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PREVIEW

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**Currency denomination in international loan contracts of
commercial banks**

Sen, Swapan K., Ph.D.

The University of Nebraska - Lincoln, 1991

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PREVIEW

CURRENCY DENOMINATION IN INTERNATIONAL
LOAN CONTRACTS OF COMMERCIAL BANKS

By

Swapam K. Sen

A DISSERTATION

Presented to the Faculty of
The Graduate College in the University of Nebraska

In Partial Fulfillment of Requirements
For the Degree of Doctor of Philosophy

Major: Interdepartmental Area of Business
Under the Supervision of Professor Gordon V. Karels

Lincoln, Nebraska

August, 1991

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"CURRENCY DENOMINATION IN INTERNATIONAL LOAN

CONTRACTS OF COMMERCIAL BANKS"

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GRADUATE COLLEGE
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CURRENCY DENOMINATION IN INTERNATIONAL LOAN CONTRACTS OF COMMERCIAL BANKS

Swapam K. Sen, Ph.D.
University of Nebraska, 1991

Adviser: Gordon V. Karels

Most of the international loans by commercial banks are denominated in the home currency of the lending bank or a transaction currency like the US dollar. The focus of this dissertation is to provide an explanation for this empirical observation and to develop a model to determine whether or when an optimal currency choice may exist for the bank.

A model is developed to analyze the choice of currency in contracting international loans by commercial banks, where given the size of the loan, the bank chooses the rate of interest and the proportion of the loan to be denominated in its home currency. The bank maximizes the home currency value of the loan subject to a profit condition and a no-default condition by the borrower. The analysis is carried out for conditions of certainty as well as uncertainty and distinction is made between borrowers which are sovereign countries and individual firms borrowing internationally.

A major result obtained is that no unique optimum currency denomination exists for the bank. If, however, the expectation of exchange rate movement is asymmetric, then a particular currency is preferred to another. Also in the presence of institutional ceilings on the interest rate and moral hazard problems, home currency denomination of the loan is optimal for the bank. If the bank is risk averse, home currency denomination is preferred.

In the case of an involuntary default caused by temporary shortfall of the earnings of the borrower, a lending rule is derived for the bank which indicates that relending to the borrower is in the interest of the bank if the new loan and the accumulated arrears on past loans do not exceed the borrower's penalty from a default. If the loan repayment exceeds the penalty amount, the excess debt, it is concluded, must be forgiven.

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CHAPTER 1

INTRODUCTION

Most of the international loans of commercial banks are denominated in the home currency of the lending bank or a transaction currency like the US dollar. There is similar dominance of the dollar in many other areas of international finance. In 1989, over three-quarters of the Euro-bank loans were denominated in US dollars¹ (See OECD (1990)). About two-thirds of the foreign exchange reserves maintained by the industrialized as well as the developing countries over the period 1976-1986, were denominated in the US dollar. (Dooley, Lizondo and Mathieson (1989)). In the matter of invoicing of international trade, exporters seem to have a preference for their home currency but when it comes to exporting to the United States, the US dollar is a frequently accepted mode of payment. (Rao and Magee (1980)). The preference for the US dollar is similarly pronounced in the denomination of international loans by the commercial banks. Between 1974-79, over half of all borrowings by 93 developing countries were in US dollars

¹ Data on currency composition of external debt are not readily available. Most of the reported data are presented in dollar after conversion at a constant base exchange rate. This makes the reported data on debt subject to valuation problems. Error for the aggregate data on debt will be less serious, the smaller is the proportion of non-dollar denomination. The data we have reported are rudimentary and secondary. The OECD and the New York Fed are, however, well regarded sources.

(Dooley 1986). Many borrowers had nearly 100% of their external borrowings denominated in US dollars even though borrowing in dollars was not the cheapest source of debt for them when one considers both the rate of interest and the exchange rate movements². (Mohl and Sobol (1983)). Also the bid-ask spread of the American banks was higher in the euro-currency market³. (Brown (1979)).

The empirical pattern in the choice of currency appears to be at odds with the international trade theoretical position that in an efficient market, with symmetric information and many risk neutral agents, the currency of denomination of foreign trade contracts should be irrelevant. (Levich and Wihlborg(1980)). The theory makes a number of assumptions under which the irrelevance result is valid and currency denomination may become relevant if one or more of these assumptions is violated. There is some scrutiny of the irrelevance proposition in invoicing foreign trade contracts in the international trade theory literature. One study critically examined the

² This may reflect necessity rather than preference of the borrowing countries. The external commercial borrowings by the developing countries were made in the wake of massive payment difficulties arising out of current account deficits. A large part of the trade deficits was in the dollar zone. For an analysis of the concept of currency zone, see Brown (1976).

³ US banks enjoy higher credit ratings in the Euro-market because of superior capital protection laws at home and their ultimate access to the Federal Reserve System as the lender of the last resort. This superior credit rating allows them to charge a higher bid-ask spread.

assumptions of the irrelevance theory (Goeltz (1980)) and others have examined the conditions under which currency choice may be relevant as well. (Cornell (1980), Mirus and Yeung (1987)). (See Chapter 2 below for a review of this literature).

A similar theoretical results in the literature on currency denomination of the international loan contracts of commercial banks is not evident. The lack of work in this area is surprising. There are important differences between foreign trade and foreign lending and there are reasons to believe that the currency denomination and the performance of the international borrower may be related. (Mohl and Sobol (1983)). There are advantages as well as disadvantages of home currency denomination for the bank. Denomination in a particular currency will have implications different from denomination in another currency.

Problem Statement

This dissertation seeks to explain the empirical pattern observed in the currency denomination of international commercial loan contracts. This explanation is based on a theoretical model that determines whether (or when) an optimal currency denomination for international commercial loans may exist.

Overview of the Dissertation

A review of literature is presented in chapter 2. In the absence of any work directly on the question of currency denomination of international loan contracts, we present a survey of the literature in the related areas which have close resemblance to the choice of currency question in international loans. These include (1) international demand for money or the currency substitution literature, (2) the literature on the currency invoicing of foreign trade in goods and services and (3) the literature on currency denomination of foreign exchange holdings by foreign government central banks. Some data are presented on these three areas and also on the currency denomination of the Euro-bank loans.

Chapter 3 presents a model of the choice of currency denomination in an international loan contract of a commercial bank. A simple certainty model is developed where given the size of the loan, the bank chooses the interest rate and the proportion of the loan to be repaid in the home currency of the bank. The balance is repaid in the local currency of the borrower. The case of a sovereign borrower and an individual borrowing firm are both examined.

Chapter 4 examines the currency denomination problem under conditions of uncertainty for both a country borrower and a borrowing firm. Uncertainty in the earnings

of the borrower and uncertainty in the exchange rate are both considered.

The bank is assumed to maximize the terminal value of the loan as measured in its home currency. This value depends on the rate of interest charged on the loan, the proportion of the loan denominated in the home currency of the lending bank and the change in the exchange rate between the borrowers and the lender's currencies during the loan period. The bank sets a combination of the interest rate and the currency proportion in the loan denomination such that the loan returns a minimum of the bank's opportunity cost of capital without inducing a default by the borrower. The set of values for the interest rate and the currency proportion which are acceptable to the bank lie on or above an iso-profit curve that satisfies the bank's minimum profit requirement. There is a trade-off between the rate of interest charged and the proportion of the loan denominated in the home currency of the bank. On this iso-profit curve, the bank is indifferent between the combinations of currency proportion and the interest rate charged on the loan. The bank tries to achieve the highest possible level among the iso-profit curves; each satisfying the minimum profit condition.

The borrower accepts the terms of the loan as offered by the bank and optimally decides whether to make

repayments on the loan or to repudiate it. In the latter case, it faces the penalty of a permanent exclusion from the international credit market⁴. Thus the borrower rationally weighs the cost and the benefit of a default and decides to default when the gains exceed the losses. The borrower's gain from a default in a particular period is that period's gross earnings due to the loan. The cost of default is the present value of all future incomes that could be generated from a steady state repetition of the the borrowing and the debt services. The combinations of the interest rate and the currency proportions that will not induce a default by the borrower also lie on or above a no-default frontier.

There exists a set of feasible values for the interest rate and the proportion of currency denomination that will satisfy the bank's profit condition as well as the borrower's no-default condition. A loan will not be extended if this feasible zone does not exist. The bank maximizes expected profits by shifting up its minimum profit curve to the highest possible level. At the highest level of profits, the bank's profit curve gets completely superimposed on the borrower's no-default curve. Thus the

⁴ Many models use exclusion from credit market as an appropriate penalty for default. (See footnote 15). As a historical note, majority of defaulters during global crises have escaped unpunished. The only ones punished were a few countries defaulting in isolation before 1918. In the enthusiastic lending of the 1974-82 wave, lenders paid no attention to past histories of default. (See Lindert and Morton (1989)).

optimal expected-profit-maximizing currency denomination for an international loan contract by a commercial bank lies on the borrower's no-default curve. Because this no-default curve is an iso-level curve, every combination of interest rate and currency proportion lying on this curve is optimal for the bank.

Thus one major result obtained from the analysis of the country borrower under conditions of certainty is that no unique optimal combination of currencies exists for the bank. This happens because the risk of exchange rate changes implicitly gets priced in the interest rate itself. This conforms with the trade theory result that the currency composition of trade contracts is irrelevant where an equilibrium risk premium for bearing the foreign exchange risk is incorporated in the price of the commodity.

In the analysis of a firm borrower in the certainty case, the firm's earnings are assumed to be given in pesos and exchange rate changes are assumed to be exogenous to the firm's decisions. Under these circumstances, if the exchange rate depreciates or appreciates continually then the feasibility condition will be satisfied only for a very narrow range of values of the exchange rate. The firm will not likely meet the loanability criterion of the bank in a multi-period problem. If the borrowing firm knows that the bank will not renew the loan, it will lack an

incentive to repay. Consequently, a rational bank will not lend to a firm borrower. This suggests explanations for two empirical observations: first, why only predominantly exporting firms of the developing countries have access to the international private debt market, and secondly, why a public guaranty is so often required for private sector lending.

In the analysis of uncertainty in Chapter 4, it is found that the conclusion of currency irrelevance changes if we recognize the asymmetry of expectation of the lending bank and the borrower regarding the changes in the exchange rate. In such a case, there exists an optimal currency choice. The optimal contract is to denominate the loan entirely in either the borrower's or the lender's home currency depending on whether the borrower's expectation regarding changes in the value of its currency is less or more than that of the bank. If the borrower's currency depreciates less than that expected by the bank, it will be optimal for the bank to denominate the loan entirely in the borrowers currency. If, on the other hand, the depreciation of the borrower's currency were overestimated, the optimum proportion of currency denomination of the loan will be to denominate it entirely in the bank's home currency.

It is also established that the complete denomination of the loan in the bank's home currency will allow the

bank to minimize the variance of its expected profits due to exchange rate changes. Thus we find that whereas a risk neutral bank will be indifferent between the home currency and the foreign currency for denominating the loan, a risk averse bank will find home currency denomination optimal. Risk aversion thus explains the empirical observation that most of the loans are denominated in the bank's home currency.

The presence of moral hazard problems in international loans of the sovereign variety indicate denomination of the loan entirely in the bank's home currency is optimal for the bank. Thus, this model can potentially explain another empirical observation that the sovereign debts are always denominated in the bank's home currency, or a stable third currency over which the borrower has little control, and never in the borrower's currency.

In the certainty model, because of the repetition of the same cycle of borrowing and repayments, if a default does not occur in the current period, it does not occur in any future period either. In the model under uncertainty, however, the earnings by the borrowing country are assumed to be random across periods and as a consequence, a default can occur in any period.

The currency irrelevance result drawn from the study of steady state earnings, however, remain unaltered under

assumptions of stochastic earnings, as long as the earnings are independently distributed and have a finite variance and the changes in the earnings across periods are independent of the changes in the exchange rate.

An analysis of involuntary default by the borrower indicates that relending to a distressed borrower is rational for the bank up to the point where the amount due in the repayment of the loan, including new loan and past arrears, is below the borrower's penalty for a default.

Finally, Chapter 5 presents a summary of the results and discusses their implications for international lending by the commercial banks. Some comments are offered on the methodological aspects of modelling currency invoicing and the institutional aspects of sovereign borrowing. Also implications are drawn for future research in the area of currency denomination of international commercial bank lending.

CHAPTER 2

LITERATURE REVIEW

Introduction

The implications of denominating international loans in the currency of the borrower or adopting a combination of currencies of the borrower and the lender have not been subject to academic scrutiny in recent times. Whereas practical bankers' preferences have been dominated by the choice of the bank's home currency or a relatively stable third currency like the US dollar, financial economists believe that in an efficient market, currency denomination should be irrelevant. Both of these factors seem to have contributed to the apparent negligence of the topic. There is, however, some discussion in the literature on the question of currency choice in issues that resemble the question of currency denomination of international commercial loans. The literature in these related areas include:

- (1) international demand for money
- (2) currency denomination in international trade contracts, and
- (3) official foreign exchange reserve holdings of the central banks of the world.