Public Debt Market Risk: The Effects on the Financial System and on Monetary Policy - The Case of Colombia

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Introduction

The expansionary fiscal policy pursued during the last decade in Colombia has raised important issues for the financial system as well as for the conduction of monetary policy. On the one hand, fiscal deficits have generated a dramatic issuance of public debt. The financial turmoil experienced at the end of the decade increased the appetite for these assets, as financial institutions sought to rebalance their portfolio to less risky assets. In addition, since 2002, the Government has been reducing its foreign exchange risk exposure by relying more on the domestic capital market. Recently, the central bank has increasingly intervened in the foreign exchange market, sterilizing its dollar purchases with sales of Government paper. As a result, the financial system has dramatically changed its asset composition towards undiversified holdings of domestic public debt. This has implied that market risk has become a major concern for institutions used to manage credit risk. In Colombia this issue is magnified by the lack of hedging mechanisms and by problems relating to the measures of market risk used to calculate capital requirements.

On the other hand, the increase in public debt can impose constraints on monetary policy that differ from traditional effects such as public debt monetization, crowding out and threats to the payments system or financial intermediation. Namely, due to the specific problems mentioned above, market risk can become a relevant constraint on the response of monetary policy in the outburst of an external shock. Facing a shock to the sovereign spread that causes a depreciation of the currency and a fall in domestic long bond prices that affects the financial soundness of intermediaries, the central bank may be constrained or reluctant to adjust policy to keep inflation on target.

This note is divided into three sections. The first presents the evolution of public debt and its effect on the financial system. The second section discusses why market risk may become a constraint on monetary policy and how the central bank could respond to a shock to the capital account in these circumstances. The final section concludes.

1.   Public Debt Market Risk and the Financial System

(a)   Evolution and effects of public debt

Public debt has increased rapidly in Colombia since the mid-1990s as a consequence of the expansion of public expenditure that resulted from the adoption of a new Constitution in 1991 (Graph 1). Although several tax reforms have been approved since then, tax revenues have not kept up with expenditures and increasing deficits have ensued, especially after proceeds from privatizations declined (Graph 2). Central Government gross debt rose from 14% of GDP in 1995 to 54% in 2002 (Graph 3). Part of this increase, however, is explained by the effect of the sharp real depreciation of 2002 on the domestic currency value of external debt. Since 2003 the public debt ratio has diminished due to both a real appreciation and a reduction of the fiscal deficit (Graph 2).

The share of foreign currency denominated debt hovered around 50% of total Central Government debt between 1995 and 2002 (Graph 4), while total debt increased (Graph 3). Thus, the foreign currency risk exposure of the public sector rose significantly, becoming a source of concern. Since 2002, the Government has started to rely increasingly on the domestic market (Graph 5). This process was made easier by the disruption of the credit markets caused by the financial crisis of 1998-2000. The financial weakness of households and corporations reduced credit demand, while the fragility of banks' net worth and the high credit risk perception decreased credit supply. Hence, the Government was able to place increasing amounts of public paper (called TES) in the domestic financial sector without exerting excessive pressure on the market for loanable funds. The growing size of private pension funds' portfolios has been another source of demand for TES. In this process the Government has carried out several swaps of foreign debt for domestic currency debt, in addition to the direct placement of TES in the domestic market.

More recently, an additional supply of TES to the market has come from the sterilization of central bank intervention in the foreign exchange market (Table 1). This intervention has been linked to the uncertainty about the persistence and strength of the appreciation of the domestic currency. Both the rise in domestic public debt and the sterilization of intervention in the foreign exchange market have produced a growing exposure of the financial system to non-diversified market risk, since a large fraction of its TES holdings are long term, fixed rate bonds that are valued mark-to-market.

An interesting aspect of this discussion is the rationale behind the willingness of the financial system to accept a growing exposure to domestic public debt without diversifying it. Part of the explanation has to do with the absence of domestic assets with an inverse correlation. However, financial intermediaries may invest abroad to diversify their portfolios, so their incentives to hold a large stock of domestic public debt must be explained by other reasons. Capital adequacy ratios (CARs) well above the minimum required levels and an international conjuncture characterized by declining sovereign spreads and expectations of currency appreciation may be plausible ones. On the other hand, an underestimation of market risk measures or moral hazard (the expectation of a bail-out) may be other, more worrisome explanations.

The increase in domestic public debt holdings by financial institutions is probably the mayor change Colombian banks have suffered during the last 5 years. As Graph 6 shows, by 1997 securities holdings by credit institutions represented around 12% of their assets. By 2005, holdings increased to 32%. This dramatic change in the balance sheet structure implies that market risk issues have increased their importance in a financial system used to manage almost entirely credit risk.

A simple stress test applied to the Colombian financial system's holdings of public securities reveals that the effects described are important today and may become more relevant in the future, if exposure to public debt growth is not curtailed. Tables 2 and 3 show that a 100 bps. parallel increase in the TES spot curve could cause losses close to 17% of the profits obtained by credit institutions, which are historically high, and 2.5% of the value of their portfolios as of May 2005. To provide an idea of the potential for such losses to occur, it suffices to recall the electoral uncertainty in Brazil in 2002 which led Colombian sovereign spreads to rise by 490 bps with a corresponding increase in domestic long interest rates of 430 bps. . It subsequently took six months for the spread to return to its previous levels.

The problem is not restricted to credit institutions. Pension funds' exposure to market risk is also significant (Table 3), although it might be argued that a large part of their TES portfolios is to be held to maturity. However, the option given to savers to change their pension fund every six months increases liquidity and market risk for the funds.

(b)   Some Additional Problems Specific to Colombia

Adequate bank capital or the existence of risk sharing mechanisms may alleviate market risk. In this regard, however, there are some deficiencies in Colombia that are a matter of concern, especially given the size of the exposure of the financial system to market risk.

(i)   Insufficient aggregate risk sharing:

The financial system as a whole holds an uncovered long position in TES. Again, this is the counterpart of a reduced foreign exchange exposure of the public sector. Both risks may be lessened by transferring them to another agent, which in this case would be non-residents. The participation of foreign investors in the local TES markets is small and has been restricted by a tax on interest

remittances, the need to register and set up a "country fund" and a minimum holding period regulation aimed at discouraging short term volatile inflows. In addition, to some extent, domestic and external bonds are imperfect substitutes due to currency risk, among other things.

On the other hand, some aggregate hedging has been provided by recent issues of peso-denominated external debt bonds (called Global TES) by the Ministry of Finance, although the amounts are still small relative to the size of the foreign currency denominated debt stock or the TES holdings of the financial system (the Global TES stock represents 1.6% of total Central Government debt). In addition, the hedge provided by this instrument is limited by the fact that part of these bonds could end up in the hands of local financial intermediaries, in particular if there is an effort to do so to improve the liquidity of the bonds and make them more attractive for potential non-resident buyers. Nevertheless, this mechanism should be exploited as long as there is interest on the part of foreign investors[2].

(ii) Insufficient individual risk sharing:

A well developed system to share market risk among financial intermediaries does not exist in Colombia. Among other things, the following factors explain this deficiency.

- Lack of legal protection for the holders of guarantees, which inhibits the development of liquid Repo and security lending markets. It also constrains the administration of margin calls by the exchanges.

- Incomplete regulation of security lending markets (it is not clear what may or may not be done) and inadequate regulation of Repo markets3.

- Lack of a benchmark to develop short and long run forward rate agreements.

The result is the possibility that an under-capitalized and over-exposed institution may fail after a shock to the prices of TES. Depending on the size of the institution, the authorities might then face a "too big to fail" problem that could have been avoided through an adequate distribution of market risk among banks.

Since the reasons behind this problem are mainly related to legal or regulatory gaps, there is plenty of room for improvement. A Securities Law approved in June 2005 addressed some of these issues, but more remains to be done. The scope for market risk sharing is large. As long as CARs vary among banks, more capitalized agents could offer hedging alternatives to those exposed to a larger extent to fluctuations in market rates. In particular, those agents with substantial long positions in TES but with a CAR close to the regulatory level of 9% could benefit from the hedging offered by highly capitalized and less exposed agents. Graph 7 shows that there is room for such a risk sharing scheme to develop in Colombia. Firstly, there seems to be a negative correlation between exposure to market risk (in TES only) and CAR[4]. Secondly, intermediaries with a similar portfolio (in size) have different exposures and adequacy ratios. This suggests that there are suitable counterparts in the hedging market.

(iii) Problems with the measures of market risk:

The measures of market risk in Colombia are based on a VaR approach that suffers from some shortcomings that imply an underestimation of the related capital requirements. Current regulation allows financial agents to reduce capital requirements by matching active positions belonging to the trading book with liabilities from the banking book, thus underestimating the marginal cost of an additional unit of public debt exposure. To illustrate this, Table 4 shows the estimated capital requirements for the financial system that would result from the application of the standard model recommended by the Basel Committee[5]. The interest rate module is disaggregated in all instruments

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[2] Maiguashca A.F. (2005). "Colombian Issuance of Local Currency Debt Abroad: some notes on the opportunities and challenges of the current juncture". Banco de la República. Mimeo.

[3] For example, capital requirements for a Repo are the same as those for interbank loans without collateral. Also the Banks Superintendency regards the holding of simultaneous large long and short Repo positions as an unsafe practice.

[4] Given that market risk measurement is imprecise, current CAR figures may be biased. However as long as there is dispersion in CARs and risk exposure among intermediaries with similar portfolio size, the conclusions remain unchanged.

[5] Basel Committee on Banking Supervision (1996). Under this approach, cash flows, from both assets and liabilities in the trading book, are mapped into 14 different time bands, depending on either the maturity or the duration of each instrument. For each band, the total net exposure and a risk weight are calculated, in order to estimate the value at risk (VaR) at each

(TES) which are subject to such a risk. The exchange rate and stock exchange modules refer to the financial system's exposure to foreign currency[6] and market stocks[7], respectively. This exercise illustrates that the current capital requirement (COP$ 880 billion) is about 50% below the requirement implied by the standard model (COP$ 1,271 billion). This happens even though this methodology takes into account only the risk associated to the trading book and the information available is not sufficient for the measurement of market risk for all positions (e.g. private sector securities and options are excluded from the exercise).

A correction of this underestimation does not imply an immediate need to raise banks' capital, since the current CAR for the system is around 14, higher than the minimum requirement (9). However, if the exposure keeps growing with the financing needs of the Government, this constraint may become binding, especially after 2007, when the introduction of a new system to compute credit risk related provisions could imply lower observed CARs[8]. In this sense, a revision of the current methodology to measure market risk is important and, with time, would imply a downward correction of the TES prices, since the marginal cost of capital required to buy TES would be higher.

Another issue regarding the measurement of market risk has to do with the fact that TES markets are relatively less liquid in stress periods than bond markets in developed countries, so the time period used to estimate the volatilities needed to compute potential losses is probably longer in Colombia than in other countries. Indeed, the main concern for monetary policy is not the losses stemming from a day to day fall in TES prices, but rather a rapid and persistent climb in interest rates such as the one recorded in 2002-2003 after sovereign spreads skyrocketed (Graph 8).

2.   Public Debt Market Risk as a Constraint on Monetary Policy.

The fact that exposure to market risk is high and that conditions for alleviating such risk are limited may pose a constraint on monetary policy. The importance of these conditions for monetary policy depends on the possible effect that a shock to the capital account (e.g. higher sovereign spreads) may have on the health of the financial system and the risk that this may pose for low and stable inflation. Such a shock could simultaneously cause a depreciation of the currency and a decline in the value of the TES. If the depreciation is pronounced or the pass-through effects are large, the central bank may have to increase its interest rates to keep inflation on target. Higher interest rates may in turn result in further reductions in the price of TES. If banks' capital is too low to absorb those losses, financial stability considerations could constrain the ability or willingness of the central bank to raise interest rates, thereby inducing higher inflation risks.

Hence, the perils of a large public debt are reflected in trading off foreign exchange risk for market or inflation risks, and vice versa. Heavier reliance on domestic public financing and international reserve accumulation may reduce the economy's and the public sector's foreign exchange risk, but will probably imply larger market risks. If mechanisms for alleviating suck risk are limited and the central bank tries to avoid the realization of market risks, it must assume an inflation risk:
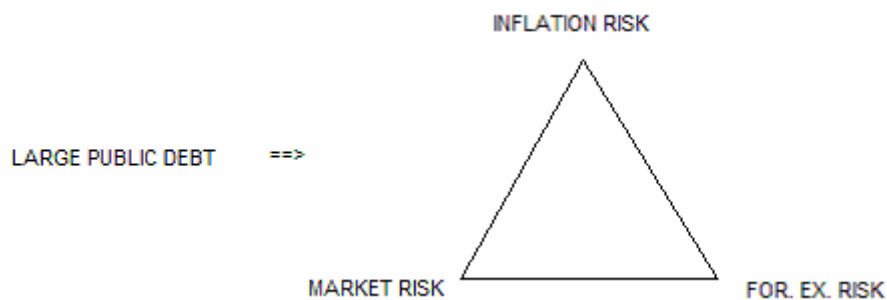
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specific time band. The risk weight is defined as the percentage change in the present value of one peso, given the largest 30-day change in the spot rate at each term during the period 2003-2005. The horizontal summation of the VaR in each time band gives the capital requirements which the regulator should impose.

[6]   Capital requirements are calculated as 8% of the highest position between total net assets and liabilities. Net positions are calculated for each currency and then all net assets (liabilities) are added to calculate the totals referred to above.

[7]   Capital requirements for this module are calculated as 8% of total stock exposure.

[8]   This is due to increases in loan provisions derived from the adoption of countercyclical components and more stringent criteria.

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                                    INFLATION RISK

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     LARGE PUBLIC DEBT    ==>         /      \
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                          MARKET RISK            FOR. EX. RISK
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Under the conditions described above, it is worth thinking about an adequate response of monetary policy to a sudden, sharp increase in sovereign spreads. How to deal with the risks implied by the financial losses associated with the resulting fall in the prices of TES? To answer this question, the behavior of the economy after the shock must first be characterized.

A rise in the spread will result in a depreciation of the currency and a decline in the TES price. Although exchange pass-through is low in Colombia, if the depreciation is large, the inflation target may be at risk[9]. Aside from the cost push effects, the depreciation may increase aggregate demand, since the foreign exchange exposure of the private sector has diminished in previous years (Graph 9). Inflation expectations may also go up if the inflation target is not fully credible, which might be the case after a large depreciation.

Hence, the central bank will probably have to raise interest rates to minimize the deviation of inflation from its target. The size of such a rise will depend on the magnitude of the pass-through effects. It will also be affected by the behavior of long term rates and its connection with aggregate demand. The increase in long term spreads will cause long domestic rates to go up. If aggregate demand responds not only to short rates, but also to long rates, the required rise in the former will be smaller, since part of the inflation-control job would be done by the long term rates themselves. This effect would work through the impact of long rates on investment or private sector wealth.

If both market risk exposure and the shock to the spread are sizeable, the foregoing analysis will have to be qualified, since the threat of bankruptcy of some financial institutions may force the central bank to be less aggressive in fighting inflation. However, it may still have some degree of freedom to limit this possibility:

- The increase in interest rates could be accompanied by intervention in the foreign exchange market. If (sterilized) intervention is effective, this could curtail the size of the depreciation and the interest rate hike. In addition, the monetary contraction resulting from the sale of international reserves could be compensated by purchases of domestic public bonds, thereby moderating the fall in their price. However, this option is limited because the central bank will probably have to raise interest rates, the demand for money will fall and the sale of reserves cannot be fully compensated by purchases of TES.

- If the shock to the price of TES is too large and the effect on banks' balance sheets is severe, the authorities may allow them to temporarily stop pricing part of their portfolios mark-to-market when the following conditions are met:

    – The shock is perceived as temporary and exogenous (not linked to domestic fiscal conditions).

    – Public debt is deemed sustainable; that is, it is perceived that the Government will be able to honor its debt.

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[9] For example, according to the core simulation and forecasting model used by Banco de la República, a 1% exogenous increase in the nominal exchange rate causes a maximum increase in annual inflation of 0.064% four quarters later. It must be noted that this simulation assumes an active policy by the central bank to drive inflation back into line with the target. The experience of 2002-2003 also reveals a low degree of pass-through. Between May 2002 and February 2003 there was a 28% nominal depreciation and between February and September 2003 the currency appreciated by 3.7%. Annual core inflation (excluding food prices) rose from 5.06% in May 2002 to a maximum of 7.4% in September 2003.

–   Some (possibly large) financial losses are allowed. Otherwise, moral hazard problems
    may be exacerbated leading to future over-exposure to public securities.

3.   Concluding Remarks

The increase in public debt issuance has brought important consequences for the Colombian financial
system. The balance sheet structure, specially that of credit institutions, has changed dramatically with
an increasing importance of public securities. As result, market risk exposure has become an issue for
a financial system used to manage credit risk. This rebalancing has created potential threats for the
stability of the financial system not only due to the size of the exposure, but also because of the
existence of institutional features that restrict risk mitigation. Particularly, lack of sufficient risk sharing
mechanisms as well as a proper measurement of capital requirements make market risk a financial
stability issue. As a consequence, monetary policy conduction might be constrained when facing
external shocks thus implying an inflation risk.

Public debt market risk needs to be reduced in Colombia. The latter calls for an effort to reduce not
only public debt but to remove structural impediments for market risk shedding as well as addressing
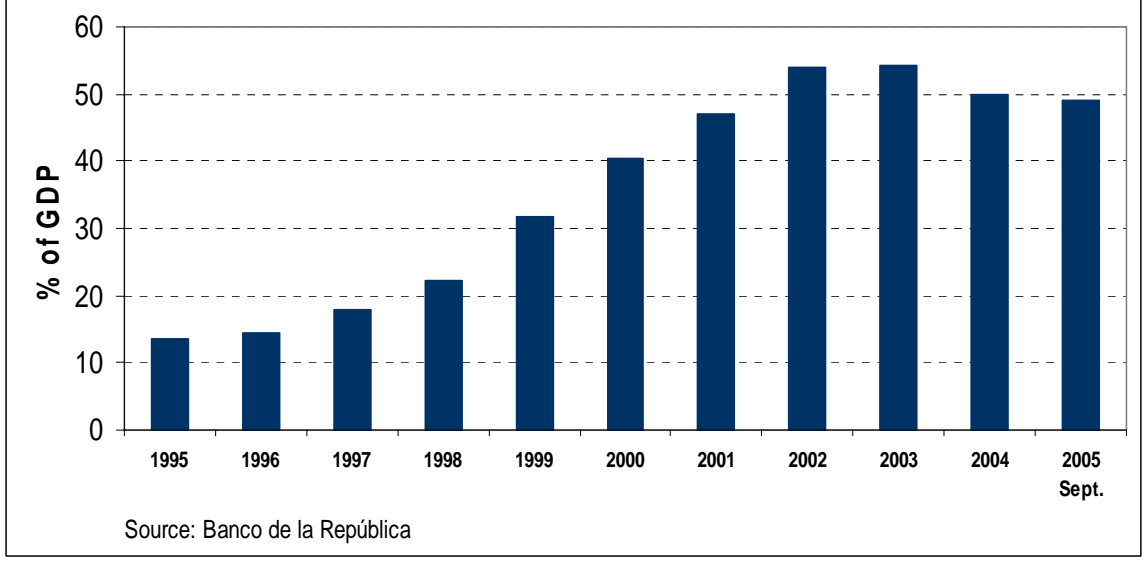regulatory issues.

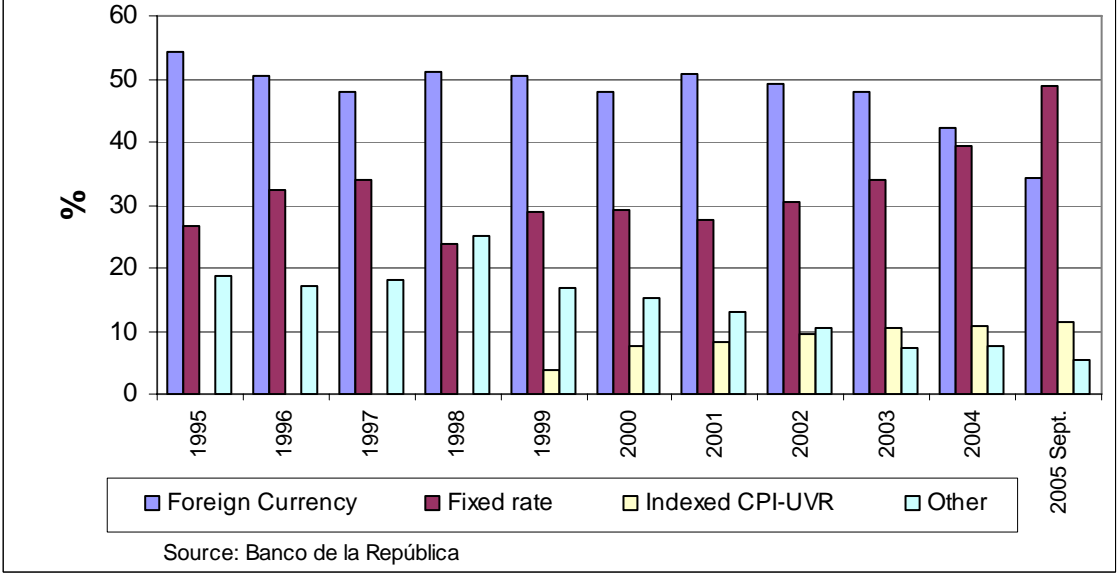**Graph 1: CENTRAL GOVERNMENT EXPENDITURE WITHOUT INTEREST PAYMENTS**

Source: DNP and Confis
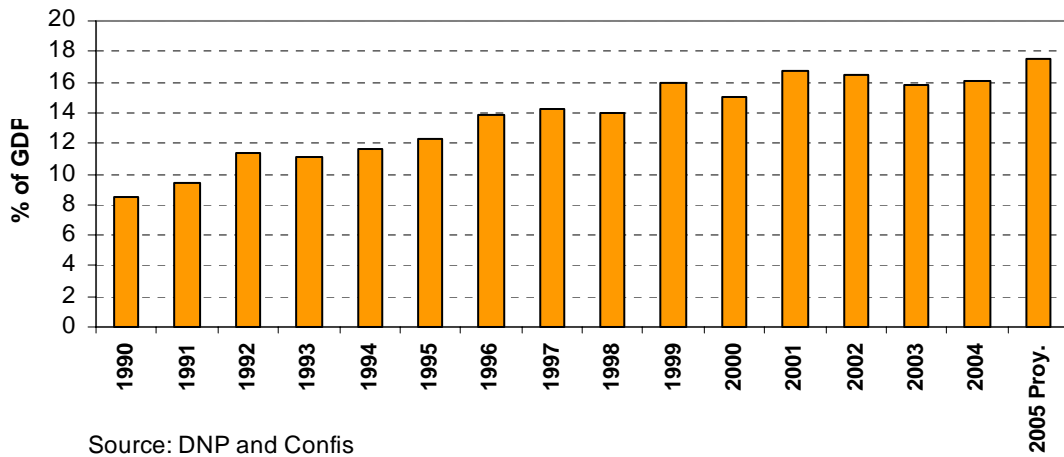
Graph 2: FISCAL BALANCE OF THE CENTRAL GOVERNMENT

Source: DNP and Confis
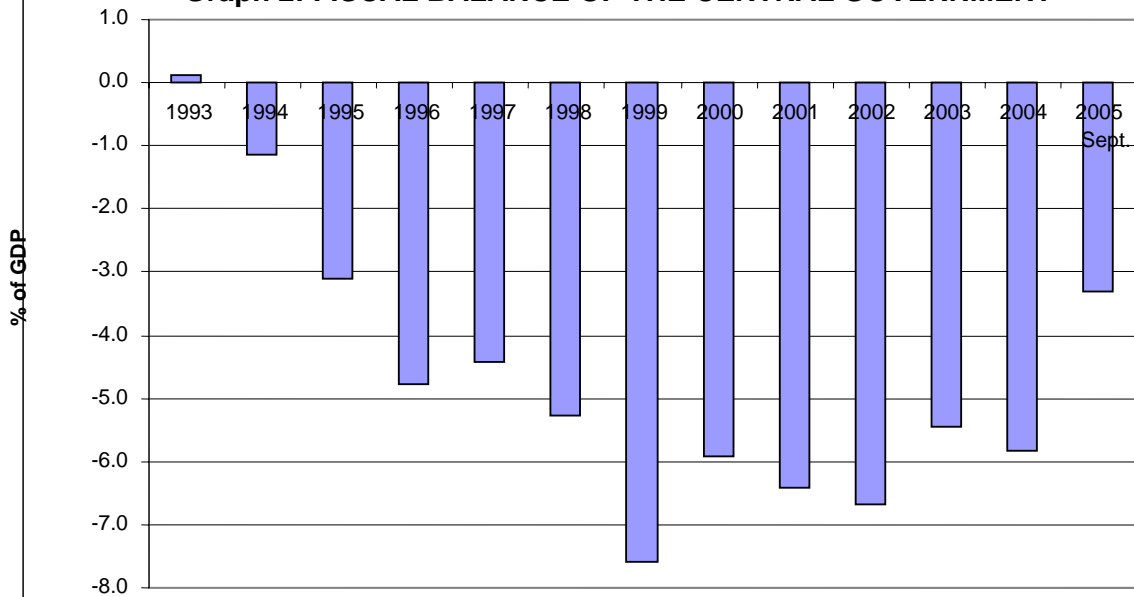
Graph 3: GROSS DEBT OF CENTRAL GOVERNMENT

Source: Banco de la República

Graph 4: CENTRAL GOVERNMENT DEBT COMPOSITION
As percentage of the total debt

Foreign Currency   Fixed rate   Indexed CPI-UVR   Other

Source: Banco de la República

Graph 5: CENTRAL GOVERNMENT: INTERNAL AND EXTERNAL NET FINANCING

As a percentage of its fiscal deficit

□ Internal net financing ■ External net financing
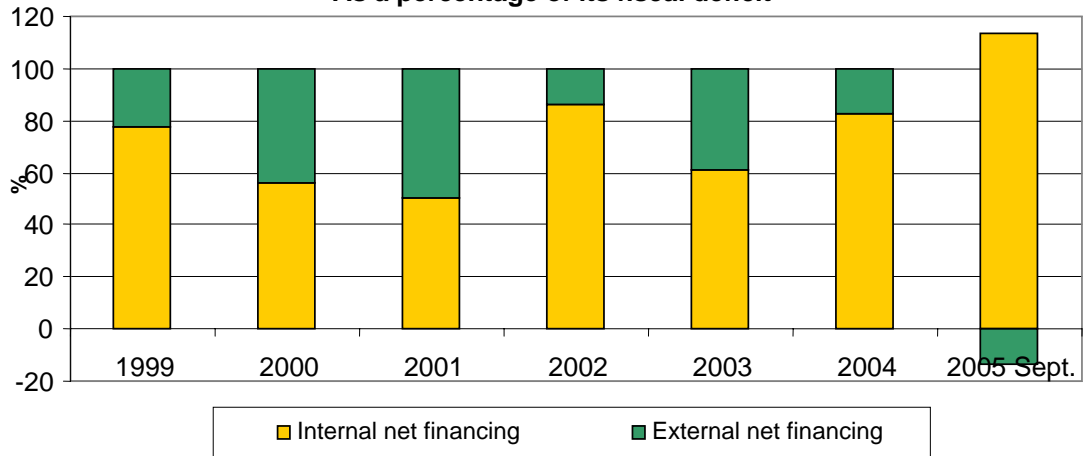
Source: Banco de la República

Loans and securities investments of credit institutions

— TES /Total assets — Net loans/total assets (right axis)

Graph 7

Market Risk Exposure (TES only) and Capital Adequacy Ratio

Size of bubbles = market risk (TES)

Source: Banco de la República

Graph 8: COLOMBIAN EMBI VS TREASURY BONDS 2012
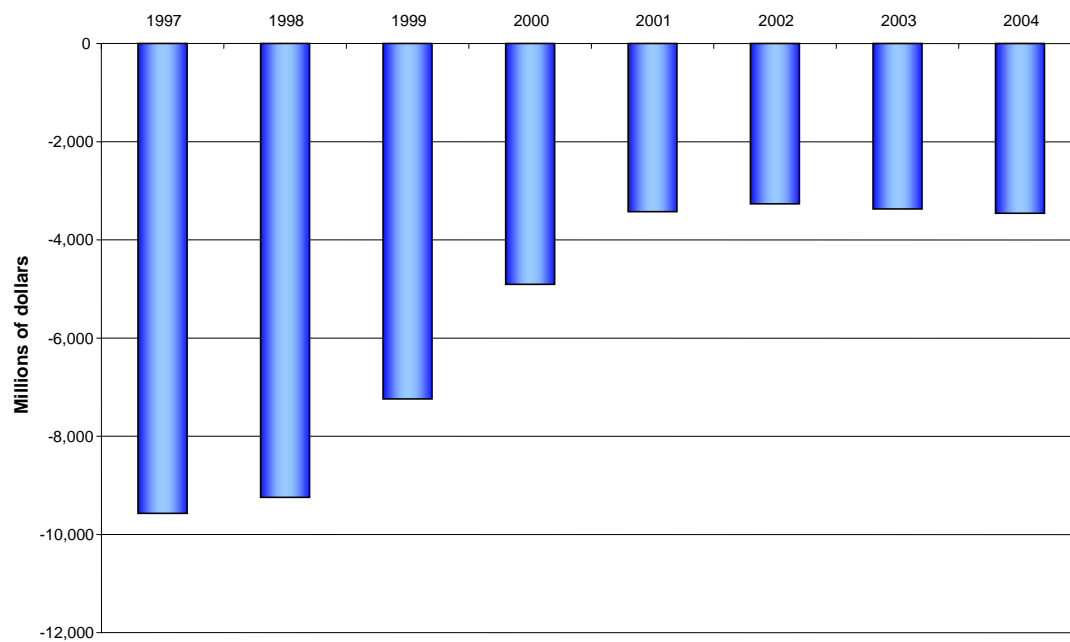
Source: Banco de la República and Bloomberg — TES Ene 12 — EMBI
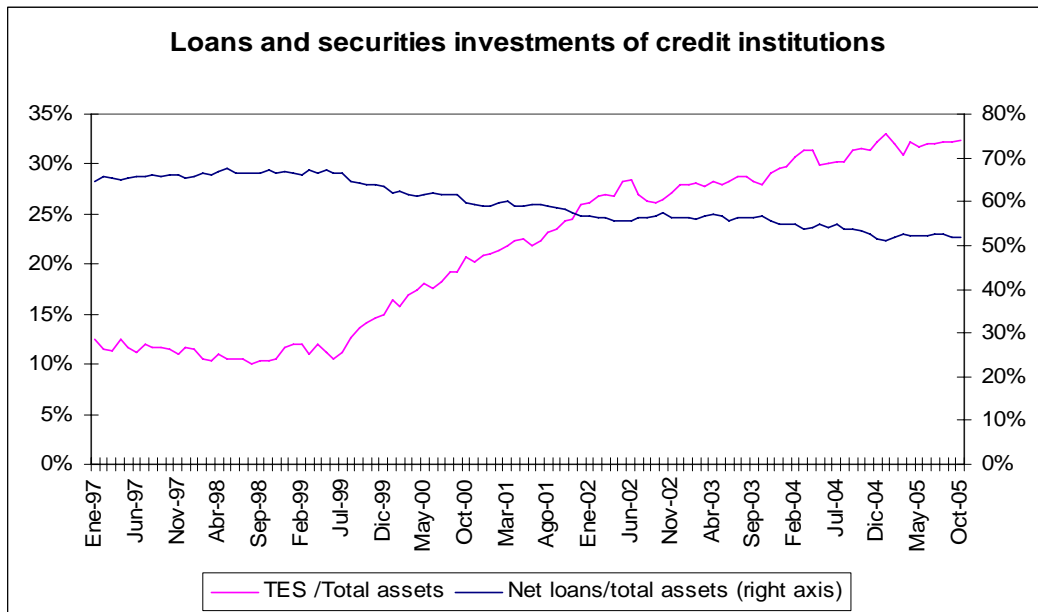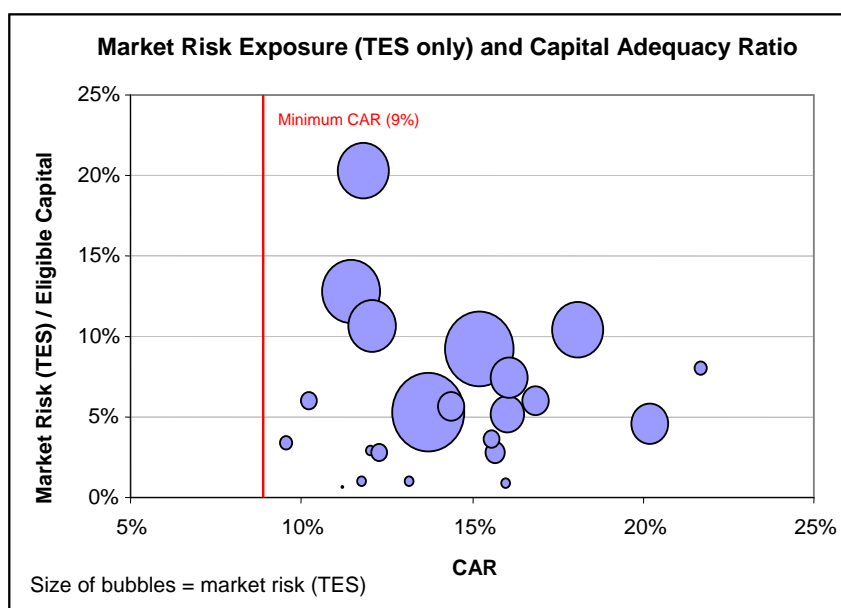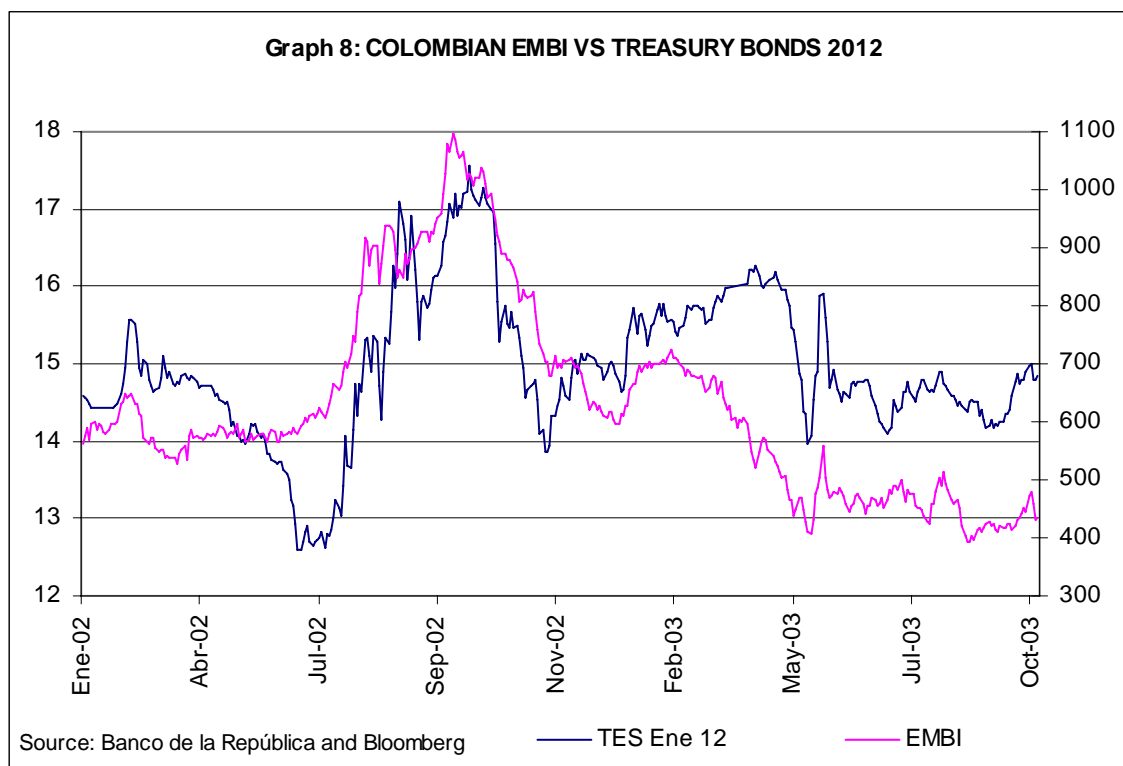
Graph 9: NET INTERNATIONAL INVESTMENT POSITION-COLOMBIA
PRIVATE SECTOR WITHOUT FDI 1/

1/ Excluding banks
Source: Banco de la República

Table 1

**Sterilization of the monetary effects
of foreign exchange intervention**

	2004	2005 Total operations Jan - Oct
Net expansion in the market (billions of COP$)	**4,501.05**	**6,691.13**
Net purchases of International Reserves from the market		
Millions of US$ Dollars	2,904.9	3,730.9
Billions of COP$	7,628.8	8,691.0
Sales of TES in the market		
Billions of COP$	3,127.8	1,999.9
Net expansion with the Government	**−1,460.28**	**−6,458.8**
Sales of International Reserves to the National Government (NG)		
Millions of US$ Dollars	500.0	2,950.0
Billions of COP$	1,313.1	6,872.0
Purchases of TES associated to sales of International Reserves to NG		
Billions of COP$	1,246.2	5,230.3
Deposits of the NG in the central bank	1,393.4	4,817.1

Source: Banco de la República

Table 2

Resistance of credit institutions' profits

Given a 100 bps. increase in TES B interest rates

	Loss given by higher interest rates	Profits - last 12 months (April 2005)	% of profits that would be lost given a 100 bps. increase in TES B rates
Total Credit Institutions	**−502,265**	**2,941,908**	**17.07%**
Commercial Banks	−473,361	2,471,470	19.15%
Commercial Finance and Leasing Corporations	−1,233	167,367	0.74%
Cooperative Banks	−99	17,973	0.55%
Finance Banks	−27,573	285,097	9.67%

The exercise was performed using data up to May 2005.
Source: Banco de la República

Table 3

Valuation Losses[1]

As a percentage of the TES B portfolio

	Fixed Rate	CPI	UVR	Total
Total Credit Institutions	**2.11%**	**3.32%**	**3.42%**	**2.50%**
Commercial Banks	2.10%	3.34%	3.41%	2.50%
Commercial Finance and Leasing Corporations	1.92%	2.94%	4.31%	2.22%
Cooperative Banks	1.58%	0.00%	0.00%	1.58%
Finance Banks	2.19%	2.95%	3.57%	2.57%
Total Non-Bank Financial Sector	**2.60%**	**3.51%**	**3.68%**	**2.96%**
Stock Brokers	2.20%	3.54%	3.32%	2.63%
Insurance Corporations	2.42%	3.55%	4.20%	3.02%
Pension Funds	2.72%	3.88%	3.88%	3.09%
Trust Funds	2.33%	3.21%	2.67%	2.57%

The exercise was performed using data up to May 2005.

[1] For each parallel shift of 100 basis points.

Source: Banco de la República

Table 4

Market Risk Capital Requirements	
COP$ Billions	
July 29, 2005	**CAPITAL REQUIREMENTS**
TES Fixed Rate	831.2
TES UVR	135.2
TES TRM	1.4
Globals	22.0
TES CPI	64.4
INTEREST RATE MODULE	**1,054.3**
EXCHANGE RATE MODULE	**54.7**
STOCK EXCHANGE MODULE	**162.5**
TOTAL	**1,271.5**

Source: Banco de la República