



5-1994

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Max Proano '94

Illinois Wesleyan University

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ILLINOIS WESLEYAN UNIVERSITY

**INVESTMENT AND INTEREST RATES IN ECUADOR
DURING 1970 - 1990**

Max Proano

May, 1994

1. INTRODUCTION

Today, several less developed countries are implementing liberal economic policies, such as privatization of state-owned services, reduction and elimination of tariffs and trade barriers, creation of well-developed capital markets, and openness of the economy to foreign capital, among others. Their main purpose is to achieve rapid economic development, just as Mexico, Chile, and Argentina successfully have done recently. One of these countries is Ecuador, where the new conservative government is implementing these policies. This study is motivated by the author's desire to determine how financial and monetary policy in Ecuador influence its economic development. In order to understand the effects of these policies, it is important to analyze what theory predicts, past experiences and the structure of the Ecuadorean economy.

It is generally recognized that there are four essential functions of a financial system, and that each of these functions is an important determinant of economic growth:

- Provide a medium of exchange
- Provide financial intermediation
- Distribute the risk
- Establish a set of policy instruments

This research project focuses on the financial intermediation function by exploring how the Ecuadorean financial system affects the level of fixed investment in plant and equipment. Particularly, the project covers the relationship between investment and interest rates

in a small open economy, such as Ecuador. This topic is important because investment in plant and equipment is a well known determinant of economic growth, and it is financial intermediating which moves financial resources from savers to those who invest in plant and equipment. The interest rate is one of the important costs of investing.

The objective of the project is to demonstrate that in the case of Ecuador the relationship between investment and the interest rate is different from what is generally believed. Normally, macroeconomic textbooks teach that investment is inversely related to interest rates and it is a linear relationship. But the relationship between investment and interest rates, for the case of a small open economy, such as Ecuador, when the financial system is repressed¹ is rather parabolic. Either lower or higher levels of interest rates discourage investment. Lower levels of interest rates discourage investment because there will be an outflow of financial capital from the small open economy leaving little domestic savings for investment. Of course, higher levels of interest will also discourage investment, because they imply a high cost to businesses which are considering investing in new plant and equipment. The theory suggests that there must be an intermediate range of interest rate which stimulates the most investment.

The least squares regression method is used to build a statistical model to test the hypothesis, that there is a parabolic relationship between Ecuadorian investment and interest rates. Time

¹if governments tax or otherwise distort their domestic capital markets, the economy is said to be financially repressed.

series data from 1970 to 1991 are used in the regression. Most of the data are collected from the International Monetary Fund, and "Cuentas Nacionales del Ecuador".

The first part of the paper contains general information about the Ecuadorean economy. It describes the economic structure and its present outlook. In the second part, the theoretical model is created. A model for the relationship between investment and interest rates is built under the microeconomic model of supply and demand of loanable funds in the Ecuadorean economy. The third part explains the empirical model along with the variables and proxies used, and the results. Finally, the end of the paper is dedicated to conclusions and comments for further studies.

2. BACKGROUND

Before beginning the theoretical and empirical analysis it is helpful to present information about trends in the Ecuadorean economy and to describe the state of the Ecuadorean financial system. This background information is necessary to understand the effects that government regulation and international market forces will have on domestic interest rates and investment.

2.1- THE ECUADOREAN ECONOMY

Ecuador, a South American country located at the north west of the continent, is a developing country that which like other LDCs, was trying to achieve growth in the 90s. Actually, Ecuador is engaged in a

process of liberalization of its economy. However, there are huge structural and conjectural problems that hinder the economy from progress. Among the most important are the wide range of price fluctuations for the commodities that Ecuador exports, the huge external debt burden, political instability, and the lack of an efficient and effective financial system to provide the private sector with long term credit.

During the past couple of decades, several serious problems have arisen in Ecuador. Since 1970 it has depended on its oil production to foster growth. Around 60% of all Ecuadorean exports come from oil production. Unscrupulous administrations have left Ecuador with one of the largest external debt per capita in the world today, around \$1200.00 per capita (Price Waterhouse, 1992). The rest of exports come from primary products that, as well as the oil, depend on international market prices. Among these exports there are flowers, shrimp and bananas. Second, Ecuador suffered from economic policies which greatly increased government intervention. Thus, the public sector became a costly and inefficient burden for the country, and Ecuadorean industry lost competitiveness due to government protectionism. Industries were heavily protected from competition and granted many benefits. However, most industries are not heavily integrated and depend on foreign supply of raw materials. Third, economic recession and limited import capacity stunted the growth of industry (A.I.D., 1985).

During the studied period, from 1970 to 1990, unemployment and underemployment have risen constantly, even more in the late 80's, as economic conditions forced a large part of the economically

active population to turn to the informal economy (Price Waterhouse, 1992). The latest macroeconomic data (1992) show unemployment at 14.7 % and underemployment at 50 % of the labor force.

Since the late 1980s the new administrations have tried restructuring the economy with more liberal economic policies such as privatizing public sector firms, reducing tariffs, changing labor laws, fostering foreign investment, and liberalizing and developing financial markets.

2.2. THE ECUADOREAN FINANCIAL SYSTEM.-

The Ecuadorean financial system includes the Central Bank of Ecuador, state development banks, private commercial banks, foreign bank branches, and public as well as other private financial institutions. All these entities are governed by the General Bank Law and various complementary regulations.

There are 32 private commercial banks in Ecuador, plus three foreign bank branches. In general, the financial sector in Ecuador is very segmented; institutions are limited in what they can offer. Aside from banks, financial institutions include finance companies, leasing companies, factoring companies, and foreign exchange houses. Through separate legal entities, most of those companies belong to only a few investors.

The financial system has traditionally been extremely regulated and heavily dependent on the Central Bank. However, over the past few years, deregulation and a reduced role for the Central Bank have spurred competition and development of services.

The Central Bank is an autonomous state institution responsible for directing monetary and credit policies, regulating the exchange markets, and administering the internal and external monetary resources through credit mechanisms and serving as comptroller of commercial bank reserves.

Commercial banks are the largest financial institutions in the country; they offer a full range of banking services including checking accounts, saving accounts, short-and-medium-term financing, foreign currency trading, income tax collection, and other foreign currency transactions².

There are several special-purpose banks owned by the state. Most of these are engaged in economic development programs that receive support from international organizations. During the analyzed period, the majority of these banks have usually presented losses in their balances due to the high rate of credit default of their clients³.

Complementing the services offered by commercial banks is a wide range of financial institutions. Other financial institutions provide medium- and long term credit to industrial, commercial and agricultural enterprises. Finance intermediaries provide specialized services in financial markets, generally by acting as brokers or discounting third-party paper. Leasing and factoring are rapidly growing activities in the Ecuadorean market. Finance leases are treated as operational for tax purposes. Leasing is used primarily as a

²A substantial part of the Ecuadorean external debt comes from the bearing by the Central Bank of part of the default loans in US dollars from private banks .

³Most of the loans were made to small farmers and speculators at a subsidized interest rate. Thus, almost all these loans default either because of catastrophes or because they were spent on consumption rather than investment.

mechanism to finance purchases of assets, because of the absence of other sources of credit.

There are two stock exchanges in Ecuador, one in Quito and the other in Guayaquil. They deal mostly in government securities and other long term fixed-income securities. Stock transactions are extremely limited, accounting for less than 1% of the total trade of the exchange. Most trading of securities is done by banks in the repo market, outside the exchanges.⁴ Obviously, the securities market is grossly underdeveloped. The largest buyers and sellers are usually government institutions.

At present, in Ecuador there are no investment institutions such as mutual funds, pension funds or other investment companies. In addition, the foreign exchange market is made up of commercial banks, finance institutions and other authorized exchange agents. This market is very active; annual trading counts for 60% of GDP. The most widely traded currency is the US dollar (Price Waterhouse, 1990).

2.3. INVESTMENT IN ECUADOR.

A serious constraint on investment in the country is the lack of a well functioning credit system. There is a complete lack of medium- and long-term credit, primarily due to inflationary risk inherent in such operations.

⁴The trading of securities is done more as over the counter transactions, among treasuries of commercial banks.

Most of the credit is offered only to finance working capital - 90 days maximum- in limited amount. Usually, high collateral requirements for borrowing firms make even more difficult their access to credit.

In general, investment in Ecuador suffers from various inefficiencies. The following model tries to give a theoretical explanation for this phenomenon.

3.- THEORETICAL MODEL

3.1. DEFINITION OF INVESTMENT.-

At a macroeconomic level, investment (I) is one of the components of Gross Domestic Product (GDP). GDP is equal to :

$$GDP = C + I + G + (X-M) \quad (1)$$

where :

C: Consumption

I: Investment

G: government spending

X-M: Net exports

Investment is the most volatile component of GDP. Usually, investment is divided in : Business fixed investment, residential investment, and inventory investment (Mankiw,1990). However, for the purpose of this project only business fixed investment is going to be studied.

3.2. THE MODEL

In order to explain the relationship between investment and interest rates, a theoretical model has to be built. For the case of Ecuador, the model represents a small open economy. The horizon of the study is the short-run. The assumptions of the model are:

- There is one country, with a small open economy, and the rest of the world.
- There are two markets for lending funds : internal and external, both linked to each other.
- The real interest rate (r) within the country is variable. The interest rate abroad (r^*) is considered fixed. It isn't affected by capital flows from or to the small country .
- In the internal market the supply and demand for funds are stable functions in the short-run. This means, *ceteris paribus*, that the quantity supplied and the quantity demanded will change only with changes in the internal interest rate, because the other factors will remain constant in the short run.
- The exchange rate in the country is regulated by the government.

3.3. THE MARKET FOR LOANABLE FUNDS

Given these assumptions, the supply of loanable funds (S) and the demand for loanable funds (D) are expressed as:

$$S = f (r: e, r^*, M_2)$$

where:

e: real exchange rate

M₂: supply of money in real terms

r: real domestic interest rate

r*: real international interest rate

The supply of loanable funds will come from the private sector, government sector, and foreign sector. This supply will depend on: internal real interest rate, exchange rate, international interest rate - assumed fixed-, and money supply. In the short-run, it is assumed that all of the variables except for r are fixed. Basically, the quantity of loanable funds supplied depends on internal real interest rates. Following the literature, it is assumed that the supply of loanable funds is a positive function of r. The higher the real interest rate, the higher the opportunity cost of holding money for individuals. They will be more eager to save. Thus, the slope of the curve is positive - refer to figure #1. Movements of the line will depend on changes in factors besides r such as Central Bank determined money supply, international interest rates, and exchange rates. However, these variables are assumed fixed for this short-run model. Later on, some of the assumptions regarding these variables will be relaxed.

$$D = f(r: e, r^*, MgP(k), GDP(t-1)) \quad (2)$$

where:

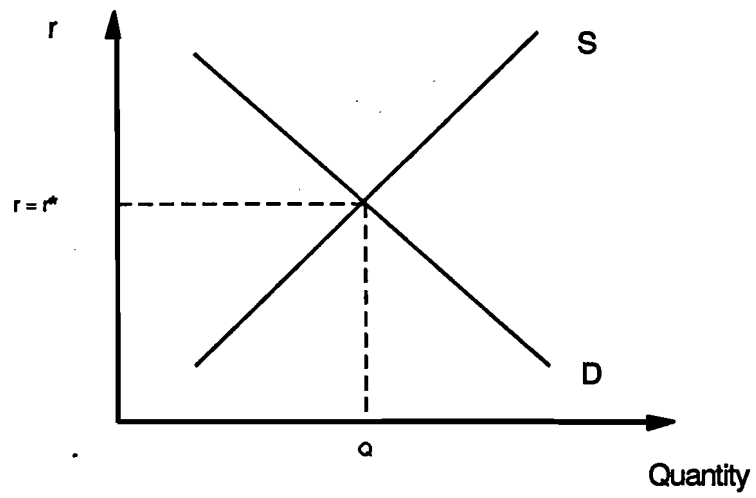
MgP(k): the marginal productivity of capital

GDP(t-1): Growth in GDP over the previous year.

The demand for loanable funds is determined by the internal real interest rate, the real exchange rate, international real interest rate, the marginal productivity of capital (Mankiw 1990), and growth in the previous period. A higher real interest rate represents a higher opportunity cost for the investor, and thus the amount of resources demanded will be smaller. If real interest rate is low, there will be a larger demand for funds. This is shown in figure #1, where the demand for loanable funds has a negative slope. Movements of the curve will be mainly caused by changes in e , r^* , and GDP. These variables are assumed to be fixed for the short run model.

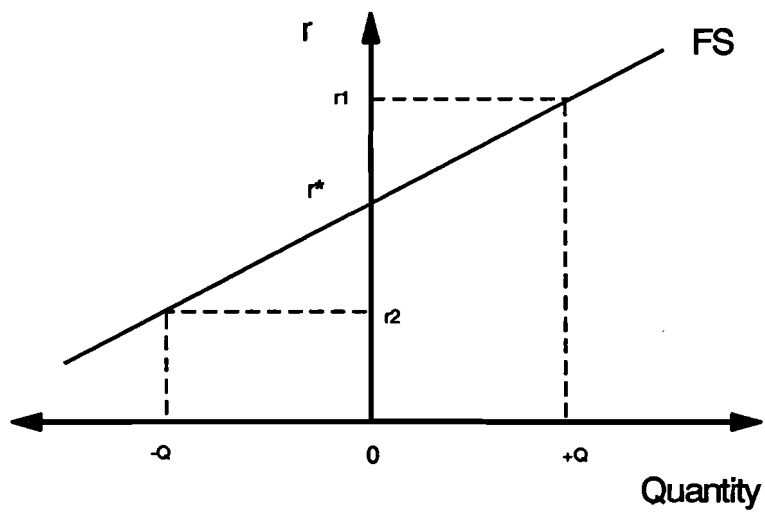
A major argument of this paper is that investment in fixed plant and equipment comprises the market for loanable funds illustrated in figure #1. Either the demand or supply of loanable funds can influence investment depending on the level of domestic real interest rate, r .

GRAPH #1



LOANABLE FUNDS MARKET

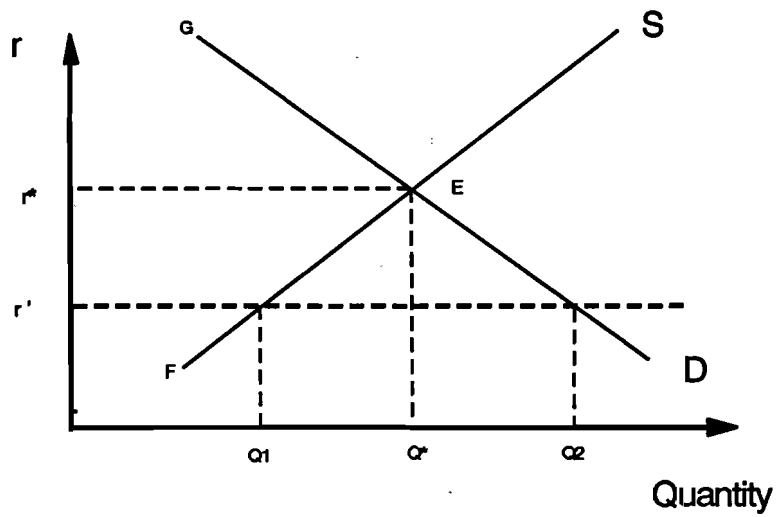
GRAPH #2



INTERNATIONAL CAPITAL FLOW

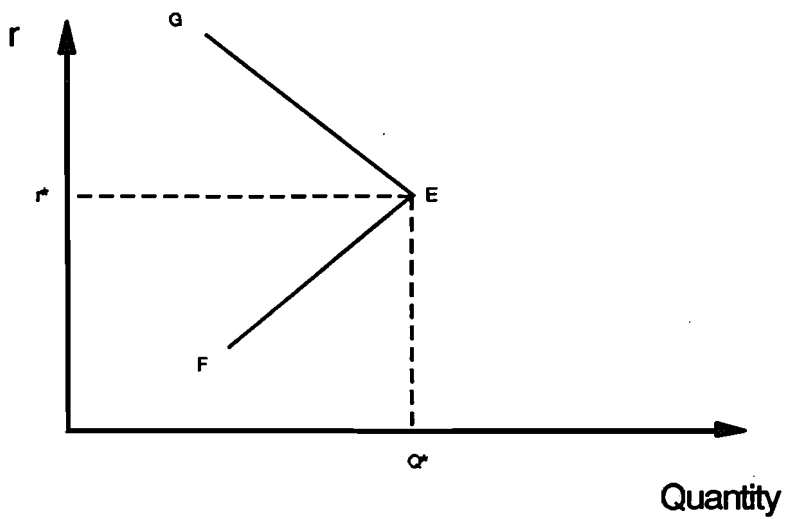
To begin our analysis, assume that $r^* = r$ and that r^* is fixed at the level which would create equilibrium in the internal market for loanable funds. Now, r will be allowed to vary while r^* is held constant in order to see how internal loanable funds markets are affected. If by any external shock or government regulation the internal real interest rate moves from equilibrium, imbalances in the quantity of loanable funds demanded and supplied arise. When r is higher than r^* , the market will have more funds supplied due to external capital inflow, and more domestic savings. At the same time national investors will drop projects with lower rate of return. This excess of funds and reduction in quantity demanded will force r to go down, until equilibrium is reached again. The same way, when r is lower than the international interest rate, a capital outflow arises. This creates a higher demand for funds and a lower supply due to a capital outflow. This effect is explained in figure #2 with the net supply of lending by foreigners. At values of r lower than r^* , foreigners will borrow rather than lend, so a capital outflow will occur. The opposite will occur if r is higher than r^* ; foreign savings will flow in.

GRAPH #3



LOANABLE FUNDS MARKET WITH GOV. INTERVENTION

GRAPH #4



FUNDS INVESTED THROUGH THE MARKET

3.4. GOVERNMENT INTERVENTION.-

Now, in the particular case of the small open economy when the government puts a ceiling on r , which is lower than r^* .⁵ The internal rate of interest imposed by the government r will create an imbalance, as figure #3 shows. The amount of loanable funds demanded is much higher than the amount supplied at r . This disequilibrium comes from two causes. Some national savers have the possibility of investing at a higher interest rate abroad. This outflow leads to a reduction of loanable funds available for domestic investment. The second cause is that the quantity demanded for loanable funds increases due to the reduction in the cost of capital. If there would not be any ceiling rate, r would tend to rise in order to attract capital. The ceiling rate does not allow a smooth functioning of the market, instead it hurts the loanable funds market leaving an unsatisfied demand. And even more harmful, this ceiling rate will affect the quality of the use of the scarce loanable funds. This unsatisfied demand is fulfilled by international capital flows brought through the government borrowing from international financial organisms, such as the World Bank, and also from the international private banking system, but in the medium-run.⁶ However, a logical inference would be that this unsatisfied demand could be filled by

⁵ It was very common that governments of developing countries, in the decade of 60's and 70's, tried to foster internal investment by subsidizing the cost of capital. Their objective was to promote growth from inside. This economic doctrine was known as the import-substitution model, closely associated with the U.N. Economic Commission for Latin America (ECLA).

⁶ Particularly in the case of Ecuador.

borrowing from abroad. There are two main factors that invalidate this argument. First, because the model is based on a developing economy, there is a lack of information in the market. Second, international borrowing is less likely because of a high currency risk in LDCs particularly. Consequently, the amount of financial intermediation through the international financial system will be reduced. Furthermore, it has to be considered the fact that most of international sources of credit were cut down due to the default declaration of Ecuador in 1982.

If the relationship between loanable funds intermediated through the domestic financial system is drawn, the graph will show a kinked line, as that one presented in figure #4, under the assumption that there isn't any change of S and D in the short-run. The top segment is the portion of the demand for loanable funds which is above the equilibrium in figure #3, and the bottom segment is the portion of the supply for loanable funds which is under the equilibrium in figure #3 also. Extremely high and low r will reduce financial intermediation. However, there will be a specific interest rate (r^*) which will maximize the amount of internal lending.

Financial intermediation through the loanable funds market is in a rudimentary state imposing serious financial constraints on external investment in new technologies which yield high rates of return, while investment continues in the older, self-financed sectors which yield low rates of return. Generally, a rudimentary state is understood as a state where most of the investment in fixed equipment carried out by firms is with self-financing. It follows that improvements in the process of financial intermediating which tend to shift financial and

real resources from older low-yield investments to new investments are likely to result in a dramatic acceleration in the overall rate of economic growth (Galbis 1977).

Investment in fixed capital comes from different resources, such as: self-savings, external savings, and internal loanable funds intermediated. However, the loanable funds intermediated have a large share of total investment. Thus, it is expected that the real internal interest rate affects investment in a similar way as r affects loanable funds intermediated. The higher or lower the interest is, the lower investment would be.

5. THE EMPIRICAL MODEL

There is a main relationship that is going to be tested using OLS regression analysis. The purpose is to find statistical evidence of the quadratic relation between investment and interest rates. The data used come from the International Financial Statistics of the International Monetary Fund, from the World Bank Statistics, and "Cuentas Nacionales del Ecuador". The data are annual, starting in 1970 up to 1990.

The data used as a proxy for investment is aggregated fixed investment fixed capital - plant and equipment- during the period. It takes into account investments from all sectors in the economy: private, government, public, and foreign.

The proxy for r is calculated with the following equation:

$$r = (1 + r_n) / (1 + e)$$

where:

r_n : nominal interest rate

e : expected inflation

Due to the fragmented structure of the Ecuadorian financial market it is difficult to find a good proxy for r . However, the data used for this model are an average of the nominal interest rate charged by the largest bank of the system.

The data are in real terms to avoid the effect of inflation. The data for interest rates were the real interest rate, which usually is calculated taking into account nominal interest rate and inflation rate. The proxy for nominal interest rate used was the interest rate paid on bank loans for 90 days. It is true that the interest rate paid on bank loans doesn't reflect the return for savers. However, the profit margin of banks is not large because of the strong competition among them. The Ecuadorean banking sector has 32 banks and other financial companies.

As graph #5 shows, there are broad fluctuations in investment at different interest rates. This fluctuation is caused because of external shocks, such as oil prices changes, natural catastrophes, or the drastic reduction of credits after Ecuadorean declaration of default, in 1982. Furthermore, foreign investment is low during this period.

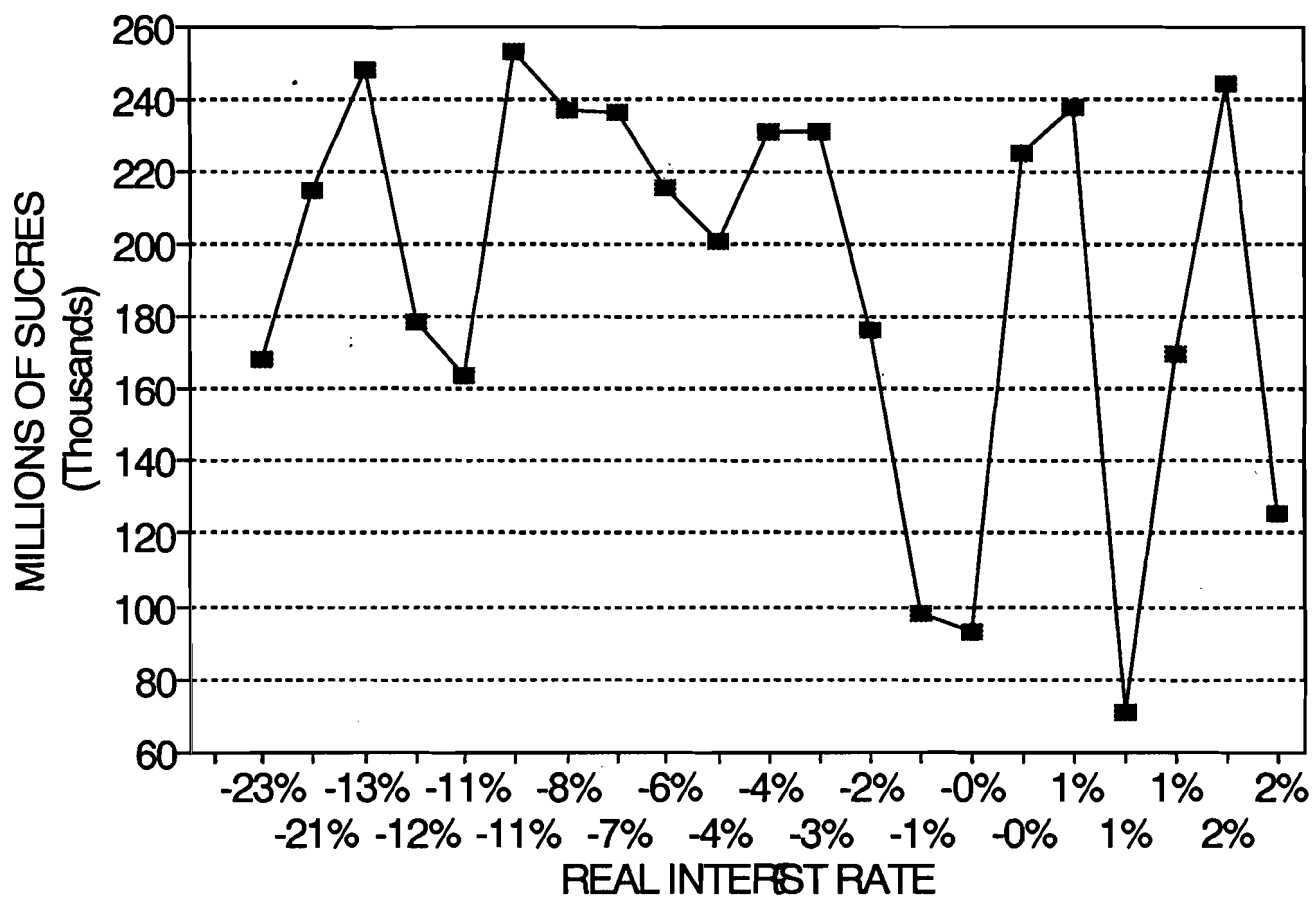
However, the graph doesn't show a downward sloping linear relation. Thus, I tried first a linear model to see if there is any statistical evidence. All other things held constant:

$$I = I_0 + a_1 r \quad (2)$$

Where:

GRAPH #5

INVESTMENT vs INTEREST RATES



I_0 : autonomous investment

a_1 : interest rate coefficient (hypothesis: $a_1 < 0$)

As I expected there is no statistical relationship. The t-statistics are really low, although the sign for the coefficient was negative.

Since the linear model did not predict well, the next step is to build a model with a quadratic relationship. I expect to have a negative sign for the coefficients of r and (r^2) ⁷, for reasons discussed in section 3.

$$I = I_0 + (a_1) * r + (a_2) * r^2 \quad (3)$$

Where:

a_1 and a_2 : interest coefficients (hypotheses: a_1 and $a_2 < 0$)

The results of the regression are as follow:

$$I = 360 - 1368*r - 6594*r^2 + u$$

t-stat	(2.354)*	(2.244)*
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* : significant at the 10% level.

$$R^2 = 0.287$$

The low value of R^2 is because of the lack of other explanatory variables that may be important in explaining investment, such as GDP in previous periods, exchange rates, etc.

⁷ Geometrically, the figure expected is a concave parable, with the roots of different sign.

The results support my hypothesis that the relationship between investment and interest rates is parabolic. The t-statistics are high enough to accept the hypothesis at a 10% level.

5. CONCLUSIONS AND RECOMMENDATIONS

As the results of the empirical model show, the relationship between investment and real interest rates in Ecuador, during the decades of 70s and 80s, is parabolic. The theory developed earlier and the empirical findings presented above provide support for the relationship. Extremely high real interest rates (r) discourage investors from borrowing money from the market. Instead, they are tempted to speculate with their own capital rather than use it productively. On the other hand, when extremely low real interest rates (r) exist, either because of government regulations or high inflation, the amount of capital supplied is reduced drastically. Domestic financial capital flows out because of interest rate differentials ($r^* > r$). In summary, the total amount channeled through the financial system decreases at high or low r . The flow of loanable funds through the Ecuadorean banking system is reduced, forcing potential investors to rely more on self-finance, borrowing abroad at a higher cost and risk, or just dropping the project.

A clear implication arises when a government regulation occurs, there is a specific range of r at which investment can be maximized. This range fluctuates around r^* . Thus, if the government needs to fix r for any reason, the most efficient level at which r can be fixed is when $r = r^*$. Now, if the assumption that r^* is constant is relaxed,

then the government should peg r to r^* , in order to maximize investments. This policy turns out to be the second best, because the most efficient way to maximize investment is to have a totally liberalized financial system. Thus, costs related to implementation of regulations are avoided.

The results of the empirical model were not as strong as I expected, probably because the proxies I used were not quite accurate. Particularly, the data for nominal interest rates could be improved in future research. Because of the large segmentation of the market, the interest rate paid for loans varies among different agents in the economy. A good area for future research would be to explore alternative specifications of the interest rate variable.

Although a strong case for liberalization of the financial system is made here, there are a number of institutional barriers which must be overcome. The first is the concentration of ownership of banks by a handful of special interest groups. In Ecuador, the truncated flow of bank lending varies arbitrarily from one class of favored or disfavored borrower to another (McKinnon 1991). Most of the banking system has been developed under the need of particular economic power groups. In this way, the scarce resources - coming mainly from savings - are lent primarily to companies in the group, and if there is some amount left, it is distributed to favored borrowers outside the group. Thus, a policy goal of financial reform should be to make the banking system more competitive; loans should be available to all qualified borrowers. Currently, loans are not available to many qualified borrowers. These firms and households must rely on inefficient systems of self-finance.

qualified borrowers. These firms and households must rely on inefficient systems of self-finance.

In addition to making the banking system more competitive, financial reform should stabilize prices as a priority. Socially costly inflation hedges look more attractive than physical investment. It is very common in Ecuador that the main and leading participants in foreign exchange markets are large firms, which are hedging inflation and exchange risk.

One advantage of improving internal financial market is that Ecuador would no longer be subject to the fluctuations in international markets. For example, after 1982, Ecuador went into default to the international banking system and instantly most of the credit lines were closed. Solving financial repression is one of the important steps that the actual government is taking in order to achieve growth. Keeping a positive and more uniformly high real rates of interest with comparable types of bank deposits and loans by eliminating excessive high reserve requirements, interest ceilings, and mandated allocations of cheap credit will be the first step towards a more efficient use of financial resources. Then, domestic savers and investors would better see the true scarcity price of capital and thus reduce the great dispersion in the profitability of investing in different sectors of the economy.

This paper opens the doors to new questions that in the future could be studied and solved, such as the effect of the type of exchange rate used on investment, or the effects on the domestic financial system of integration with other Latin American countries.

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