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CREDIT MARKET BEHAVIOR DURING TURBULENT ECONOMIC ENVIRONMENTS: AN EXAMPLE FOR A LATIN AMERICAN COUNTRY

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Abstract

The variability of the economy's growth rate in Latin American Countries (LACs) tends to far exceed that found in developed nations. Huge recessions are frequent in LACs. Typically, these recessions are accompanied by major exchange-rate-policy breakdowns. In turn, these output and exchange rate changes drastically alter private expectations concerning the future behavior of these variables. As a result, discrete and significant changes in private behavioral functions occur. This typically affects crucial monetary policy indicators, such as interest rates and credit. This turbulent economic environment makes it particularly troublesome for econometricians to test theoretical propositions dealing with credit market behavior, as well as for policymakers to interpret and forecast credit and interest rate behavior. This paper illustrates this issue using Chile as a case study. A simple theoretical model of business credit is developed, which is then used to interpret the developments in Chile's credit market during 1980-1986. Using a partial equilibrium analysis, it is shown how the contemporaneous correlation between output and credit demand can change sign, whenever the economy is subject to unanticipated recessions and devaluations. The analysis is a timely one for policymakers in many LDCs, who are currently on the path of transforming their economies to free-market open-economies.

* I am indebted to some of my former graduate students interested in Latin America –both, at Tulane University, New Orleans, and at ITAM (Mexico)– for stimulating me in writing this paper. Some were particularly puzzled when doing econometric work dealing with the bank credit market during turbulent economic environments. I hope this paper contributes to answer their queries. I also acknowledge comments from three anonymous referees. Of course, the content of this paper is entirely my responsibility.

I. Introduction and General Motivation

Output fluctuations in developed countries are usually interpreted as phases of business cycles. These, in turn, typically show up as regular and smooth patterns of expansions and contractions in economic activity around a path of trend growth. This time series behavior of aggregate output is in remarkable contrast with the one typically encountered in LDCs, such as in Latin American Countries (LACs). The time series behavior of GNP in LACs is characterized by a series of huge (sometimes double digit) and abrupt recessions, preceded and/or followed by growth rates that may be substantially higher than the ones typically encountered in developed countries. As a result, the variability of the economy's growth rate in LACs tends to far exceed that found in developed nations.[1] Thus, as shown in the Appendix, for a sample of 6 developed countries and 6 LACs, the average variability coefficient in annual growth rates for LACs is 3.6 times (about 260%) higher than that for the developed countries. This asymmetry also shows up when comparing the absolute ranges of lowest/highest growth rates, for developed countries versus LACs.

In addition, these huge recessions in LACs are typically accompanied by quite significant alterations in the government's exchange rate policy, i.e., huge devaluations. This type of instability in the economy's growth path and exchange rate policy makes it particularly difficult to forecast the behavior of many other time series of the economy. Such difficulties in forecasting are enhanced (as we will discuss here) when the private sector is highly indebted in foreign currency, and when these dramatic changes are not fully anticipated by private agents.

Several LDCs and historical episodes can be found that fit the above stated description.[2] As an example, I will consider the case of Chile during the late 1970's through the 1980's.

This paper will focus on some time series that are significantly affected under such unstable circumstances. Specifically, I will consider the behavior of interest rates and credit. These two variables are typically regarded as crucial economic indicators by policy makers, especially by monetary authorities.

Consider the following scenario. Suppose we wish to analyze the annual trends in the Chilean bank credit market during 1980-1986. This time interval allows to take averages of, say, about 24 quarterly observations of data for bank interest rates, bank credit, and other presumably correlated variables such as GDP (or some sectoral GDPs). Assume, further, that somewhere "in between" such a time interval we have a major (and mostly unexpected) exchange rate policy change as well a major breakdown in the economy's growth path. These type of structural changes should affect (theoretically speaking) the behavior of these credit market related time series, at least after the corresponding changes in policy and output path are materialized.[3] Thus, in order to do econometric testing concerning the joint behavior of these different time series, we necessarily need to end up with time-varying parameter econometric models.[4] However, the relatively small size of this sample barely allows to do any econometrics at all, not to mention time-varying parameter models! Are we stuck? Is there any hope for some sort of

empirical analysis?[5] One of the purposes of this paper is precisely to show an alternative route: an "*heuristic analysis*". This I define as a simple, verbal type of partial equilibrium supply/demand analysis, based on: a) the relevant data available which is directly correlated (theoretically) to the corresponding demand and supply functions; b) basic economic principles of supply/demand behavior and market clearing analysis; and c) some underlying theoretical models useful for such a supply/demand analysis, whose main **assumptions** fit some relevant stylized facts implied by the data.[6] This "heuristic analysis" may represent a "second best" analysis; the "first best" being a rigorous econometric analysis under turbulent economic environments, triggered by drastic economic policy changes. However, as explained earlier, the latter type of econometric analysis is not feasible under the current circumstances, basically because of the small size of the sample.

This paper therefore adopts this "heuristic" type of partial equilibrium analysis. The aim is to show, using as a reference the Chilean bank credit market episode during 1980-1986, how the contemporaneous correlation between output and credit demand can change sign, whenever the economy is subject to unanticipated recessions and devaluations.

Several studies have dealt with the behavior of interest rates in Chile during this period[7]. As well, others have provided some general theoretical framework which could be applied in interpreting these interest rates developments in Chile[8]. This paper shares with many others the market-clearing approach applied to the Chilean credit market. However, it radically departs from other studies in the implicit general theoretical framework for interest rate determination in open economies. This is explained in Section II of the paper. Section III briefly illustrates the interest rate behavior throughout 1980-1986 in Chile. Such a behavior –and especially the correlation between credit demand and economic activity– represents the subject matter of this paper. Section IV describes some crucial structural characteristics of the private credit market. First, it provides empirical evidence about the structure of the private aggregate demand for credit in a LAC, as opposed to that found in developed countries. Data for Chile and the United States are provided. This evidence is used as an input for interpreting the observed interest rates and credit behavior in Chile during 1980-1986. Secondly, I present a thorough description of business financial indebtedness by sectors of economic activity in Chile. This, in conjunction with evidence on sectoral growth, is used to interpret credit market behavior. Section V develops a simple theoretical model of business demand for credit. This analytical framework, together with the empirical regularities previously examined, are put together in Section VI. It is then argued that the observed interest rate path in Chile was fundamentally triggered by demand rather than supply behavior in the credit market. This seems to be the only scenario consistent with the actual trends of interest rates and credit. This hypothesis, however, can only be consistent with the actual growth pattern of the Chilean economy if the 1982 recession and exchange rate policy breakdown were largely unanticipated by private agents. This conjecture about expectations is also supported by relevant empirical evidence. Thus, the paper concludes that private credit demand behavior for the post-1982 period is in a sense noncomparable to the

previous one, since it incorporates an entirely different set of expectations about the economy's exchange rate and output paths. Section VII concludes, and presents some final remarks in which the relevance of this paper's analysis for policymaking is stressed.

II. The Underlying Theoretical Framework for International Trade in Financial Assets

This paper implicitly adopts Sanyal-Jones (1982) approach for conceptualizing international trade[9]. In terms of commodity trade, this "new trade theory" radically departs from the traditional trade theory. Essentially, Sanyal-Jones' "middle product theory" involves a major switch in terms of how traded goods are to be formally modelled: from the countries' utility functions to the countries' production functions. According to this approach, only firms participate in the world commodity market; households only trade in local markets. As a corollary, all final consumption goods represent nontraded goods.[10] A theoretical application of this approach to open-economy macroeconomics was done for the issue of "purchasing power parity" (PPP). A crucial implication was that PPP no longer holds under this framework (neither in the "short run" nor in the "long run")[11]. This paper (implicitly) adopts this theoretical framework not only for trade in commodities, but (most relevant for this paper) also for international trade in financial assets.

In order to compare this paper's (implicit) approach to international trade in financial assets with the traditional approach, the following charts may be helpful[12].

Chart 1 illustrates the traditional view in International Finance Theory. The private sector is lumped into a single agent: financial intermediation is effectively assumed away. Borrowing-lending decisions among countries are equivalent to borrowing-lending decisions among final asset (debt) holders (firms-households) of each country. The supply of foreign funds faced by country A is equivalent to the supply of funds faced by individuals and firms within country A, and correspondingly for country B.

Chart 2, on the other hand, illustrates the view taken in this paper. The private sector is comprised of two groups: a financial private sector (banks) and a non-financial private sector (individuals and firms). International trade in financial assets is assumed to take place among financial intermediaries (banks) of countries A and B, not directly between final asset holders within each country (individuals-firms). However, domestic interest rates in any particular economy are determined within the domestic financial market, as an outcome of the joint behavior of domestic suppliers (domestic banks) and demanders (domestic individuals or firms). Thus, international trade in financial assets takes place at a different level than the one at which the interest rates are determined in each country. Prices of assets exchanged in the world financial market represent "input prices" from the standpoint of financial intermediaries of each country. The supply of funds faced by a country (i.e., by financial intermediaries) and the supply of funds faced by

CHART 1

THE TRADITIONAL APPROACH

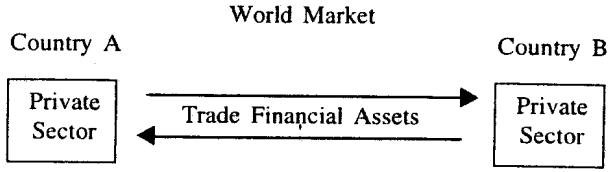
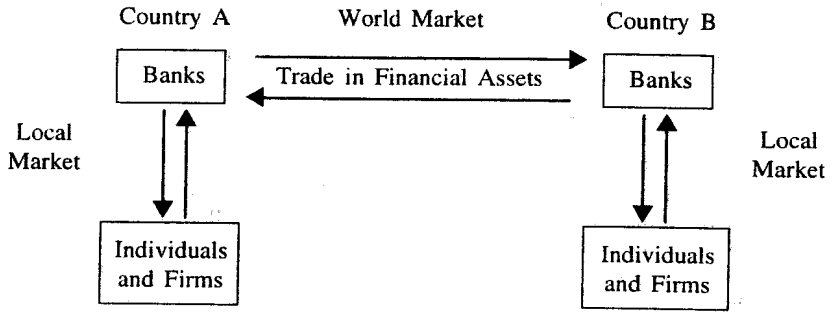


CHART 2

THE APPROACH ASSUMED HERE



individuals and firms within the economy, are separate issues. In this framework domestic interest rates are always interest rates of nontraded assets and liabilities. This approach implies that equilibrium interest rates within each particular economy are determined in a way essentially analogous to closed-economy models: by local demand and supply conditions.[13]

According to the scheme illustrated in Chart 2, only financial intermediaries participate in the world market: households trade in local markets.[14] Note that this implies that households' portfolio will always differ from banks' portfolio, as the former solely contains "nontraded" assets (and liabilities). This "pattern of trade" is adopted here (assumed), not derived.[15]

Within this general framework the behavior of foreign interest rates (and other variables which may well "add up" to these, such as different sorts of risk premium, transaction costs), as well as government (Central Bank) policy, are all subsumed in the behavior of the financial intermediaries' domestic credit supply.[16]

As it will be further explained later, the interpretation of interest rate developments in Chile throughout 1980-1986 will be based on a simple supply/demand, partial equilibrium analysis. As with any partial equilibrium analysis, this involves taking as exogenous the explanatory variables of both the demand and supply functions of (in this case) bank credit. In addition, only a (partial equilibrium) model for the **demand** for credit is provided and used in this paper. The reason is (as explained later) that empirical evidence suggests that the trend for bank loan interest rates in Chile was fundamentally **demand driven** during 1980-1986. It is therefore unnecessary to consider an explicit model for the supply of bank credit for the purposes of this analysis.

III. Illustrating the Facts

Figure 1 plots the behavior of the interest rate on bank loans in Chile throughout the 1980-1986 period. Both, indexed and non-indexed bank contracts are available to market participants in Chile. The non-indexed contracts determine **nominal** interest rates (this, indeed, is the usual type of financial contract available in most countries). The behavior of this nominal rate is plotted in Figure 1, panel A.[17] In an **indexed** bank contract the market determines a **real** interest rate. Such a contracted rate adopts the form of a spread over and above the inflation rate materialized during the specific term of the contract. The evolution of this **ex-ante** real interest rate in Chile appears in Figure 1, panel B.[18]

As illustrated by Figure 1, from 1980 on, there exists an increasing annual trend for the average interest rate on bank credit. The peak is reached in 1982, the year of the huge recession and of the abrupt alteration in the Chilean exchange rate policy (see Table II)[19]. The post 1982 sub-period displays the opposite behavior: the time path of the interest rate is decreasing. This overall trend holds for both, nominal and real interest rates. This asymmetric pattern in the time path of domestic interest rates on bank credit is the core subject of this paper's analysis.

Interest rates in Chile were entirely free, market-determined throughout this time period.[20] Therefore, the interpretation of such an observed behavior on market interest rates requires considering the likely behavior of the demand and supply functions of bank credit in Chile throughout such a period. Our supply-demand analysis will use an heuristic approach, since –as explained earlier– any econometric analysis of supply and demand for credit in Chile during this period is doomed to fail under such an unstable economic environment.[21]

IV. Some Structural Characteristics of the Private Credit Market

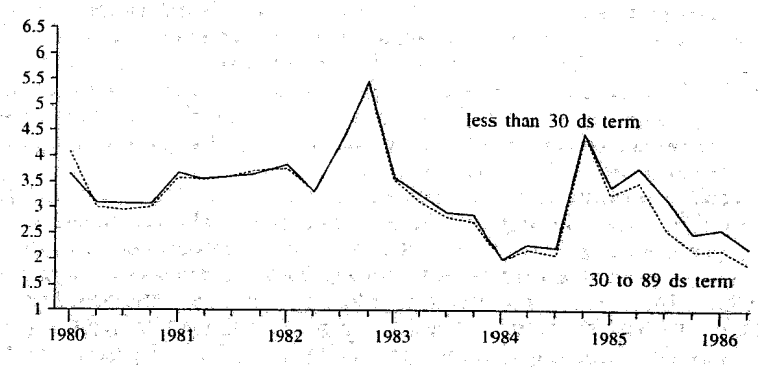
4.1. General remarks

In order to analyze the behavior of the private supply and demand functions for bank credit, it is first necessary to identify the specific economic agents underlying such functions. In the case of the supply function, this offers no problem:

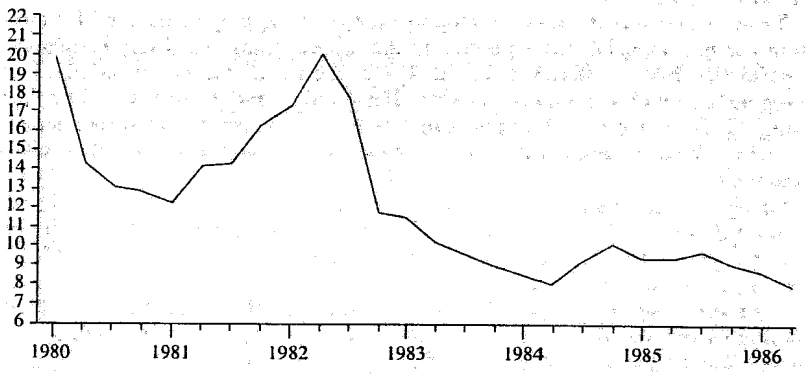
FIGURE 1

QUARTERLY WEIGHTED AVERAGE INTEREST RATES ON BANK CREDIT

A. Non-Indexed (Nominal) Rates
(percentages per month)



B. Indexed (Real) Rates
(percentages per year)



Source: Based on data contained in the D-3 Form, Superintendency of Banks and Financial Institutions, Chile.

Note: These interest rates include all financial institutions, and all types of loan operations, except for interbank loans. Interest rates are weighed by the actual amounts traded at each observed interest rate. These weighted averages were computed using raw data reported by financial intermediaries. They are not regularly published data. I am grateful to the Central Bank of Chile for providing me with this data base.

Memo: The average inflation rates in Chile throughout this period were:

1980	1981	1982	1983	1984	1985	1986
35.1	19.7	9.9	27.3	19.9	30.7	19.5

financial intermediaries underlie the behavior of the credit supply. The private demanders of bank credit are households and firms. The relevant variables that can shift the demand for credit through time are different depending on which of these two agents are considered. For example, if the credit demand is concentrated in the Household Sector because of consumer credit, then private consumption would be the relevant "scale variable" shifting the aggregate demand for bank credit through time. If, on the contrary, business credit is the relevant source, then aggregate output (or some sectoral outputs) would represent the relevant explanatory variable. These distinctions are very important for LACs, since structural changes in both GDP expenditures and sectoral GDPs are quite frequent in these economies. Thus, it is necessary to determine the relative empirical significance of these two agents as private demanders of credit in the economy. The purpose of this section is to examine the evidence on this issue.

Table I presents empirical evidence that illustrates the structural bias one observes in a LAC in terms of the economic agents who constitute the private aggregate demand for credit. More than 80% of the outstanding loans offered by financial intermediaries represent borrowing by the nonfinancial business sector in Chile. Moreover, since funds supplied by financial intermediaries to the nonfinancial business sector are basically equivalent to the total funds supplied to the (consolidated) nonfinancial business sector in LACs,[22] the figures in Table I can also be interpreted as dealing with the total amount of funds raised in the credit market. This pattern contrasts with the one observed in a developed country such as the United States.

Table II presents the sectoral composition of the aggregate demand for credit within the nonfinancial private sector in the US economy. As Table II indicates, no particular bias is observed in the US economy in the composition of the aggregate demand for credit between households and businesses. The U.S. household sector accounts for approximately half of the private aggregate demand for credit, which is roughly three to four times the share observed for the Chilean economy.

Given this empirical evidence, the analysis about the path followed by the demand for credit in Chile will focus on the **firm's** demand for credit. In particular, we will consider that the demand for business credit is positively correlated with GNP. Thus, an underlying assumption is that the production functions of firms involve a time-to-produce type of technology such that the demand for bank credit is derived from the firm's real decisions.[23] On the other hand, we will assume that the supply function of bank credit is positively sloped with respect to the domestic bank loan rate, and that shifts in the supply of bank credit through time can be explained by the evolution of the aggregate of financial resources available to financial intermediaries (i.e., their total liabilities).[24]

4.2. Sectoral indebtedness in Chile

Our next table presents the **total** level of debt with financial intermediaries in Chile for each of the sectors of economic activity defined in the national accounts, as a share of the corresponding sectoral GDP.

TABLE I

STRUCTURE OF AGGREGATE DEMAND FOR BANK LOANS: CHILE
(percentages)

	Nonfinancial Business	Households
1979	88.3	11.7
1980	84.9	15.1
1981	79.9	20.1
1982	85.3	14.7
1983	86.9	13.1
1984	86.8	13.2
1985	86.3	13.7
1986	87.2	12.8
1987	87.0	13.0
1988	87.4	12.6

Notes: 1. Percentages are based on end of year figures, except from 1984 on, in which November figures are used (data for December no longer exists). These information is not available for years prior to 1979.
2. Roughly between 1/4 and 1/3 of the shares for households correspond to consumer loans. The remainder is related to housing loans.

Source: Based on data appearing in *Información Financiera*, Superintendency of Banks and Financial Institutions; Santiago, Chile (several issues).

TABLE II

STRUCTURE OF AGGREGATE DEMAND FOR BANK LOANS: UNITED STATES
(percentages)

	Nonfinancial Business	Households
1975	43.9	56.1
1976	43.3	56.7
1977	43.9	56.1
1978	42.6	57.4
1979	45.8	54.2
1980	52.4	47.6
1981	59.0	41.0
1982	59.3	40.7
1983	43.0	57.0
1984	55.8	44.2
1985	46.5	53.5
1986	50.1	49.9
1987	47.2	52.8
1988	50.3	49.7

Note: The sum of these two sectors plus the US Federal, State and Local governments (not included in Table II) yields the total net borrowing by domestic nonfinancial sectors in the US.

Source: Based on data appearing in *Economic Report of the President*, Washington, DC, United States Government Printing Office. Figures for 1975-1979 were obtained from the February 1985 issue (Table B-65), whereas 1980-1988 comes from the February 1990 issue (Table C-72).

The first five columns in Table III correspond to the sectors for which the following behavioral pattern in this debt/output ratio holds: a) an increasing trend beginning from 1980, reaching its peak in the year of the recession (1982);[25] and b) a decreasing trend in the aftermath of the recession.

How significant are these five economic activities from the standpoint of the aggregate demand for credit of the Chilean nonfinancial business sector? Table IV answers this question.

According to Table IV (see column Subtotal) these five economic activities altogether represent about 70% of the total amount of loans acquired by businesses from financial intermediaries. Therefore, it is possible to assert that the credit demand of these five sectors determines the aggregate demand for credit of the Chilean nonfinancial business sector. I will thus concentrate on these five sectors for this analysis.[26]

Next, five diagrams are presented. These plot the behavior of the debt-output ratio throughout this time period, for each of the five selected sectors. In parentheses, the corresponding sectoral GDP annual growth rate is noted. These five diagrams easily illustrate the following pattern that ought to be stressed here. The behavior of the debt-output ratio resembles that of the market interest rate (Figure 1). Thus, it increases from 1980 on, reaching its peak in 1982, the year of the huge recession and alterations in the exchange rate policy. The post-1982 sub-period displays the opposite behavior: these sectoral debt-output ratios decline.

TABLE III

FINANCIAL DEBT - GDP RATIO BY SECTORS OF ECONOMIC ACTIVITY
(percentages)

	Agric. Fores. & Fishing (1)	Manufac. (2)	Electr. Gas & Water (3)	Construc. (4)	Servic. (5)	Wholes. Retail Trade (6)	Mining (7)	Transport. & Comm. (8)
1979	45.1	38.6	1.8	29.7	5.6	35.7	4.7	16.5
1980	59.0	39.3	3.0	59.5	10.6	45.6	9.2	26.3
1981	71.3	43.8	7.2	98.5	17.5	55.4	12.7	27.1
1982	78.6	**56.7**	**16.3**	**139.8**	**32.9**	59.8	17.2	30.2
1983	**83.2**	50.7	12.6	131.2	28.8	60.2	16.3	33.5
1984	76.7	45.5	11.0	112.1	26.1	61.7	18.1	36.1
1985	73.5	47.7	9.9	97.8	26.5	64.9	16.9	34.8
1986	69.3	41.5	10.3	89.7	23.1	59.9	16.8	28.3

Sources: 1. For figures on sectoral financial debt: same as of Table I.
2. For figures on sectoral GDP: National Accounts, Central Bank of Chile.

TABLE IV

TOTAL BUSINESS DEBT WITH FINANCIAL INTERMEDIARIES:
COMPOSITION BY SECTORS OF ECONOMIC ACTIVITY
(percentages)

	Agric. Fores. & Fishing (1)	Manufac. (2)	Electr. Gas & Water (3)	Construc. (4)	Servic. (5)	Subtotal	Wholes. Retail Trade (6)	Mining (7)	Transport. & Comm. (8)
1979	16.7	36.6	0.2	6.0	7.8	67.3	27.4	1.5	3.8
1980	16.0	27.8	0.2	10.4	11.0	65.4	27.6	2.2	4.8
1981	14.8	23.4	0.4	15.4	14.2	68.1	25.8	2.4	3.7
1982	14.6	21.7	0.8	15.1	20.6	72.8	20.9	3.1	3.3
1983	16.0	21.3	0.7	14.3	19.2	71.5	21.6	3.1	3.8
1984	15.9	21.1	0.6	12.8	18.4	68.8	23.3	3.5	4.4
1985	15.6	21.6	0.6	12.5	18.0	68.3	24.1	3.3	4.3
1986	16.8	21.3	0.7	12.2	17.2	68.2	24.6	3.5	4.0

The observed behavior in these sectoral debt-output ratios must underlie the one on the private supply and demand in the Chilean credit market. The problem, however, is that there exists a somewhat puzzling asymmetry when considering the behavior of the debt-output ratio jointly with economic activity. Thus, for the most part, a **positive** correlation between these two variables shows up during the pre-1982 period. This is consistent both with our hypothesis about the behavior of the interest rate throughout this sub-period, and with the expected relationship between business demand for credit and the level of economic activity. However, for the 1982-1986 sub-period this is not the case. Thus, if this trend in the debt-output ratio is consistent with our hypothesis that it was basically credit demand behavior that triggered the declining path in the interest rate in the aftermath of the recession, then such credit demand behavior appears inconsistent with that of economic activity. An inverse (and hence perverse) relationship between business demand for credit and output seems to prevail after 1982. Why is this the case? The answer to this question is provided in Section VI of this paper.

Next, I develop a simple theoretical model of business credit demand. This will be applied (in Section VI) to interpret the interest rate developments in Chile during 1980-86.

FIGURE 2

DEBT-OUTPUT RATIO:
MANUFACTURING

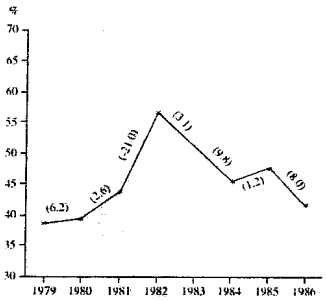


FIGURE 3

DEBT-OUTPUT RATIO:
AGRICULTURE, FORESTRY, AND FISHERIES

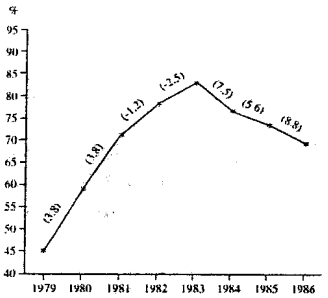


FIGURE 4

DEBT-OUTPUT RATIO:
ELECTRICITY, GAS, AND WATER

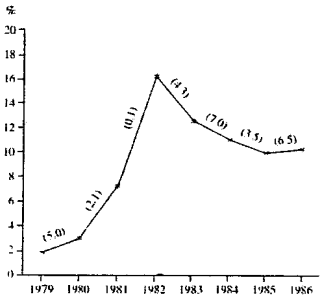


FIGURE 5

DEBT-OUTPUT RATIO:
CONSTRUCTION

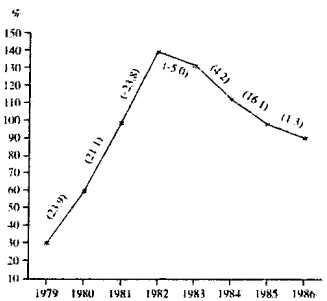
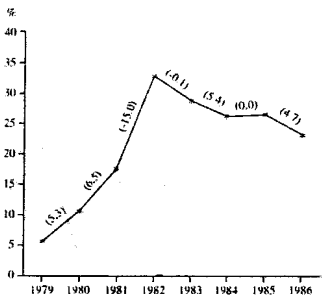


FIGURE 6

DEBT-OUTPUT RATIO:
SERVICES



Sources: Same as of Table III.

Note: The figures in parentheses are the corresponding sectoral GDP annual growth rates.

V. Business Demand for Credit: A Simple Model under Non-Instantaneous Production and Uncertainty

Consider a representative firm in a perfectly competitive setting. Assume that this firm is owned by a representative individual, and let us refer to such an individual as "the household-owner." Assume, further, that production takes time. This means that some form of "investment" is required in order to produce output at some positive rate. Specifically, production in this economy requires working capital in the form of inventories of goods in process. This is introduced by a "point input-point output" production process:

$$X_{t+h} = \phi\ (L_t) \qquad (1)$$

where X stands for some homogeneous output, L corresponds to the variable input (labor) and h represents the period of production. Equation (1) thus involves an "Austrian" approach for modelling the technology.[27] Contrary to the Austrian tradition, however, here we will assume that the period of production is an exogenous variable, i.e., a technological parameter of the production function. For simplicity, let us set the period of production as h = 1.

The firm's motivation for holding inventories of goods in process is twofold. First, we assume that production takes time. This allows to rationalize the existence of unfinished commodities, and also of business credit: current production needs to be financed. Second, the firm's cash flows are assumed to be random. We adopt a mean-variance model and assume the firm is risk-averse.

Equation (1) implies that, at any time t, there exists a stock of goods in process inherited from the past. As labor is the only variable factor of production, at any time t the value of this stock of commodities is equal to the value of its contents in labor services. Assume, further, that there is a fixed requirement of labor in order to produce these inventories of goods in process. Thus, at any given point in time,

$$I_t^{WK} \cdot n = L_t \quad (2); \qquad \text{and} \qquad X_{t+1} = \tilde{\mu} I_t^{WK} \qquad (3)$$

where $\mathbf{I^{WK}}$ is investment in working capital; **n** is the labor coefficient per unit of goods in process; and represents the marginal efficiency of investment. Uncertainty is introduced by assuming that the marginal efficiency of investment is a random variable, $\tilde{\mu}$, following an unknown probability distribution with finite first and second order moments. Hence, the firm's cash flows are random.

Assume all investment is financed by a foreign currency denominated loan, B^*, at an exogenously given interest rate[28], R^*. Define:

$$(1 + R_t) = (1 + R_t^*)\ (1 + E_t(\hat{e}))\text{; and} \qquad (4.A)$$

$$(1 + r) = (1 + R)\ \frac{P_t}{P_{t+1}} \qquad (4.B)$$

where

R_t → domestic-currency-denominated nominal interest rate
$\hat{e}_t$ → percentage change in the nominal exchange rate
r → one-period real interest rate
P_t → price of the final output X

The firm's net cash flows in commodity units, F_{t+1}, are given by:

$$F_{t+1} = \tilde{X}_{t+1} - (1 + r)\frac{B_t}{P_t} = \tilde{\mu} I_t^{WK} - (1 + r)\frac{B_t}{P_t} \quad (5)$$

Equation (5) asserts that the firm's net cash flows at the end of the period of production are equal to the final goods obtained at t + 1 due to the investment in working capital at time t, less the amount of real resources the firm must release in t + 1 so as to pay-back the loan acquired at time t. However, the relevant quantity for the firm's investment decision is the expected value of such cash flows:

$$E_t F_{t+1} = E_t \tilde{\mu} I_t^{WK} - (1 + r)\frac{B_t}{P_t} \quad (6)$$

The other quantity relevant for the firm's investment decision, is the variance of the cash flows:

$$\sigma^2 (F) = \sigma^2 (\tilde{\mu}) (I_t^{WK})^2 \quad (7)$$

It will also be convenient to define the relative price of working capital. In this model, the value of working capital is equal to the value of the labor services contained in a unit of goods in process. Thus:

$$\frac{P_t^{WK}}{P_t} = \frac{W_t}{P_t} n \quad ; \quad \begin{array}{l}\text{where } \mathbf{P^{WK}} \text{ is the nominal price of working} \\ \text{capital and } \mathbf{W} \text{ is the nominal wage rate.}\end{array} \quad (8)$$

Next, assume that there exists a subjective value function V(•), which represents this household's preferences regarding the trade-off between expected net cash flows and the standard deviation of these cash flows:

$$V = G \underset{(+)\quad(-)}{\{E_t F_{t+1}, \sigma (F_{t+1})\}} \quad (9)$$

Finally, the firm has a financial constraint. This constraint states that the amount invested in working capital cannot exceed the amount borrowed in the financial market, given the technological opportunities the firm faces:

$$\frac{P_t^{WK}}{P_t} I_t^{WK} \leq \frac{B_t}{P_t} \quad (10)$$

At any time t, the firm chooses the level of investment in working capital, and hence next period's output level.[29] Note, however, that the specification of this firm's production technology (equations (1), (2), and (3)) implies that the investment decision is not independent of the firm's labor demand and credit demand decisions. Rather, these three decisions are interdependent and simultaneous, and altogether yield the optimal choice for the firm's output to be delivered at the end of the period of production.

The firm's constrained optimization problem can thus be stated as follows:

$$Max \left(I_t^{WK}, \frac{B_t}{P_t}\right) V = G \{E_t F_{t+1}, \sigma (F_{t+1})\}; \text{ subject to equation (10).}$$

As shown in the Appendix, the following general functional form for the firm's "desired debt-output ratio", $(b/X)^d$, can be derived from this model:

$$\left[\frac{b}{X}\right]_t^d = \underset{(+)\quad(-)\quad(-)\quad(+)}{F [\pi^e_{t+1}, \sigma^2(F), R_t^*, E_t(\hat{e})]} \quad (11)$$

where π^e_{t+1} is the firm's expected profit rate.

Finally, the actual debt/output ratio may differ from the desired debt/output ratio. As noted earlier, in this model the firm's credit demand is derived from the firm's investment decision. As with the capital stock adjustment, there may be costs associated to an instantaneous adjustment of the firm's credit stock. Thus, a gradual adjustment may be optimal. Let λ be the fraction of the gap between the desired and actual debt/output ratios that the firm plans to close in each period. Then,

$$\left(\frac{b}{X}\right)_t = \left(\frac{b}{X}\right)_{t-1}^d + \lambda\left[\left(\frac{b}{X}\right)_t^d - \left(\frac{b}{X}\right)_{t-1}\right] \quad (12)$$

VI. Interpreting the Facts

As illustrated by Figure 1, interest rates during the post-recession period in Chile showed a decreasing trend. The opposite was observed during the pre-recession period. In principle, two possible hypotheses could be consistent with such interest rate behavior. One possibility is that, for a given trend in demand, the supply of bank credit grew at a faster rate during the post-1982 period than before 1982. For this interpretation to be valid, the total amount of financial resources available to financial intermediaries in Chile should have grown more during the post-1982 period than before 1982. In fact, however, the corresponding empirical evidence reveals that just the **opposite** occurred. Thus, the stock of foreign debt held by financial intermediaries in Chile multiplied 5.6 times from 1978 up to 1981. These foreign resources represented the main source of the steady increase in the total funds available to Chilean financial intermediaries throughout this period. Such a scenario of increasing foreign indebtedness by financial intermediaries stopped abruptly after the recession of 1982. The secular growth in domestic bank deposits and in bank liabilities with the Central Bank

after the recession was far from compensating for the decline in the banks' foreign debt flow.[30] As a result, the total funds available to financial intermediaries were **substantially less** than the ones available before 1982. Therefore, the supply side hypothesis must be discarded as a plausible explanation for the observed interest rate path.

We are thus left with the demand-side hypothesis, which is the second possible explanation for observed interest rates. For this to represent a valid interpretation, a decreasing trend in the private demand for bank credit should have shown up after the 1982 recession. The time path of the demand for credit must have followed a behavior similar to that displayed by the market interest rate illustrated by Figure 1. Hence, interest rates increased during the pre-1982 period because the growth in the private demand for credit exceeded the supply of credit. The credit market could only be cleared at increasingly higher equilibrium interest rates. These declined throughout the post-1982 period because the demand for credit shrunk relatively more than the supply. **This is the only consistent scenario.**

The increasing trend in the private demand for credit throughout the pre-1982 period can be easily rationalized if we assume that the time path of business credit is positively correlated with the time path of output. Thus, the 1977-1981 period shows an annual average growth rate in GDP of about 8.7%. By this time, it was nearly impossible to find another five-year period in the history of Chile with such high growth rates. However, for the post-1982 period–in which the economy's output resumes growth at significant rates–this linkage between output behavior and credit demand behavior breaks down.[31]

We will consider the theoretical set up presented in Section V, in order to rationalize this bank credit market behavior in Chile. But before doing this, some comments are on place.

First, our analysis is implicitly assuming that, during the time period considered, all of international trade in financial assets in Chile was channelled through financial intermediaries[32]. Therefore, foreign interest rates represented "input prices" (and foreign debt represented a source of funds) from the standpoint of Chilean financial intermediaries.[33] This, indeed, represents a good simplifying assumption. Thus, for example, during 1980-1981, about 80% of the financial private capital inflows in Chile corresponded to financial intermediaries' foreign borrowing, and the remainder 20% was direct foreign indebtedness by the non-financial private sector.[34]

Second, our theoretical model allows to rationalize a business demand for credit which is derived from the firm's investment in "working capital". This is, typically, "short run investment". Hence, implicitly, the model yields a short run credit demand for businesses. On the other hand, government regulations prevailed in Chile during the time period under study. These dealt with the term structure of private foreign debt. These regulations biased private foreign debt towards medium/long term debt, and against short term (less than one year maturity) foreign debt. Nevertheless, financial intermediaries' domestic credit supply to the business sector–both, domestic currency and foreign currency denominated bank loans–was mostly concentrated on short term (less than one year) loans: about 78% on

average, during 1980-1982.[35] Therefore, the "short run nature" of the firm's credit demand function that our model yields, does not imply a serious limitation for applying such a model for these purposes.

Finally, our model assumes that the entire credit demand of firms corresponds to foreign-currency denominated debt. According to the information on sectoral indebtedness in Chile presented in Section II, the majority of business debt with financial intermediaries was denominated in foreign currency. Hence, such a simplifying assumption of the model, rather than representing a limitation, it captures the essential elements that ought to be highlighted in this analysis.

Recessions, devaluations, and business expectations

As argued before, the corresponding evidence clearly supports a **demand-driven** upward (downward) trend during 1980-1982 (1983-1986) for interest rates and bank credit. Hence, it must be the case that the explanatory variables shown in (11) behaved –on average[36]– in a way consistent with such a time path for $(b/x)^d$: increasing for 1980-1982, and decreasing thereafter. This, in itself, restricts the qualitative behavior of the "shift parameters" included in equation (11): π^e, $\sigma^2(F)$, and $E(\hat{e})$. Let us focus on only two of these, namely, businesses expectations concerning profit rates and the exchange rate.[37] Since π^e and $E(\hat{e})$ have opposite signs (partial derivatives) in equation (11), several combinations for the behavior of π^e and $E(\hat{e})$ through 1980-86 are in principle consistent with the said behavior in $(b/x)^d$. Nevertheless, we can reduce these "degrees of freedom" by using some anchor for $\pi^e(t)$. Thus, let us assume that π^e_{t+1} is positively correlated with the **actual** behavior of business profit rates at date t. Specifically, we will assume that $\rho(\pi^e_{t+j}, \pi^e_{t+j-1}) > 0$, $\forall\, j = 1, 2, \ldots$; where the parameter ρ stands for the correlation coefficient. Thus, for example, if π_t increases (decreases) then π^e_{t+1} increases (decreases) also. Furthermore, assume that π_t is positively correlated with the actual behavior of the corresponding growth rate at date t. Alternatively, one can assume that the expected growth rate in GDP for t+1, g^e_{t+1} (or π^e_{t+1}) is positively correlated with the actual percent change in investment at date t, $\hat{I}_t$, so that $\rho\,(g^e_{t+j}, \hat{I}_{t+j-1}) > 0$. This hypothesis asserts that if fixed capital investment accelerates in year t (i.e. its growth rate is significantly positive), there is a presumption that businesses expect a positive economic growth rate and profit rate for year t + 1. The sole purpose of these hypothesis is to be able to conjecture whether the Chilean 1982 recession (breaking point in time series of economic growth) was mostly unanticipated or anticipated, based on relevant information concerning private sector behavior in the years immediately before the year of the recession. Of course, these simple types of hypothesis can be used to conjecture about the sign (not absolute levels) of π^e and g^e only under the assumption of a **stable economic policy environment**. Such an assumption, although mostly valid throughout 1978-1981 in Chile, is invalid after the (June) 1982 Chilean devaluation: during 1983 crucial changes in economic policy took place, which affected the prospective evolution in economic activity from there on.

These simple hypothesis concerning $\pi^e(t)$ are enough to capture the following conjecture[38]. The private sector in Chile[39] expected an increasing trend in the level of economic activity, beginning 1980 on. Whatever the specific predictions about future output, these involved some positive growth rates for 1980, 1981, and 1982. This seems the only prediction consistent with the information then available: an average annual growth rate above 8% during 1977-1981, and a 5.5% growth in the year before 1982.[40] The latter rate, although below the preceding ones, is still quite significant, and in no way could anticipate the huge recession (–14.1%) that took place in 1982. In addition, investment and (per capita) private consumption grew at very significant (and increasing) rates during 1979-1981, the period immediately before the recession was materialized[41]. Altogether, this information suggests that the 1982 recession was mostly **unanticipated** by the private sector in Chile. This hypothesis is also consistent with the observed increasing trend in the firms' debt/output ratio immediately before the recession (see Figures 2 - 6, in Section II).[42] Of course, and by the same token, the 1982 recession alters businesses expectations concerning prospective profit rates: π^e drastically declines from 1983 on, thereby contributing to a reduction in $(b/x)^d$.

We next deal with exchange rate expectations, E(ê), the other "shift parameter" of our business credit demand function. It must be noted, however, that once our presumption about the behavior of $\pi^e(t)$ during 1980-86 is considered as a likely one, the conjecture about E(ê) is in a sense unimportant for the current analysis. Thus, for example, **if** E(ê) is positive (negative) during 1980-82 (1983-86), the effect of $\pi^e(t)$ on $(b/x)^d$ **must** prevail. Otherwise, it would be inconsistent with the (empirically supported) hypothesis that interest rates on bank loans were demand-driven throughout the entire time period. In spite of this, some other relevant data will be used to conjecture about the likely behavior of E(ê) throughout this period.[43]

The exchange rate in Chile was fixed by policymakers on June 30, 1979. This fixed exchange rate system was maintained until June of 1982.[44] At the same time, the stock of business debt with financial intermediaries denominated in foreign currency grew at annual rates of about 34% in 1980 and 65% in 1981, for the aggregate of the five economic activities previously specified. The latter rate more than doubles the one observed in 1981 for the corresponding domestic-currency-denominated loans. The private sector's net debt position in foreign currency increased substantially and progressively throughout 1979-1981, and its net asset position in domestic currency increased substantially. *It seems difficult to reconcile such patterns with rational behavior unless one asserts that the private sector in Chile believed the fixed exchange rate policy, and internalized such a policy as a permanent one.* Therefore, for the most part, the 1982 breakdown of the fixed exchange rate policy was, as of 1981, also unanticipated by the Chilean private sector.[45] As a by-product, the private sector suffered a huge capital loss in 1982.[46] After the June 1982 devaluation, two pieces of evidence seem particularly relevant. First, the structure of private sector's portfolio, between

domestic and foreign-currency denominated assets and liabilities, changes drastically, displaying the opposite pattern shown before 1982.[47] Second, the exchange-rate-policy breakdown in Chile did not consist of a once-and-for-all devaluation. Rather, a series of devaluations and exchange rate depreciations followed throughout 1983-86.[48] Both types of elements support the presumption of a positive E(ê) throughout 1983-86.

In sum, the following average behavior for the two "shift parameters" highlighted in our business credit demand function is consistent with both, a demand-driven time path for bank loan interest rates, and the corresponding additional information already discussed here: a) 1980-1982, the $\pi^e(t)$ was positive and increasing, whereas E(ê) was roughly equal to zero (up to the first semester of 1982); b) 1983-86, the $\pi^e(t)$ was negative and/or decreasing, whereas E(ê) was positive.

Let us apply now the theoretical set up of Section V. For convenience, we reproduce here equations (11) and (12) of the model:

$$\left[\frac{b}{X}\right]_t^d = F\underset{(+)}{[\pi^e_{t+1}}, \underset{(-)}{\sigma^2(F)}, \underset{(-)}{R_t^*}, \underset{(-)}{E_t(\hat{e})}] \tag{11}$$

$$\left(\frac{b}{X}\right)_t = \left(\frac{b}{X}\right)_{t-1} + \lambda\left[\left(\frac{b}{X}\right)_t^d - \left(\frac{b}{X}\right)_{t-1}\right] \tag{12}$$

and recall that $\pi^e_{t+1} = \dfrac{E_t X_{t+1} - \omega L_t}{I_t^{WK}}$ is the expected profit rate.

If the firm maximizes its (expected) profits at each point in time, the firm also maximizes its (expected) present value. In a dynamic setting, therefore, we can express the firm's desired debt/output ratio as a function of the entire time paths for the explanatory variables appearing in (11). Note that the firm's expectations concerning the future profit rates are affected by the expected time path for the growth rate in output, $E\{X_{t+1}/X_t\}_{t+1}^{\infty}$, where X_t is given by past decisions.[49]

Let us assume that before 1982 the firm's desired debt/output ratio was equal to the firm's actual debt/output ratio, at each point in time. Accordingly, such an equilibrium was consistent with some business expectations regarding exchange rate policy and output path. The business sector in Chile received new information in 1982, regarding both the prospects for economic growth and the exchange rate policy. As a consequence, businesses drastically changed their previous expectations about these two variables. In turn, this revision of expectations implied a reduction in these firms' desired debt-output ratios, $(b/X)^d$, from 1982 on. Thus, the equilibrium is disturbed in 1982: $(b/X)^d < (b/X)_0$. From 1983 on, what one observes thus corresponds to an adjustment process in the

business debt-output ratio towards a new equilibrium, which is below the one that prevailed in the neighborhood of 1982. This adjustment adopts the form of a lower demand for credit by firms.[50]

This means that a discrete "fall" in the firms demand for credit took place in 1982, and that the contemporaneous positive correlation between business credit demand and output that prevails before 1982 need not show up after 1982. In fact, one can rationalize the firm's demand for credit during 1982-1986 as including two different components. On the one hand, the component that is positively correlated with the level of economic activity. On the other hand, there exists another part of the credit demand function that responds to this downward adjustment in the firm's desired debt-output ratio, as specified by equation (12). The empirical evidence suggests the latter part was the dominant one in the aftermath of the huge recession and exchange rate policy breakdown in Chile.

VII. Conclusions and Some Closing Remarks

This analysis has shown that the path of the market bank loan interest rate in Chile throughout the 1980-1986 period was fundamentally demand driven. In order to reconcile such an interest rate behavior with the (positive) contemporaneous (expected) correlation between business credit demand and business output, however, we need to account for a drastic change in businesses expectations by the end of 1981-beginning of 1982. Such a shift in private expectations was motivated by the presence of "new information," triggered by a violent interruption of the economy's sustained output growth path, and by a major exchange-rate-policy breakdown. Both of these events –mostly unanticipated– altered the credit demand function in an essential way: the pre-1982 and post-1982 credit demand functions are in a sense non-comparable, as they incorporate entirely different sets of expectations about the economy's output and exchange rate paths.

Some implications deserve to be emphasized. On the one hand, econometric modelling and testing of credit demand (and interest rate) behavior during time periods such as the one examined in this paper is, to say the least, quite troublesome.[51] On the other hand, within such unstable economic environments, policymakers should be extremely careful when using interest rates as monetary policy targets or "indicators": the implicit assumption of a "stable credit demand function" may not represent an adequate assumption. In particular, businesses demand for credit may or may not display a positive contemporaneous correlation with economic activity. The sign of such a correlation crucially depends upon the presence of an "expectational equilibrium" which locks the firm's desired debt/output ratio to the actual ratio. Whether or not such an equilibrium is disturbed depends upon the nature of the shocks –anticipated or unanticipated. The example

discussed in this paper shows how unanticipated shocks can drastically change the contemporaneous correlation between businesses demand for credit and economic activity.

Many Latin American Countries (in Central America, Mexico, Peru, Bolivia, etc.), as well as some formerly socialist European countries, are currently undertaking major economic policy reforms. These reforms involve profound departures from the traditional interventionist role of the government in these economies, and an increasing role for free private markets as the central entities for relative-price-determination and resource allocation in the economy. Such a contemporary economic policy trend presents very close similarities to the Chilean laissez-faire economic policy reforms since mid 1970s through the 1980s. As it was the case in Chile during the implementation of these reforms, policymakers will be dealing –in many cases, for the first time– with market determined monetary policy "indicators", such as bank interest rates and credit. Although not necessarily all these policy reforms need to pass through a crisis as acute as the Chilean crisis of 1982-1983, one cannot disregard the possibilities of future recessions and exchange-rate-policy breakdowns in these other countries.[52] In this sense, this paper is a timely one for policymakers in many LDCs, as well as for those interested in empirical research concerned with credit market behavior during turbulent economic environments.

THEORETICAL APPENDIX

Using equations (6) and (7) in the value function, we can form the following Lagrangean:

$$\mathcal{L} = G\left\{E_t\,\tilde{\mu}\,I_t^{WK} - (1+r)\frac{B_t}{P_t},\ \sigma^2(\tilde{\mu})\,(I_t^{WK})^2\right\} + \lambda_t\left(\frac{P_t^{WK}}{P_t}I_t^{WK} - \frac{B_t}{P_t}\right)$$

The first-order conditions relevant for the investment choice and credit demand are:

$$\text{(i)}\quad E_t\,\tilde{\mu}\frac{\partial G}{\partial E_t F_{t+1}} - 2\,\sigma^2(\tilde{\mu})\,I_t^{WK}\left\{\frac{\partial G}{\partial \sigma F_{t+1}}\right\} + \lambda_t\frac{P_t^{WK}}{P_t} = 0$$

$$\text{(ii)}\quad -(1+r)\frac{\partial G}{\partial E_t F_{t+1}} - \lambda_t = 0$$

Substituting the value for λ_t obtained in (ii) into (i), and solving for I_t^{WK}, yields:

$$(A_1)\quad I_t^{WK} = \left[\frac{\partial G/\partial E_t F_{t+1}}{\partial G/\partial \sigma (F_{t+1})}\right]\left[\frac{E_t\,\tilde{\mu} - (1+r)\,P_t^{WK}/P_t}{2\sigma^2(\tilde{\mu})}\right]$$

where the first parenthesis in (A_1) corresponds to the marginal rate of substitution (MRS) between expected net cash flows and risk of the cash flows. We will assume this MRS is a given constant, γ.

Using equation (8) to substitute for P_t^{WK}/P_t above we get:

$$(A_2)\quad I_t^{WK} = \frac{\gamma}{2\sigma^2(\tilde{\mu})}\left[\left(E_t\,\tilde{\mu} - \frac{W_t}{P_t}n\right) - r\,\frac{W_t}{P_t}n\right]$$

where the last term in (A_2) corresponds to the one-period real rate of interest, times the relative price of working capital.

Define $\omega_t \equiv W_t/P_t$ as the real wage rate. Use equations (2) and (3) to substitute in the first term in parenthesis in (A_2), and use equation (7) to express $\sigma^2(\tilde{\mu})$ in terms of the variance of the firm's cash flows. This procedure yields the following expression:

$$(A_3)\quad I_t^{WK} = \frac{\gamma}{k\,\sigma^2(F)}(\pi^e_{t+1} - r\,\omega\,n)$$

where $\pi^e_{t+1} \equiv \dfrac{E_t X_{t+1} - \omega L_t}{I_t^{WK}} \equiv$ expected profit rate; and k is a positive constant.

Equation (A_3) yields the following (general) short-term investment function:

$$(A_4)\quad I_t^{WK} = I(\pi^e_{t+1},\ \sigma^2(F),\ r,\ \omega,\ n)$$
$$(+)\quad (-)\ (-)\ (-)\ (-)$$

Expression (A_4) states that the firm's short-run investment function depends **positively** on the expected profit rate, π^e_{t+1}, and **negatively** on: i) the variance of the project's cash flows (which also equals the variance of the profit rate); ii) the short-run (one-period) real rate of interest; iii) the real wage rate; and iv) the labor coefficient per unit of goods in process.

Given the specification of the production technology in this model, equation (2) of the model together with (A_3) also yields an analogous general form for the firm's labor demand:

$$(A_5)\quad L_t^d = L^d(\pi^e_{t+1},\ \sigma^2(F),\ r,\ \omega,\ n)$$
$$(+)\quad (-)\ (-)\ (-)\ (-)$$

The firm's financial constraint, equation (10), has to be satisfied with equality in equilibrium. Therefore, equation (A_3) determines the following demand for credit, as an implicit function of the firm's short-run investment function:

$$(A_6)\quad \left[\frac{B_t}{P_t}\right]^d = \omega\,n\,I_t^{WK} = \omega\,n\cdot\Psi(\pi^e_{t+1},\ \sigma^2(F),\ r,\ \omega,\ n);$$ which can also be written as:

$$(A_7)\quad \left[\frac{B_t}{P_t}\right]^d = b(\pi^e_{t+1},\ \sigma^2(F),\ r,\ \omega,\ n)$$
$$(+)\quad (-)\ (-)\ (?)\ (?)$$

The firm's credit demand in this set up equals the variable production costs which, in turn, equals the firm's labor costs. The response of the firm's labor expenses whenever real wages change, depends upon the wage-elasticity of the demand for labor. Hence the ambiguity in the signs for the response of the firm's credit demand to changes in the real wage (and labor coefficient). If, for example, the demand for labor is inelastic, then an increase in the real wage will raise the firm's labor expenses, and therefore, increase the demand for credit.

Let us simplify, and omit ω and n in (A_7). Instead, substitute the real rate of return r by using the relationships in (4.A) and (4.B) of the model, as:

$$(A_8)\quad \left[\frac{B_t}{P_t}\right]^d = b\ [\ (\pi^e_{t+1},\ \sigma^2(F),\ R_t^*,\ E_t(\hat{e})\ ]$$
$$(+)\quad (-)\ (-)\ (-)$$

In equilibrium, the firm's financial constraint (10) has to be satisfied with equality. Use equations (10) and (8) into (3). We can then rewrite (A_8) as a "desired debt-output ratio", $(b/X)^d$, in which debt is dated at time t and output at t+1. This desired ratio is of the same general functional form as (A_8). Thus:

$$\left[\frac{b}{x}\right]^d_t = F\ [\ (\pi^e_{t+1},\ \sigma^2(F),\ R_t^*,\ E_t(\hat{e})\ ] \qquad \text{which is equation (11) of the text.}$$
$$(+)\quad (-)\ (-)\ (-)$$

EMPIRICAL APPENDIX

A. VOLATILITY OF GNP GROWTH RATES: 1971-1990

Developed Countries	Average	Lowest	Highest	Standard Deviation	Variability Coefficient (V.C.)
United States	2.70	–2.20	6.20	2.30	0.85
Canada	3.78	–3.20	7.70	2.43	0.64
Japan	4.37	–0.80	8.40	1.92	0.44
England	2.34	–2.20	7.40	2.44	1.05
France	2.83	–0.30	5.40	1.50	0.53
Germany	2.48	–1.30	5.50	1.97	0.80
Average V. C.					0.72
Latin American Countries					
Argentina	0.88	–6.60	7.30	4.35	4.94
Uruguay	1.82	–9.40	8.90	4.45	2.45
Brazil	5.08	–4.40	13.50	5.30	1.04
Peru	1.65	–12.60	9.30	6.27	3.81
Chile	3.02	–14.10	9.90	6.96	2.31
Mexico	4.13	–4.20	9.20	3.91	0.95
Average V. C.					2.58

Source: Based on information appearing in *International Financial Statistics*, Yearbook 1995, IMF, Washington DC, USA.

B. GROWTH AND REAL INTEREST RATES IN CHILE
(Quarterly Figures)

	1981		1982		1983	
	Δ% GDP	R_L	Δ% GDP	R_L	Δ% GDP	R_L
I Q	8.6	12.24	–8.1	17.35	–8.0	11.49
II Q	9.5	14.15	–13.0	20.06	–2.3	10.15
III Q	9.7*	14.27	–19.0	17.74	2.0	9.50
IV Q	–4.6*	16.31	–16.1	11.77	6.4	8.99

Δ% GDP ≡ Percent change on Gross Domestic Product
R_L ≡ Ex-ante real rate of interest on bank loans (indexed loans). These quarterly weighted averages are plotted in Figure 1, panel B.
* Note the drastic change from the third to the fourth quarter, 1981.

C. BEHAVIOR OF NOMINAL EXCHANGE RATES IN CHILE: 1979-1986
(Chilean Pesos per US Dollar)

Since July 1979: fixed at $ 39, up to May 1982.

	June	July	Aug.*	Sept.	Oct.	Nov.	Dec.
1982	43.02	46.65	55.34	63.04	66.27	69.19	72.39

	1983	1984	1985	1986
Averages	78.79	98.48	160.86	192.93

* Beginning August 5, the Central Bank of Chile allowed the exchange rate to float.

Sources: National Accounts of Chile and *Monthly Bulletin* - Central Bank of Chile. (For tables B and C).

D. INVESTMENT AND PER-CAPITA PRIVATE CONSUMPTION IN CHILE

	1978	1979	1980	1981	1982	1983
$\Delta\%I_T$	23.4	29.1	30.4	17.3	–56.9	–22.0
I/GDP	14.5	15.6	17.6	19.4	13.8	12.1
Δ%C/N	5.7	4.7	5.0	8.9	–12.4	–6.3

$\Delta\%I_T$ ≡ Annual percent change on total gross investment, at constant prices.
I/GDP ≡ Annual fixed capital investment rate.
Δ%C/N ≡ Annual percent change on per-capita private consumption, at constant prices.

Source: Based on *National Accounts of Chile, 1974-1985*. Central Bank of Chile.

E. ANNUAL PERCENTAGE CHANGES IN GDP AND EXCHANGE RATE: CHILE

	1979	1980	1981	1982	1983	1984	1985	1986
GDP	8.3	7.8	5.5	–14.1	–0.7	6.3	2.4	5.7
ê	15.2	0.0	0.0	85.6	20.3	45.0	44.6	11.6

Source: Indicadores Económicos y Sociales (Social and Economic Indicators), 1960-1988. Central Bank of Chile
Note: ê = percentage change in the nominal exchange rate from December to December (Chilean Pesos per US Dollar). Policymakers in Chile announced and implemented a fixed exchange rate system, effective June 30, 1979. This fixed exchange rate system ended in June, 1982.

Notes

[1] Presumably, this is due to the high instability of economic policies in LACs, and its profound effects on the structure of the economic system. For some evidence on this, see Mena (1995a).

[2] México went through a huge recession in 1995, which was also accompanied by an exchange-rate-policy breakdown (Dec. 1994).

[3] If the policy changes were anticipated, then the behavior of the corresponding time series will be affected even **before** the policy changes are materialized. This we know at least since Lucas' (1981) piece.

[4] See Lucas (1981). Also, see Maddala (1977). These models become quite complicated whenever we require estimation of simultaneous equations (supply/demand, for example).

[5] This type of situation is not unique to the particular episode we wish to analyze in this paper for the Chilean economy. Rather, it is a common situation encountered in Latin American countries.

[6] Note that in this type of methodology for empirical analysis one needs to be much more careful when choosing the "right assumptions" of any given theoretical model, since the model itself (its implications) is not econometrically tested.

[7] See, for example, Edwards and Cox (1987, esp. pages 81-88), Ramos (1986, esp. chapter 8), and Arellano (1985).

[8] See, for example, Dornbusch (1983), Obstfeld (1986).

[9] See, Sanyal and Jones (1982).

[10] Empirical support for this theoretical approach, for a sample of 52 countries, appears in Mena (1997).

[11] See Jones and Purvis (1983).

[12] This Section draws on Mena (1995b).

[13] This approach implies that, for a small economy the stocks of domestic credit and bank deposits are determined **both** by supply and demand conditions. On the contrary, "interest-rate-parity-models" imply that such stocks are demand-determined.

[14] Of course, in the "real world" one does observe some (few) exceptions: typically some large corporations (this is **business credit**, however; it does not represent **consumer credit**, as is usually assumed in open-economy models). For these exceptions, it must be the case that the benefits of short-circuiting the process by trading directly (or skipping the "local banks") outweighs the corresponding costs. But for the **bulk** of the business sector, and certainly for the households (consumers), Chart 2 best illustrates the most common "pattern of trade" in the world financial market.

[15] This parallels the strategy followed in Sanyal-Jones (1982) for international trade in commodities: traded assets (traded goods) represent "middle assets" ("middle products"); "final assets" (final goods) are all non-traded. Endogeneizing such a pattern of trade for financial assets boils down to explaining–within a general equilibrium framework–why do financial intermediaries exist. Although related, this is certainly a different issue, and is therefore not modelled here. The author is currently engaged in a (joint) research project on this issue.

[16] Thus, for example, an increase in the local banks' borrowing costs, either with the Central Bank (open market operations) or with the outside world (triggered by exogenous increases in world interest rates and/or in the country-specific borrowing risk premium) will raise the local banks' cost of funds, thereby affecting their domestic credit supply.

[17] Two interest rates are plotted; for bank loans of: i) a less than 30-day-term, and ii) a 30 to 89 day-term. Altogether, these two different terms represent about 95% of the total non-indexed bank loan operations during this period (the said percentage displays extremely low variability throughout 1980-1986).

[18] Interest rates for 90 to 365 day-term are plotted. This term captures about 85% of the total indexed bank loan operations during this period (the percentage is slightly higher for 1980-82, and slightly lower for 1983-86).

[19] The highest ex-ante real interest rate in the Chilean bank loan market amounted to 23.07 percentage points per year, and was reached in July, 1982.

[20] Since 1975, financial institutions in Chile are free to set lending and deposit interest rates.

[21] The implied difficulties of "structural instability" for macroeconometric testing in LACs are examined in detail in Mena (1995a).

[22] Corporate bonds and common stock are insignificant sources for private business financing in LACs.

[23] An Austrian specification of the firm's technology would be consistent with such a scenario. An explicit treatment appears in Section V.

[24] Total bank liabilities can be decomposed into domestic and foreign sources. The impact of monetary policy (open market operations) on bank liabilities is subsumed in the domestic sources of bank financial resources.

[25] Except for agriculture. This sector's debt/output ratio reaches its peak one year later (1983). Presumably, this is because of the special lags typically involved in the agriculture technology of production.

[26] By the end of December 1981, these five sectors held about 60% of their total debt with financial intermediaries, as foreign-currency-denominated debt (Source: same as of Table I.)

[27] See, for example, Weizsäcker (1971).

[28] Given our implicit theoretical framework for international trade in financial assets (Section II of this paper), condition (4.A) should **not** be interpreted as a traditional "interest rate parity" condition: B^* is a **domestic** bank loan which is denominated in foreign currency units. The fact that R^* is exogenous is consistent with the assumption of a perfectly competitive **domestic** credit market.

[29] Note that, since we assumed that the period of production is equal to 1, **current** output is **given**.

[30] Detailed information on this can be obtained from the Central Bank of Chile's monthly bulletin. See, the tables on *Financing Sources and Uses of Bank Credit.*

[31] Thereby suggesting that the income elasticity of business credit demand represents a time-varying parameter.

[32] Section II of this paper dealt explicitly with this issue.

[33] The effects on the domestic credit market of the increase in the **international** borrowing rate relevant for the Chilean economy (LIBOR + surcharge) during 1979-1981 are therefore already included (implicitly) in the behavior of the Chilean banking system credit supply to the non-financial private sector.

[34] These figures can be obtained from the *Monthly Bulletin*, Central Bank of Chile, April 1985 ("Foreign Borrowing Pursuant to Art. 14 - Foreign Exchange Law").

[35] These figures can be obtained from information included in the *Monthly Bulletin* and in *Síntesis Monetaria y Financiera* (various issues), Central Bank of Chile.

[36] It is important to emphasize that this analysis deals with annual averages (trends). Thus, expectations are to be defined as "average" expectations during a given year t, so as to forecast next year's (t+1) "average" behavior of a given variable: based on information available at year t.

[37] Presumably, the variance of the firm's cash flows, $\sigma^2(F)$, was perceived as decreasing (increasing) throughout 1979-82 (1983-86), thereby working in favor of the actual path for $(b/x)^d$ throughout the entire period.

[38] Of course, these are only **conjectures**. Strictly speaking, it is impossible to **prove** whether the 1982 recession in Chile was anticipated or unanticipated. A necessary (though not sufficient) condition for such a "proof" is to have a convincing (and testable) story about the (-14%) Chilean recession of 1982, based on a theory (model) of economic growth. As of today, such a necessary condition has not been accomplished.

[39] Specifically, the first five sectors of economic activity identified in Table IV.

[40] The same pattern can be observed if quarterly data is considered instead. The recession in Chile started in the last quarter of 1981 (see quarterly data presented in Empirical Appendix). But the 1981 scenario consisted of very high GDP growth, and accelerated quarterly growth rates. The economy turned from a 9.7% growth rate in the third quarter, to a –4.6% in the fourth quarter.

[41] See Table D in Empirical Appendix.

[42] Otherwise, in 1981 businesses would have **reduced** $(b/x)^d$ due to a negative π expected in 1981 for 1982. But, if so, this would be **inconsistent** with the (already examined) evidence, which supports a demand-driven upward trend in the bank loan interest rate up to 1982 (the "peak").

[43] Given the underlying theoretical framework for international trade adopted here –as specified in Section II of this paper– such relevant data will obviously exclude empirical evidence on PPP

comparisons between domestic and foreign inflation rates. Such PPP comparisons are irrelevant under this theoretical framework. Details can be found in Jones and Purvis (1983).

[44] This means that the exchange-rate-policy breakdown in Chile was materialized three quarters after the recession began. For detailed information on this, see Empirical Appendix.

[45] This statement should be taken literally: **as of 1981**, the evidence examined here suggests that the Chilean private sector had not anticipated the June 1982 devaluation. Whether such a devaluation was (or was not) "somewhat anticipated" a day, a week, or three weeks before, is **irrelevant** for this analysis (only annual **trends** matter here). Of course, the "new information" received by the private sector in June 1982 and immediately thereafter –further exchange rate depreciations, shrunk in foreign credit to Chilean banks, increase in foreign interest rates, reduction in international reserves– all conspired towards a **positive** $E(\hat{e})$ throughout the second semester of 1982 and thereafter.

[46] Recall that by the end of 1981, about 60% of the total debt with financial intermediaries held by the five economic activities identified in Table IV, represented foreign-currency-denominated debt.

[47] Its debt position in foreign currency declines substantially and progressively during 1983-86, and its assets position tends to switch from domestic towards foreign currency. Detailed information on this can be obtained from the Central Bank of Chile's Monthly Bulletin, and Monetary Synthesis. See especially the tables on "Financing Sources and Uses of Bank Credit".

[48] For details, see Empirical Appendix.

[49] Recall that the production function, equation (1) of the model, determines **next period's** output (and hence, implicitly, determines the growth rate).

[50] This is similar to the adjustment in the capital stock that follows a reduction in a firm's investment demand in a simple neoclassical set up. In fact, equation (12) assumes a **gradual** adjustment process for the firm's debt/output ratio.

[51] This, of course, is nothing but another example of the well know "Lucas' critique" (see Lucas, 1981.) But the implications of "structural instability" for econometric testing in LACs may go beyond the "Lucas' critique". On this issue, see Mena (1995a).

[52] Mexico is a current example. The collapse of the (semi) fixed exchange-rate-system in December 1994 meant a 150% depreciation of the Mexican Peso in about eleven months. Estimates for the 1995 decline in GNP yield about –7%.

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