-4.8	-113.56	-4.4	-112.51	-4.4	
February 1996 - December 1996	6.94	0.3							
May 1997 - December 1997	-45.34	-1.5	-51.40	-1.7	-51.34	-1.6	-51.03	-1.6	
December 1996	825.87	10.0	822.99	10.3	844.44	10.5	842.20	10.5	
Constant	-53.31	-4.7	-53.09	-4.9	-51.98	-4.5	-49.55	-4.6	
R-squared	0.77		0.76		0.76		0.76		



**Table 5**  
**ESTIMATED EFFECTS OF INTEREST RATE DIFFERENTIALS ON CASH CAPITAL FLOWS**  
*(Monthly averages)*

	Interest rate differentials 36-months loans (percentage points)			Estimated effects of interest rate differentials using cointegration analysis <sup>a</sup> (millions of US dollars)			Estimated effects of interest rate differentials using Kalman filter <sup>a</sup> (millions of US dollars)		
	Excluding deposits	Including deposits	Net effect of deposits	Excluding deposits	Including deposits	Net effect of deposits	Excluding deposits	Including deposits	Net effect of deposits
January 1990 - February 1992	1.3			5.8			4.5		
March 1992 - September 1993	7.0			32.2			24.9		
October 1993 - March 1994	9.8	6.1	3.7	45.2	28.2	17.0	32.7	20.4	12.3
April 1994 - August 1994	16.4	4.2	12.2	75.9	19.7	56.3	56.5	14.6	41.9
September 1994 - January 1996	15.2	-0.8	16.0	70.4	-3.8	74.1	62.2	-3.3	65.5
February 1996 - December 1996	9.5	2.6	6.9	43.9	11.8	32.1	56.0	15.1	40.9
January 1997 - March 1997	16.1	4.4	11.6	74.3	20.5	53.8	138.4	38.2	100.3
April 1997 - May 1997	16.7	8.2	8.5	77.3	38.1	39.2	150.0	73.9	76.1
June 1997 - December 1998	0.9	-4.1	5.0	4.1	-19.0	23.1	7.7	-36.1	43.8
January 1998 - December 1998	-0.3	-4.1	3.8	-1.5	-19.0	17.5	-2.6	-32.6	30.0

<sup>a</sup> Estimates based on equation 2 from table 4.

The tests for the temporary and discrete effects of different policy decisions<sup>20</sup> indicate that there were some stock adjustments following the February 1992 and September 1993 liberalizations, but the results are statistically weak. They also indicate that a strong speculative wave prior to the August 1994 decision generated record registrations, leading to sizable undesired inflows through the rest of the year. However, the August 1994 control measures also had a delayed direct effect, which reduced capital inflows by over US\$100 million per month from January 1995 to January 1996. The net effect of these measures was to reduce capital flows by US\$1.1 to 1.3 billion during the 17 months they were in effect. If these effects are added to those caused by the additional costs of borrowing (table 5), the total effect is quite sizable: US\$2.6 billion during the 17-month period. Results also suggest significant discrete effects from the May 1997 regulation, of about US\$50 million per month.

As an alternative exercise to estimate the effects of capital flow controls, we applied a Kalman filter to equation (1). Figure 4 graphically displays the effects of interest rate differentials for 36-month loans, both excluding and including the coefficient obtained for the constant (panels A and B, respectively). Capital account regulations were effective in reducing capital inflows when regulations were made more restrictive (particularly in August 1994, January 1997 and May 1997), which is consistent with the increases in capital flows following the easing of regulations (February-March 1996 and January 1998).<sup>21</sup> This effect results from factors other than the price-based regulations. However, as shown in panel C of figure 4, which compares the estimated effects of interest rate differentials including and excluding the cost of deposits, the effect is largely attributable to capital account regulations, since the difference among series is mainly determined by the cost of the deposits.

The estimated effects of interest rate differentials, using the Kalman filter methodology, follows the same dynamics as that found using cointegration analysis (see table 5). The main difference occurs in the short period when the explicit Tobin tax was in place, for which the Kalman filters estimate a stronger effect (a reduction of capital inflows by US\$100 million per month).

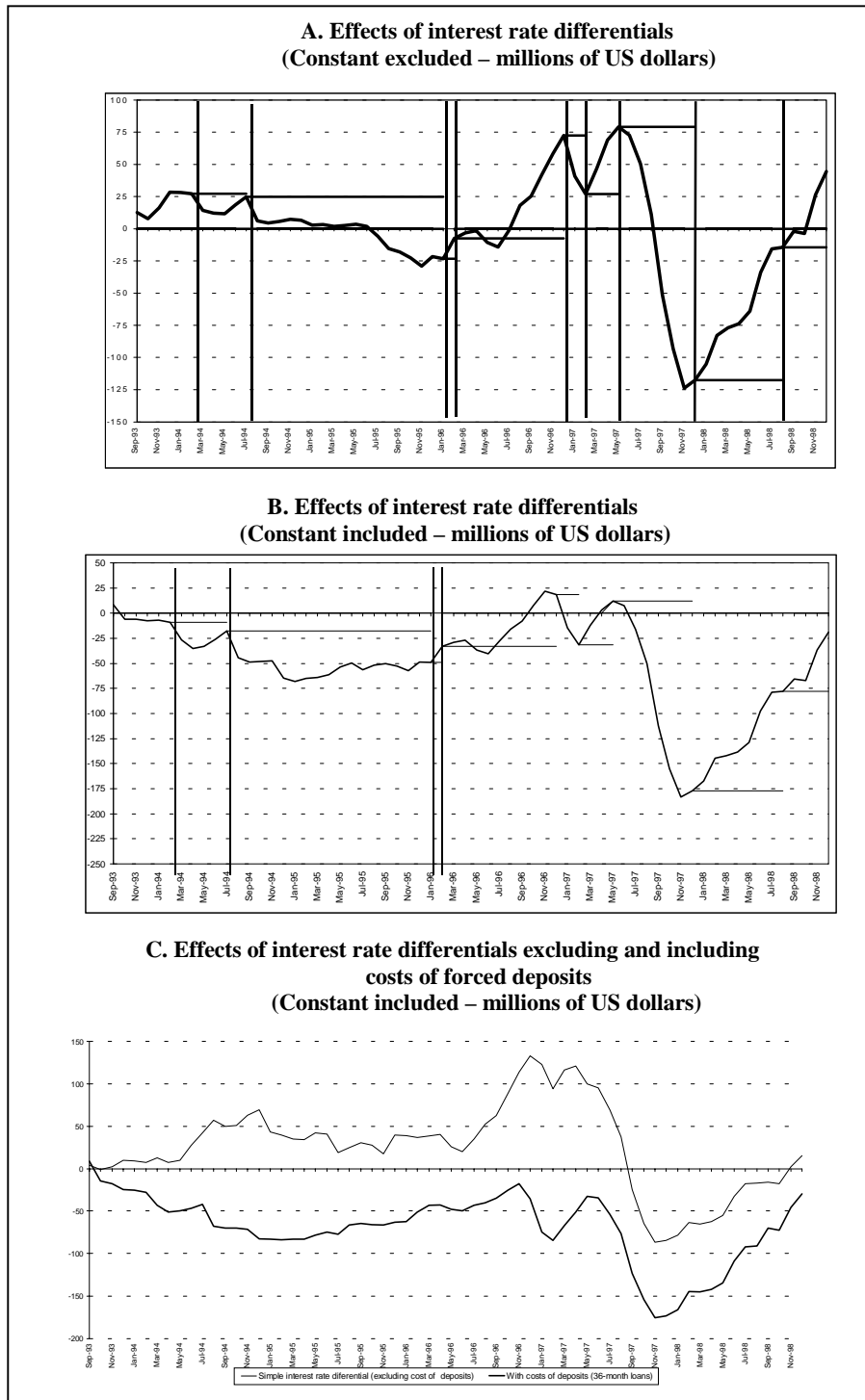
These results indicate that price-based capital controls were effective in reducing the *volume* of capital inflows, both due to the increased costs of shorter-term borrowing and to the discrete effects of regulations, associated to the imperfect substitution of borrowing at different maturities. In particular, the strict August 1994 controls (with a lag related to speculative behavior before the regulations were introduced) and the January and May 1997 restrictions had the expected effects. The results also indicate that temporary stock adjustments may have taken place following the February 1992 and September 1993 liberalizations.

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<sup>20</sup> Only dummy variables with the expected signs are included in the results presented here.

<sup>21</sup> The substitution of the January 1997 explicit Tobin tax by stronger capital account regulations in March 1997 had a net liberalization effect, according to these estimates.

**Figure 4**  
**ESTIMATED EFFECTS OF PRICE-BASED CAPITAL CONTROL**  
**ON CASH CAPITAL FLOWS**



**Source:** Authors' estimates based on Banco de la República data.  
**Definitions:** See text.

## V. The term structure of external borrowing

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Regulations have also been effective in determining the *term structure* of private borrowing. Table 6 presents data on registrations of new debt contracted with foreign financial institutions in 1994-1998. As shown, maturities clearly increased as a result of the March and August 1994 regulations, which raised the minimum maturity for deposit-free loans from 18 months to three years and from three to five years, respectively. This is also true of the March 1997 regulations, which again increased minimum maturities from three to five years. The return to a three-year minimum maturity in March 1996 had the opposite effect. Also, the flat tax introduced in May 1997 was not a perfect substitute for the system based on minimum maturities; it thus led to a relative reduction in longer-term borrowing, which became increasingly clear when the deposit rate was reduced in 1998. Most of the short-term debt (i.e., less than six months and some export financing at 7 to 18 months) is associated with import and export financing, which has been free from deposit requirements or has had smaller deposit requirements since March 1996.

These results raise the interesting question of whether the term structure is exclusively determined by relative costs or whether regulations on minimum maturities are also important. Table 7 presents the share of medium-term loans (37-60 months) and long-term loans (more than 60 months) on the basis of the corresponding regime (captured by dummy variables) and the relative costs of borrowing. The results indicate that the regime is a crucial determinant of the share of long-term borrowing. In this regard, the May 1997 change from minimum loan maturities to a flat tax was not neutral in terms of

the term structure of external borrowing. In contrast, the relative costs of borrowing, rather the regime, seem to be the major determinant of the share of medium-term borrowing.

Table 6  
EXTERNAL DEBT REGISTRATIONS WITH FOREIGN FINANCIAL INSTITUTIONS  
ACCORDING TO LOAN MATURITIES

Monthly averages	Maturity in months					Total
	0-6	7-18	19-36	37-60	More than 60	
<b>A.- Values (millions of US dollars)</b>						
<b>1994</b>						
January - March	3.1	1.2	346.6	83.9	8.6	443.4
April - August	12.6	22.2	52.2	170.7	33.9	291.6
September - December	13.0	12.2	9.3	13.7	179.5	227.6
<b>1995</b>						
January -December	48.2	27.3	9.2	8.5	277.6	370.7
<b>1996</b>						
January-March	13.6	15.9	8.4	9.6	219.2	266.7
April - December	83.4	33.4		345.9	138.4	629.2
<b>1997</b>						
January - March	68.2	10.4	6.1	118.5	100.6	303.8
April - May	129.2	18.8	8.2	40.3	201.5	397.8
June - December	64.6	48.3	15.0	74.6	117.6	320.1
<b>1998</b>						
January - August	70.7	38.3	13.1	21.4	34.1	177.6
September - December	45.3	35.8	20.9	72.1	32.6	206.7
<b>B.- As % of Total</b>						
<b>1994</b>						
January - March	0.7	0.3	78.2	18.9	1.9	100.0
April - August	4.3	7.6	17.9	58.5	11.6	100.0
September - December	5.7	5.3	4.1	6.0	78.9	100.0
<b>1995</b>						
January -December	13.0	7.4	2.5	2.3	74.9	100.0
<b>1996</b>						
January-March	5.1	6.0	3.1	3.6	82.2	100.0
April - December	13.3	5.3	0.0	55.0	22.0	100.0
<b>1997</b>						
January - March	22.4	3.4	2.0	39.0	33.1	100.0
April - May	32.5	4.7	2.0	10.1	50.6	100.0
June - December	20.2	15.1	4.7	23.3	36.7	100.0
<b>1998</b>						
January - August	39.8	21.6	7.4	12.1	19.2	100.0
September - December	21.9	17.3	10.1	34.9	15.8	100.0

Source: Banco de la República.

Table 7

**ESTIMATED DETERMINANTS OF THE TERM STRUCTURE OF  
PRIVATE CAPITAL INFLOWS  
(SEEMINGLY UNRELATED REGRESSION EQUATIONS)**

*(t-statistic in parentheses)*

<b>Dependent variable</b>	<b>Share of medium term loans (37-60 months)</b>	<b>Share of long term loans (more than 60 months)</b>
Minimum maturity of three years	0.0869 (0.73)	0.1481 (1.07)
Minimum maturity of five years	-0.1925 * (-1.61)	0.5088 ** (3.50)
Restriction based on flat tax on all loans (June 1997 - September 1998)	-0.129 (-1.09)	0.1568 (1.15)
Relative cost of medium- vs. short-term debt	0.2962 ** (2.79)	
Relative cost of long-term vs. medium-term debt		0.1219 (1.00)
R <sup>2</sup>	0.30	0.39
D.W. statistic	0.65	0.82

\* Statistically different from zero at 90% confidence level.

\*\* Statistically different from zero at 95% confidence level.

## VI. Conclusions

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The econometric evidence presented in this paper indicates that price-based capital account regulations have been effective in Colombia during the 1990s, in terms of both reducing the volume of capital flows and improving the term structure of external borrowing. The effects on the volume of external borrowing are due to the additional costs that deposits (or reserve requirements) impose on the cost of borrowing, as well as to discrete effects of the regulations. The latter are interpreted as the result of the imperfect substitution of longer-term versus shorter-term borrowing. Price-based regulations thus give the authorities leeway to adopt restrictive monetary policies during international capital market booms.

The evidence provided also indicates that the relative cost of borrowing is crucial in determining the share of medium-term (36-60 months) versus shorter-term loans, but that the regime is the basic determinant of longer-term borrowing. In this regard, the system used in Colombia since May 1997, based on a flat reserve requirement on all loans, although simpler to administer, is not a perfect substitute for that used between September 1993 and May 1997, based on reserve requirements for loans with a certain minimum maturity. In any case, through either of the two channels discussed, the price-based regulations have improved the debt profile of the country, which is a crucial determinant of macroeconomic risks in the face of sudden busts in the international capital market.

## Appendix

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### Costs of borrowing in foreign currencies with deposits

The present value of deposits, per dollar borrowed ( $C$ ), is:

$$(A1) \quad C = r \left( 1 - \frac{1 + d^e \theta}{1 + i} \right)^{td}$$

where  $r$  is deposit rate,  $td$  the time they have to be held,  $d^e$  the expected rate of devaluation, and  $i$  the domestic interest rate.  $\theta = 1$  if deposits are dollar-denominated (Sept. 1993-May 1997) and  $\theta = 0$  if they are peso-denominated.

Since the deposit and credit periods do not necessarily coincide, it is easier to estimate the future value of the loan per dollar borrowed ( $Lf$ ), including the future value of deposits:

$$(A2) \quad Lf = \left[ (1 + i^*) (1 + d^e \theta) \right]^c + C(1 + i)^{tc}$$

where  $i^*$  is the external interest rate and  $tc$  the credit period. From (A2), we can obtain the total annual costs of the loan ( $\varphi$ ):

$$(A3) \quad \varphi = Lf^{(1/tc)} - 1$$

The precise expression for  $\varphi$  can be derived from equations (A1) to (A3).

Finally, the tax equivalent of deposits ( $\tau$ ) can be expressed as:

$$(A4) \quad \tau = \frac{(1 + \varphi)}{(1 + i^*) (1 + d^e)} - 1$$



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