

CREDIT SUPPLY DETERMINANTS IN THE COLOMBIAN FINANCIAL SECTOR

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I. INTRODUCTION

Elements of both supply and demand interact during a financial crisis, which explains the precarious growth in credit. Nonetheless, it is important that demand-side incentives be generated *ex post*. These also help to reactivate loans by fueling the supply of credit. The latter usually remains depressed due to aspects that become relevant during and after a crisis, such as low bank capitalization and the increased risk aversion banks experience with a high rate of non-performing and doubtful loans. This situation can balance out when banks find investment alternatives in the financial market that might not provide a great deal of return, but keep risks low compared to the risk of extending credit at that particular moment.

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Clearly, after one of the worse financial crises in times recent (1998-1999), a number of elements emerged in Colombia that did, in fact, encourage the demand for credit. The reduction in interest rates at a time of generous liquidity, the growth in domestic and foreign investment, and good export performance are some examples, all of which have stimulated the growth in revenue. Moreover, the behavior of agents in the economy, particularly households, shows a low indebtedness level. This surely allowed for a certain amount of momentum in bank loans, which helped put the Colombian economy back on the path to growth. However, to achieve the growth required, for example, to lower the jobless rate and to provide greater well-being, we must identify the barriers might explain the slow growth in loans, especially mortgage loans, and determine if these barriers remain on the supply side.

* The authors are researchers with the Financial Stability Department at Banco de la República. The opinions expressed herein imply no commitment on the part of Banco de la República or its Board of Directors. The valuable comments from Dario Estrada are gratefully acknowledged. This article is a summary of Murcia and Piñeros (2006b), which contains a more complete and detailed analysis.

¹ These characteristics were found in the financial institution surveys done by Banco de la República (see Murcia and Piñeros, 2006a).

Therefore, we must find out if, after almost five years, there still is evidence of a credit crunch, and if the factors of the crisis period remain in play, or if others have emerged to preserve this phenomenon. Three factors can be identified to explain the limited growth in loans. First of all, credit is limited because financial institutions do not have the capacity to loan. In other words, they are forced to reduce or limit their credit supply because of capital and/or deposit-taking constraints. Aversion to extending loans is a second factor. For example, although financial institutions may have the capacity to loan, they prefer not to. This is because of problems in identifying clients with high-risk

and/or due to a special preference for less-profitable but highly liquid assets that imply little risk of default (e.g. government bonds). A third factor is the decline in lending because of less demand as a result of less economic activity. In response, many companies close down because of a steady decline in sales, or simply decide to shift the source of their liabilities from loans to the issue and sale of stocks or bonds.

The objective of this article is to evaluate the first two factors (which deal with supply) as essential elements of the credit crunch. The assumption is that they might have prevailed after the financial crisis in the late 1990s, creating temporary imbalances between credit supply and demand that might have been absorbed through quantities rather than prices (interest rates), considering the good liquidity environment and the decline interest rates registered since then.

II. A REVIEW OF THE LITERATURE

It is important to differentiate between two concepts that appear in the literature on this subject: credit rationing and credit crunch. The first, according to Stiglitz and Weiss (1981), is a tightening of supply caused exclusively by information problems that prevent banks from knowing the real return or the risk involved in projects potential clients want to finance. This prompts banks to set lending rates below the interest rate that clears the market. The result is a demand surplus. In other words, the existence of asymmetric or imperfect information creates incentives for banks not to raise their lending rates and to extend whatever loans they want, even though the volume might not fully satisfy the demand.

The concept of a credit crunch is very similar to that of credit rationing. However, a credit crunch is generated by factors in addition to asymmetric or imperfect

information. Problems can arise when bank loan capacity is limited by capital constraints or by a reduction in loan sources (i.e. deposits). Therefore, when examining some of the determinants of loan portfolio growth from the standpoint of supply factors that reflect the capacity to loan, on the one hand, and the desire of financial intermediaries to extend loans, on the other, we must speak of a credit crunch in the strict sense. For the purpose of this work, both concepts are used indistinctly; however, it is important to remember that the reasons for a credit crunch or credit rationing in the economy are different.

In the loan market, asymmetric information stems from the difficulty in differentiating less risky projects from those with greater risk. Accordingly, banks are motivated to keep the supply of credit (at the same interest rate) below the supply that eliminates surplus demand. The assumption is that, with a higher rate, only the riskiest borrowers would apply for loans. Under these circumstances, lending rates would not be expected to adjust immediately to a change in market rates. For lack of complete information on client performance and credit rating, financial intermediaries prefer to make the adjustment themselves by rationing credit. Consequently, one way to identify the existence of a credit crunch is to determine whether or not lending rates show a certain amount of rigidity to changes in the market rate.

For the Colombian case, there are a number of studies that attempt to identify the presence of a credit crunch;² we will present only two. One is the study by Echeverry and Salazar (1999), who try to explain why the supply of credit tightened during the financial crisis in the late 1990s. According to their findings, it was largely because of capital adequacy ratios, the deterioration in loan portfolio quality, and less of a return on equity for financial institutions. Urrutia (1999), on the other hand, identifies the primary factors that disrupted credit supply growth, such as credit risk, equity reduction, the loss of loan collateral value (value of real estate and companies) and the reduction in banking operations, which spelled less liquidity. Both Echeverry and Salazar (1999) and Urrutia (1999) focus on the problem of asset impairment in the financial sector and the desire of banks to tighten credit in response to more risk.

III. STYLIZED EVENTS THAT ASSUME CREDIT RATIONING

Developments in the loan portfolio of the financial sector as a whole show a cycle that can be divided into three periods (See Graph 1A). The first,

² See Murcia and Piñeros (2006b) for reference to other studies.

from 1994 to the third quarter of 1998, saw a sizeable increase in that portfolio. This was called a *credit bubble*, given the highly atypical pattern of loans during those years, based on macroeconomic fundamentals that were far less dynamic (Graph 1B). In fact, the loan portfolio rose from approximately \$60 to \$90 trillion (t) (in September 2005 constant pesos), which is equivalent to a real increase of 50%.

The second period involves the financial crisis in the late 1990s and early 2001, which was marked by an abrupt drop in the loan portfolio to below the level registered at the start of 1994. During that lapse, the value of the portfolio accumulated over a period of more than four years was reduced by half. The third period is characterized by a gradual recovery in loan growth that persists to this day and, after five years, has barely managed to reinstate a third of what was lost during the crisis.

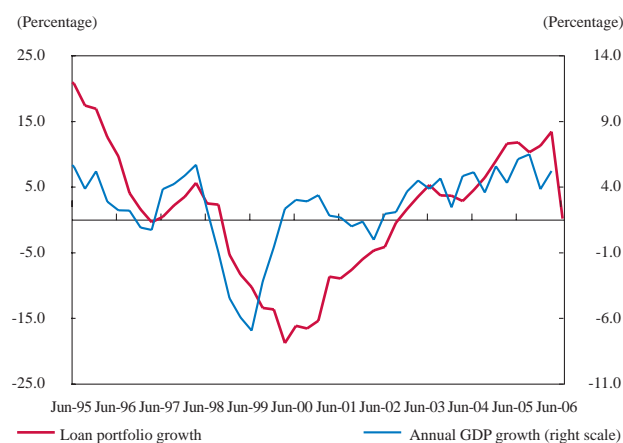
Identifying what determines credit supply in Colombia is no simple task, particularly because some factors might have had more of an impact than others at various stages during the period in question. At the time of the crisis, one of the repercussions of equity reduction was a tighter credit supply. Financial intermediaries saw their equity position (capital adequacy ratio) fall sharply to 9.64% in December 1998. This is a historic low. However, after that year, the capital adequacy ratios of loan institutions recovered quickly and they are now at a satisfactory level (12.4% in July 2006).

Loan portfolio quality is another supply determinant that influenced the pattern of loans, and apparently still does, given the banks' aversion to risk. Although the ratio of non-performing loans to the total gross loan portfolio is now at an all-time low, it rose substantially during the crisis, aggravating risk aversion and affecting portfolio growth. Nevertheless, at the time of the surge in credit, and at present, the index seems to have no implications that would obstruct the good momentum in loans. Moreover, credit-reporting agencies clearly have better financial information about debtors in the loan sector and cover many more clients. Therefore, within the range of factors that can lead to credit rationing in Colombia, asymmetric or imperfect information is expected to become less relevant.

A. TOTAL GROSS LOAN PORTFOLIO OF THE FINANCIAL SYSTEM



B. REAL ANNUAL GROWTH IN THE FINANCIAL SYSTEM'S LOAN PORTFOLIO AND IN ECONOMIC ACTIVITY



Source: A) Office of the National Superintendent of Financial Institutions and the authors' calculations. B) DANE, Office of the National Superintendent of Financial Institutions and the authors' calculations.

The fact that the intermediaries restructured their assets after the crisis in the late the 1990s is another important element of credit growth in financial system. Investments, largely in domestic government bonds, now account for 28.2% of the financial system's assets, as opposed to only one third (10.6%) in December 1994. Lending activity has borne the cost of that shift. In December 1994, the loan portfolio accounted for 61.1% of all assets in the system; the proportion is now 54.9%.

Deposits, as a source of loanable funds for financial intermediaries, have evolved in line with the trend in credit. During the crisis, between June 1998 and December 2000, they declined at real annual rate of -6.61%, on average. However, assets dropped at an even greater rate (- 7.31% in the same period).

IV. TESTS APPLIED TO IDENTIFY THE PRESENCE OF CREDIT RATIONING

Two separate tests were conducted to detect the presence of credit rationing in the Colombian economy. The first is designed to determine if the lending rate is somewhat rigid or inflexible to variations in the market interest rate. The second attempts to identify any changes in the determinants of credit supply growth in recent years.

A. Degree of Rigidity in Lending Rates to Changes in the Market Interest Rate

Some rigidity in interest rate adjustments in the Colombian economy could be understood as a necessary condition, but not enough in itself, to identify the existence of credit rationing at the aggregate level and by portfolio type. As mentioned earlier, in a credit rationing environment, banks do not adjust their lending rate; doing so could increase their credit risk, as they expect new borrowers to be those with projects that have higher expected returns, which also makes them the riskiest.

The behavior of the interbank rate (TIB in Spanish), which was used as a proxy of the market rate and the lending rate by portfolio type, is shown in Graph 2. As illustrated, TIB performance varied considerably after the inflation targeting system was adopted, when the monetary aggregate goals were substituted and the interest rate became the primary monetary-policy tool.

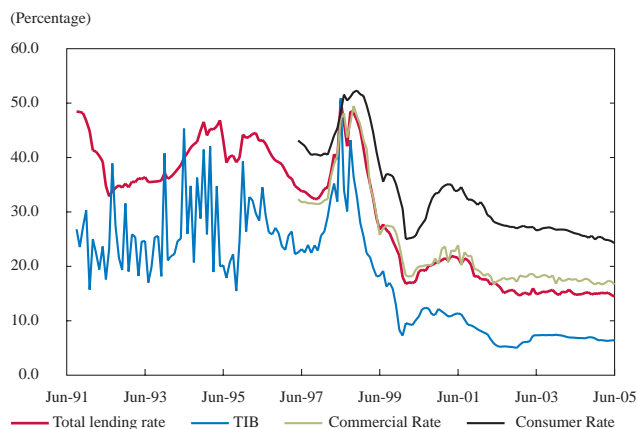
Afonso and St. Aubyn (1998) say that stationarity tests are one way to identify rigidity in interest rate adjustment. These tests start by determining if the interest rate series are stationary in levels. The results, using the augmented Dickey-Fuller statistic (ADF), are shown in Table 1. As

illustrate, none of the interest rates is stationary in levels at 5% significance. The lending rate spread is defined as the difference between the respective lending rate and the TIB. For example, *spreadcom* is the difference between the commercial rate and the TIB. The same stationarity test done on interest rates in levels is then done on these variables. The results are shown in Table 2.

In the case of the commercial rate and the total lending rate in the system, the spreads proved to be stationary under identification with intercept. Therefore, it is possible to say that a change in the market rate will lead to a significant change in the lending rate. In other words, the rate adjustment could very well be complete, since the rate rigidity characteristic of credit rationing periods does not exist. However, the series is not stationary in the case of consumer interest rates, perhaps because this was one of the first sectors to be rationed, particularly during the crisis. Major changes in the TIB at the time were not absorbed by the interest rate on consumer loans. This produced sharp variations in the spread series. For example, the TIB rose by nearly 2,000 basis

GRAPH 2

INTEREST RATES



Source: Office of the National Superintendent of Financial Institutions, Banco de la República and the authors' calculations.

TABLE 1

STATIONARITY TESTS ON INTEREST RATES: ADF STATISTIC (*)

	With Intercept	With Tendency & Intercept	Without Tendency or Intercept
TIB	-1.94	-3.37	-1.29
Total lending rate	-1.55	-2.87	-1.39
Consumer rate	-1.37	-3.00	-1.10
Commercial rate	-0.97	-2.81	-1.20

(*) Stationary variable at the 5% level.

TABLE 2

STATIONARITY TESTS ON INTEREST RATE SPREADS: ADF STATISTIC

	With Intercept	With Tendency & Intercept	Without Tendency or Intercept
<i>Spreadactiva</i>	-5.18 *	-	-
<i>Spreadcons</i>	-2.24	-2.3	-0.5
<i>Spreadcom</i>	-5.71 *	-	-

* Stationary variable at the 5% level.

points (bp) during a single month in 1998. During that same period, these variations boosted the commercial interest rate by 700 bp and the consumer rate by 300 bp. In the months thereafter, these rates continued to rise, with the commercial lending rate accelerating more than in the rate on consumer loans.

A time series analysis³ was done to quantify the effects of a TIB change on the various lending rates in the system. The impulse-response functions show a highly similar pattern for these rates (Attachment 1). An increase in the TIB is accompanied by a lending rate increase with a maximum effect about two months later, which is lost about one year thereafter. For the consumer rate, the adjustment is slower compared to the adjustment in the commercial rate and the total lending rate.⁴

In summary, the results of the rate adjustment exercises do not support the credit rationing hypothesis for the Colombian economy, simply because the lending rate adjustment in response to a change in the market rate is complete in the case of the total rate and the commercial rate. As for the consumer rate, the stationarity test to determine the difference in rates (*spread*) suggests a rigidity that can be explained by risk aversion and the rationing that follows. This series is stationary for the remainder of the period, suggesting a full rate adjustment. The estimate of autoregressive vectors and the Granger causality test (Attachment 1) show a close relationship between the changes in the market rate, which cause changes in lending rates shortly thereafter.

B. Changes in Credit Supply Determinants: 1996-2005

The assessment of agent loan capacity is based, essentially, on the quarterly balance sheets of the country's major financial agents (commercial and

³ Autoregressive vectors and the respective impulse-response functions were used. The Granger causality test was run; in all cases the results show the TIB causes a change in lending rates. It is, therefore, logical to find shocks in the market rate variable and to see their impact on lending rates. The results are presented in Attachment 1.

⁴ It is important to bear in mind that the exercise for the total lending rate in the system involved a longer period (since June 1992), which includes a time of considerable change in the market rate.

mortgage banks). The period in question is from June 1996 through June 2005. The method used is similar to the one employed by Echeverry and Salazar (1999) to identify the presence of a credit crunch in the Colombian economy at the end of the 1990s. It consists of a crosscut estimate where loan growth ($\Delta cartera_t$) is the dependent variable. Loan growth is represented by the quarterly percentage variation in the gross loan portfolio⁵ for each financial institution during a particular period. The supply indicators for the same institutions during a previous period (X_{t-1}) were used as the independent variables to determine if the growth in loans is related to supply-side constraints. The following is the equation used to estimate each variable of supply X :

$$(1) \quad \Delta cartera_t = \beta_0 + \beta_1 X_{t-1} + \varepsilon_t$$

The first independent variable (X_{t-1}) is loan portfolio quality, measured as the non-performing portfolio over the total loan portfolio. During a credit crunch, financial intermediaries would be expected to reduce their loan supply in response to the increased decline in loan portfolio quality. Therefore, the sign is expected to be negative: the more deterioration in portfolio quality, the greater the perception of risk. This prompts banks to become more cautious in selecting loan clients, which leads to the problem of credit rationing.

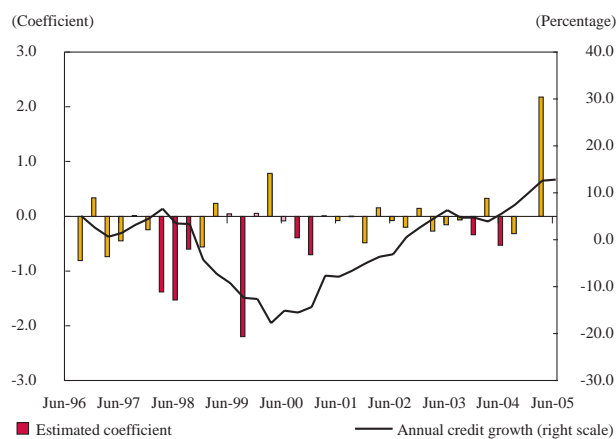
The investment-asset ratio is the second independent variable.⁶ As mentioned earlier, financial institutions have moved in the direction of assets that are more liquid and imply less risk of default. Domestic government bonds are one example. That shift has reduced the credit supply; therefore, the expected sign for this variable is negative.

Return on equity (ROE)⁷ was used to capture the effect of equity constraints on credit supply: the more equity an institution has, the more it is expected to enlarge its credit supply. Hence, the sign for this variable is expected to be positive. In other words, banks with larger returns are expected to place more loans.

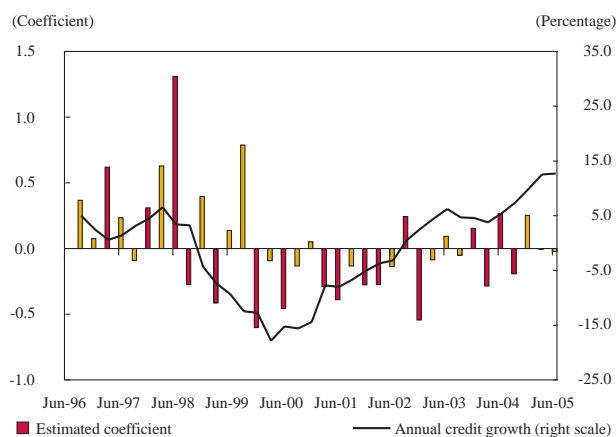
⁵ In their work, Echeverry and Salazar (1999) used the net portfolio. However, with portfolio deterioration, the provision increased, which meant the net portfolio declined without a reduction in credit as such. This is why we used the gross portfolio in our study.

⁶ We also wanted to determine the relationship between loan growth and the extent of loanable funds. The deposit-asset ratio was used to identify the loan sources available to financial institutions. However the results in this estimate were not conclusive.

⁷ Estimates also were developed with return on assets (ROA) and the capital adequacy ratio (the results are quite similar).

GRAPH 3**ESTIMATED COEFFICIENT OF THE IMPACT OF PORTFOLIO QUALITY ON CREDIT AND THE CREDIT CYCLE**

Source: Office of the National Superintendent of Financial Institutions and the authors' calculations.

GRAPH 4**ESTIMATED COEFFICIENT OF THE IMPACT OF INVESTMENTS ON CREDIT AND THE CREDIT CYCLE**

Source: Office of the National Superintendent of Financial Institutions and the authors' calculations.

The results for portfolio quality, as an explicative variable, are presented in Graph 3. It shows the estimated regression coefficient of Equation (1) over the course of time and the evolution in credit, making it possible to pinpoint the different phases of the loan cycle on the graph. The dark colored bars represent the statistically significant coefficients. For example, the limited loan-portfolio growth witnessed during the first three quarters of 1998 is associated with deterioration in the quality of that portfolio. This is precisely what is found in the different studies in literature on the financial crisis period. For the most recent period, the substantial improvement in portfolio quality is associated with the growth in loans during two quarters. Consequently, although portfolio quality was a serious constraint to credit growth, it could be regarded as an incentive in the last few years, given the apparent reduction in banks' aversion to risk at seeing the quality of the loan portfolio improve.

An analysis of investments as a portion of assets in the financial sector and as a possible alternative to credit (Graph 4) indicates they are an important factor in explaining credit growth. Ever since the financial crisis, credit institutions have shown a strong preference for investments in highly liquid securities with low risk. This is due to their increased perception of risk and has limited loan portfolio growth. Even if the expected signs are not found in every quarter,⁸ one sees that investment (e.g. TES) had a negative impact on credit growth during different periods. In other words, this market could contain evidence of a crowding out effect since the start of the crisis.

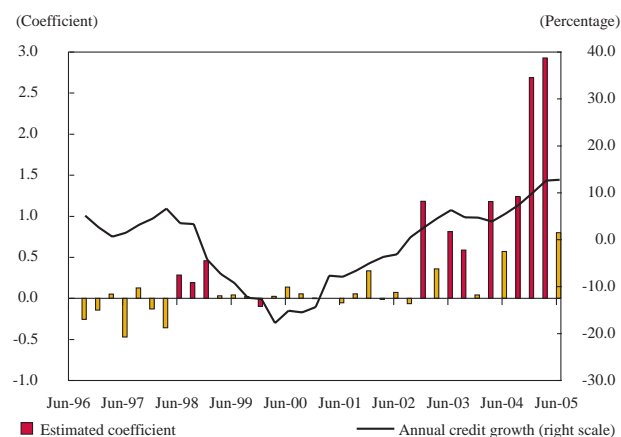
This pattern continued during the latest period, but has become less relevant, meaning that it does not pose a constraint to further growth in credit. This result is consistent with the findings in Murcia and Piñeros (2006a), which show that credit institutions are opting, once again, for loan activity as the primary use for surplus liquidity. This

⁸ As noted earlier, the expected sign for this variable is negative. However, the high return on these investments can give financial institutions a better balance sheet and can increase their credit capacity as a result. This might be why the coefficient of the estimate is positive in several quarters.

has been detrimental to the acquisition of investments.

As mentioned earlier, the ROE indicator was used to evaluate equity capacity. During a credit crunch, a tighter supply of credit would be associated with fewer profits for credit institutions. The results of this estimate are shown in Graph 5 and corroborate what Echeverry and Salazar (1999) found for the crisis period; that is, when institutions have equity problems, they would be expected to reduce their loan supply. This happened during the latter half of 1998. After that year, the ROE results show no major restrictions. In the second half of 2002, when the total loan portfolio of the financial system began to grow at positive rates, profitability again became a source of credit growth.

ESTIMATED COEFFICIENT OF THE IMPACT ON RETURN ON CREDIT AND THE CREDIT CYCLE



Source: Office of the National Superintendent of Financial Institutions and the authors' calculations.

Except for the regression found in the investment variable, the others have one particular result in common: the lack of significance for the supply variables estimated for the period from mid-2000 to mid-2002. They, in contrast, are more robust during the crisis periods and in recent years. These statistical events can be attributed to supply factors, to explain the sharp drop in credit at the end of the 1990s, but also to the fact that they are no longer a constraint to maintaining the credit growth seen in recent years, as changes in the loan portfolio are supported by the favorable behavior of such elements. It is, therefore, evident that supply variables seem to pose no limit to credit growth during the current decade. This suggests that problems with demand cause a slowdown in credit, particularly in sectors such as mortgage loans, where the recovery in credit is not yet complete.

V. CONCLUSIONS

Understanding the credit cycle in Colombia and its determinants is no simple task. Supply and demand factors interact at different stages, making it impossible to clearly distinguish the determinants or their relative importance. Different ways to detect credit rationing are identified in literature. One is based on the degree of rigidity in lending rates to changes in the money market rate. Extreme rigidity can cause a risk aversion

problem among financial institutions. The evidence for the Colombian case does not support the assumption of credit rationing, as lending rates adjust fully to changes in the market rate.

Secondly, the balance sheets of financial institutions were used to evaluate the presence of credit rationing. Cross-section regression exercises were proposed to determine if credit growth is associated with supply variables. If so, this would mean that periods of low growth or tight credit are related to capacity problems and/or to the desire of financial institution to loan. The results point to the presence of credit rationing in the late 1990s. However, in the years thereafter, variables such as loan portfolio quality and return ceased to pose a constraint to credit growth. Accordingly, the low growth during that period can be explained, primarily, by demand factors and by the shift in financial sector assets towards investments. This last phenomenon accentuated the drop in credit during the crisis and mollified its subsequent recovery. Therefore, credit activity was cut short by a risk aversion problem among financial institutions. They preferred to acquire less profitable assets but ones with more liquidity and less risk of default, than to extend credit to the private sector. Nonetheless, this effect seems to have become less significant as of late.

Presently, some of the factors that affect credit supply, such as loan portfolio quality and profitability, have regained importance in explaining the momentum in credit. However, given the recent good results for these indicators, one can assume the supply of credit has become more dynamic and the low growth in commercial and mortgage loans probably is more related to problems with demand.

BIBLIOGRAPHY

- Afonso, A.; St. Aubyn, M. (1998) “Credit Rationing and Monetary Transmission: Evidence for Portugal,” Working Paper No. 7/98, ISEG Economics Department.
- Echeverry, J. C.; Salazar, N. (1999) “¿Hay un estancamiento en la oferta de crédito?,” *Archivos de Macroeconomía*, No. 118, National Department of Planning.
- Huertas, C.; Jalil, M.; Olarte, S.; Romero, J. V. (2005) “Algunas consideraciones sobre el canal del crédito y la transmisión de tasas de interés en Colombia,” *Borradores de Economía*, No. 351, Banco de la República.
- Murcia, A.; Piñeros, H. (2006b). “Determinantes de la oferta de crédito en Colombia: ¿Aún existe un problema de racionamiento de crédito?,” (mimeograph) Financial Stability Department, Banco de la República.
- ; —. (2006a) “Situación del crédito en Colombia desde la perspectiva del sector financiero,” *Reporte de Estabilidad Financiera*, Banco de la República, March.
- Stiglitz, J. E.; Weiss, A. (1981) “Credit Rationing in Markets with Imperfect Information,” *American Economic Review*, No. 71, v. 3, pp. 393-410.
- Urrutia, M. (1999) “Crédito y reactivación económica,” (Editorial Note) *Revista del Banco de la República*, No. 860, v. LXXII, Banco de la República, June.

ATTACHMENT 1

Lending Rate and TIB

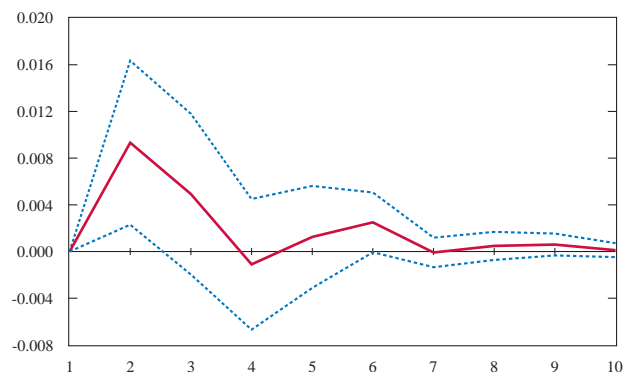
According to the causality test, changes in the interbank rate cause changes in the system’s lending rate, but not vice versa (Graph A.1).¹

GRAPH A.1

GRANGER CAUSALITY TEST

Null hypothesis:	F Statistic	Probability
DIFLTIB no cause DIFLTACT	2.99759	0.03252
DIFLTACT no cause DIFLTIB	1.37975	0.25107

IMPULSE-RESPONSE FUNCTION



¹ The autoregressive vectors estimated for all types of loans are shown in Murcia and Piñeros (2006b).

Commercial Rate and TIB

The causality test shows that changes in the interbank rate cause changes in commercial lending rates, but not vice versa (Graph A.2).

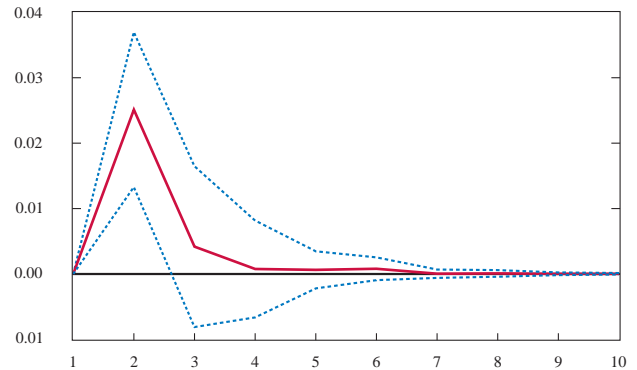
GRAPH A.2

GRANGER CAUSALITY TEST

Sample: 1991M09 2005M06
Lags: 3
Observations: 94

Null hypothesis:	F Statistic	Probability
DIFLTCOM no cause DIFLTIB	0.30389	0.82251
DIFLTIB no cause DIFLTCOM	9.76656	1.3E-05

IMPULSE-RESPONSE FUNCTION



Consumer Rate and TIB

The causality test shows that changes in the interbank rate cause changes in consumer lending rates, but not vice versa (Graph A.3).

GRAPH A.3

GRANGER CAUSALITY TEST

Sample: 1991M09 2005M06
Lags: 3
Observations: 94

Null hypothesis	F Statistic	Probability
DIFLTIB no cause DIFLTCONS	19.4376	9.8E-10
DIFLTCONS no cause DIFLTIB	0.05910	0.98104

IMPULSE-RESPONSE FUNCTION

