Export Credits and the Costs of Trade Financing

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Abstract

This study is motivated by the observation that countries in adverse external financial situations have to make larger use of more expensive trade financing and payment arrangements. It attempts to contribute to the understanding of the channels through which the external financial situation of debtor countries affects their trade financing, and to identify the determinants of the costs associated with such financing. These costs reflect the higher risk of default associated with credits extended to them and include, for example, interest rate spreads and credit insurance premia. For the purpose of demonstrating the channels through which the perception of such a risk influences these costs, the study adopts the perspective of a "small" creditor or credit insurer, meaning that the risk is exogenous to the creditor/insurer. This leaves the problem of incorporating these risks in the credit insurance premia and interest rate spreads. For this purpose, a theoretical concept of the determination of credit insurance premia is established. Based on the idea that export credit insurance, viewed as a security, is similar to a contingent claim, such as a European put option, the concept uses tools from option pricing theory. Some of its implications are compared with observations and found to be consistent with them, i.e. there is some support for the following hypotheses. The less favourable a country's solvency and liquidity indicators, the higher are the insurance premium rates applying to it, the latter indicators appearing to be relatively more important than the former ones. Moreover, they are higher the greater the volatility of the rates of change in these indicators. The impact of the share of public (and publicly guaranteed) debt in total foreign debt on the costs of external financing is discussed within the same theoretical framework. It is shown that these costs may be a non-monotonic function of that share.

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The second, third and fourth chapters draw on discussion papers written by the author. The fifth chapter is based in part on joint research with Martin Klein. The sixth chapter is based on joint research with Toni Haniotis.

To Monika and Winfried

Addendum

The pages (i) to (xi) after the bibliography contain an addendum. It refers to the text on pages 73, 95, 215, and 218, and the table 6.4 on page 221. It also contains another table (Table 6.5: Data on net claims, premium income, and amount of insured contracts, 1981-1990).

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Chapter 1: Introduction

1.1 Motivation and perspective of the study

It can be observed that the indebtedness and creditworthiness of a country determine the trade financing and payment arrangements available to it and that countries in adverse external financial situations have to make larger use of more expensive arrangements. Consequently, the trade of such countries is saddled with higher transaction costs than that of countries with a favourable external financial position. This study attempts to contribute to the understanding of the channels through which the external financial indicators of a debtor country affect its trade financing costs, and to identify determinants of additional transaction costs. It is not concerned with the moral judgements concerning these additional costs.

The additional costs reflect the higher risk associated with credits extended to these countries. International trade is not generally based on payment in cash, but usually involves a credit from the exporter or his bank to the importer, that is an export credit. Consequently, a credit risk arises. The typical responses to such a risk include the charging by the creditor of a risk premium - a spread[1] - on the interest rate or the provision to the exporter of insurance cover from an export credit insurance agency. For such credit insurance cover, the export credit insurance agency charges a premium rate per amount of credit insured. Like the spread in interest rates on international credits (or in the yield to maturity of international bonds), this premium rate is influenced by the perception of the risk that the debtor country's government cannot or will not meet its country's debt-servicing obligations (political risk).[2] In this connection the present study places particular emphasis on the identification of the determinants of these risk premiums that are specific to each debtor country, e.g. its liquidity and solvency indicators.[3]

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[1] The spread is defined in chapter 3, section 3.2.

[2] Political risk is defined in the next section.

[3] Clearly, it cannot be expected that such country-specific factors will explain fully the additional costs in trade financing of a country. Other important influences include supply factors and group or regional contagion effects. Supply factors include the extent to which banks have made loan-loss reserves, the business cycle in the creditor/insurer

For the purpose of demonstrating the channels through which the perception of the political risk influences additional trade financing costs, the present study adopts the perspective of a "small" creditor or insurer. By small we mean that the creditor/insurer can influence neither the economic and political situation in the debtor country nor the occurrence of default and the mechanism of the debt rescheduling process in default. Thus, the probability of default is taken as exogenous. This simplifies the analysis, i.e. it leaves the problem of incorporating these risks in the insurance premia and interest rate spreads.

1.2 Basic concepts and methods

The study is concerned with the additional cost of trade financing faced by those countries which are perceived as susceptible to a notable probability of default on their external financial obligations. Trade financing is interpreted here in a broad sense, i.e. including not only export credits - credits extended by the exporter or his bank to the importer - but also other, more indirect, forms of external financing, such as the issuance by the debtor (importer) of bonds on international markets.[4] The second chapter discusses several forms of external financing and gives special attention to the costs and conditions associated with the insurance of export credits by an export credit guarantee agency. The fourth and the sixth chapter are concerned with the premium rates for export credit insurance while the third and the fifth ones are concerned with the risk premia in external bonds.

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country, and the competition both in markets for exports and for credits. The importance of the group effects was evident in the case of Latin American debtors after the outbreak of the debt crisis in the beginning of the 1980s and, as our discussion of the experience of Central and Eastern European countries (CEECs) suggests, for the latter during the late 1980s.

[4] External financing by the means of issuing bonds is also referred to as general-purpose financing because of the absence of a link between the issue and specific trade transaction. Clearly, such a form of external financing can be used by the debtor not only for the financing of its international transactions but also for purchases of domestically produced consumption or investment goods.

By default we mean *any* failure on the part of the debtor to meet its debt-servicing obligations as specified in the debt contract.[5] This can take on different forms.[6] In general, the following categories can be distinguished. The debtor may declare that it can not or does not want to pay its debt or that it does not recognise the debt obligation (repudiation). The latter is rarely observed,[7] and it is more common that the debtor and creditor either renegotiate or reschedule the debt or that a moratorium is either agreed upon or declared unilaterally by the debtor. Only foreign currency borrowing is considered here, that is borrowing and repayment are effected in currencies whose issue is not controlled by the debtor country. Consequently, default by means of currency debasement is not feasible.[8]

In lending where the debtor is a resident in a different country than the creditor (cross-border lending) one often uses another term related to the default risk, i.e. the country risk. There is no generally accepted definition for it but the following one by Nagy (1979) is widely used. It is the "exposure to a loss in cross-border lending caused by events which are, at least to some extent, under the control of the government of the borrowing country."[9] This is a narrower concept than default risk since it does not cover the loss due to bankruptcy of a private debtor without any influence of its government. It is similar to the concept in the export credit insurance literature of political risk, which is in practice distinguished from the commercial risk. The distinction between the two

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[5] In fact, default is *called* by the creditors rather than the borrower. With the view to simplifying the verbal exposition there are no further references to this distinction in the discussion.

[6] An illustrative list of examples is provided by Winkler (1933, p.16f): "A default may fall under any of the following classifications. 1. Reduction in the rate of interest. 2. Reduction in the amount of sinking fund or principal. 3. Delay in payment of interest. 4. Delay in the payment of sinking fund or principal. 5. Suspension of payment of interest. 6. Suspension of payment of sinking fund or principal. 7. Reduction in the rate of interest through the levy of taxes subsequent to the flotation of loans upon the interest. 8. Payment of interest in depreciated currency where the contract designates 'gold' payment. 9. Payment of sinking funds or principal in depreciated currency where the contract calls for 'gold' payment. 10. Payment of interest and/or principal in so-called blocked native currencies. 11. Payment of interest and/or principal in so-called scrip, that is interest or non-interest bearing certificates. 12. Forced conversion of loans. 13. Repudiation of interest. 14. Repudiation of sinking funds or principal. 15. Any number or all of the preceding categories together."

[7] This form of default has sometimes occurred after a new government has taken power. The exponent *par excellence* is Russia in 1918; Spain, Portugal France and Mexico afford earlier examples of this type of default.

[8] In ancient times the favourite form of default was through such currency debasement (Winkler, 1933, p.21).

[9] This is a broader concept than sovereign risk which is the risk associated with lending directly to the government of a sovereign nation.

types of risks is conventionally made with reference to the event causing the loss (Dunn and Knight (1982)). Either this is of a commercial nature or a political nature.[10] Commercial loss arises through the inability of the private debtor to repay the debt because of insolvency. Political loss arises through the occurrence of some event in the debtor's country which prevents it from repaying the debt. The events leading to such a political loss can include a wide spectrum, from changes in government policy and restrictions on the availability of foreign exchange to civil war.[11] Chapters 2, 5 and 6 distinguish between the political and commercial risk; elsewhere the term default risk is used.

The literature concerned with the default risk in international debt can be broadly divided into two groups: the traditional ability-to-pay approach (APA) and the modern willingness-to-pay approach (WPA). The controversy between these two approaches is about whether a sovereign debtor's default is attributable to the debtor country government's inability to mobilize the resources (Avramovic (1964)) or to its mere reluctance to adhere to the terms of the debt contract (Eaton and Gersovitz (1981)). The former view essentially claims that a country honours its obligations as long as it can direct sufficient foreign exchange away from other uses and towards debt servicing. On the other hand, the latter view considers explicitly strategic behaviour on the part of the debtor and shows that a country meets its contractual debt service obligations only as long as it deems it in its interest to do so. In other words, the debtor weighs the costs and benefits of honouring its contractual obligation and repays as long as the benefits outweigh the costs. These approaches have been reviewed extensively elsewhere (recently by Ciarrapico (1992)). Therefore, they will not be surveyed here; however, aspects of the discussion are present throughout this study. The general picture that emerges from surveys of this controversy is not always an illuminating one. In practice, it appears to be impossible to distinguish whether a default has occurred because of the debtor's unwillingness or its inability to meet its debt-service demands. As Simonsen (1985, p.121)

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[10] When the debt is either sovereign, public or publicly guaranteed debt, a commercial risk does not exist and the default risk is identical to the political risk.

[11] A clearcut distinction between these two risks is generally not possible, since they are interrelated. For example, the business cycle in a country - being influenced by the government - affects the economic and financial situation of each individual firm and thus the commercial risk as well. See chapter 6, subsection 6.2.1.

puts it in a paper presented in the 1984 World Bank Symposium on the debt of developing countries, "there is a cloudy zone between ability to pay and willingness to pay". This debate cannot be resolved here but it appears useful to draw the attention to one specific aspect that was stressed by Klein (1991a, 1994); namely, that a sufficiently small investor, whose behaviour does not affect the probability of default, is virtually indifferent as to whether default occurs because the default penalty is too low to force a reluctant debtor to pay or because the debtor's ability to do so is too low. He claims that the relevant concept viewed from the "small" creditor/investor is the debt-servicing capacity which he defines as "the maximum debt service that can be extracted from the debtor country." This maximum (debt-servicing capacity) may be influenced by aspects of both willingness and ability of the debtor but is always exogenous to the small creditor/insurer. Given the amount of total debt the probability of default is exogenous as well. A similar perspective is adopted by other recent studies concerned with the valuation of debt instruments, although their justification is a different one. Their valuation concept rests on two key assumptions about the resources and the behaviour of the debtor country. They assume that there is an exogenously given but uncertain flow of resources available to make debt-service payments, and that the debtor meets all of its contractual debt-service obligations, subject only to this resource constraint.[12] These assumptions provide another justification for taking default risk to be exogenous. The present study adopts this perspective (i.e. exogenous default risk) for the purpose of analytical simplification;[13] it makes the derivation of explicit formulae for the valuation of debt, the interest-rate spreads and insurance premia tractable.

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[12] Examples are Bartolini and Dixit (1991), Claessens and v. Wijnbergen (1990), Cohen (1985, 1990), Klein (1991a, 1991b, 1994), Nocera (1989), and Scott (1990).

[13] An exception is chapter 3 in which we use a standard model of the WPA in which the probability of default is endogenous.

1.3 Structure and results of the study

The individual chapters of this study deal with different questions related to the issue of the costs of trade financing and use different approaches to answer them. For example, the second chapter examines the link between a country's external financial situation and the financing and payment arrangements available to that country, using the example of Central and Eastern European countries (CEECs) during the second half of the 1980s. It shows that, when private banks reduced their exposure to the region, a liquidity squeeze ensued and these countries made greater use of expensive financing and payment arrangements, including countertrade. Also, qualitative changes occurred in the financing and payment arrangements used under the broad heading of countertrade, in the sense that the techniques used tended to be associated with higher costs, including legal ones. The rise in transaction costs was particularly evident in the tightening of conditions and increases in the price of official insurance cover for export credits to buyers from these countries. The findings support the hypothesis that all forms of external financing, including those that are officially supported, become more difficult to obtain and more costly for a country as its external financial position deteriorates, and thus add to the external financial stringency the respective country is confronted with. According to our estimates, the increase in transaction costs in trade financing, due to increases in the risk premiums, amounted to roughly one per cent for several CEECs and to 5 per cent for Bulgaria during 1991. Bulgaria had declared a suspension of payments of principal coming due on its medium- and long-term debt.

In order to better understand how export credit insurance premia are determined in practice, we investigate in the third chapter into the spreads in international bond issues which in many respects are similar to such premia and have been widely studied.[14] Unlike in previous empirical studies of the spread, the hypotheses about the direction of influence of the included explanatory variables are derived from an underlying theoretical model of the spread. The model is a variation of the well-known Cohen and Sachs (1984) two-period model of international lending in the presence of a default threat. It implies

[14] The appendix 4.5.6, of chapter 4, illustrates a situation in which the two risk premia are similar.

that there exists a specific debt ceiling which is determined among other factors by the creditor's assessment of the debtor's future resource transfer potential. The closer the actual debt level to this debt ceiling - i.e. the smaller the external financial margin -, the higher is the spread. This hypothesis is tested with observations using pooled time-series and cross-country observations of the spread on the one hand and liquidity and solvency indicators of the debtor countries - as proxies for their resource transfer potentials - on the other. It appears that the model parameters are different depending on whether or not a country had a rescheduling of its commercial bank debt in the past. Therefore a regression model is used which allows for different estimates of both the intercept and the slope coefficients, depending on a country's rescheduling record. The results provide some support for the hypothesis that the liquidity and solvency situation of a country with a rescheduling history determines its spread. The liquidity situation appears to be a more important determinant than the solvency situation, the estimated coefficient of the liquidity indicator being greater and significant at higher levels than the one estimated for the solvency indicator.

The fourth chapter investigates in more detail a hypothesis that arises from the analysis of the second chapter, namely that the costs associated with the insurance of export credits are relatively high for countries in adverse external financial situations. For this purpose a theoretical model of international trade finance involving export credit insurance (ECI) is developed and some of its implications are tested empirically. The central idea of the model is that export credit insurance is similar to a contingent claim such as a put option. Thus, tools from option pricing theory are used to calculate the price of export credit insurance. Two concepts are used, the Black-Scholes concept and a valuation procedure under the assumption that the insurer is risk-neutral.[15] This is - to the author's knowledge - the first application of such concepts to export credit insurance. They imply that not only the current external financial position but also the volatility of the changes in that position determine the costs of export credit insurance. The empirical results of a cross-country statistical analysis of the premium rates actually applied by a private export credit insurer provide some support for these hypotheses. In particular, the

[15] The latter method implies that the price of export credit insurance is equal to the present value of expected net losses associated with that insurance.

reserves-over-imports ratio of a debtor country and the volatility of the rates of change of this ratio appear to contribute significantly to the premium rates which apply to that country. Thus, the results lend support to the hypothesis that countries with an unfavourable external financial position and a high volatility of indicators associated with that position incur higher costs in their trade. Another finding is that the ranking of countries implied by these premium rates is consistent with the rankings implied by the (published) credit ratings of those countries. However, the relationship between those two rankings appears to be less close than those between another risk premium, i.e. the spread, and the credit ratings. The root-mean-square-percentage-error[16] between the rankings implied by the premium rates and the creditworthiness ratings is significantly higher than the one between the rankings implied by the spread and these ratings.

The fifth chapter extends the theoretical analysis of the fourth chapter and discusses the valuation of public and private foreign debt when public debt is senior to private debt. By senior we mean that servicing of the former is given priority *vis-à-vis* the latter in cases when not all foreign debt can be serviced. The perception of such seniority is reflected in the rating practice of debt rating agencies, and in the fact that in most countries the average annual spread on private issues without enhancements exceeds the one on similar public issues. Based on the conceptual analysis of the fourth chapter, a model of spread determination is developed that is able to capture the effects of seniority, and that agrees with these observations. Its major implications are as follows. The private (junior) debt is more expensive than the public (senior) debt. The cost of issuing private debt rises with an increasing relative share of public debt. Another result of the model is that the weighted average spread in the country's external debt issues has its minimum if the relative public share in total external debt is either 0 or 100 %. Intermediate shares of public debt lead to higher spreads. The basic model is then extended to include inefficiency losses in public debt and private debt default sunk costs. Under these circumstances, the disbursement that the country obtains from issuing debt instruments, or equivalently the value of its debt, may be a non-monotonic function of the relative share of public foreign debt. The allocation between private and public foreign debt which

[16] This criterion measures the deviation of two vectors, with the same number of observations, from each other. It allows to compare the relative deviation among one pair of vectors with that among another pair of vectors.

maximizes the weighted average value of the foreign debt (or its disbursement obtained from issuing bonds) may be a non-monotonic and non-continuous function of that country's debt-servicing capacity.

The sixth chapter discusses the issue of subsidies in publicly provided export credit insurance. More specifically it asks what the justifications are for public insurance and for subsidizes in such insurance. In an attempt to answer these questions, selected relevant articles from the literature on the economics of insurance and the one on international trade under imperfect competition are interpreted in the specific context of export credit insurance. The following tentative answers are suggested. As for any insurance there is some theoretical support for public provision of export credit insurance, but not for the provision of *subsidized* ECI. As to the second goal, there are two theoretical lines of argument in favour of export subsidies (from the national point of view). However, they rely on rather specific assumptions which may not be appropriate for the description of the practice of ECI. As to the third goal, if imperfect competition is considered and account is taken of the institutional circumstances under which export credit insurance cover is provided, subsidization through export credit insurance agencies (ECAs) may harm rather than benefit the importing countries, the reason being that it could relax price competition between exporters on the market of the importing countries. This means that the two goals of export promotion and development aid may be in fact conflicting. The chapter concludes with an attempt to measure the extent of the subsidies provided through ECAs in 16 countries during the period from 1981 to 1990. According to these estimates all major agencies, except four, provide significant subsidies.

Chapter 2: Indebtedness and the Financing of Trade - The Example of Central and Eastern European Countries between 1985 and 1991

2.1 Introduction

The growth and pattern of a country's international trade are inseparably linked to its financing and its payment arrangements. This becomes particularly obvious when a country is experiencing financial stringency on the international capital markets. Thus, the difficulties experienced by developing countries subsequent to the outbreak of the debt crisis in 1982 have demonstrated some key relationships between the (general) availability of external financing and the growth of trade, on the one hand, and among types of international lending and payment arrangements, on the other. Countries in adverse financial situations generally have to make greater use of more expensive financing and payment arrangements in their trade. Little attention has been devoted to the channels through which external financial stringency hampers a country's ability to engage in international trade - via its effect on the country's costs of doing business.[1] External financial stringency depicts a situation where a country has great difficulties in obtaining external finance because the country is perceived as susceptible to a high probability of default on its external obligations.

In the light of the recent experience of Central and Eastern European countries (CEECs), this chapter investigates the channels through which external financial stringency has affected their modes of trade financing and payment arrangements. In particular, the terms and availability of official insurance for export credits to buyers from CEECs are analyzed.[2]

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[1] Cf. UNCTAD: "Consideration of the present situation and current problems in the field of trade financing - Trade financing for developing countries: Some aspects of current difficulties and policy responses", study by the UNCTAD secretariat (TD/B/C.3/212), 11 July 1986.

[2] This chapter is a revised and shortened version of a discussion paper by the author (1992b). The section 2.4 and the appendices of the present chapter are not contained in that discussion paper.

A major hypothesis of this chapter is that the (perceived) default risk of a country is closely related to its transaction costs in international trade. The transmission mechanism between this and the transaction cost are the trade financing and payment arrangements that are available to a country. Take, for example, very simple payment arrangements where imports are purchased on an open-account basis and goods are shipped but payment is delayed for some weeks or months.[3] The exporter loses control of the goods at the time of their despatch and has no way of enforcing payment. Clearly, reliance on such an arrangement presupposes confidence in the importer's willingness and ability to meet its payment obligations. Hence this form of purchase arrangement is unlikely to be available to importers whose creditworthiness is doubtful.

This analysis finds support for the hypothesis that high indebtedness and deteriorating creditworthiness had saddled the imports of the great majority of CEECs with increased transaction costs. When banks reduced their exposure towards the region, a liquidity squeeze ensued in these countries, and the cost of financing and payment arrangements for their imports increased, as greater use was made of more expensive financing and payment arrangements, including counter-trade. Also, qualitative changes occurred in the financing and payment techniques used under the broad heading of "counter-trade", in the sense that the required loan-financing period accompanying the counter-trade transaction was shorter, while the techniques used tended to have higher costs attached, including legal ones. This rise in transaction costs was also evident in the tightening of the conditions on which official insurance cover was available for credits which exporters granted to buyers from these countries, i.e. export credits, the example of the ECGD of the United Kingdom being singled out for special attention. This shows that, like private international lending, the terms and conditions of officially supported export credits are responsive to a country's economic situation.

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[3] The open-account transaction is the easiest and cheapest payment arrangement. The exporter, having received a purchase order from the importer, ships the goods with an invoice to the importer who is allowed (deferred) payment at a predetermined future date. Thus the exporter bears all risks related to that trade transaction. Since no intermediary is involved the costs associated with this arrangement are minimum; it is commonly used in domestic trade in developed countries.

The analysis in this chapter also provides some support for the hypothesis that one penalty of default consists of an increase in the trade financing costs of the defaulting country. For example, according to our estimates, following its declaration of a moratorium on its debt-servicing, Bulgaria experienced an increase in its trade financing costs of an equivalent of almost 5% of total convertible currency imports.

The chapter is organized as follows: section 2.2 deals with the development of CEECs' indebtedness, creditworthiness and liquidity situation at the end of the 1980s. In detail, subsection one of section 2.2 reviews the development of indebtedness from the beginning of the 1970s until that time. Then subsection 2.2.2 considers the burden that the indebtedness represents and looks at the creditors' perception of these countries' debt situation, i.e. their creditworthiness. Subsequently subsection 2.2.3 briefly discusses the liquidity situation of the CEECs. Section 2.3 analyses the changes in the financing and payment arrangements that have occurred in CEECs' trade in convertible currencies. Subsection 2.3.1 explains the most commonly used trade-financing and payment arrangements, such as, for example, officially guaranteed export credits which represent a traditional form of East-West trade financing. Subsection 2.3.2.1 takes a closer look at the terms and conditions of insurance cover from official export credit guarantee agencies (ECAs). The general points are then investigated in greater detail in subsection 2.3.2.2, the example of the practice of the United Kingdom's Export Credit Guarantee Department (ECGD) towards CEECs in the second half of the 1980s being singled out for particular attention. Subsequently, in section 2.4 some aspects on the likely effects on trade of these countries are briefly discussed.

2.2 Central and Eastern European countries' (CEECs) indebtedness

2.2.1 Development of CEECs' indebtedness

Prior to 1970 trade between Western countries and CEECs was generally balanced and represented a comparatively low share of total trade of both country groups. In the face of slowing growth, Eastern European countries increased their imports of goods with

a high-technology content from Western countries during 1971 to 1975, the volume of imports of investment goods from OECD countries rising by 50% over the previous period.[4] In addition, imports of consumption goods were expanded to improve the consumption standards. Imports from the hard-currency area rose faster than exports which caused widening convertible currency trade-balance deficits. Western banks were willing to finance the deficit by extending convertible currency credits. The Eastern European countries' indebtedness was low, the economic prospects seemed to be favourable and Western bankers appreciated that the authorities of the centrally planned economies could, by issuing commands, directly control the key economic variables affecting the hard currency balance of payments. The former Soviet Union with its abundant natural resources appeared to be a first-class borrower and a potential source of support for the credit standing of the smaller CEECs - it was believed that the former Soviet Union would assist other CMEA[5] countries which might experience financial difficulties in order to protect the credit standing of the group as a whole ("umbrella theory").[6]

Initially the bulk of lending was guaranteed by Western Governments eager to promote exports. As a result, banks were able to earn income with only limited or no risk. Western banks developed correspondent banking relationships with the foreign trade banks and the National Bank of Hungary, which provided a base for short-term bank-to-bank financing by means of letters of credit.[7] Throughout the 1970s the East-West financial relations became increasingly emancipated from East-West trade. The lending business to Central and Eastern European countries exhibited endogenous dynamics in the sense that banks with only a minor interest in East-West trade began seeking to acquire non-trade related claims on the region. Competition among banks intensified and banks became increasingly willing to lend without guarantees.

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[4] United Nations, Economic Commission for Europe, *Economic Bulletin for Europe,* 1989, p. 80.

[5] As of 26 September 1991, the Governments concerned dissolved the Council for Mutual Economic Assistance (CMEA).

[6] See e.g. Schröder (1983, 1985) and Delamaide (1984, therein chapter 4: *The Umbrella Myth*).

[7] The irrevocable letter of credit (ILC) subsequently became the most common method of payment in East-West trade, whether for sight payment (cash) or time payment (credit). This payment arrangement consisted of an eastern bank issuing a letter of credit in favour of the western exporter which was advised and payable through the Western exporter's bank. For definitions of this and other investments of trade financing see also subsection 2.3.2.1.

This tendency found expression in the rising scale of Eastern European borrowing in the syndicated Eurocurrency market and Eurobond market towards the end of the 1970s, where funds not tied to particular transactions could be raised for general purposes. The margins over LIBOR (London interbank offered rate) that Eastern European countries were charged in these markets contracted.[8] Thus the lending to Eastern European countries developed in parallel with the boom in worldwide sovereign lending. It must, however, be noted that Eastern European countries were enjoying above-average market confidence due to the alleged advantages of centrally planned economic systems in maintaining debt service and the belief in the Soviet "umbrella". Throughout the 1970s, the net and gross debt continued to rise steadily; the total indebtedness of the CEECs in 1981 amounted to more than 66 billion US dollars - a more than ten-fold increase compared to the debt at the beginning 1970s. As a result, the Eastern European countries were confronted with an increasing debt-service burden. By the end of 1979, Poland's debt service was already swallowing up more than 90% of its export revenues. Poland was facing increasing difficulty in obtaining the needed hard currency, and in March 1981 Poland was obliged to ask its official and private creditors to reschedule its debt. Initially Western investors held Poland to be an exceptional case and the credit-standing of the rest of the region was hardly affected. However, the Polish crisis shook the belief in a Soviet "umbrella" considerably.[9] Indeed, the emergence of developing countries' liquidity crisis and the Romanian demand for rescheduling its external debt induced a general change in view. As part of the general worldwide credit contraction, banks sought to reduce exposure to Eastern European countries. The immediate consequence was that general purpose credits practically ceased to be available for Eastern European countries. The Eastern European countries - with the exception of Hungary - were no longer able to borrow on the Euromarket; the share of borrowing of the group of Eastern European countries as a percentage of total Euromarket volume dropped to 0.4% in 1982 from 7.4% at the peak in 1977. Credits from international institutions, such as the IMF and the World Bank, were only available to the member countries Hungary and Romania, and thus

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[8] The average margin, expressed in basis points over LIBOR, gradually fell from 134 basis points in 1975 to 70 basis points in 1979. At the same time the average maturity increased. OECD, *Financial Market Trends*, 1987, p.30.

[9] See for a detailed description of the crisis Delamaide (1984).

Eastern European countries had, in general, to rely on other methods of financing and payments.[10]

For example, the demand for counter-trade increased and Eastern European countries came to rely more heavily on supplier credits.[11] They could obtain only two- or three-year financing and then only with export credit guarantees. These trade-related credits bore interest rates of 1 to 1.5% above LIBOR and thus were much more expensive than the trade credits of the 1970s. In fact, these rates of interest would have been even higher if the exporters had not offered lower interest rates and then factored the "hidden" subsidies into their prices for goods.[12] Allowing for these effects, the effective yield of the credits would have amounted to 3% above LIBOR.[13] Thus transactions involved higher financing costs either openly, in the form of higher interest rate margins, or concealed by higher export prices or transaction costs associated with distress counter-trade operations.

The imports of CEECs were cut drastically. The current account of Eastern Europe, which was in deficit throughout the 1970s, moved into strong surplus after 1982. Between 1981 and 1984 the net hard currency debt of the six Eastern and Central European countries fell by roughly 20%.[14] This significant successful adjustment effort reinforced the view held by Western bankers that central administration of an economy facilitated debt servicing. By mid-1984 all countries, except Poland and Romania, could obtain medium-term trade-related credits at margins of no more than 1% above LIBOR, and "hidden" exporter subsidies - as explained above - were no longer needed.

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[10] Poland, Czechoslovakia and Bulgaria did not obtain any funds from the IMF until they joined this institution in 1990.

[11] The trade financing and payment arrangements used in East-West trade will be explained in subsection 2.3.1.

[12] It was common that the exporter charged a higher price to compensate itself or its bank for a relatively low interest rate in the trade-related credits. Case studies are discussed in Bolz (1976), Fuss (1979), and Schich (1986).

[13] Estimates from the OECD, *Financial Market Trends*, March 1985, p. 25.

[14] As a result of exchange rate movements, the "nominal" decline expressed in US dollars appears to be greater than the "real" decline. This is due to the fact that in 1984 between 42% and 85% of individual countries' hard currency debt was denoted in currencies other than the US dollar. Therefore an increase in the US dollar exchange rate against other major currencies meant that the "nominal" debt denoted in US dollars declined without any "real" reduction taking place. OECD, *Financial Market Trends*, February 1991, p.21.

From 1984 until the end of the decade most CEECs were able to use the private markets, which were often willing to offer terms as favourable as those available on officially guaranteed credits. The adjustment process between 1981 and 1984 was characterized by investment and import cuts. After 1985 the emphasis in these countries shifted more towards fostering growth by means of investment acceleration. As a consequence, import growth resumed, even though the problems of exporting to non-socialist markets persisted. There was another surge in lending to CEECs and, as a result, the net hard currency debt more than doubled between 1984 and 1989 (see table 2.1). Part of the increase in the nominal debt was attributable to the devaluation of the US dollar, that is exchange rate movements over-stated the "real" increase in debt.[15]

During this time, the markets for syndicated Eurocurrency credits were characterized by a general contraction of margins, because the competition among banks for allegedly good credit risks increased while the total market volume was shrinking. The CEECs profited more than most borrowers from the increased competition. The average margins above LIBOR for the region declined from 118 basis points in 1983 (representing almost double the margin for the average borrower from the OECD) to 55 basis points in 1984 - a margin almost as low as that for the average borrower from an OECD country. Although CEECs increasingly used the Euromarket once again for raising funds for general purposes, with the exception of Hungary, the Euromarket remained a relatively minor source of external finance for CEECs. The bulk of lending was provided by banks in the form of buyer and supplier credits.[16]

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[15] See "Debt at Constant Exchange Rates", OECD, *Financial Market Trends*, February 1991, table 5, p.21.

[16] A supplier credit is an arrangement under which the supplier allows for deferred payment by his customer of the financed amount of the commercial contract. By contrast, under a buyer credit, a specific loan is arranged between the creditor and the buyer, and the obligations associated with this credit contract are independent of the obligations of the parties to the commercial contract.

Table 2.1: Debt in convertible currencies of CEECs[a]

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Gross debt										
Bulgaria	3162	2977	2482	2165	3739	4955	6218	7915	9133	10400
Czechoslovakia	4598	3998	3612	3135	4608	5567	6657	7281	7915	7900
Hungary	8699	7952	8250	8836	13804	16914	19592	19625	20605	21700
Poland	25869	26460	26550	26908	29806	33587	38800	37746	41400	48200
Romania	10159	9766	8880	7198	6861	6984	6515	2799	582	2300
Total Five	52487	51153	49774	48242	58819	68008	77783	75367	79636	90500
Former USSR	26534	26737	23587	22513	28900	31400	39200	43000	54000	52000
Total Six	79021	77890	73361	70755	87719	99408	116983	118367	133636	142500
Net debt[b]										
Bulgaria	2352	2017	1312	737	1648	3574	5132	6137	7957	9800
Czechoslovakia	3528	3268	2672	2132	3597	4350	5059	5609	5724	6300
Hungary	7799	7222	6920	7303	11527	14726	18089	18246	19440	20300
Poland	25109	25490	25280	25361	28211	31866	35806	34122	37469	41800
Romania	9859	9466	8370	6557	6492	6349	5129	1990	-1254	1300
Total Five	48647	47463	44554	42090	51476	60866	69216	66105	69337	79600
Former USSR	18084	16707	12547	11172	15838	16631	25065	27745	39319	43400
Total Six	66731	64170	57101	53262	67314	77497	94281	93850	108656	122900

Source: OECD (a) Millions of dollars. (b) Gross debt less deposits in BIS-area banks.

As a result of the rapid increase in debt and increasing economic and political uncertainty, Western bankers downgraded their perception of the CEECs' creditworthiness. A marked shift in banks' attitudes *vis-à-vis* Eastern Europe became apparent when the arrears of payments by the former Soviet Union surfaced in March 1990 and the Bulgarian Foreign Trade Bank announced the suspension of repayments of principal. As a result, the group as a whole experienced a net capital outflow *vis-à-vis* private banks. The bulk of the contraction was borne by the former Soviet Union and Hungary. Except in the case of Czechoslovakia, private banks were extremely reluctant to extend any new credits at their own risk and, when granting export credits, banks were generally unwilling to lend without official export credit guarantees. As a consequence, 1990 was characterized by a decrease of claims of more than 10% - a decline that followed an increase of claims of banks *vis-à-vis* this region of more than 40% over the previous five years.

2.2.2 Relative indebtedness and the perception of default risk

The relative size of the external debt varies widely among the individual countries of the region. Poland had the largest external debt, amounting to almost $50 billion in 1990. But Hungary, with half Poland's debt but a quarter of its population, had the highest external debt per capita. With a per capita debt of almost $2,000, Hungary has found itself in a position similar to that of Argentina, the forerunner in Latin America in terms of relative indebtedness.

There are various ways of measuring the relative indebtedness of a country. For example, Cohen (1991) has suggested to use debt-per-capita.[17] According to this indicator, Hungary appears to be the most heavily indebted because of its small and slow-growing population. Conversely, the former Soviet Union's debt burden appears to be relatively modest - as a consequence of its large population. The relative debts of Bulgaria and Poland lie between those of the two countries, i.e. Hungary and the former Soviet Union, and the relative debt of Romania is only marginal. Although these figures convey an idea of the magnitude of external debt, there is a further measure of relative debt that

[17] He uses a modification of the standard debt-per-capita indicator; namely, gross debt-over-population.

is more closely related to solvency, i.e. the debt-service ratio.

The servicing of the external debt requires foreign exchange. Hence the capacity to service debt ultimately depends on the willingness and ability to earn foreign exchange. The debt service ratio is thus often referred to as the single best indicator of the relative indebtedness of a country. It expresses the debt service, i.e. both interest payment and repayments of principal as a percentage of annual exports. Its economic meaning is discussed in appendix 2.5.1 of this chapter. According to this indicator, Bulgaria, Hungary, and Poland were forced to devote almost three-quarters of their export earnings to the servicing of debt in 1990 as being shown in table 2.2. Czechoslovakia and the former Soviet Union showed lower debt burdens but their position was tending to deteriorate.[18]

Table 2.2: Debt-service ratios of CEECs[(a)]

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Bulgaria	27	27	24	20	14	31	30	35	48	77
Czechosl.	21	20	21	18	20	20	21	18	23	25
Hungary	43	38	36	47	58	67	52	57	49	65
Poland	169	180	138	103	96	63	79	68	76	71
Romania	37	48	37	27	28	28	26	20	19	10
Former USSR [(b)]	24	20	14	16	20	23	24	22	26	29

Source: OECD

(a) All interest and amortisation on medium- and long-term debt as a percent of one year's exports.

Since this ratio is widely used, one would expect that it has a significant impact on the perception of the sovereign risk associated with lending to a country. In fact, the market's perception of the creditworthiness of most countries of the region deteriorated during the second half of the 1980s. This is illustrated in the country risk-rating published

[18] Another prominent indicator of relative indebtedness relates the net interest payments (the difference between interest paid and interest received) to annual exports. It suggests that the relative debt burdens of Bulgaria, Hungary and Poland had been very high indeed and that the burden for the former Soviet Union was increasing.

in *Euromoney* (see table 2.3). This rating is based on the answers of a cross-section of bankers invited to give their views on each country with particular reference to certain criteria, e.g. the country's economic and political situation, its payment record, its access to international capital markets, etc.[19]

Table 2.3: Country ranks of CEECs

Country	1987	1989	1991
Former USSR	19	23	111
Czechoslovakia	41	38	35
Hungary	28	39	44
Bulgaria	40	51	114
Romania	63	66	89
Poland	70	75	57

Source: *Euromoney*, September 1987, 1989, 1991.

The reasons mostly cited for the deterioration of creditworthiness are rapid increase in indebtedness, poor economic performance, and uncertain prospects in the light of accelerating reforms. In particular, decentralization of the foreign exchange regime has been assessed negatively with regard to the countries' creditworthiness.[20] In the case of the former Soviet Union, national disintegration had a very unfavourable effect on its creditworthiness. The broad picture emerging is one of a significant deterioration of the region's creditworthiness ranking with the exception of Czechoslovakia and Poland.

2.2.3 The liquidity situation of CEECs at the end of the 1980s

The financing and payment arrangements available to a country depend on its creditworthiness and its current liquidity position. Clearly these two aspects are interrelated. For example, the deterioration in the credit standing of most of the countries

[19] Some of the potential economic determinants of these ratings are discussed in subsection 4.4.2, of chapter 4.

[20] The chapter 5 includes a discussion of situations where borrowing is either centralized or decentralized.

in the region induced private banks to reduce their exposure towards the region, and indeed at the end of the 1980s the CEECs were experiencing a net outflow of funds with respect to banks.[21] Such a reduction squeezes the liquidity of borrowers. In general, whether a country facing an outflow of private funds will encounter a liquidity crisis depends on how long the net outflows continue and the extent to which the individual country is able to finance these flows with trade surpluses or recourse to undisbursed credit commitments, official funds or foreign exchange reserves.

The external financial management might be rendered more difficult by the fact that the burden of debt itself renders more difficult the successful management of external payments and financing. The high amount of debt at variable interest rates works as a channel for the transmission of higher international interest rates to the external accounts of CEECs. The share of private bank debt - which can be assumed to represent the amount of such debt on a variable interest rate basis - was indeed considerable (as table 2.4 shows) and has been partly responsible for the increasing interest burden between 1986 and 1989.[22] This transmission process has been experienced by debtors from developing countries between 1979 and 1982,[23] the relative increase in their interest burden being more significant during that time period than for the CEECs between 1986 and 1989. This increase in the interest burden, as a part of a complex of shocks such as export volume decline and terms of trade deterioration, was responsible for the subsequent debt servicing difficulties of many developing countries.[24]

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[21] UN ECE, *Economic Survey of Europe in 1990-91*, p. 5.

[22] Clearly, the increase in the net interest payment obligations is not only the result of the increase in the interest rate level but is also due to the increase in the stock of debt.

[23] See Fishlow (1984) and UNCTAD, *Trade and Development Report*, 1985.

[24] Official debt, unlike private bank debt is generally agreed upon at fixed interest rates so that subsequent interest rate changes do not induce any change in the burden associated with existing debt.

Table 2.4: Shares of private bank debt and increases in interest burdens

	Share of private bank debt (percentage)		Net interest payments (millions of dollars)	
Country	1986	1989	1986	1989
Bulgaria	66	72	164	615
Czechoslovakia	39	53	265	485
Hungary	49	47	840	1,676
Romania	34	43	465	45
Poland	25	20	2,351	3,479
Former USSR	45	62	1,026	2,875

Source: OECD, *Financial Market Trends.*

The need to earn foreign exchange increased as a consequence of both higher interest rates and a higher stock of debt. At the same time, exporting to Western markets became more difficult because overall demand was lower, likewise lowering demand for CEECs' goods. The effect was exacerbated by the inability of the respective countries to provide internationally competitive trade financing.[25] All these effects led to accelerated deterioration of the external financial position of CEECs.

For example, at the beginning of 1990, Bulgaria was forced into a liquidity crisis, whereas the other countries of the region were able to meet their immediate external financing requirements with increased official funding throughout 1990. Bulgaria declared a moratorium on repayments of principal in March 1990 and subsequently also on its interest obligations. Before that, reserves had been falling significantly, undisbursed credit commitments had been halved and the hard-currency trade balance continued to deteriorate. Maturing debt was not rolled over and consequently the maturity structure of

[25] The lack of internationally competitive export credit systems in Central and Eastern European countries had stimulated a discussion about the establishment and appropriate structure of credit guarantee agencies in these countries (see *Financial Times*, 1 June 1989).

outstanding debt had significantly shortened.[26] Furthermore, Bulgaria exhibited a "classical" phenomenon that also preceded the liquidity crisis experienced by Latin American countries at the beginning of the 1980s: a rise in "excess" short-term debt, defined as that part of short-term debt which appears to be in excess of strict trade needs.[27] A rise in the ratio of "excess" short-term debt to reserves indicates that a country draws down on credit lines established previously against a liquidity crisis. It appears to be a good indicator of the liquidity squeeze which a country might be experiencing. According to this indicator, Bulgaria experienced a liquidity squeeze in 1990 which was more severe than that of Mexico prior to its first declaration of default in 1982.[28]

The former Soviet Union's external financial position deteriorated drastically in 1990. The reserves/imports indicator which measures reserves as a percentage of imports fell back significantly, representing the equivalent of only 22% of imports (see table 2.5) - below the level of 25 which is generally considered as critical. This was partly the result of the collapse of central control over international payments which led to imports and payments being initiated by independent enterprises without authorization. Reports of widespread delays in Soviet enterprises' repayments of short-term supplier credits began to surface in March 1990,[29] although Vneshekonombank continued to service its obligations punctually.[30] However, as a consequence, banks began to reduce their exposure *vis-à-vis* the country by not rolling over debt which became due. In addition,

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[26] Debt with a maturity of up to one and including one year accounted for 54.2% (47.4%) of total debt at the end of 1990 (end-1989). BIS (b), August 1991.

[27] "Excess" short-term debt is that part of debt which appears not to be related directly to imports, but to the need to maintain the debt service. It emerges because the country draws down on liquidity lines (for example, short-term credit lines from banks) which have been established earlier against a liquidity crisis. The "excess" short-term debt is calculated as that part of short-term debt in excess of six months' equivalent of merchandise imports and is expressed as a percentage of the nominal import volume. *Euromoney*, April 1984, pp. 37.

[28] The ratio of "excess" short-term debt to reserves was less than 200% for Mexico in both 1981 and 1982 (see AMEX, 1984, p. 1187) and amounted to 400% for Bulgaria in 1990 (own calculations from BIS (b), August 1991 and *Economic Survey of Europe in 1990-1991*. An application of this concept to the other Central and Eastern European countries did not generate satisfactory results.

[29] At the end of 1990 Soviet enterprises were estimated to owe already DM 1 billion in arrears to German exporters alone. *East West*, 28 January 1991, p. 8.

[30] *Financial Times*, 5 June 1990.

short-term credit lines were cancelled, thus leading to a decrease in unused credits (see table 2.6). As a result of these various factors, the liquidity of the country came to essentially depend on OECD Governments' financial support because, in contrast to the other countries in the region, the former Soviet Union had no access to multilateral financing.

Romania, at the end of the 1980s, has incurred a large convertible currency trade debt, after large surpluses in earlier years. The foreign exchange reserves built up by means of a draconian trade policy in the previous decade fell steeply, representing the equivalent of only 18% of imports by the end of 1990 (see table 2.5).

Table 2.5: Reserves-over-imports ratios[(a)]

Country	1985	1986	1987	1988	1989	1990
Bulgaria	57	40	26	39	27	20
Czechoslovakia	30	30	34	33	43	28
Hungary	56	47	30	27	20	28
Poland	35	37	55	53	47	91
Romania	8	16	31	18	53	18
Former USSR	50	60	58	44	38	22

Source: OECD, *Financial Market Trends.*

(a) Reserves measured by "deposits in BIS-area banks" as of June 1990.

In 1990, Hungary had achieved a record convertible currency trade surplus, but its liquidity position was threatened by a large withdrawal of short-term credits by banks and unplanned repayments to the IMF. Obligations were met by drawing upon foreign currency reserves as well as making recourse to bilateral and multilateral financial assistance.[31] The reserves-over-imports ratio slightly improved during 1990, although it remained at a critical level of 25% (see table 2.5).

[31] Hungary and Poland were the major recipients of official financial assistance to Central and Eastern European countries.

Czechoslovakia was also faced with the failure of foreign banks to roll over debt. Debt repayment and the convertible currency trade deficit were financed chiefly by the drawing down of reserves. However, Czechoslovakia was also able, albeit to a limited extent, to tap the Eurobond market for the first time, thus obtaining new private funds. Czechoslovakia has been characterized in 1990 by a reserves-over-import ratio that is near a critical level (see table 2.5).

In contrast to other CEECs, Poland was able to strengthen its liquidity position. The rescheduling of official and some commercial obligations, drawing upon various bilateral and multilateral credit facilities and deferrals in meeting interest payments represented the equivalent of a large inflow of finance. This enabled Poland to add to its foreign currency reserves and the reserves over imports ratio improved considerably (see table 2.5).

Table 2.6: Unused credits of CEECs[a][b]

Country	1989		1990	
Bulgaria	1,115[c]	(14.3%)[c]	547	(6.9%)
Czechoslovakia	1,109	(20.6%)	1,003	(8.9%)
Hungary	1,268	(10.6%)	1,003	(8.9%)
Poland	426	(4.2%)	853	(7.9%)
Former USSR	7,249	(16.7%)	5,781	(14.0%)

Source: Bank for International Settlements, *The Maturity Distribution.*

(a) Undisbursed credit commitments of bank *vis-à-vis* CEECs.
(b) No data available for Romania.
(c) In millions of US dollars (figure in brackets denotes unused credits as a percentage of the country's total debt *vis-à-vis* banks).

2.3 Changes in CEECs trade financing and payment arrangements

2.3.1 Financing in East-West trade at the end of the 1980s

As noted in section 2.2, a country's external debt position will determine its creditworthiness, which in turn has a considerable influence on the financing and payment arrangements available for its international trade, thus being a factor which determines the day-to-day costs of importing. In this section recent changes in the East-West trade financing and payment arrangements will be discussed. East-West trade financing takes various forms. In addition to such traditional forms as buyers and suppliers credits and counter-trade, other forms of financing have been used, such as forfeiting, factoring, syndicated Eurocurrency credits, Eurobonds and loans from Western governments and multinational institutions.[32]

Supplier and buyer credit are customary financing techniques in East-West trade. A supplier credit is an arrangement under which the supplier - the exporter - agrees to allow deferred payment by the buyer - the importer. The exporter, in general, refinances the supplier credit by means of a separate loan arrangement with a bank domiciled in his country. If the bank extends the credit directly to the buyer, the credit will be classified as a buyer credit.[33] According to the maturity of the credit, a distinction is usually made between short-term (up to 360 days) and medium- and long-term (more than 360 days) credits. The payment arrangement under a supplier credit most favourable to the importer is that of open-account trading where the exporter receives payment at agreed intervals after the buyer has received the goods. This payment arrangement has essentially ceased

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[32] The Western and Eastern partner involved in the trade financing arrangements were generally a firm or a bank on the Western side and a government department or a (state) foreign trade organisation (FTO) on the Eastern side. In addition, a Western government was involved when directly granting a credit or guaranteeing private credits to Eastern state organisations, and in certain countertrade arrangements. The foreign trade system in most CEECs had been liberalized between 1989 and 1991, as being described in section 2.4.

[33] The basic legal difference between a buyer and a supplier credit is that under a buyer credit a specific loan is arranged between the bank and the buyer. This is documented by a direct loan agreement between the bank and the buyer/borrower, which specifies the obligations of the parties independently of the obligations of the parties to the commercial contract.

to be used in East-West trade at the end of the 1980s, however.[34] Under a much more common payment arrangement, the Western exporter asks the importer for a promissory note or to accept a bill of exchange - drawn on the importer - in exchange for the receipt of the documents relating to the goods. Clearly the latter arrangements induce higher transaction costs than open-account trading.[35]

For both supplier and buyer credits, the lender can apply for credit insurance. It appears that insurance cover from private insurers had only been scarcely available for export credits to buyers from CEECs and, if available, was considerably more expensive than official cover.[36] Export credit insurance represents "the insurance against non-payment by an overseas buyer due under a properly carried out contract, for a premium paid by the seller".[37] As one might expect from this definition, concern about the ability and willingness of an importer to meet his payment obligations has an influence on the terms and availability of insurance cover provided by ECAs.[38]

Another frequently used form of financing trade between Western and Eastern European countries is that of counter-trade. Basically, two primary forms may be differentiated: buy-back arrangements and compensation deals.[39] Buy-back arrangements include that the Western exporter supplies machines, manufacturing plants, or licences and commits himself to accept goods produced by the Eastern importer through these

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[34] According to an informal communication (September, 1991) from a specialist working in the ECA of a major European country. It should be noted that it is generally used within associated companies, which are rare in East-West trade.

[35] See Waxman (1985, p.125).

[36] In general, comprehensive information about the premium rates of private insurers are not available.

[37] Waxman (1985).

[38] This idea is formalized in chapter 4.

[39] This follows the German-Austrian tradition of research into East-West trade: counter-trade is defined primarily according to its microeconomic financing aspect. It distinguishes itself from other trade transactions by the fact that there exists a more or less close linkage between delivery and counter-delivery. Accordingly, co-operation arrangements - often subsumed under counter-trade - might or might not coincide with a counter-trade transaction. Altmann and Clement (1977).

machines, etc. as a means of payment.[40] A long-term relationship between the Western and the Eastern partner is involved. Buy-back arrangements may be differentiated into traditional buy-back deals and compensation-financed equipment leasing.[41] These two forms are explained later in this subsection. Compensation deals are similar to standard commercial transactions except that delivery of goods is tied to the counter-delivery of other goods. They are mostly of a short-term nature. Compensation deals include barter, simple compensation deals and counter-purchase.[42]

The two single most important counter-trade techniques are buy-back arrangements and counter-purchases. Estimates of the quantitative magnitude in the mid-1980s indicated that all forms of counter-trade accounted for 15 to 20% of total East-West trade;[43] more recently this figure was around 50%.[44] Although these figures are not produced on a consistent basis, it is evident that the relative importance of counter-trade within East-West trade had increased significantly. Such a feature appears to be a common pattern of trade for a country experiencing an external liquidity crisis.[45]

The costs of counter-trade vary with the type of transaction and the chosen method of financing. In general conventional methods of financing international trade can be used in association with counter-trade transactions. However, compared with conventional methods of financing and payments, counter-trade typically involves additional

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[40] This arrangement might involve a third party such as a western public institution. Typical examples were the gas-pipeline deals between the then-Federal Republic of Germany and the former Soviet Union, where Western firms supplied the gas pipelines and Western communities received the natural gas.

[41] The compensation-financed equipment leasing is not classified as a compensation deal, but instead as a buy-back arrangement, because its main characteristic is a long-term, cooperation-like relationship between the western and the eastern partner. As a general rule, buy-back arrangements are characterized by a strong element of cooperation, whereas compensation deals involve the exchange of products and, mostly, a relatively short-term contractual relationship. See Gabrisch (1986, p. 172).

[42] Both barter and simple compensation deals require only one contract, the distinguishing feature between these two being that simple compensation deals include the drawing up of an invoice. Counter-purchases involve the conclusion of two contracts. An invoice is drawn up, and payments in the forms of counter-deliveries are delayed by up to two years.

[43] Gabrisch (1986).

[44] Gwiazda (1990).

[45] UNCTAD, *Trade and Development Report*, 1986.

non-financing costs such as discounts and commissions to intermediaries of some 5 to 15% of the value of the transaction,[46] thus rendering it a more costly alternative.

Among the techniques under the broad heading counter-trade, qualitative changes have recently occurred. The required loan financing periods accompanying the counter-trade transactions have shortened, the risk exposure of the Western partners has been reduced and the techniques used have more frequently exhibited higher transaction costs. For example, under a traditional buy-back arrangement, the importer receives licences, equipment or manufacturing plants and pays the exporter by means of goods produced through these licences or manufacturing plants.[47] The repayment by means of goods normally takes up to seven to 12 years, so that a long-term credit is needed for financing the arrangement.[48] Banks have become more and more reluctant to extend long-term credits without a guarantee from an export credit agency. In the absence of such guarantees, this traditional form of buy-back arrangements has become less frequent.

With the deterioration in the Eastern European countries' hard-currency position, another form of buy-back arrangement has emerged: the compensation-based financing of leased, imported industrial equipment.[49] Increasingly used - in particular in the context of joint ventures - this trade financing technique has not yet been adequately discussed in the literature on East-West trade financing. Compensation-based financing of leased imported industrial equipment consists of a leasing of imported Western capital equipment, where the payment of leasing fees is made by means of counter-deliveries of the resultant products. The Western and Eastern partners usually open an escrow account, into which all sales income will be deposited and then transferred to the Western partner (the lessor) according to a pre-arranged payment schedule. Under compensation-based

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[46] UNCTAD, *Trade and Development Report*, 1986, p. 79.

[47] The value of the counter-delivery by the Eastern partner does not have to match exactly the contractual value of the Western deliveries, but it can be either higher or lower. Gabrisch (1986).

[48] Zloch (1986).

[49] See United Nations, Committee on the Development of Trade, *Non-traditional financing of equipment leasing in East-West trade: The role of compensation-based financing* (Trade/Sem.9/R.3), 3 July 1989, p. 9. However, it should be mentioned that the agreements can in principle be renewed.

financing of equipment leases, several additional contracts (unlike the traditional buy-back arrangements) must be negotiated between the parties involved - the lessee (Eastern partner), the lessor (Western partner), the Western end-user, and the trading company. The required negotiations and the associated drafting of contracts increase the legal costs of the transaction, as compared to the simpler traditional buy-back arrangements. Another factor contributing to higher transaction costs is the absence of export credit guarantees for leasing arrangements. Their non-availability may necessitate the purchase of a private insurance policy which is, in general, more costly than an official insurance policy. Usually such a leasing arrangement lasts for four or five years and thus has a shorter duration than traditional buy-back arrangements. The recent shortening of the duration of counter-trade arrangements has also manifested itself in an increase in the share of counter-purchases within total counter-trade with CEECs. These counter-purchase deals typically involve a short-term agreement, where delivery and counter-delivery differ by 12 to 18 months.[50]

Another trade financing technique affected by the decline in creditworthiness of CEECs is that of forfeiting. Generally, forfeiting in East-West trade has been most frequently used in transactions not covered by insurance.[51] Forfeiting consists of the purchasing by a forfeiter of a claim from the exporter at a discount of the face value. The key feature of forfeiting is that the debt instruments are purchased from the exporter on a non-recourse ("*à forfait*") basis. The forfeiter takes the credit risk and, in return for this, charges the exporter a commitment fee and a discount on the purchasing price. The forfeiter in general resells the claim on the secondary market. Clearly, the availability and the price of this type of trade financing instrument is highly sensitive to the perception of the credit risk characterizing a specific country. Indeed, after the declaration of default by Bulgaria, trade in claims created by forfeiting *vis-à-vis* most CEECs virtually ceased - despite the fact that trade in these claims had accounted for roughly one-third of the

[50] Gabrisch (1986, p. 180).

[51] But forfeiting may also be used when the exporter has obtained a guarantee or insurance. From the viewpoint of the exporter, the main attraction of forfeiting is that he can realize cash on his claims, and this clearly is easier with a guarantee or insurance.

total forfeiting market volume in the mid-1980s.[52] Moreover, the discount rates on such claims also increased.[53] However, there has been a modest revival of the trade in claims *vis-à-vis* Poland in the aftermath of the country's debt reduction and some trade in claims *vis-à-vis* Czechoslovakia, albeit only in those ones with a maturity of up to two years. Forfeiting was not available for trade with Bulgaria, Hungary, Romania and the Russian Federation. For Czechoslovakia and Poland it was available only occasionally and at a high price.

Non-trade related or general-purpose financing is not common in the external finance of CEECs.[54] This form of external financing was used by Hungary, the former Soviet Union, Czechoslovakia and Bulgaria during the second half of the 1980s. General-purpose financing occurs either in the form of bank-to-bank credits, awarded on Western capital markets or in the form of syndicated credits or bonds on the Euromarkets. It remains of only minor quantitative importance for most of the CEECs. Financing from the Euromarkets offers the advantage that the funds can be used flexibly, but the interest cost is generally higher than for trade-related credits. The interest costs on Eurocredits can be decomposed into two parts: a fluctuating component usually equal to the six-month interbank rate (LIBOR, etc.), and the margin or spread over LIBOR representing the specific component of the credit. Like the case of Eurocredits, a spread for Eurobonds may be defined as the additional yield that an issuer must offer on its bonds as compared to that on a riskless bond. The spread increased for Central and European countries between 1985 and 1991. The development in the spread of Hungarian bond issues, the region's largest borrower on these markets, is described in section 3.4 of chapter 3. Most of these countries experienced extreme difficulties in raising any new funds at all from the Euromarkets. Only Hungary and Czechoslovakia continued to have access to funds from such sources.

The general picture emerging from this discussion is one of increased costs of

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[52] Zloch (1986, p. 150).

[53] *Trade Finance and Banker International*, February 1990, p. 60.

[54] The distinction between trade-related and non-trade-related credits refers to the purpose of the individual credit.

financing - interest rates, fees and commissions - in response to deteriorating creditworthiness. There has also been a general switch towards the use of trade financing techniques involving higher transaction cost, such as counter-trade.

2.3.2 Officially guaranteed trade credits

2.3.2.1 Terms of insurance cover for credits to CEECs

The traditional forms of East-West trade financing such as buyers and suppliers credits usually have export credit insurance cover, generally from official ECAs. Thus the terms and conditions of such cover are another determinant of the transaction costs of international trade. In the following subsections, aspects of the terms and the availability of official export credit insurance cover are discussed, and, in the next section, aspects of the relative quantitative importance of this trade financing mode are discussed.

Export credit insurance serves to insure the exporter against the risk of non-payment. The event causing this loss can be either of a commercial (commercial or buyer risk) or political nature (political risk).[55] Commercial loss arises through the inability of the borrower to repay the debt because of insolvency. Political loss arises through the occurrence of some event in the debtor's country which prevents it from repaying the debt. The events leading to such a political loss can include a wide spectrum from changes in government policy, restrictions on the availability of foreign exchange, to the outbreak of civil war. When Eastern European foreign trade and external borrowing were centralized in government hands, commercial risk and political risk were indistinguishable. The recent move towards decentralization of foreign trade and borrowing means that commercial risk has now become an independent factor and, in order to offset it, a guarantee from the State Bank must be acquired by the exporter.

Political risk can be reflected in insurance premium surcharges and other

[55] See also the definition in section 1.2, of chapter 1.

conditions on which insurance cover is available.[56] The insured exporter has to pay premium surcharges in addition to the annual base premium for general activity if he extends export credits to those (perceived risk) countries for which such premium surcharges apply. Such premium surcharges can be considerable. For example, the Italian Sezione Speciale per l'Assicurazione del Credito all' Esportazione (SACE) imposes premium surcharges of up to an equivalent of 3% of the amount of credit covered for insurance against political risk. Other credit agencies, such as the United Kingdom's ECGD, do not distinguish between political and commercial risk explicitly and charge a unique premium for cover of both categories of risk, amounting to more than 6% for "high-risk" countries.[57] In addition to insurance against a credit risk, an exporter can insure himself against "pre-credit risk", that is against losses incurred by him in the event of frustration of his export contract before despatch of the goods. Losses in this context refer to costs expended less any proceeds arising from disposal of the goods elsewhere. The premium that is charged for insurance against the pre-credit risk - in general lower than the premium for insurance against the credit risk - also rises with political risk.

Not only the premia but also other conditions on which insurance cover is available reflect political risk. When an importing country's political risk is increasing, the conditions on which insurance cover is available for export credits are likely to become more restrictive.[58] This tightening of conditions represents an increase in the transaction cost - comparable to higher premium surcharges - in the sense that either the fulfilment of the additional requirement induces additional costs, or the conditions cannot be matched, and so recourse must be had to other - more costly - forms of financing and payment arrangements.

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[56] The term premium surcharges which is used in the practice of export credit insurance corresponds to the concept of premium rates which is used in the theoretical insurance literature. It is called premium surcharges because this part of the premium payment is charged *in addition* to the premium for a global or comprehensive insurance policy, i.e. when the insured has exposure in those markets to which such premium surcharges apply. See also section 6.2, of chapter 6.

[57] Communication from *Jardine Credit Insurance Ltd.* on 27 August 1991.

[58] It should also be noted that the identification of country-specific determinants is rendered difficult by the complexity of other factors influencing the availability of insurance cover, such as the nature of the good imported, the reputation of the individual firm, the economic situations in the importing and exporting countries, and the political goals of the credit insurance agency, etc..

The most frequently applied restrictive conditions concerning terms of payment are the requirements to obtain a letter of credit or a State guarantee.[59] For example, for those countries where the borrower is not identical to a State institution - because some decentralized external borrowing is already authorized - ECAs tend to require that the export credit be guaranteed by the State Bank or that an "irrevocable letter of credit" (ILC)[60] be issued by a bank approved by the credit guarantee agency. If the State Bank extends a guarantee, the credit risk is reduced to sovereign risk.[61] If another non-state bank issues an ILC, this means that the bank promises to pay in case the importer does not pay - and thus the risk that the importer goes bankrupt is replaced by the lower risk that both the issuing bank and the importer go bankrupt.

The most restrictive condition applied by the United Kingdom's ECGD represents the requirement of a "confirmed irrevocable letter of credit" (CILC). Confirmation of an irrevocable letter of credit means that another bank - usually an OECD bank[62] - adds its own promise to pay to the one given by the issuing bank. From the point of view of the exporter, a CILC represents a superior form of insurance against non-payment[63] because the OECD bank's promise will stand even if the issuing bank cannot or will not make good on its promise. Thus, for the exporter the sovereign risk is completely removed, as it is for the credit guarantee agency. The fact that an ECA requires a CILC means that it is not willing to cover the credit risk but only the pre-credit risk. The credit risk will thereby be borne by the confirming bank. It subsequently became difficult to obtain a confirmation for CEECs, and, even when available, the fees charged were considerable,

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[59] The following brief exposition will concentrate on the practice of ECGD, which is important for the empirical analysis in the following section.

[60] A letter of credit is a document issued by a bank authorizing another bank or banks in a foreign country to provide funds to the named holder of the letter against reimbursement by the issuing bank. An irrevocable letter of credit is one to which amendments cannot be made, nor can the credit be cancelled, without the full consent of all parties to the credit. Waxman (1985).

[61] The State Banks of Bulgaria and the former Soviet Union had become increasingly reluctant to extend guarantees.

[62] In theory, a confirmation of a letter of credit can also be made by another bank located in the same country as the importer and issuing bank. In practice, however, such a confirmation will not be accepted by credit guarantee agencies.

[63] It must be borne in mind that several credit guarantee agencies do not cover 100% of the credit amount - whereas a confirmation applies to the whole credit amount.

as shown in table 2.7.

Table 2.7: Indications of confirmation fees for letters of credit[a]

Country	Fee in percentage of credit volume	Restrictive conditions
Bulgaria	6%	sight preferred[c]
Czechoslovakia	1-2%	up to 180 days only[b]
Hungary	2-3%	up to 180 days only
Poland	3-4%	up to 180 days only
Romania	3%	up to 180 days only
Former USSR	6%	sight only[c]

Source: Informal communication by expert from Deutsche Bank AG.

(a) As of end-August 1991. Confirmation being extremely difficult to obtain, the indication should be treated with caution. The confirmation fees are in fact approximate and subject to frequent changes. The indications should be regarded as the minimum fee that would have to be paid.

(b) Up to 180 days only: Payment has to be made by the purchaser's bank (the issuing bank) within 180 days after presentation of the bill of exchange.

(c) Sight only: The purchaser's bank has to pay immediately on presentation of the bill of exchange.

Other restrictive conditions include increases in the "claims waiting period" or the application of "discretionary limits". These have not been applied by ECGD to CEECs but have occasionally been applied by other credit insurance agencies. The national credit insurance systems differ widely[64] with respect to the application of conditions for insurance cover. For example, in response to deterioration of a country's creditworthiness, the German Hermes Kreditversicherungs-AG applies liability ceilings in the form of maximum amounts for single transactions or for liabilities incurred in the country concerned, raises the uninsured portion of the risk to be borne by the exporter or the claims waiting period, and eventually takes a risky country completely off cover.[65] In sum, there was a general trend among national ECAs of tightening conditions for

[64] Attempts at harmonization within the EC have been unsuccessful as yet. "The Long Good-Bye to Export Credits", *Trade Finance*, August 1991, p. 45.

[65] Cover from Hermes for Bulgaria was not available. "Hermes-Plafond an den Iran ist ausgeschöpft", *Frankfurter Allgemeine Zeitung*, 17 August 1991.

insurance cover for credits to that region, and to a lesser extent of increasing the price for such insurance cover.

When the conditions required by ECAs cannot be fulfilled and thus official insurance cover is unavailable, recourse is often had to payment arrangements that involve collateralization. Collateralization represents a costly alternative: even when the collateral is in the form of liquid assets, the bank takes a commission that amounts to between 1% and 2% of the value of the order.[66]

2.3.2.2 The example of ECGD of United Kingdom

This subsection illustrates how the points concerning the availability of export insurance cover made in the general analysis in subsection 2.3.2.1 above have applied in practice to CEECs, mainly on the basis of data from 1985 to 1991 for the ECGD of the United Kingdom. A general analysis of the practice of ECAs suggests that policy changes towards most debtor countries do not differ widely among ECAs from different countries.[67]

Information about the policies of ECGD and Eximbank are available from Trade Finance. On the basis of this, the policies of these agencies towards any individual country can be broadly classified according to whether insurance cover for credits to this country is available on normal terms, only on restrictive conditions, or not available at all. The terms and conditions of insurance cover conceivably differ between short-term export credits, on the one hand, and medium- and long-term export credits, on the other.

Table 2.8 gives an account of the changes in these agencies' policies *vis-à-vis* the CEECs and the group of Highly Indebted Countries (HICs) based on the classification described above. It shows that for the latter the favourable changes were more numerous than the unfavourable ones. The favourable changes were concentrated among countries

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[66] Brun and Gooptu (1990).

[67] In general, Germany's Hermes is less restrictive than other ECAs towards CEECs.

which had reduced their external indebtedness. On the other hand, for the CEECs, the unfavourable changes were more numerous than the favourable ones. Although this broad classification gives some insights, a more detailed classification should allow the representation of more of the available information.

Table 2.8: Terms of insurance cover available to HICs and CEECs (number of instances[a])

		CEECs			HICs		
		1987	1989	1991	1987	1989	1991
Normal terms[b]	short-term[c]	4	2	2	2	3	8
	medium-term	5	4	2	1	3	3
Restrictive terms	short-term	3	6	8	25	23	18
	medium-term	2	4	6	25	22	18
No cover	short-term	5	4	3	3	4	4
	medium-term	5	4	3	4	5	9

Source: UNCTAD's calculations for HICs (Highly Indebted Countries) and author's own calculations for CEECs based on the Exporter's Regional Guides in Trade Finance, between 1987 and 1991.

(a) The principle underlying the statistical analysis is that a country can be characterized by one of the three possible situations regarding the availability of insurance cover: normal terms, restrictive conditions, or completely unavailable. On the basis of the data about the United Kingdom's ECGD (1) short-term and (2) medium-term policy and about the American Eximbank's (3) short-term and (4) medium-term policy, each country corresponds to four units in the table (i.e. ECGD short-term, ECGD medium-term, Eximbank short-term and Eximbank medium-term).

(b) Normal terms apply when cover is available without restrictive conditions and without premium surcharges.

(c) Short-term credits are defined by ECGD as those with maturities of up to 180 days. Eximbank uses the same classification with the difference that credits for the purchase of certain equipment goods and bulk agricultural commodities with maturities up to 360 days are also denoted as short-term credits. Other ECAs and institutions define short-term credits in general as those with maturities of up to 180 days.

In the analysis which follows, the ECGD's policy towards an individual country is characterized by one of five combinations of the above-mentioned terms and conditions. For example, insurance cover available on normal terms for short-term and for medium- and long-term export credits represents the most favourable policy of the ECGD, whereas

the most restrictive policy is that where insurance cover is not available - for any period whatsoever of export credit. Table 2.9 lists the terms available for CEECs from the end of 1985 to mid-1991, where an entry of 1 denotes the most favourable and 5 the most restrictive policy.

All deviations from normal terms ("standard terms") are classified as constituting restrictive conditions - with the exception of the conditions "limited foreign goods", "no foreign goods" and "guarantee from State Bank or ILC required". The condition "limited foreign goods" means that coverage for non-domestic components is available only for the share of foreign goods not exceeding 15 to 20% of the total transaction, and "no foreign goods" means that no coverage is available for foreign components. These two restrictions appear to be stimulated by national interest considerations rather than by considerations relating to a country's credit risk; an assessment supported by the cumulative imposition of this restriction on a number of countries at the same time. "Guarantee from State Bank or ILC required" is not included among the deviations from normal terms because this condition is intended purely to eliminate the ECA's exposure to commercial risk, while the present discussion is concerned only with political risk.[68]

The table illustrates that Czechoslovakia is the only country which consistently enjoyed normal terms. For Bulgaria and the former Soviet Union, insurance cover was available on normal terms until mid-1990 and early 1991, respectively, but thereafter cover for short-term export credits was only available on restrictive conditions. For medium- and long-term export credits to Hungary, insurance cover was consistently available on normal terms, whereas insurance cover for short-term export credits was only available on restrictive conditions. For medium- and long-term export credits to Romania, insurance cover became available from mid-1986, and thereafter for both short-term, and medium- and long-term export credits insurance cover was available but only on very restrictive conditions.

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[68] However, it should be noted that the imposition of this condition in fact can raise the cost for the importer or even inhibit imports. This can result when the State Bank does not extended guarantees automatically but only on special terms and conditions. For example, the State Bank of Bulgaria and Vneshekonombank of the former Soviet Union became increasingly reluctant to extend guarantees because they did not want to accumulate further sovereign debt and, in the case of the latter country, also because of the progressive breakdown of the State.

Table 2.9: Estimates of the restrictiveness of terms of insurance cover available for CEECs from ECGD (method 1) [a]

Date	B[b]	C	H	P	R	S
Late[c] 1985	1	1	2	5	4	1
Early 1986	1	1	2	5	4	1
Mid-1986	1	1	2	5	3	1
Late 1986	1	1	2	5	3	1
Early 1987	1	1	2	5	3	1
Mid-1987	1	1	2	5	3	1
Late 1987	1	1	2	3	3	1
Early 1988	1	1	2	3	3	1
Mid-1988	1	1	2	3	3	1
Late 1988	1	1	2	3	3	1
Early 1989	1	1	2	3	3	1
Mid-1989	1	1	2	3	3	1
Late 1989	1	1	2	3	3	1
Early 1990	1	1	2	3	3	1
Mid-1990	2	1	2	3	3	1
Late 1990	2	1	2	2	3	1
Early 1991	2	1	2	2	3	2
Mid-1991	2	1	2	2	3	2

Source: "Exporter's regional guides" in *Trade Finance and Banker International*, December 1985 - August 1991.

(a) The numbers denote the "regime" concerning official insurance that the specific country is facing. In general the higher the number the more restrictive is the system. In particular:
1. Standard terms apply to cover for both short-term credits and medium/long-term credits.
2. Standard terms apply to either short-term or medium/long-term credits, whereas restricted terms apply for the remainder.
3. Restricted terms apply to cover for both short-term and medium/long-term export credits.
4. For either short-term or medium/long-term credits cover is available on restrictive conditions, whereas for the remainder no cover is available at all.
5. There is no cover available for either short term or for medium/long-term export credits.

(b) B = Bulgaria C = Czechoslovakia H = Hungary
P = Poland R = Romania S = Former Soviet Union

(c) The information published in the April, August and December issue of *Trade Finance* are classified as "early year", "mid-year" and "end-year", respectively.

For export credits to Poland, insurance cover was not available until late 1987 but then became available for short-, medium- and long-term export credits on restrictive conditions. Thus, for the region as a whole, according to the broad classification used here, no clear trends in the terms and conditions available are observable. A detailed analysis of the restrictions reveals that further changes have occurred in the terms and conditions applied to CEECs. These changes are illustrated in table 2.10, which lists the degree of "restrictiveness" of conditions for export credit insurance cover. The percentage figures therein are based on a weighting of the terms and conditions applied by the ECGD. Czechoslovakia does not appear in the table because it had consistently been considered by the ECGD as a market for which normal terms applied, the sovereign risk being considered as low. An irrevocable letter of credit (ILC), issued by an ECGD approved bank, or a guarantee from the State Bank was the only requirement for export credit insurance cover for this country.

Bulgaria enjoyed throughout the second half of the 1980s normal terms for insurance cover for short-term export credits. Only an ILC or guarantee from the State Bank was required for export credit insurance cover. At the beginning of 1990, Bulgaria's external debt position had deteriorated critically, which triggered the application of premium surcharges on export credit insurance.[69] When, in March 1990, the Bulgarian Foreign Trade Bank declared a suspension of payments of principal coming due on its medium- and long-term debt, the ECGD as a consequence required a confirmed irrevocable letter of credit as a condition for extending insurance cover for short-term credits. Thus the imposition of this highly restrictive condition for export credit insurance cover was one cost of default for Bulgaria. In the beginning of 1991 this condition was dropped. However, the premium surcharges applying for cover of credit risk and pre-credit risk remained considerable. Cover for medium-term export credits, although subject to restrictive conditions after Bulgaria's moratorium on debt, remained generally available.

The former Soviet Union enjoyed standard terms for both short-term and medium-term credits until early 1991. Afterwards standard terms applied only for short-term export

[69] The ECGD now uses the term "market rate additions" to denote premium surcharges.

credits, while for medium-term ones considerable premium surcharges applied for the cover against the credit risk.

After the declaration of default by Romania in 1982, no cover was available for medium-term credits to that country during the first half of the 1980s. As a reaction to the countries' successful policy of debt reduction, the ECGD again made available insurance cover for medium-term credits to Romania as of mid-1986. However, the conditions for export credit insurance cover remained very restrictive, cover for both short-term and medium-term credits requiring a CILC.

The conditions and terms applied to export credits to Hungary deteriorated during the second half of the 1980s, in response to the massive build-up of external debt. Premium surcharges - modest in the mid-1980s - increased significantly. The premium surcharge applied even to credits between associated companies, that is between companies characterized by close relations and experience in doing business with each other. Although the quantitative importance of this restriction is rather limited because of the small number of companies of this kind involved in trade with Eastern and Central Europe, the application of this additional restriction indicates concern over the sovereign risk.

The only country of the region that had experienced an improvement in the terms and conditions of insurance cover in recent years was Poland. After Poland's declaration of default, no cover was available from ECGD for export credits to Poland until the end of 1987. Thereafter, cover was made available by ECGD on the condition that the exporter obtain a CILC. Shortly before the announcement by the G-7 nations in January 1991 of a reduction in Poland's official debt, the ECGD had lifted the requirement of a CILC to cover short-term debt. Afterwards only an ILC was required; however, the premium surcharges were considerable.

Table 2.10: Estimates of the restrictiveness of terms of insurance cover available for CEECs from ECGD (method 2)[a]

	Bulgaria	Hungary	Poland	Romania	Former USSR
1985III	0	20%	100%	95%	0
1986I	0	20%	100%	95%	0
1986II	0	20%	100%	90%	0
1986III	0	20%	100%	90%	0
1987I	0	20%	100%	90%	0
1987II	0	20%	100%	90%	0
1987III	0	20%	90%	90%	0
1988I	0	20%	90%	90%	0
1988II	0	20%	90%	90%	0
1988III	0	20%	90%	90%	0
1989I	0	20%	90%	90%	0
1989II	0	40%	90%	90%	0
1989III	0	40%	90%	90%	0
1990I	0	40%	90%	90%	0
1990II	20%	40%	90%	90%	0
1990III	55%	40%	85%	90%	0
1991I	40%	50%	85%	90%	30%
1991II	40%	50%	85%	90%	30%

Source: Own calculations based on "Exporter's regional guides" in *Trade Finance* and ECGD "Market Rate Additions" (communicated by ECGD).

Explanation: All deviations from "standard terms" of insurance cover (as explained in the previous table), either for short-term export credits or medium- and long-term credits, are considered as restrictive conditions. Each restriction is given a weight, and the weights are added up. The weights attached to the restrictions are set so that they would reflect most accurately the relative importance of each restriction. This decision is based on a careful analysis of the restrictions applying to both developing countries and CEECs between 1985 and 1991. Thus, the higher the percentage figure, the more difficult it is to obtain insurance cover for export credits to the country. The following weights are used (percentage points of weights in brackets): insurance premium surcharges of up to 1% (20%), between 1% and 2% (30%), between 2% and 4% (40%), confirmed irrevocable letter of credit (45%), "no cover" (50%), each of these conditions being mutually exclusive (so that the maximum possible score would be 50%). Insurance cover for short-term credits, on the one hand, and medium- and long-term credits, on the other, is considered separately; thus the final score, i.e. the degree of restrictiveness, lies between 0 (normal terms) and 100% (no cover either for short-, medium- or long-term export credits). This presentation is valuable because premium surcharges are relatively inert for any debtor country and changes in its risk perception are primarily reflected in the application or removal of the above conditions.

The practice of ECGD is used to illustrate the point that the conditions on which official insurance cover is available for export credits to Bulgaria, the former Soviet Union and Hungary have become more restrictive. Conditions for insurance cover for the Polish market - although somewhat improved - and for the Romanian market had to be classified as restrictive. Only for the Czechoslovakian market did normal terms apply. In general, all major ECAs - with the exception of the German Hermes and the Italian SACE - had stiffened their conditions for CEECs. Common to all agencies is that changes in the debtor country's creditworthiness are reflected primarily in the tightening or easing of conditions rather than in variations of the price for insurance, i.e. the premium rates. For example, the premium rates applied by the ECGD to insurance cover of credits to CEECs have not changed significantly during the second half of the 1980s.

2.4 Trade financing modes and the trade financing costs of CEECs

The analysis in the previous section of the experience of CEECs between 1985 and 1991 shows that the trade financing modes available to a country depend on its creditworthiness. More specifically, the lower the creditworthiness, the more expensive and complicated are such arrangements. This is particularly evident in the tightening of conditions of official insurance cover for export credits to buyers from these countries. This section is concerned with aspects of the effects on trade of such a worsening of financing conditions. Clearly, it is not possible to disentangle these relative price effects - i.e. the increase of the price of imports - from the other important developments affecting the economies of CEECs, principally the income effects, i.e. the reduction in national output and the effects of the structural adjustments that these economies are undergoing. However, some likely effects on trade of the described changes in trade financing conditions are briefly discussed in this section. It also includes a tentative estimate of the additional transaction costs in the trade of CEECs in 1991.

The tightening of terms and conditions for officially insured export credits to CEECs was reflected in a decline in guaranteed buyer's credits, that is, guaranteed credits from banks extended directly to the importer. Despite strong demand for guaranteed

credits, their amount had declined during the second half of the 1980s for most of the CEECs as shown in the table 2.11. Alongside the decline in guaranteed buyer's credits there was a decline of supplier's credits for almost all CEECs, with the notable exception of Poland, in this period. These suppliers credits contained both guaranteed supplier credits and credits extended directly to the foreign buyer by the official sector of the exporting country.[70] The exceptional increase in suppliers credits to Poland was due to the fact that the country received (direct) credits on a large scale from the G-24 countries, for the financing of imports. On the other hand, Bulgaria, Czechoslovakia, Hungary, Romania and the former Soviet Union experienced a reduction in their total trade-related debt. If the focus is purely on banks' claim, then the CEECs' trade-related claims declined during the late 1980's whereas their total bank debt increased. As a consequence, the ratio of trade-related claims as a share of total claims of Western banks diminished (see table 2.12).

In general, the tightening of trade financing conditions does not only imply cost increases but also makes the transactions more complicated. Like cost increases, this might discourage trade.

When discussing the effects on trade of increases in transaction costs a crucial question is about the incidence of such costs among exporter and importer. In the first place, the costs of export credit insurance must be met by the exporter. However, the literature on export credit insurance takes it almost as an axiom that the exporter passes on the insurance costs to the importer. As an OECD study (*Export Financing Systems*, 1987, p.84) puts it: "as a general rule the exporter passes on the premium charges directly to the buyer, either by including them in its price or by charging for them separately." This hypothesis is valid only under specific circumstances, as being discussed briefly here and in section 6.4 of chapter 6. In general, the incidence of these additional transaction costs, like the incidence of export taxes[71] depends on the slope of the importing

[70] Unfortunately, there exists no published information which contains disaggregated data for officially insured (or guaranteed) credits, on the one hand, and credits extended directly by official institutions in the exporter's country to the buyer, on the other.

[71] Export credit insurance premium rates are in this sense similar to export tax rates, except that the former are not obligatory but are paid in an attempt to minimize risks.

country's demand curve and the market structure. For example, for a competitive market, the proportion of costs that is passed on from the exporters to the importers is generally between 0 and 100%, with 100% shifting if the elasticity of supply is infinite or the demand completely inelastic.[72] In a non-competitive market the situation is different. As Stern (1987a) has demonstrated, the shifting can be either below or above 100%, the proportion shifted depending sensitively on the slope of the demand curve. Intuitively, the lower the elasticity of demand the greater will be the shifting, because the rise in price is only little dampened by the increase in elasticity. The author thus comments that 100% shifting is not the polar case which it would appear to be in a simple model of perfect competition, and that "it is possible that it provides a sensible middle choice for some applied work".[73] Evidence from case studies[74] of individual East-West transactions during the 1970s and 1980s suggests that at least a considerable proportion of the trade financing costs was indeed passed on from the exporter to the importer.[75] The scope for such shifting is likely to have increased as a result of the changes in the foreign trade regime in CEECs between 1988 and 1991,[76] the move from centralized to decentralized trade meaning that certain restrictions on import demand were lifted.

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[72] Stern (1987a) and Stern (1987b, p.70ff).

[73] Stern (1987a, p.141).

[74] It appears that individual case studies could provide some more guidance with respect to the aspect of the shifting of additional costs or taxes than empirical analyses on a larger scale. The latter suffers regularly from the problem that determinants of prices cannot be separately identified. This is reflected in the results of empirical studies concerned with the impact of exchange rate risk on the prices of a country exports. There does not appear to be any pattern to their results; and some of them are conflicting, the results being reviewed e.g. in Mann (1989).

[75] This is particularly well documented for the gas pipeline deals between the Federal Republic of Germany and the former Soviet Union. When the Soviet partner refused to pay a certain risk premium - spread - on its trade credits, the Ruhrgas AG increased their prices to compensate the banks. It has been suggested that such arrangements occurred because the Soviet trade negotiators were more constrained by higher authorities with respect to the trade financing costs rather than to contract prices - the latter of which were more difficult to asses by the authorities (see Schich (1986)). Clearly, the scope for such practices hinged on the importance for the Soviet Union of the goods.

[76] By June 1991 all CEECs had abolished the foreign trade organizations' monopoly and firms were in principal allowed to trade directly. The major liberalization measures were implemented between 1988 (Hungary) and 1990 (Romania) according to IMF, *Exchange Rate Restrictions*, 1993.

Table 2.11: Exchange-rate-adjusted cumulated changes in stocks of trade-related credits of CEECs

		1897[a]	1988	1989	1990
Bulgaria	Guaranteed buyer's credits[b]	-40	+127	+36	-16
	Suppliers credits[c]	-96	-54	-272	-282
	Total trade--related credits	-136	-63	-299	-597
Czechos-lovakia	Guaranteed buyer's credits[b]	-36	-182	-219	-353
	Suppliers credits[c]	-59	-171	-224	-245
	Total trade--related credits	-95	-353	-443	-598
Hungary	Guaranteed buyer's credits[b]	-51	-353	-608	-527
	Suppliers credits[c]	-87	-160	-165	-111
	Total trade--related credits	-138	-513	-773	-638
Poland	Guaranteed buyer's credits[b]	-281	-92	-807	-796
	Suppliers credits[c]	+2154	+1566	+2890	+3718
	Total trade--related credits	+1873	+1474	+2083	+2922
Romania	Guaranteed buyer's credits[b]	-52	-192	-807	-796
	Suppliers credits[c]	-349	-589	-853	-868
	Total trade--related credits	-401	-781	-1040	-1060
Former USSR	Guaranteed buyer's credits[b]	-1392	-2101	-2061	-2321
	Suppliers credits[c]	-2854	-4551	-3871	-4047
	Total trade--related credits	-4246	-6652	-5932	-6368

Source: BIS, OECD.

(a) End-year figures (millions of US dollars).
(b) Guaranteed external bank claims.
(c) Non-bank trade-related credits (non-bank trade-related credits under official insurance or guarantee and credits extended directly to the foreign buyer by the official sector of the exporting country).

Table 2.12: Ratio of guaranteed trade-related claims against total bank claims *vis-à-vis* CEECs[a]

	1988	1990
Bulgaria	18.0	5.9
Czechoslovakia	23.9	12.5
Hungary	13.4	8.7
Poland	20.2	8.1
Romania	31.9	11.0
Former USSR	16.0	11.1

Source: BIS, OECD.

(a) Guaranteed external bank claims as a percentage of total external bank claims.

Several problems are associated with the attempt to quantify the extent to which the trade of CEECs had been saddled with higher transaction costs. In general, the premia applied by official ECAs are relatively inert and changes in the debtor's creditworthiness are primarily reflected in the tightening or loosening of their conditions for cover. It is difficult to quantify the effects of restrictive conditions and the estimation results depend sensitively on the weights attached to each restrictive condition. Unlike official insurance, the premium rates for private insurance cover are more flexible with respect to the debtor's creditworthiness; however, historical data on these terms are generally not available.[77] Despite these shortcomings a tentative estimate of the additional transaction costs can be made and is shown in table 2.13.

[77] However, a list of premium surcharges applied by a private insurer to developing countries during 1992 and 1993 was obtained for our research. It was subjected to an empirical analysis, and the results of that analysis are shown in the fourth chapter of this thesis.

Table 2.13: Estimates of additional trade financing costs of CEECs in 1991[a]

(in thousands of US dollars)

	Total	In private financing	In official financing	Total as % of value of imports[b]
Bulgaria	185.35	156.76	28.59	4.8%
Czechoslovakia	20.11	20.11	0	0.2%
Hungary	65.55	56.48	19.07	0.7%
Poland	118.13	76.04	42.09	0.9%
Former SU	475.48	399.61	75.87	1.0%

Source: own calculations based on data from BIS (*Maturity Distribution*), OECD (*External Financing*) and UN/ECE (*Bulletin*).

Explanation: Additional transaction costs are defined as the costs that exceed those associated with standard trade financing conditions. A laborious procedure had to be used for the estimation because data on new gross trade-related credits are not available. The procedure is described in the following: Total debt (as of end - 1990) minus debt up to and including one year (as of end - 1990) gives the hypothetical debt outstanding at end 1991, i.e. debt outstanding in the absence of any new contracting during 1991. The value of this hypothetical debt outstanding is subtracted from actual outstanding debt as of end 1991 to obtain debt contracted during 1991. The debt contracted during 1991 was associated with surcharges in form of a higher interest in the case of bank lending and with premium rate increases in the case of officially supported credits (data being communicated from Jardine Credit Insurance Ltd.). The former is approximated by the confirmation fees as shown in table 2.7 and the latter by ECGD's premium surcharges as discussed in the previous section. These rates are applied to the estimated figures for the debt contracted during 1991 in form of bank credits and officially supported credits, respectively. The shares of bank credits and officially supported credits in the debt contracted during 1991 were estimated by taking the median of the shares of these two forms of debt as of end-1990 and end-1991, respectively. This appeared to be a valid estimate because the shares did not change significantly between these two dates.

(a) Romania is not included because for this country no official cover and thus no indications of premium surcharges were available.

(b) Imports in convertible currencies.

The table relates the additional transaction costs to the imports of CEECs. It shows that these costs were considerable for Bulgaria, amounting to the equivalent of almost 5% of total convertible currency imports. This shows the extent to which default can increase

the costs of importing[78] and it provides some support for the hypothesis that one penalty of default consists of an increase in trade financing costs.

Some caveats must be acknowledged. Most importantly, since there exists no published breakdown of officially supported credits into officially insured and directly extended credits, both were included. Strictly speaking, the increase in costs does not apply to the latter, which are often extended at concessional rates. Thus, the inclusion of the directly extended credits tends to overestimate the increase in transaction costs. On the other hand, the total increase in these countries' transaction costs is underestimated in so far as no account is taken of the increase in costs resulting from the greater use of other more expensive trade financing arrangements, such as counter-trade.

To the extent that the additional transaction costs are borne by the importing country, such increases in costs are similar to interest rate increases or price increases and represent - ceteris paribus - a terms of trade deterioration. The effect of terms-of-trade changes due to these transaction cost increases is not separately identifiable in CEECs' recent trade figures[79] and may have been small in relation to that caused by other factors, especially in the former Soviet Union. In general, terms-of-trade deteriorations of any kind reduce the purchasing power of existing output and thus may induce cuts in consumption and investment, thereby potentially cutting future output as well. If imports of essential goods are cut, i.e. of goods which, at least in the short run, can only be obtained via imports, then future output may further decline. However, in most CEECs the general decline in trade-related credits did not coincide with a decline in imports.[80] Only

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[78] For example, given 100% shifting (as discussed above), these point estimates indicate the increase in these countries' import bills.

[79] At the time when this chapter was written, terms-of-trade figures were only available for the period between 1980 and 1989. The deterioration in the terms-of-trade with the convertible currency area (the relevant currency area) during this period was concentrated among those CEECs which were characterized by an increasing debt burden; i.e. Bulgaria, Hungary and the former Soviet Union. On the other hand, Czechoslovakia, Romania, and Poland experienced an improvement in their terms-of-trade. The data on terms-of-trade were obtained from Marer et. al. (1992). It should be noted that the terms-of-trade figures are calculated for the trade with non-socialist countries, including developing ones, for Czechoslovakia, Poland, and Romania, for trade with developed countries only for Hungary and the former Soviet Union, and for both convertible-currency and non-convertible-currency trade for Bulgaria.

[80] However, if import prices had increased, the value added of a constant amount of nominal imports would have decreased.

Bulgaria had to curb imports from the convertible currency area considerably. Elsewhere, imports increased.

2.5 Appendix

2.5.1 The solvency constraint and the debt-service ratio

The most frequently used rule of thumb in appraising the debt-servicing capacity of borrowing countries is the debt-service ratio, i.e. the ratio of interest and principal payments associated with debt over export earnings. It signifies the proportion of foreign exchange earnings absorbed by debt service and is used as a measure of the pressure of debt service on the debtor's economy. The usefulness of this ratio for the assessment of a country's debt-servicing capacity has been questioned but the following arguments in favour of it are acknowledged: (i) it is seemingly simple and states an easily understandable relation - i.e. debt service against exports, (ii) it can easily be computed and has a relatively firm statistical basis, unlike variables recorded in the country's national accounts, and (iii) there is no alternative that has found wide acceptance. This section describes one situation in which this ratio is meaningful - namely, where it can be related to the "solvency constraint" in the external borrowing of a small country.[81]

Consider the standard formulation of borrowing of a small debtor country which is treated as if there were a representative consumer who tries to maximize the discounted value of its utility from consumption. The utility is additively separable across time (future consumption being discounted), and utility in each period is a concave function of consumption in period t. The debtor country can borrow from abroad at an interest rate, r, which for simplicity is assumed to be constant over time. The country receives foreign exchange from the export of services, X_t, which are assumed to be exogenous and entail no costs for the country. There is no other domestic production and thus consumption is

[81] The presentation follows in parts Eaton (1993) to which the interested reader can turn for a detailed discussion of the solvency constraint.

restricted to goods purchased by means of export earnings and the net transfer.[82] The resulting maximization problem of the borrowing country will not be described explicitly; it is described elsewhere.[83] The borrowing country maximizes utility by choosing the optimal consumption path subject to the solvency constraint. This solvency constraint is the subject of the remainder of this section; in particular, it is shown how the debt-service ratio can be related to it.

Let D_t denote the stock of debt in period t and assume that D_0 is equal to zero.[84] Then $D_t - D_{t-1}$ is the new borrowing in period t, rD_{t-1} is the interest payment on debt accumulated as of the end of the previous period, and NT_t is the net transfer in period t, i.e. the new borrowing less debt service. Then the consumption in each period is given as

$$C_t = X_t + (D_t - D_{t-1}) - rD_{t-1} = X_t + NT_t \qquad (1)$$

and debt at the end of period t is given as

$$D_t = (1 + r)D_{t-1} + NT_t = \sum_{i=0}^{\infty} (1 + r)^{t-i} NT_i \; . \qquad (2)$$

Debt in period t is just the cumulative discounted net transfer since the period zero. With a perpetual roll-over of maturing debt, i.e. all principal and interest payments being forever financed by issuing new debt, the debtor can achieve an arbitrarily high level of consumption.[85] This path is not considered here because it implies that the debt-servicing capacity of a country - which is the crucial concept of this study - does not have any meaning. If all resources were provided in this way, the event of default would only

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[82] This implies that all consumption is from imports.

[83] The maximization problem and solution are described by Eaton (1993). It will not be repeated here because this section is concerned primarily with the relation between the solvency constraint and the debt service ratio.

[84] A list of all symbols used is provided following the conclusion in chapter 7.

[85] This path is called Ponzi financing. It is named after Charles Ponzi, a Boston "financial wizard" who offered high returns on "deposits" to acquire large amounts of them, so that he could use new "deposits" to fulfil his commitments on previous ones. Such financing schemes are discussed by Minsky (1982, 1986), and in the context of international lending by O'Connell and Zeldes (1988).

depend on the supply side.[86] To avoid losses, lenders cannot allow the anticipated discounted value of resource transfers that they ultimately provide the country to exceed zero.[87]

$$\sum_{t=0}^{\infty} \frac{NT_t}{(1+r)^t} = \sum_{t=0}^{\infty} \frac{C_t - X_t}{(1+r)^t} \leq 0 . \qquad (3)$$

This is often called the intertemporal budget constraint. Dividing equation (2) by $(1 + r)^t$ results in the following expression.

$$\frac{D_t}{(1+r)^t} = \sum_{i=0}^{t} \frac{NT_i}{(1+r)^i} , \qquad (4)$$

which can be substituted into (3), so that the following condition is obtained:

$$D_t \leq \sum_{\tau=t+1}^{\infty} \frac{X_\tau - C_\tau}{(1+r)^{\tau-t}} . \qquad (5)$$

Because consumption cannot be negative, this condition implies, from the creditors' perspective, that

$$D_t \leq \sum_{\tau=t+1}^{\infty} \frac{X_\tau}{(1+r)^{\tau-t}} . \qquad (6)$$

This condition is often called the solvency restriction. It states that debt in any period cannot exceed the present discounted value of the borrowing country's stream of export earnings. Otherwise, lenders would not find their relation with the borrowing country profitable. It can be related to the debt-service ratio using the assumption that all debt instruments have a maturity of one period. This means that, in any period t, the total disbursed debt from the previous period becomes due. Thus the debt service in period t

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[86] This does not mean that aspects of the supply are not important. It means that these aspects are not the only important ones.

[87] All present discounted values regarded here should be expected discounted present values. However, for notational convenience, we ignore this.

is equal to $(1 + r)\, D_{t-1}$ and new borrowing in period t is identical to D_t. Thus the above condition (6) can be transformed into a condition for the debt service, i.e.

$$(1 + r)D_{t-1} \leq \sum_{\tau=t}^{\infty} \frac{X_\tau}{(1 + r)^{\tau - t}} \,. \tag{7}$$

This condition states that, in any period t, the debt service associated with the previous period's disbursed debt cannot exceed the value of the stream of export earnings, i.e. including both the value of current and the present discounted value of future export earnings. Note that the debt-service ratio, DS_t / X_t is identical to $(1 + r)\, D_{t-1} / X_t$. Dividing (7) by X_t and substituting DS_t / X_t into it, the following condition is obtained:

$$\frac{DS_t}{X_t} \leq 1 + \frac{X^F}{X_t} \tag{8}$$

$$\text{with } X^F = \sum_{\tau = t+1}^{\infty} \frac{X_\tau}{(1 + r)^{\tau - t}} \,.$$

This condition states that the debt-service ratio cannot exceed the sum of one and the quotient of present discounted value of future export earnings over current export earnings. This is equivalent to saying that the debt service cannot exceed the sum of current export earnings and the discounted present value of future foreign exchange earnings. It implies in particular, that if the debt-service ratio becomes greater than one[88], the discounted value of future export earnings must be positive - otherwise the inequality stated above does not hold. Thus the debt-service ratio is of importance in one formulation of the solvency constraint of the debtor country.[89] There are several limitations to the practical use of the ratio in that interpretation. For example, in practice this ratio rarely exceeded the value of one for borrowing countries, while default can be observed for countries where the value of this ratio is well below one. Thus, the question arises whether a debt-service ratio which is substantially lower than one may point to the

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[88] Note that this does not imply default since the debt service can be financed through new borrowing.

[89] We acknowledge that standard theory of international debt requires to include the current account surplus, i.e. exports minus imports instead of just exports in the solvency constraint. However, this would be less neat for the backing of DS_t/X_t as a meaningful indicator.

emergence of debt-servicing difficulties at some future date; and if such critical level exists, what it is. Some empirical studies of default have identified the debt-service ratio as statistically significantly related to the event of rescheduling;[90] however, they have provided no guidance with respect to the determination of a critical level.[91]

2.5.2 The balance of payments and the debt-service and reserves-over-imports ratios

The reserves-over-imports ratio is an indicator of the external financial position of a country, which is related to aspects of its liquidity.[92] Clearly, to prevent default a country must always be liquid, i.e. its foreign exchange available must exceed its debt-service demands in each period. For example, default could occur despite a country being solvent because it encounters a liquidity problem.[93]

We use the standard discrete time notation for the balance of payments with the exception that we assume that all securities are in the form of zero-coupon bonds with a maturity of one period and a continuously compounded interest rate. This assumption is used frequently for analytical simplicity in this study and its introduction in this section is designed to ease the understanding of the notation in later parts. However, as a result of this assumption the presentation of the balance of payments differs from the one in standard textbooks and thus may look unfamiliar to the reader.

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[90] See Frank and Cline (1971), Feder and Just (1977), Sargen (1977), Cline (1984), and Solberg (1988).

[91] A similar conclusion was made by Mikesell (1962, cited by Avramovic (1964, p.40)) in his analysis of past defaults, i.e. "history provides little guide for determining the maximum debt-service ratio which countries can sustain without default". One example of a practical application of the solvency concept is provided by Cohen (1985, 1990). He assumes that a country's resources are given by the present value of its future export earnings. These he calculates as follows. He projects future exports by augmenting current exports by the GNP growth rate and discounts future values by a constant interest rate to obtain present values. The resulting estimate he interprets as a solvency index for each country. Almost all developing countries appear to be solvent according to that index.

[92] The presentation follows Klein (1991) in some parts.

[93] The debate in the mid-80s about the issue whether the observable defaults were attributable to insolvency or illiquidity of the debtor country is reviewed in Armendariz de Aghion and Ferreira (1993). The discussion is reflected in the collection of papers presented at the 1984 World Bank symposium on international debt of developing countries edited by Smith and Cuddington (1985).

In general, the balance of payments can be represented as follows:

$$LB_t + KB_t + D_t^X = 0 \ . \qquad (9)$$

The first term, LB_t, denotes the current account balance, the second one, KB_t, the balance of capital transactions and D_t^X "exceptional financing".[94] For convenience consider that all securities are in the form of discounted zero-coupon bonds with a maturity of one period and a face value of one. Let F_{t-1} denote the number of foreign securities, such as international reserves, which were purchased by the debtor country in period t - 1 and N_{t-1} denote the number of bonds issued abroad in t - 1. Furthermore, let r (in $R = e^{-r}$) be the discount factor for foreign securities and b_t (in $B_t = e^{-bt}$) the one for the bonds issued by the debtor country.[95] Since the nominal value of the bonds at their date of maturity can be split up into their purchase price, i.e. RF_{t-1} [and $B_{t-1}N_{t-1}$, respectively] and their discount, i.e. $(1 - R) F_{t-1}$ [and $(1 - B_{t-1}) N_{t-1}$], the current account balance - which records export and import of goods and services - can be written as follows:

$$LB_t = (X_t - I_t) + (1 - R)F_{t-1} - (1 - B_{t-1})N_{t-1} \ , \qquad (10)$$

where $(X_t - I_t)$ denotes exports and imports of goods and services, $(1 - R) F_{t-1}$ denotes the interest obtained from foreign securities (i.e. from F_{t-1} bonds purchased in t - 1 at the price R, paying one at time t) and $(1 - B_{t-1}) N_{t-1}$ denotes the interest paid on bonds issued in period t - 1 (i.e. from N_{t-1} bonds issued in period t - 1 at the price of B_{t-1} and requiring the repayment of one in period t).

The second term in the balance of payments is the balance of capital transactions, KB_t, which records export and import of capital,

$$KB_t = [RF_{t-1} + B_tN_t] - [RF_t + B_{t-1}N_{t-1}] \ . \qquad (11)$$

Its right hand side contains two terms. The first one documents the capital inflow,

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[94] Note that the changes in the reserves are accounted for in KB_t, unlike in the standard presentation of the balance of payments. D_t^X is defined in equation (12) where it is stated that it is non-negative.

[95] Time indicators are suppressed because by assumption all debt instrument have a maturity of one period.

consisting of the principal of foreign securities purchased in period t - 1 and the value of newly issued debt. The second term documents the capital outflow which consists of purchases of foreign assets and the retirement of own debt issued in the previous period.

The third term in the balance of payments is exceptional financing D_t^x which is a hypothetical form of external finance and results either from unilateral suspension of payments or from a renegotiated debt reduction. It is by definition positive when the debtor country is in default on its debt servicing obligations. Combining and rearranging the above identities the following condition can be obtained for exceptional financing:[96]

$$\begin{aligned} D_t^x &= 0 \quad \text{for } (X_t - I_t) + (F_{t-1} - RF_t) + B_tN_t \geq D_t \,, \\ D_t^x &> 0 \quad \text{for } (X_t - I_t) + (F_{t-1} - RF_t) + B_tN_t < D_t \,. \end{aligned} \tag{12}$$

Exceptional financing D_t^x is, by definition, non-negative. It is positive when the trade balance, $X_t - I_t$, a reduction of foreign securities and international reserves, $F_{t-1} - RF_t > 0$, or the issuing of new bonds abroad, $B_tN_t > 0$, do not generate sufficient foreign exchange such that the country could meet its debt-service demands.[97] This gives us another definition for default. One could proceed to a theory of default by making assumptions about the relative importance of the variables for the occurrence of liquidity problems.

For example, consider the case where international lenders cut their capital flows to a debtor country, i.e. $B_tN_t = 0$, because they perceive liquidity problems of the debtor country. These might reflect underlying solvency problems (as defined in the previous section) or may be due to coordination problems among the lenders regarding provision of the necessary finance so that the debtor's liquidity problems can be overcome. In such a situation, the debtor does not build up further foreign assets, i.e. $RF_t = 0$, but has to make recourse to its reserves in order to meet its debt-service obligations.[98] Under these circumstances, the above equations can be reduced to the following forms:

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[96] Note that D_t replaces N_{t-1}.

[97] Otherwise, exceptional financing is equal to zero.

[98] For a description of this scenario see Feldmann (1991, in particular pp. 688-89).

$$D_t^x = 0 \quad \text{for } X_t + F_{t-1} \geq I_t + D_t \,, \qquad D_t^x > 0 \quad \text{for } X_t + F_{t-1} < I_t + D_t \,. \tag{13}$$

The above inequalities illustrate that - under the specific assumptions made - default of a country occurs, if export earnings, X_t, and the foreign assets, F_{t-1}, are not large enough to meet import and debt-service demands. This relation can be restated as follows:

$$D_t^x = 0 \quad \text{for } X_t - D_t \geq I_t - F_{t-1} \,, \qquad D_t^x > 0 \quad \text{for } X_t - D_t < I_t - F_{t-1} \,. \tag{14}$$

The above representation illustrates that the relation between the variables could be expressed in terms of two ratios, i.e. the ratio of exports to debt-service demands, X_t/D_t, and the ratio of foreign assets to imports, F_{t-1}/I_t. Given that, in practice, international reserves are a major component of foreign assets, F_{t-1}, the latter ratio can be proxied by the reserves-over-imports ratio. Similarly, the former ratio can be proxied by the debt-service ratio. Thus, under the specific assumptions made here, default can be related to the realization of the two external financial indicators, i.e. the reserves-over imports ratio and the debt-service ratio. This provides a rationale for the use of the two ratios in assessing the external financial situation of a country.[99] The debt-service ratio is more relevant for its solvency and the reserves-over-imports ratio for its liquidity.

[99] The two indicators described in this and the previous section are particularly relevant if the binding constraint for the debt service was the debtor's ability-to-pay. By contrast, if aspects of its willingness-to-pay were more important, these indicators are presumably less relevant. Other factors, such as the debtor's expectations about benefits from and the penalty for default would became more relevant. A model which includes aspects of the willingness-to-pay is explained in the third chapter.

Chapter 3: The Interest Rate Spread in External Borrowing

3.1 Introduction

The previous chapter suggested that the creditworthiness of a country is reflected in the interest rate premium - the spread - that it is charged in its borrowing on international capital markets. To understand the determination of the spread, the present chapter applies a conventional model of international lending in the presence of a default threat. It tests the implications of the model with respect to the spread empirically, using the example of the international borrowing of LDCs and CEECs between 1989 and 1992. The model is a variation of a model by Cohen and Sachs (1985) incorporating aspects of both the ability and the willingness of the debtor country to meet its debt-service demands. It implies that in the presence of a default threat there exists a debt ceiling, which is determined in particular by the debtor's expected future resource transfer potential and its expected losses in default. The closer the country's actual debt level gets to that ceiling, i.e. the smaller the external financial margin, the higher will be the spread in its international borrowing. The model allows the derivation of an expression for the spread as a function of economic variables for which proxies can be selected and included as explanatory variables in an empirical regression of the spread. By contrast, most previous empirical studies were not based on an explicit theoretical model and the explanatory variables, such as e.g. international reserves or the debt-service ratio, were selected rather on an *ad hoc* basis.[1]

The empirical part of the chapter consists of two separate analyses. The first one is concerned with the identification and description of the spread in Hungary's Eurobond market issues between 1985 and 1991. It appears that the spread in these bond issues increased with the amount of the country's outstanding bond debt, thus providing some weak support for one implication of the theoretical model, i.e. that the spread is, ceteris paribus, increasing in the level of debt. The second analysis uses the example of the

[1] Bäcker and Klein (1993) conduct their empirical analysis on the basis of an underlying theoretical model. The present study uses their data.

borrowing on international capital markets of 16 LDCs and CEECs between 1989 and 1992. It finds some support for the hypothesis that the spreads in these transactions were influenced by the country-specific economic variables in the direction suggested by the theoretical model. This is an interesting result because previously some authors have argued that the spreads have varied so little among transactions that they could not reflect the country-specific economic variables of the debtors.[2]

More specifically, the results of the latter empirical analysis are as follows. They point to the hypothesis that the spread tends to be higher in the borrowing of countries which have a rescheduling record than in the borrowing of those which do not have such a record.[3] If the focus is on countries with a rescheduling record, the spread appears to be significantly determined by indicators related to their liquidity and solvency situation. In particular the ratio of reserves over the IMF quota (included as a proxy for the liquidity situation) appears to be significant, pointing to the hypothesis that the liquidity of the debtor is of central importance to the spread.[4] There is also some support for the hypothesis that the spread in the borrowing of these countries is positively related to their debt-service ratio. Unlike for countries with a rescheduling history, the spreads of those without a rescheduling history does not appear to be significantly influenced by indicators related to their liquidity or solvency situation. The estimated direction of influence of openness, i.e. the ratio of imports to GNP, on the spread differs among the two groups of countries. For example, it appears to be positive for the countries with a rescheduling record, thus agreeing with the prediction of the ability-to-pay approach. Since imports represent claims of foreign exchange which compete with debt-service obligations, a higher share of imports implies a greater probability of solvency or liquidity problems and thus a higher spread. By contrast, the spread of countries without rescheduling records appeared to be significantly negatively related to their openness, thus agreeing with the

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[2] Guttentag and Herring (1985), Folkerts-Landau (1985), Plan (1985), and Group of Thirty (1982).

[3] A first statistical and graphical analysis of the data suggested that the model parameters are different depending on whether a country previously had a rescheduling of its commercial bank debt or not. Therefore a regression model was used which allows for different estimates of both the intercept and the slope coefficients, depending on a country's rescheduling record. To the author's knowledge this distinction has not been made in any previous spread analysis.

[4] The reserves-over-IMF-quota ratio was included instead of the reserves-over-imports ratio because the inclusion of the latter, together with the debt-service ratio, gave rise to problems of multicollinearity.

prediction of the willingness-to-pay approach. Namely, to the extent that one penalty of default consists of the loss of trade financing facilities, countries with a higher share of imports of GNP would suffer more in default, and thus have a greater incentive not to choose such a measure. It is beyond the scope of this study to investigate in detail the reasons for these empirical results concerning openness; however, a tentative explanation is suggested at the end of section 3.5.

This chapter is organized as follows. The second section provides a rationale for the interpretation of the spread as a (default) risk premium and presents selected results of previous empirical studies of the spread. The third section presents a standard model of international lending in the presence of a default threat. Section 3.4 describes the practical aspects of identification of the spread using the example of Hungarian Eurobonds, and it also describes its development. Readers familiar with the spread analysis can turn directly to section 3.5 which presents the results of a pooled cross-country time-series analysis of the spread in LDCs' and CEECs' borrowing.

3.2 The interest rate spread as a default risk premium

The typical interest rate on an international syndicated loan consists of two elements, (i) a variable component that is equal to the three or six months London interbank offered rate (LIBOR) and (ii) a fixed component called the spread that is specific to each individual loan contract. In analogy to these uses in the market for credits, a spread can be defined for any bond as the differential between its yield and the yield of a benchmark bond. This benchmark bond must be one that is customarily regarded as risk-free and should have (otherwise) the same characteristics as the bond under consideration. Such a spread can be interpreted as a measure of the market's perception of the default risk associated with that debtor. The underlying rationale for this interpretation is described in the following where, for illustrative purposes, all debt instruments are assumed to be zero-coupon bonds.

In a world without uncertainty, default does not occur. Creditors could calculate *ex ante* that level of debt above which the sovereign debtor would *ex post* declare default. Consequently, they would restrict their exposure to that country so that this level would not be reached. Realistically, this critical level and repayment are uncertain. For example, repayment might depend on the realization of a country's debt-servicing capacity, K, i.e. the maximum debt service that the debtor country can meet, given its economic and political constraints (see also section 1.2, chapter 1). Consider that default then occurs when the contractual debt service D exceeds the debt-servicing capacity, i.e. $D \succ K$. Under these circumstances the *ex post* return on a debt instrument $\tilde{r}$ issued by a country is stochastic and can be written as follows:

$$\tilde{r} = \begin{cases} b & \text{if } K \succeq D \,, \\ \tilde{r}_D & \text{if } K \prec D \,, \end{cases} \tag{1}$$

where b denotes the nominal yield of the debtor's bonds and $\tilde{r}_D$ the stochastic return in default. Thus, the expected net return viewed from the investor is

$$E\tilde{r} = (1 - \pi)b + \pi E[\tilde{r}_D \,|\, K \prec D] \,, \tag{2}$$

where π = prob $\{K \prec D\}$ denotes the (positive) probability of default and $E[\tilde{r}_D \,|\, K \prec D]$ the conditional expected value of the net return in the event of default. Assuming that investors do not receive any interest payments, but only their principal in default, the conditional expected return is given as follows:

$$E[\tilde{r}_D \,|\, K \prec D] = 0 \,. \tag{3}$$

Assume that international investors are risk neutral, competitive, and face the alternative to invest in a risk-free asset with a return of r. Under these circumstances, no arbitrage opportunities would be left and the expected return on the (defaultable) bond would be equal to the return on the default-free asset r.

$$E\tilde{r} = r \,. \tag{4}$$

Thus the nominal yield on the country's bonds b will be determined by the condition that investors obtain the risk-free return on expectations for a given default probability.

$$b = \frac{r}{1 - \pi} \succ r \,. \tag{5}$$

Since π is positive, by assumption, the nominal yield b of the defaultable bond must be higher than the risk-free interest rate r. The difference between the bond yield and the risk-free interest rate is the spread, that can be written as follows:

$$s = b - r = \left(\frac{\pi}{1 - \pi}\right) r \succ 0 \,. \tag{6}$$

This equation gives a definition of the spread. It also gives a theoretical rationale for the view that the spread is a measure of the (default) risk perception of the market. This risk perception may be particularly influenced, among other variables, by the economic and financial indicators characterizing the debtor's country. For convenience, most empirical studies assume either explicitly or implicitly a specific function for the influence of these indicators on the risk perception. Namely, they assume that it is a logistic function of a vector of indicators κ, i.e.:

$$\pi(\kappa) = \frac{e^{\alpha_0 + \sum_{n=1}^{N} \alpha_n \kappa_n}}{1 + e^{\alpha_0 + \sum_{n=1}^{N} \alpha_n \kappa_n}} \,, \tag{7}$$

so that the logarithm of the spread (according to (6)) can be written as follows:

$$\ln s = \alpha_0 + \sum_{n=1}^{N} \alpha_n \kappa_n + \ln r \,. \tag{8}$$

Consequently, proxies were selected for the vector κ, and the spread regressed on these variables. These variables were generally selected on an *ad hoc* basis and not from an explicit theoretical model.

Table 3.1 lists selected hypotheses and results of empirical studies of the spread. At the top of each cell, it shows the sign that was expected for the estimated coefficient of the included variable (i.e. either + or -), and below, at the bottom of the cell, the actual sign of the estimated coefficient (i.e. either + or -). If that estimated coefficient is significant in at least one regression specification and at least at the 5% level, the cell

includes an exclamation mark. Similarly, if the coefficient was significant in at least one regression specification and at least at the 10% level, the cell includes a bracketed exclamation mark.

Table 3.1: Selected hypotheses and results of empirical studies of the determinants of the spread[a][b]

	Feder and Just (1977)	Feder and Just (1980)	Edwards (1984)	Edwards (1986)	Gottlieb (1987)		Schich (1992a)	Özler (1992)
					APA[d]	WPA[d]		
debt service/ exports[c]	+ + (!)	+ + (!)	+ + (!)	+ - (!)	+ + !	+ + !	+ + (!)	+ +
imports/GNP	+ + !	+ + !	+	+ +,-	- + !	+ + !		+,- -
debt, debt/GNP, debt/population	+ +		+ + !	+ + (!)	+ + !	+ + !	+ + !	+ + !
investment, investment/GNP			- - (!)	- - !				- - !
reserves over IMF quota, over GNP, or over imports	- - (!)		- - !	- +	- - !	- - !		
observation period	1973 - 1974	1973 - 1975	1976 - 1980	1976 - 1980	1971 - 1983	1971 - 1983	1985 - 1991	1968 - 1981

(a): Most studies use pooled cross-country time-series data, except for Gottlieb (1987) and Schich (1992a), which use pure time-series data.

(b): The cells contain signs and exclamation marks. The sign at the top of the cell indicates the direction in which the variable was expected to influence the spread and the sign below it indicates the estimated direction of influence. The exclamation mark '!' and the bracketed exclamation mark '(!)' indicate that the coefficient was found significant at least in one regression specification, and at least at the 5% level, or at least at the 10% level, respectively.

(c): Feder and Just (1977) use a modified debt-service ratio which includes both exports and capital inflows.

(d): APA stands for the ability-to-pay approach and WPA for the willingness-to-pay approach.

Three observations are singled out for special attention:

(i) The reserves variable, i.e. either reserves over the IMF quota, either over GNP, or over imports, were always found to be significantly negatively related to the spread when it was included in the empirical analysis.

(ii) Although the debt-service ratio is the most widely used indicator to assess the solvency situation of a country, it did not appear to influence the spread to such a great extent as one might have expected from that fact. The coefficient of the debt-service ratio was found significant in the expected direction only once at the 5% level and otherwise only at the 10% level. In one study (Özler (1992)), it was not significant, and, in another one (Edwards (1986)), it was significant at the 10% level in the opposite direction, i.e. with a negative sign.

(iii) The expected sign of the coefficient of openness, i.e. imports/GNP is controversial. For example, the willingness-to-pay approach (WPA) suggests a negative sign for this coefficient whereas the ability-to-pay approach (APA) suggests a positive sign. The WPA implies that the higher the relative importance of imports the greater should be the debtor's incentive to maintain access to capital markets to finance its imports.[5] On the other hand, the APA suggests a positive sign because of the following reasoning. Since imports reflect claims of foreign exchange which are competing with debt-service obligations, higher ratios imply a higher probability of default.[6] The empirical results of existing studies seem to suggest that investors believe in the APA rather than in the WPA. For example, the coefficient of

[5] See Aizenmann (1987, 1988, 1991).

[6] For example, Avramovic (1964) explains that the "debt servicing capacity depends on the ease with which a county can reconcile competing claims on its resources" (p.10). For example, the higher the ratio of imports over GNP, the higher tend to be the non-compressible imports, i.e. imports that have to be pursued even in a situation where there is financial distress and thus the greater will be the probability of default. Another aspect is stressed by Frenkel (1983), who states that more open countries would be more vulnerable to adverse external shocks, such as e.g. sudden import price increases.

openness is never found significant with a negative, but only with a positive sign.[7]

It is of interest to note that, except for one study, the observation periods do not extend beyond 1983.[8] It is likely that the ideas put forward by the willingness-to-pay approach were not widely disseminated during these observation periods since the seminal article of that approach dates back only to 1981.[9] This may have changed since 1983. None of the studies has included variables related to the debtor's payment record.[10] As explained in the fifth section of this chapter, the reesults of our empirical analysis suggested to distinguish between debtor countries, i.e. between those which previously had a rescheduling and those which did not.

3.3 A macroeconomic model of the spread

3.3.1 The basic model with certainty

This section is concerned with the establishing of a theoretical framework which helps to identify economic variables that are potentially relevant for the determination of the spread. For this purpose, a two-period model of lending in the presence of a default threat is described, which is a variation of a well-known model by Cohen and Sachs (1985). It will allow us to derive an expression of the spread as a function of several economic variables. This subsection explains the basic model with certainty to introduce some aspects of cross-border lending and to ease the understanding of the model with uncertainty. Certainty means in particular that the debtor's second period resource transfer

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[7] Gottlieb (1987), testing explicitly the empirical implications of the two approaches against each other estimates a positive coefficient for openness and interprets this as evidence for the hypothesis that international investors believe in the APA.

[8] To the author's knowledge there exist no other empirical studies of the spread than those listed in the table, which were checked for cross-references.

[9] Eaton and Gersovitz (1981a).

[10] Özler (1992) includes the number of previous credit transactions of a borrower as explanatory variable for its spread, the idea being that the number of transactions increase the investors' "experience" with the borrower and thus reduce the spread. However, it is not clear how the author accounts for the performance of the previous issues, i.e. whether they have been serviced in full or not.

potential is known already in the first period. Under these circumstances, no default will be observed since lenders provide debt just below the level at which the borrower would default. Consequently, neither default nor a spread will be observed.

Consider that the world consists of a capital-abundant (creditor country) and a capital-deficient country (debtor country). Cross-border borrowing is effected through the issuance of foreign bonds, i.e. the debtor country issues bonds on the domestic capital market of the capital-abundant country. These bonds have a maturity of one period and an interest rate of b, the total nominal value of bonds being denoted by D. The debtor country receives in each period an exogenously given endowment of (transferable) resources X, say, for example from the net export of services, the production of which entails no costs. There is no other production. Thus, the debtor country's total resources available in period one are equal to (D + X); they can be used either for consumption, C_1, or investment, I. Thus, its budget constraint in the first period is given as follows:

$$X + D = C_1 + I \,. \tag{9}$$

The total resources in the second period, X_2, are given as the sum of the regular constant endowment of resources X and the return of the investment; they are transferable and thus can be used either for domestic consumption, C_2, or for the repayment of debt to foreign creditors. Since (by assumption) these resources are completely transferable, they define the debtor's resource transfer potential in the second period, which is as follows:

$$X_2 = X + (1 + \iota(I))I \quad \text{with} \quad \iota'(I) > 0 \,, \tag{10}$$

where ι is the rate of return on investment, which is increasing in I. The rationale for this specific form of the investment function is as follows. Consider that all investment represents investment in the restructuring of the economy. In general, such restructuring efforts are more effective the more extensively they are done, which is reflected in the common notion that half-hearted reforms on a limited scale come to nothing.[11] However,

[11] This appears to be a plausible assumption for economies undergoing structural changes. This specific assumption about the form of the investment function is not necessary to obtain the results presented later. Other simple investment functions have the same implications.

it is assumed that, due to administrative and technical constraints, the scope for restructuring has an absolute limit I^C, thus $0 \leq I \leq I^C$. Consider that the borrowing country is governed by a social planner who maximizes the country's welfare, which is represented as an additively separable function of consumption in periods one and two, the consumption of the second period being discounted by the social preference rate β:

$$U(C_1,C_2) = C_1 + C_2(1 + \beta)^{-1} . \tag{11}$$

By definition, the consumption in the first period is the difference between total resources available and those used for investment, i.e.

$$C_1 = X + D - I . \tag{12}$$

The feasible consumption in the second period depends on the government's decision whether to meet the debt service demands or to default on its debt. The costs of honouring the debt contract consist of the resources transferred to the creditors, (1 + b) D, which are no longer available for consumption in period two. Thus, when repayment is made, the debtor's consumption C_2^R is given as follows:

$$C_2^R = X_2 - (1 + b)D . \tag{13}$$

Alternatively, i.e. in default, the contractual debt service (1 + b) D continues to be available for consumption; however, the debtor country suffers a default penalty which is inflicted upon it by the creditors. Following the convention, it is assumed that the debtor's loss from that penalty is equivalent to a fixed fraction γ of its resource transfer potential in that period.[12] Consequently, consumption in default, C_2^{Df}, is given as follows:

$$C_2^{Df} = (1 - \gamma)X_2 . \tag{14}$$

The fraction γ summarizes all of the possible costs of retaliation of the creditors including e.g. the freezing of the debtor's assets held abroad, the withdrawal of future

[12] Like Cohen and Sachs (1985), a large number of studies assume that the default penalty represents a fixed and exogenous fraction of the debtor's resources and that it does not imply any costs to the creditors. The present chapter follows this assumption in order to keep the model simple. An example of an endogenous penalty is provided by Aizenmann (1987, 1988, 1991) and an example of a stochastic penalty in Eaton (1990). Bulow and Rogoff (1988) consider a penalty that is costly to the inflicting party. Introducing such assumptions in the present model would have an influence on the spread determination, the direction of which is not clear.

access to credit, and in particular to trade financing facilities, etc.[13] The government chooses not to repay its debt if the costs associated with it are lower than the costs of repayment.[14] Thus, actual consumption in the second period, C_2, is the maximum of feasible consumption in the cases of repayment, i.e. (13), and default, i.e. (14),

$$C_2 = \max[X_2 - (1 + b)D, (1 - \gamma)X_2] . \qquad (15)$$

The remainder of this subsection explains the behaviour of the creditors, i.e. the investors purchasing the bonds issued by the debtor. They are assumed to be competitive, risk-neutral, and to be facing the alternative of investing in a risk-free asset with a return of r. Since, by assumption, the creditors know the debtor's future resource transfer potential (and its maximization problem), they determine their supply of funds in such a way that a default never pays off for the debtor. In other words repayment is sustained by a high enough default penalty. Consequently, the interest rate b that the debtor is charged is equal to the risk-free interest rate r. The maximum feasible level of debt, i.e. the debt ceiling, D^C, is given as follows:

$$D^C = \gamma X_2(1 + r)^{-1} . \qquad (16)$$

To determine this ceiling, creditors must consider the investment decision by the government since the investment I forms part of the resource transfer potential in the second period, X_2. Due to the linearity assumptions in the present model, the investment is equivalent to either zero or I^C. In a world without default, the debtor would always exploit all investment opportunities as long as the return of investment ι exceeds the risk-free rate of return r. In a world with default, the decision by the debtor whether to invest

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[13] The spectrum of default penalties is reviewed by Kaletsky (1985). He suggests that, in practice, the loss of trade financing facilities is the most important one. Our analysis in the previous chapter supports the hypothesis that the loss of trade financing facilities and the increase in the costs associated with them are indeed an important consequence of default.

[14] For simplification, outright default is considered. Considering partial defaults would not affect the qualitative results of this analysis, but would generally reduce the level of the spread. The assumption of outright default is a common assumption for the case of bond lending as opposed to bank lending. As Bulov and Shoven (1978) put it, "their (i.e. the bankholders) non-cohesive nature implies that they cannot negotiate to alter the terms of their loan when bankruptcy becomes a possibility." In particular, the transaction costs involved would be prohibitive. There are also free-rider problems which give each borrower the incentive to demand full repayment, knowing that the remaining creditors will still have a strong incentive to prevent default (see Folkerts-Landau (1985)). Eichengreen and Portes (1988a,b) analyze some unsuccessful attempts of arranging renegotiations between sovereign borrowers and bondholders in the interwar period.

or not depends not only on ι and r but on ι, r and β. The conditions for investment in such a case are derived in Cohen and Sachs (1985).[15] Investment tends to be maximal for relatively high values of the parameter ι and low values of the parameters r and β.[16] Substituting for X_2, the equation (16) can be rewritten as follows:

$$D^C = \gamma \frac{[X + (1 + \iota(I))I]}{1 + r} . \qquad (17)$$

Summing up, in the case of certainty, the implication of this model is that the presence of the threat of default results in a credit ceiling for the sovereign debtor.[17] Repayment of the debtor is sustained by a high enough default penalty, and the debtor is charged just the risk-free rate, i.e. there is no spread.

3.3.2 The case of uncertainty

This subsection discusses a situation with uncertainty, which gives rise to a spread.[18] In particular, it is assumed that the resource transfer potential in the second period is stochastic and that the feasible realizations of it are equally likely viewed from the first period. More specifically, the resource endowment $\tilde{X}$ is assumed to be uniformly distributed in an interval between zero and 2X,[19]

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[15] See also Schich (1992a, p.8f). These conditions are not dscussed here because they would unnecessarily complicate the presentation. For our purposes it is sufficient to know how ι and r affect the spread.

[16] Cohen and Sachs (1985) consider the timing structure between actual investment and the extension of credit as an additional determinant of the debtor's actual investment efforts. If the funds are granted before the investment decision is made and there are no means to guarantee that the funds will be dedicated to investment, the debtor may find it optimal to deviate *ex post* from its prior investment announcements. If there exists such a means to guarantee the use of funds (or if the funds are granted only after the investment decision is made), the investment will be generally higher since the debtor knows that his investment decision raises its debt ceiling. Such a phenomenon is referred to in the macroeconomic literature as the problem of time-inconsistency (Calvo (1978)).

[17] The debt ceiling would be equal to zero, i.e. there would be no lending at all if the penalty parameter were equal to zero.

[18] It is assumed that the uncertainty is shared equally by debtor and creditor, i.e. information are symmetric. Introducing asymmetry - e.g. borrowers have more information than lenders about the total amount of debt they have undertaken - generally implies rationing and an equilibrium with borrowing might not exist, as shown in Kletzer (1984).

[19] The same results are obtained for *any* interval of a uniform distribution around X.

$$X_2 = \tilde{X} + (1 + \iota(I))I \quad \text{with} \quad \tilde{X} \text{ u.d.} \sim [0, 2X]. \tag{19}$$

By assumption, the debtor rationally weighs the costs and benefits from honouring its debt contract and chooses to default if the benefits of default exceeds the costs associated with it. Thus default will be observed in the second period for

$$\gamma X_2 < (1 + b)D , \tag{20}$$

where b denotes the nominal interest rate of bonds. This interest rate differs from the risk-free interest rate r as long as the apread is positive; by definition, b = r + s. Assuming risk-neutral competitive investors and a zero net return in default, the no-arbitrage capital market equilibrium is defined by the following relation between interest rates:

$$1 - \pi = \frac{1 + r}{1 + b} . \tag{21}$$

This means that, in equilibrium, the investors demand such a nominal interest rate on the risky bond that the product of its nominal return (1 + b) and the probability of its repayment (1 - π) equals the return of the risk-free asset (1 + r).[20] The spread s is positive as long as the probability of default π is positive. This probability can be written more explicitly as follows:

$$\pi = \text{prob}\{\gamma X_2 < (1 + b)D\} . \tag{22}$$

In other words, the probability of default is equivalent to the probability that the resources in the second period are so low that the default penalty is lower than the costs

[20] A second term would appear on the left-hand side of the equation if the recovery value in default were different from zero, consisting of the product of π and the recovery value in default. The conceptual approach used in chapters 4 and 5 considers that the recovery value in default may be different from zero.

of debt servicing, i.e. the default penalty is not sufficient to sustain repayment.[21] Rearranging (21) and substituting (r + s) for b, the spread can be expressed as follows:

$$s = \frac{\pi}{1 - \pi}(1 + r) \quad . \tag{23}$$

This completes the system of equations needed to obtain an expression of the spread as a function of the debtors macroeconomic variables. For presentational purposes, we first consider a situation where the debtor abstains from investing. By taking the expected value of X_2 which is given in (19), substituting it into (22), and substituting the resulting expression into (23), the following expression for the spread is obtained:

$$s = \gamma \frac{X}{D}\left[1 - \left(\frac{2(1 + r)}{\gamma X}[D^C - D]\right)^{1/2}\right] - (1 + r) \,, \qquad \text{with } D^C = \frac{\gamma X}{2(1 + r)} \tag{24}$$

being the debt ceiling. D^C is the maximum feasible level of bond debt which is compatible with the no-arbitrage condition on the capital markets (21). The actual level of debt D cannot exceed this debt ceiling D^C because, otherwise, an increase in the nominal interest rate r would not be sufficient to offset - on expectations - the higher risk of default, and then (21) would be violated. When the debt ceiling is reached, i.e. $D^C = D$, the spread is equal to (1 + r) and the probability of default π obtains its maximum value, which is $\pi = 0.5$. In this situation, the no-arbitrage condition regarding the capital markets is satisfied, the expected return on the risky bonds being equivalent to (1 + r). Under rather general constellations of the parameters γ, r, and β, the debt level which maximizes the

[21] The above equation demonstrates - as claimed in the second section of the first chapter - that under certain circumstances the implications of the two concepts of explaining default, the APA and WPA, are equivalent. Namely, from the viewpoint of a small investor whose behaviour cannot influence the probability of default, it is virtually equal whether default occurs because (i) the default penalty is too low to force a reluctant debtor country to repay its debt, i.e. γ is too low, or because (ii) the debtor country's resources are so low that it is unable to meet its debt service demands, i.e. X_2 is too low. Provided that the probability of default is exogenous, the debt-servicing capacity K, as discussed in the second section, is represented here by the product of γ and X_2. Consequently, the probability prob{ $K \prec D$ } described in section 3.2 corresponds to the probability prob{ $\gamma X_2 \prec (1 + r)\, D$}. This chapter is concerned with establishing a framework from which the direction of influence of individual variables can be derived. Therefore the remainder of it continues to consider the two terms γ and X_2 explicitly. The next chapter considers only one term, i.e. the debt-servicing capacity.

debtor's welfare is lower than this debt ceiling, i.e. $D^C \succ D$.[22] This means that the debtor country is left with some room for financial manoeuvre, i.e. its external financial margin is positive. The expression for the spread becomes more complicated when investment is considered:

$$s = \gamma \frac{X}{D}\left[1 - \left(\frac{2(1+r)}{\gamma X}[D^C - D]\right)^{1/2} + \hat{I} - (\hat{I}[2+\hat{I}])^{1/2}\right] - (1+r), \quad (25)$$

$$\text{with } D^C = \frac{\gamma X}{2(1+r)} \text{ and } \hat{I} = \gamma(1+\iota)I .$$

On the basis of (24) and (25), the determinants of the spread and the directions of their influence can be identified. For example, the spread increases with a decreasing external financing margin, in other words, the supply curve of funds to the country is upward sloping. Other determinants include the expected resource endowment X, the investment I, the return on investment ι, the penalty parameter γ, and the risk-free interest rate r. The spread s is increasing in r and decreasing in γ, X, I, and ι. The determinants of the spread are listed below.[23]

$$\underset{\quad}{s} = s\underset{(-)}{(\gamma}, \underset{(-)}{X}, \underset{(+)}{r}, \underset{(-)}{D_c - D}, \underset{(+)}{D}, \underset{(-)}{I}, \underset{(-)}{\iota}) + \epsilon . \quad (26)$$

These empirical implications were tested with observations and the results are presented in the fifth section of this chapter. Before that, the fourth section explains the method of identifying a spread and describes the development of the spread in Hungary's external bond issues between 1985 and 1991.

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[22] The explicit derivation is provided by Cohen and Sachs (1985). The intuition for such situation is as follows. An increase in debt has two opposite effects on welfare. It does augment the scope to advance consumption from the second to the first period, thus increasing welfare, as long as $\beta \succ r$. However, it also raises the probability of default in the second period and thus the probability of incurring a welfare loss of the default penalty.

[23] The sign under each variable indicates the expected direction of influence.

3.4 The example of Hungary

3.4.1 Background

In the first half of the 1980s, the Hungarian economy was characterized by slow growth and the government pursued a strategy of higher imports of investment goods in an attempt to improve economic performance. Imports of consumer goods from OECD countries also increased. At the same time, hard currency exports stagnated and, as a result, the gap between hard currency earnings and spending increased. This gap was closed by borrowing on the international capital markets, in particular on the Eurobond market. Subsequently the hard currency current account balance deteriorated even more as growing interest payments added to the hard-currency burden, as a result of both an increase in total debt and the unanticipated increase of the interest rate in the syndicated Eurocurrency credits which were agreed upon on a variable interest basis. The result was a continuously increasing level of external debt, the gross debt increasing more than tenfold between 1974 and 1990 (see appendix table 3.5). The real increase in external debt has been overestimated by these figures because movements in exchange rates accounted for part of the nominal increase in external indebtedness, debt stocks being reported in nominal US dollars while most of the debt is actually denominated in other currencies such as the DM, etc..[24]

The foreign trade sector of Hungary has undergone significant structural changes during the second half of the 1980s; however, the general trend - roughly stagnation - in the capacity to earn hard currencies persisted. Only quite recently, following the shift from the settling of accounts by means of transferable roubles to the settling of accounts in hard currencies, have exports increased. This outcome came as a surprise for both economists of the National Bank of Hungary and the Western economists, who expected that this fundamental change in inner-CMEA trade at the beginning of January 1990 would have been disadvantageous for Hungary, which relied heavily on oil imports from the former Soviet Union.

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[24] The real increase in debt, i.e. the increase net of exchange rate effects is slightly lower. Until the early 1990s, it had been regularly reported for the CEECs in the February issues of the OECD's *Financial Market Trends*.

As a consequence of the almost continuous stagnation of hard currency exports since 1985 and the simultaneous increase in debt, debt-related indicators worsened. For example, the debt-to-export ratio of Hungary which had risen to 343 percentage points in 1990 clearly indicated that the country was heavily indebted at that time.[25] This heavy debt burden has forced the country to allocate two-thirds of total hard currency earnings to total debt service. As a result of these developments and also because of the generally increased uncertainty about CEECs' economies, the credit risk rating for Hungary has deteriorated, being reflected in the deterioration of the country's ranking in the *Euromoney* country risk rating poll.

3.4.2 The spread in Eurobond issues

This subsection is concerned with the spread in Hungary's Eurobond issues between 1985 and 1991. During this observation period all international bonds of Hungary were issued by the National Bank of Hungary (NBH). In addition to its activity on the Eurobond market, the Bank raised, albeit to a lesser extent, funds on other countries' domestic bond markets and on the market for syndicated Eurocurrency credits.[26]

The identification of the spread and the construction of a time series for it is often difficult and sometimes impossible, the reason being that continuous issuing activity by one debtor country is rarely observed. This is reflected in the fact that all except two empirical studies of the spread use cross-country or pooled cross-country time-series data rather than time-series data.[27] In the present study, information about the spread is

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[25] It is customary to consider a ratio of more than 200 points as indicating a heavy debt burden.

[26] The NBH ceased to borrow from the syndicated Eurocurrency market in 1990 whilst it continued to issue Eurobonds. An economist from the NBH suggested in an informal communication that this move is part of the Bank's borrowing strategy and was intended to signal that the country does not seek a renegotiation of its debt, renegotiation of bond debt unlike that of bank debt being generally prohibited by too high transaction costs. This view seems to be supported by the public statements of officials from this institution which pointed out that the country is determined not to seek a solution "à la Poland". However, it cannot be ruled out that this move was the result of the country being *shut out* of this market (a view expressed in the OECD's *Financial Market Trends*, February 1991). If the latter were true, the actual observed spread for bonds would have underestimated the true risk perception of the markets.

[27] To the author's knowledge there exist only two studies of the behaviour of the spread over time for one country (Gottlieb (1987), Schich (1992a)).

aggregated from the DM Eurobond market and the market for Syndicated Euro-DM credits to construct a time-series of the spread, consisting of quarterly data from the first quarter of 1985 to the second quarter of 1991. Essentially it is based almost exclusively on data from the former of the two markets. The spread in Euro-DM bonds is constructed as the difference between the redemption yield at issue of a Hungarian bond and a German government bond with the same characteristics such as maturity, liquidity, etc.. The latter is identified using information about bond characteristics as recorded in the capital markets' information system, *datastream*. Data on the redemption yields at issue of both bonds are obtained from Deutsche Bank Capital Markets' *bondbase*, and data on spreads in Syndicated Euro-DM credits to Hungary are obtained from the OECD's *Financial Market Trends*.[28] Quarterly data on the amount of Hungary's total bond debt are obtained from the Bank of England.

The development of the quarterly spread in Hungarian external borrowing is illustrated in figure 3.1. The vertical axis measures the spread in basis points (100 basis points equals one per cent) and the horizontal axis measures the bond debt that was outstanding when this spread was observed. The line connecting the quarterly observations is increasing, thus providing some support for the hypothesis that the spread increases with the amount of outstanding debt.[29]

Finally, using the example of a specific Hungarian bond issue, it will be shown that the spread is substantial, and thus a factor contributing to the debt service burden for Hungary. For example, it is of some interest that in March 1991, the NBH launched a DM Eurobond with a redemption yield at issue of 10.58% while in the same month the German government had to offer a redemption yield at issue of only 8.28% for its bonds

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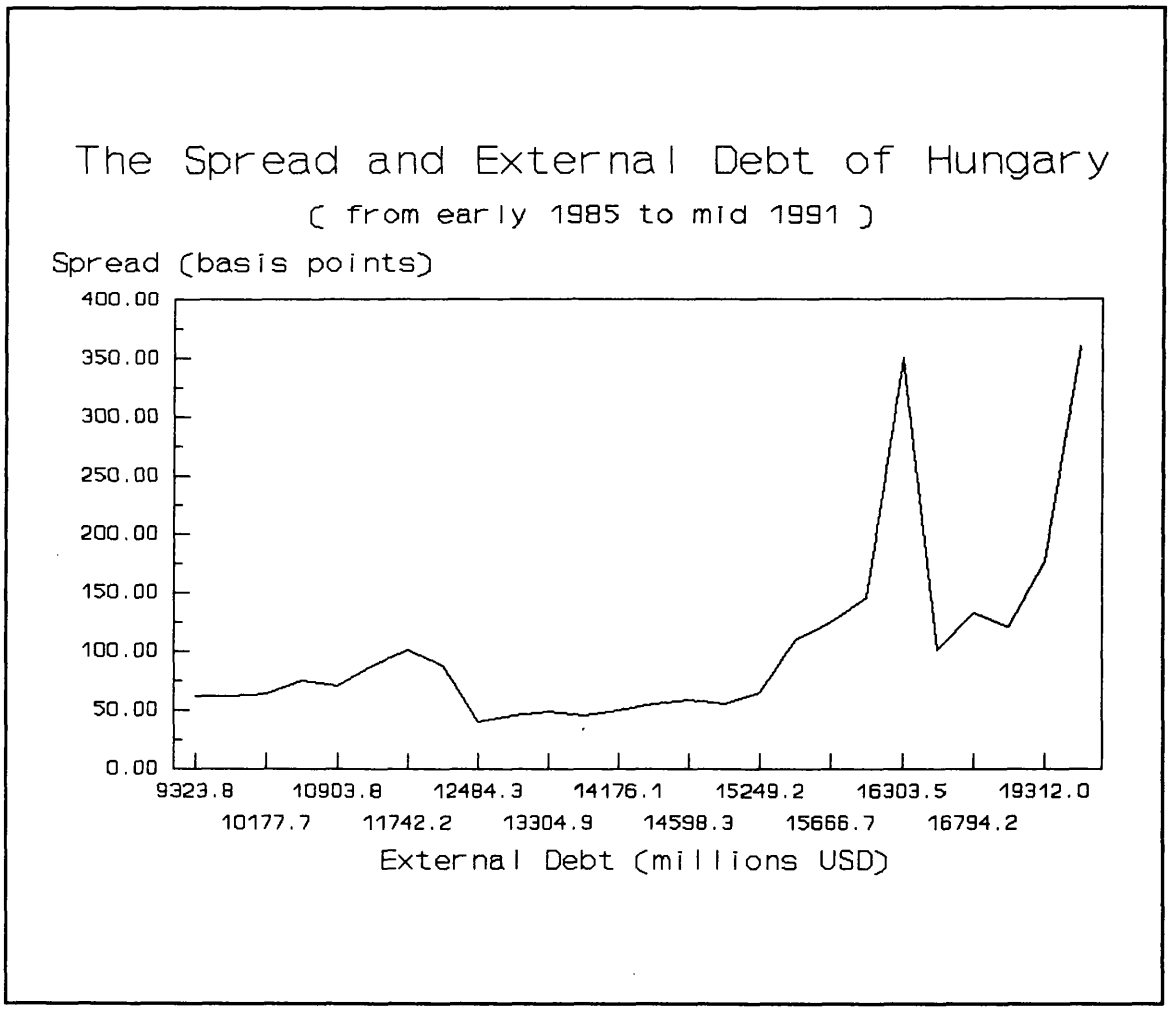
[28] For the six quarters where there was no primary activity of the NBH the volume-weighted average of the redemption yields of this debtor's outstanding Euro-DM bonds (data from *bondbase*) is calculated, and from this the average yield of German government bonds (data from OECD's *Financial Statistics Monthly*) is subtracted to obtain a hypothetical spread at issue.

[29] This statement is supported by the results of a regression analysis. Regressing the available 13 observations of the spread in Hungarian bonds on the country's lagged (by one quarter) bond debt results in significantly positive coefficient estimates for that debt. One should mention that the line in figure 3.1 is decreasing in some parts. This reflects, according to an informal communication from a bond dealer at Deutsche Bank, London, general increases in the willingness of international investors to absorb new bond issues. This kind of demand factor is not captured by the spread model described in section 3.3.

with the same characteristics. Thus the spread amounted to 2.3% (230 basis points); i.e. the NBH had to pay over a quarter more in interest than the German government.

Figure 3.1: The spread and Hungary's outstanding bond debt



Source: *Bank of England* and *bondbase*

3.5 Statistical analysis of pooled cross-country time-series data

This section presents the results of a cross-country analysis of the spread in Eurobond issues and Eurocurrency credits of 16 LDCs and CEECs during the period from

1989 to 1992. The data consists of 52 pooled time-series cross-country observations, which were obtained from Bäcker and Klein (1993).[30] The data include the spread (denoted by s) in developing countries' bond issues and syndicated credits, as recorded in the data bank of the *Deutsche Genossenschafts Bank* (DG Bank), the debt-service ratios of the debt-issuing countries (denoted by DSR), and the London interbank offered rate prevailing at the time of borrowing (denoted by RATE). Bäcker and Klein regressed the spread s on the variables RATE and DSR, and obtained significantly negative coefficient estimates for these variables. These results contradict their prior expectations; namely, they expected to obtain positive signs for both variables. One explanation for this result may be that other relevant data were omitted.

Further variables were added to the data; they were proxies for the economic determinants of the spread, as represented in equation (26). They included undisbursed credits-over-total outstanding and disbursed debt (denoted by UDBDOD), as a proxy for the external financial margin D^C - D. The reserves-over-imports ratio was not included because its inclusion gave rise to the problem of multicollinearity. Instead, we included the ratio of reserves over the IMF-quota, which had been included in previous empirical studies, that were concerned with the default risk in international debt, as a proxy for a debtor country's liquidity situation.[31] We uses this ratio, like the debt-service ratio, as a proxy for the debt-servicing capacity. The former of these two ratios is related more closely to the liquidity situation, and the latter more closely to the solvency situation of the debtor.[32] Furthermore, outstanding debt-over-GNP (denoted by DODGNP) was included as a proxy for D and gross fixed capital formation-over-GNP (denoted by INVGNP) as a proxy for I. The ratio of imports over GNP (denoted by OPEN) was included as a proxy for the openness of the debtor country.[33] All variables, except

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[30] The data set is unbalanced, the number of observations for each of the 16 countries ranging between two and four. The data are listed in table 3.7 in the appendix.

[31] An example is Lloyd-Ellis (1989) who found it significantly related to defaults.

[32] See appendices 2.5.1 and 2.5.2, of chapter 2.

[33] Data on undisbursed credit commitments were obtained from the Bank for International Settlements' (BIS) *The Maturity and Sectoral Distribution of International Bank Lending* (until 1993). Data on reserves, outstanding debt and GNP were obtained from the World Bank's *World Debt Tables* (WDT, 1992-93) and on the IMF quota and the gross fixed capital formation from the IMF's *International Financial Statistics* (until 1993). Further variables were included

RATE, were considered in the regression estimates with a time lag of one year. Thus, their values corresponded to those that were publicly available data at the time when the spread was observed. A summary list of all variables and the signs expected for their estimated coefficients are given below in table 3.2.

Table 3.2: List of explanatory variables in the spread-regression analysis

variable	name in regression	proxy for variable	expected sign of coefficient
undisb. credits over total debt outstg.	UDBDOD	$D^C - D$	(-)
debt outstanding over GNP	DODGNP	D	(+)
debt service ratio	DSR	X	(+)
reserves-over-IMF-quota ratio	RESFQ	X	(-)
imports/GNP	OPEN	γ	(APA: - , WPA: +)
LIBOR rate	RATE	r	(+)
gross fixed capital formation over GNP	INVGNP	I	(-)

There is evidence of correlation among some of the explanatory variables, the correlation coefficients being shown in table 3.6 in the appendix. Those variables for which correlation was particularly evident, i.e. UDBDOD and DODGNP, were never included simultaneously. To test whether the problem of multicollinearity is a serious one, we compared the coefficient estimates of the fully specified regression model, i.e. the one which includes all variables that are relevant according to the theoretical model, with those obtained from specifications in which possibly correlated variables were omitted. The estimated coefficients in the fully specified model, on the one hand, and the models with omitted variables, on the other, had the same signs and did not greatly differ from

in some regressions but the results are not reported here, either because the results obtained were similar to the ones obtained for comparable variables, that were already included, or, because their estimated coefficients were never significant.

each other, thus suggesting that the problem of multicollinearity is not too serious.[34] Nevertheless, the presence of this problem implies that the coefficient estimates must be treated with caution.[35]

Following the convention of empirical studies of the spread, least squares regressions were used.[36] Following Edwards (1986), a regression model was used which contains a component that is constant over time and varies from country to country, and another component that varies over time and is constant over countries,[37]

$$\log s_{c,t} = \sum_{i=1}^{k} \beta^i \log(x^i_{c,t}) + \beta_c D_c + \beta_t D_t + w_{c,t} \quad \text{with } i = 1,..,n. \qquad (27)$$

D_c is a dummy that is one when country is c and otherwise zero; D_t is a dummy that is one when time is t and otherwise zero; x^i are the explanatory variables; β^i, β_c, and β_t are the coefficients to be estimated; n is the number of explanatory variables; and $w_{c,t}$ is an error term with the usual characteristics.[38] All variables were entered in logarithmic form.[39]

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[34] This is a common procedure if there is evidence for the presence of multicollinearity. We also used the instrumental variables technique, but did not obtain satisfactory results.

[35] As a general rule, previous studies of the spread have not discussed the problem of correlation among the explanatory variables. This might be because the typical problems associated with multicollinearity (e.g. a high R^2 and insignificant coefficients) did not appear to be serious. However, one may speculate whether it has prevented the identification of actual relevant variables. For example, Edwards (1986) includes debt/GNP, the debt-service ratio, reserves/GNP, current account/GNP, and imports/GNP simultaneously in all regression specifications and failed to obtain strongly significant coefficient estimates.

[36] See e.g. Edwards (1984, 1986), Feder and Just (1977, 1980), Gottlieb (1987), and Özler (1992). Edwards (1986) considers also the instrumental variables technique.

[37] An alternative model was used by Feder and Just (1980) and Özler (1992), where all coefficients were assumed to be constant over time and constant from country to country and where the error term was assumed to capture differences over time and countries.

[38] In order to test whether the dummies should indeed be included in the regression, F-statistics for the significance of groups of dummies were conducted. It was found that the null hypothesis that each of the effects, i.e. the country-specific effects and the time-specific effects, were zero as a group were rejected. Thus the dummies were included. This is a standard procedure, described e.g. in Judge et al. (1985, p.521).

[39] A test of non-nested models was conducted comparing the log-log specification with a log-linear specification. The obtained test-statistics clearly favoured the log-log specification.

Table 3.3: Spread regression results with country and time dummies[a][b]

	Eq. 1a	Eq. 2a	Eq. 3a	Eq. 4a
UDBDOD	- 0.70 (- 1.52)	- 0.84 (- 1.74)		
OPEN	1.04 (0.73)	1.41 (0.94)		
RATE	1.85 (1.64)	1.32 (1.27)	0.31 (0.46)	0.40 (0.61)
INVGNP	0.94 (1.17)	0.82 (1.03)	1.04 (1.44)	1.17 (1.63)
RESFQ	- 1.01 (- 3.06)**		- 0.92 (- 2.82)**	- 0.95 (- 3.05)**
DSR	1.11 (1.42)		0.58 (0.77)	
DODGNP				0.88 (1.25)
R^2 (adj.)	0.88	0.84	0.87	0.87
F-statistics	(25, 26) = 15.94**	(22, 29) = 13.03**	(22, 29) = 16.48**	(22, 29) = 17.06**

(a) OLS regressions. The numbers in parentheses are t-statistics and the asterisks denote the level of significance of the estimated coefficient (* = significant at the 5% level, ** = significant at the 1% level). F-statistics are the F-statistics for the regression as a whole, and R^2 (adj.) is the R^2 corrected by degrees of freedom. Blanks denote omitted variables.

(b) These regression equations included country-specific and time-specific dummies.

As table 3.3 illustrates, the results of the first regression model were mixed. Although the estimated coefficients of all variables except INVGNP had the expected signs, most of them did not appear to be statistically significant. The only significant coefficient estimate was the one for RESFQ, and it was significant even at the 1% level of significance. This appears to be an important result. It points to the hypothesis that the spread is significantly determined by the debtor's liquidity situation; i.e. the spread is higher the lower the debtor's reserves-over-IMF quota ratio. It is interesting to note that the estimated coefficient for DSR is positive, thus corresponding to *a priori* beliefs. By contrast, Bäcker and Klein had obtained a significantly negative coefficient estimate.

As mentioned above, only one estimated coefficient was strongly significant, and the other coefficients were insignificant. It is possible that this reflected the inclusion of a dummy for each country. The dummies, to the extent that they were highly correlated with the explanatory variables, might have prevented the identification of some of the variation of the economic and financial indicators among countries. Indeed the results of regressions of each explanatory variable on the country dummies suggested that the hypothesis that there exists a high correlation between these variables and the dummies could not be rejected. Therefore, we tried to identify an alternative characteristic that separates countries, or groups of countries, and that could be included instead of the individual country dummies. We analyzed the data using various forms of graphics, examples being given in figures 3.2. to 3.5. Each figure includes two plots - one for countries with a rescheduling record and one for countries without such a record - of the spread against each of four explanatory variables.[40] The figures suggest that the spread tended to be higher for those countries which previously had a rescheduling of their debt owed to private creditors.[41] They also point to the hypothesis that the influence of the explanatory variables on the spread were different, depending on whether a country previously had a rescheduling or not.

[40] The x-axis and the y-axis have the the same length in both plots of each figure, so that the graphs can be easily compared.

[41] Information on debt renegotiations is published in the World Bank's *World Debt Tables*, 1992-93.

Figure 3.2: The reserves-over-IMF-quota ratio and the spread

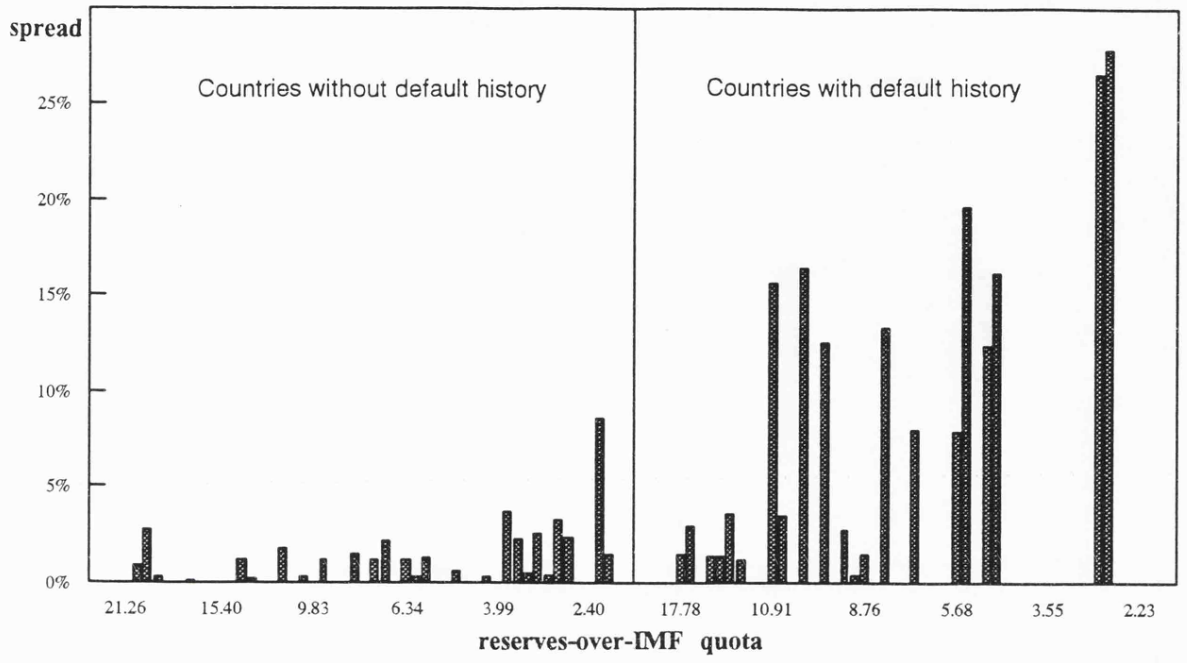


Figure 3.3: The debt-service ratio and the spread

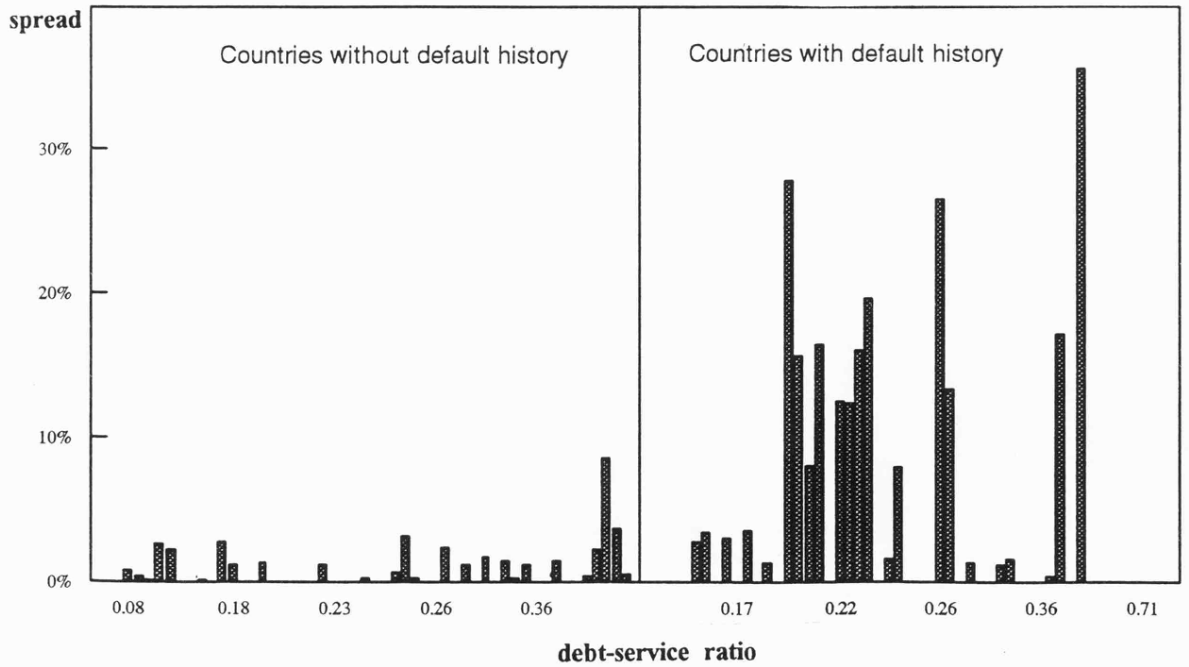
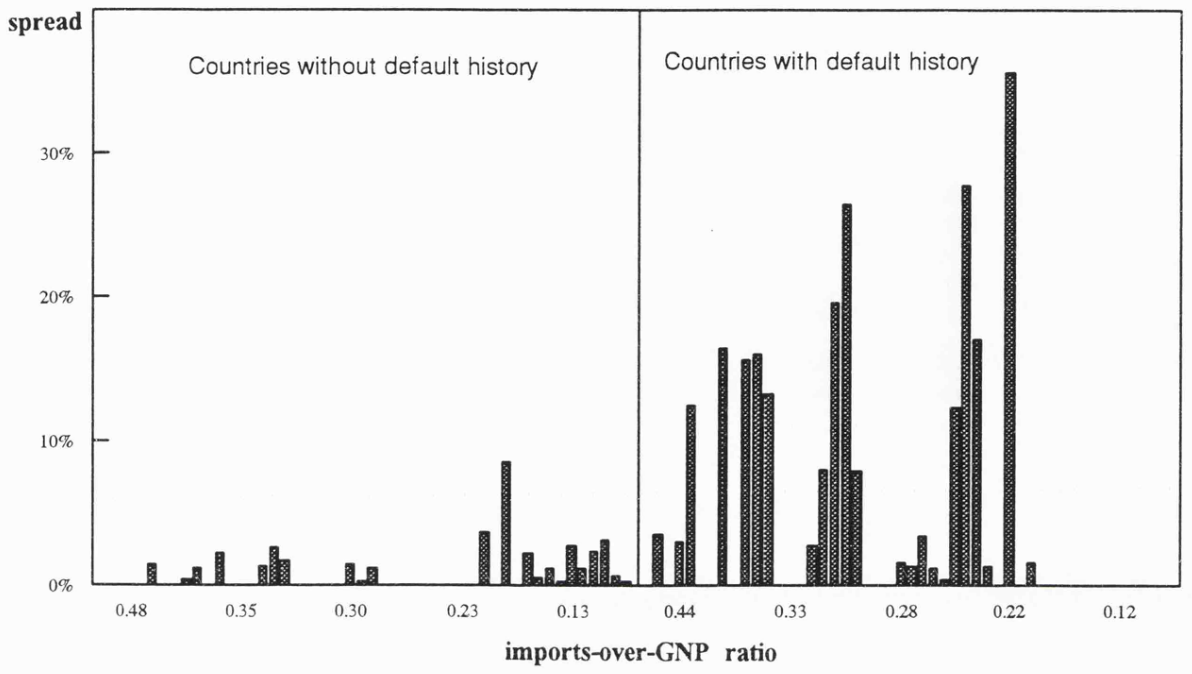
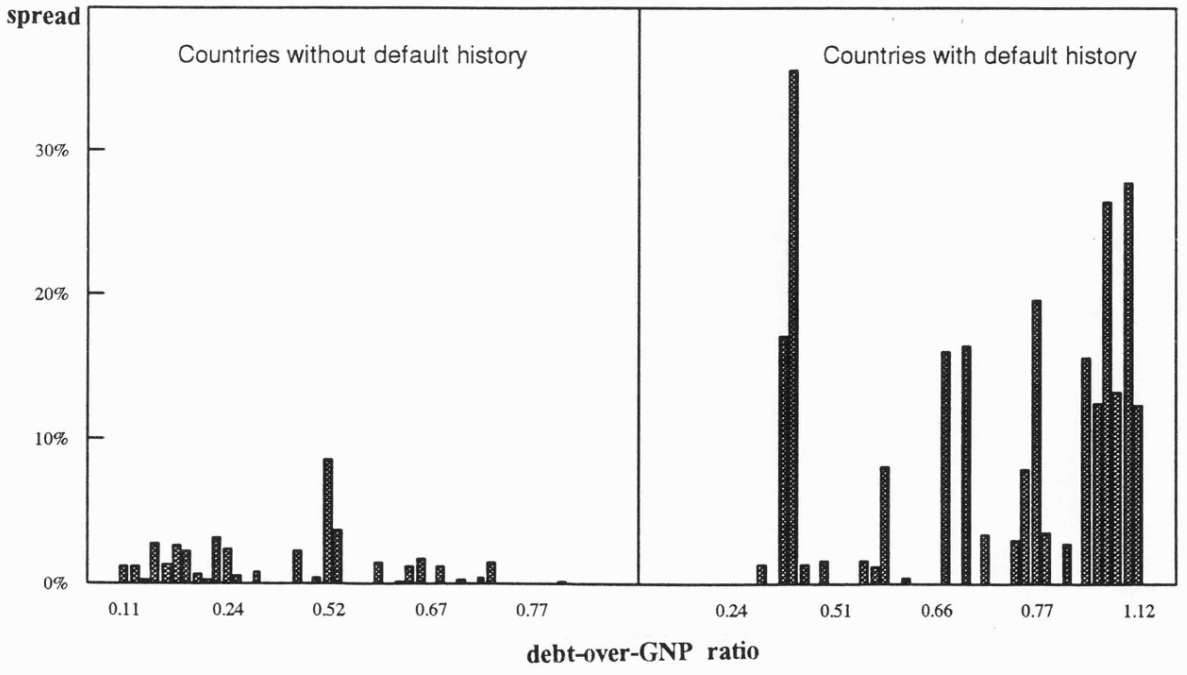


Figure 3.4: The openness and the spread



(a) Malaysia is not included in the graph because its exceptionally high openness required a larger box size for the group of non-defaulting countries, so that the axes of the two boxes would have very different scales.

Figure 3.5: The debt-over-GNP ratio and the spread



Thus, we tested for structural change in the data, i.e. for differences between countries with a rescheduling history and those without such a history, and found evidence for such a change. The tests suggested that a model should be used which allows that the intercept and the slope coefficients differ among countries depending on whether that country previously had a rescheduling or not.[42] Thus, the following model was used:

$$\begin{aligned} \log s_{c,t} = c + \sum_{i=1}^{k-1} \beta^{i}_{DF}[\log x^{i}_{c,t}]DF_c + \beta^{i}_{ND}\, ND_c \\ + \sum_{i=1}^{k-1} \beta^{i}_{ND}[\log x^{i}_{c,t}]ND_c + \beta_t D_t + \beta_r \log r + w_{c,t}\,, \end{aligned} \tag{28}$$

where DF_C is one when the country c has a rescheduling record and zero otherwise, and ND_C is one when the country c has no rescheduling history and zero otherwise. This distinction appeared important; however, it augmented the number of explanatory variables to an extent that a problem of over-identification was arising. In an attempt to reducing that problem, we eliminated those variables which were empirically less relevant, i.e. $UDBDOD^{ND}$, $UDBDOD^{DF}$, $DODGNP^{ND}$, and $DODGNP^{DF}$ and the country dummies. Such an elimination procedure is problematic because it implies that even those variables may be eliminated which are relevant according to the theoretical model; however, we believe that the limited number of observations available made such procedure necessary. The results of this exercise are shown in table 3.4. In the discussion of these results in the remainder of this section, we will refer to the countries without a rescheduling history as ND-countries and to those with a rescheduling history as DF-countries. Our preferred regression specification is model 1b because it includes all of the variables which we regard as relevant.

The estimated coefficients of the variables $INVGNP^{N}$ and $INVGNP^{D}$ had the expected signs, but were not significant. Thus, the estimates did not provide evidence for the hypothesis that higher domestic investment reduces the spread in external borrowing. The results obtained for $RATE^{ND}$ and $RATE^{DF}$ were similar to those obtained for RATE by Bäcker and Klein. They contradict the implications of the theoretical model explained in section 3.3, which predicts that an increase in the risk-free interest rate r, i.e. the rate

[42] A standard procedure was used. See e.g. Johnston (1984, p.218f).

of return on the investment alternative to the defaultable bond, be associated with an increase in the spread (see equation (23)). It is possible that RATE is not an appropriate proxy for the risk-free interest rate r, but that it reflects other developments; however, a discussion of these issues is beyond the scope of this study.

The coefficient estimates were considerably different between ND-countries and DF-countries. The intercept for DF-countries was positive and significantly different from zero at the 10% level. This provides some weak support for the hypothesis that the spread tends generally to be higher for countries with a default history. Moreover, it appeared that the sensitivity of the spread with respect to the debtor's liquidity and solvency situation differed among the two groups of countries. There appeared to be no significant relation between the spread in ND-countries' borrowing and their respective liquidity and solvency situation. By contrast, the spread in the borrowing of DF-countries appeared to be significantly influenced by the liquidity and solvency situation of these countries. In particular, their liquidity situation appears to be important, as being reflected in the highly significant coefficient estimate for $RESFQ^{DF}$. Another important result is that, unlike in the analysis of Bäcker and Klein, the signs of the coefficients of DSR^{DF} and DSR^{ND} correspond to *a priori* beliefs.

There was a significant difference in the estimated coefficients for $OPEN^{ND}$ on the one hand and $OPEN^{DF}$ on the other. For ND-countries, the spread appeared to be a decreasing function of their openness, thus agreeing with the predictions of the WPA. By contrast, for DF-countries, it appeared to be increasing in the openness, thus agreeing with the predictions of the APA. We suggest the following tentative explanation for these results. We believe that the costs of default in terms of increases in the trade financing costs are potentially considerable.[43] This may well have induced international investors to charge lower spreads to countries with a greater degree of openness - corresponding to the logic of the willingness-to-pay approach. Indeed, such a negative relationship was observed for countries which previously have not had recourse to a rescheduling. At the same time, the solvency and liquidity indicators of such countries did not appear to have

[43] Our estimates of the additional transaction costs in the trade of Bulgaria (see section 2.4, of chapter 2) provide some support for this hypothesis. A fairly comprehensive account of case studies can be found in Kaletsky (1985).

any bearing on their spreads. One possible explanation is that their liquidity and solvency situation was perceived favourably, thus leaving their incentive to pay as the only potentially relevant constraint to their debt-servicing. By contrast, the solvency and in particular the liquidity situation of countries with a rescheduling history appeared to have significantly influenced the spreads in their borrowing. This may reflect the perception that, for the latter countries, the ability-to-pay is indeed a binding constraint. Under these circumstances, a greater penalty could not improve their debt-servicing perspectives in the short run. Consequently, a greater degree of openness of a debtor country, measured by its imports over GNP, tend even to increase the probability of debt-servicing problems of that country; i.e. according to the logic that imports represent claims competing for foreign exchange resources with debt service obligations.

The coefficient estimates are quite robust among different specifications, as illustrated by the estimates in the specifications 2b and 3b. There appeared to be neither a problem of heteroscedasticity nor one of functional misspecification.[44] However, there appeared to be a problem of multicollinearity, the adjusted R^2 remaining almost constant after some variables had been omitted from the first specification. The results must therefore be treated with caution.[45]

[44] For example, we did not find evidence of systematic patterns between the residuals on the one hand and the spread and the explanatory variables on the other. It should be noted that our specification systematically underestimated the spread in the borrowing of Yugoslavia. The inclusion of a dummy for Yugoslavia did not change the other coefficient estimates significantly, but increased the explanatory power of the specification.

[45] The instrumental variable method was not feasible because of the lack of appropriate instruments.

Table 3.4: Spread regression results for countries with and without default history[a]

	Eq. 1b	Eq. 2b	Eq. 3b
general intercept	- 6.17 (- 1.25)	- 7.29 (- 1.50)	- 3.85 (- 5.64)**
intercept for DF-countries	10.73 (1.71)	6.52 (1.18)	3.22 (1.08)
$OPEN^{ND}$	- 0.58 (- 2.35)*	- 0.58 (- 2.34)*	- 0.60 (- 2.48)*
$OPEN^{DF}$	2.16 (2.36)*	1.52 (1.85)	1.49 1.85)
$RATE^{ND}$	- 1.23 (- 0.57)	- 1.42 (- 0.73)	
$RATE^{DF}$	- 2.14 (- 2.27)*	- 2.28 (- 2.42)*	- 2.19 (- 2.37)*
$INVGNP^{ND}$	- 0.12 (- 0.21)		
$INVGNP^{DF}$	- 1.24 (- 1.54)		
$RESFQ^{ND}$	- 0.29 (- 0.73)	- 0.32 (- 1.01)	- 0.45 (- 1.95)
$RESFQ^{DF}$	- 1.66 (- 4.89)**	- 1.85 (- 5.74)**	- 1.84 (-5.81)**
DSR^{ND}	0.23 (0.53)	0.20 (0.55)	
DSR^{DF}	1.63 (2.11)*	1.01 (1.53)	0.97 (1.48)
R^2 (adj.)	0.75	0.75	0.75
F-statistics	(14, 37) = 11.91**	(12, 39) = 13.53**	(10, 41) = 16.59**

(a) OLS regressions. The regressions include time dummies (i.e. for 1989, 1990, and 1991). The superscript ND denotes countries without a rescheduling history and the superscript DF denotes countries with a rescheduling record. The numbers in parentheses are t-statistics and the asterisks denote the level of significance of the estimated coefficient (* = significant at the 5% level, ** = significant at the 1% level). F-statistics is the F-statistics for the regression as a whole, and R^2 (adj.) is the R^2 corrected by degrees of freedom. Blanks denote omitted variables.

3.6 Statistical appendix

Table 3.5: External debt of Hungary, 1973 - 1990 (in millions of US dollar)

Year	Net debt	Gross debt
1973	805	2,118
1974	1,388	2,861
1975	2,000	4,199
1976	2,614	5,214
1977	3,580	6,253
1978	6,141	9,468
1979	7,123	10,507
1980	7,571	10,507
1981	7,477	10,740
1982	7,267	10,216
1983	6,994	10,745
1984	6,549	10,984
1985	8,046	13,955
1986	13,368	19,607
1987	13,683	19,584
1988	13,967	19,603
1989	14,900	20,390
1990	15,938	21,270

Source: Hungarian National Bank, (published in *Heti Világgazdaság*, 20 April 1991)

Table 3.6: Correlation coefficients of explanatory variables[(a)]

	UDBDOD	OPEN	RESFQ	DSR	RATE	INVCAP	DODGNP
UDBDOD	1 [0.0]	- 0.178 [0.206]	- 0.031 [0.825]	0.138 [0.330]	- 0.028 [0.842]	0.290 [0.037]	- 0.493 [0.0002]*
OPEN	- 0.178 [0.206]	1 [0.0]	0.422 [0.002]*	- 0.306 [0.027]	0.064 [0.652]	0.055 [0.701]	0.365 [0.005]*
RESFQ	- 0.031 [0.825]	0.422 [0.002]*	1 [0.0]	- 0.484 [0.0003]*	- 0.037 [0.791]	0.165 [0.243]	- 0.112 [0.427]
DSR	0.138 [0.330]	- 0.306 [0.027]	- 0.484 [0.0003]*	1 [0.0]	- 0.018 [0.901]	0.352 [0.010]	0.063 [0.654]
RATE	- 0.028 [0.842]	0.064 [0.652]	- 0.037 [0.791]	- 0.018 [0.901]	1 [0.0]	0.090 [0.528]	- 0.162 [0.249]
INVGNP	0.290 [0.037]	0.055 [0.701]	0.165 [0.243]	0.352 [0.010]	0.090 [0.528]	1 [0.0]	- 0.079 [0.577]
DODGNP	- 0.493 [0.0002]*	0.365 [0.005]*	- 0.112 [0.427]	0.063 [0.654]	- 0.162 [0.249]	- 0.079 [0.577]	1 [0.0]

Source: own calculations based on data from World Bank, IMF and BIS.

(a) All variables are in logarithms.

Explanation: The entries are the Pearson product-moment correlation coefficients and the values in brackets denote the probability that the correlation coefficient is significantly different from zero. The Pearson product-moment correlation is computed as

$$r_{x,y} = \frac{\sum (x_i - x^m)(y_i - y^m)}{\sqrt{\sum (x_i - x^m)^2 \sum (y_i - y^m)^2}},$$

where x^m and y^m are the sample means of x and y. The superscript * denotes that the correlation is significantly different from zero at the 1% level.

Table 3.7: The data used for the regression analysis

Country	Year	Spread[a]	UDB DOD[b]	OPEN[b]	RESFQ[b]	DSR[b]	RATE[b]	INV GNP[b]	DOD GNP[b]
Algeria	1989	52	0.0931	0.1601	3.5456	0.7130	0.0717	34.1701	0.3975
	1990	226	0.0894	0.1852	3.6434	0.6050	0.0891	29.7020	0.4677
	1991	369	0.1022	0.2194	3.7297	0.6580	0.0882	26.4921	0.5329
	1992	860	0.0815	0.2154	2.3284	0.6520	0.0885	26.8971	0.5156
Chile	1990	1257	0.0398	0.4362	9.8320	0.2230	0.0861	19.9537	0.9717
	1991	360	0.0510	0.4622	15.4007	0.1800	0.0750	20.7024	0.7690
	1992	301	0.0516	0.4432	17.4801	0.1650	0.0767	18.8406	0.7352
Yugosl.	1990	1131	0.0253	0.2612	7.9918	0.1690	0.0879	17.6892	0.2756
	1991	3132	0.0202	0.2704	10.1272	0.1900	0.0795	12.1133	0.2183
Malaysia	1989	16	0.0421	0.6237	13.5953	0.1600	0.0708	22.9576	0.8035
	1990	10	0.0445	0.6958	15.8494	0.1170	0.0897	24.1270	0.6163
	1991	34	0.0611	0.8258	19.3448	0.0830	0.0884	29.6295	0.5052
	1992	85	0.0644	0.8988	21.2650	0.0800	0.0878	32.7092	0.4461
Morocco	1990	2652	0.0191	0.3093	2.5114	0.2610	0.0924	23.0556	0.9948
	1991	1332	0.0217	0.3423	7.6156	0.2620	0.0761	24.5334	1.0011
	1992	1563	0.0193	0.3544	10.9088	0.2050	0.0700	22.3427	0.9456
Mexico	1991	153	0.0468	0.2134	8.7624	0.2370	0.0880	18.6082	0.4849
	1992	134	0.0453	0.2233	15.4820	0.1900	0.0833	19.4199	0.4166
Nigeria	1990	2777	0.0249	0.2571	2.4012	0.2030	0.0882	8.1958	1.0734
	1991	1235	0.0263	0.2662	4.8576	0.2270	0.0825	11.9427	1.1187
Philipp.	1990	1960	0.0431	0.3139	5.4500	0.2300	0.0880	20.8820	0.7684
	1991	1609	0.0423	0.3495	4.6273	0.2270	0.0794	21.8695	0.6750
	1992	1644	0.0299	0.3712	10.0818	0.2120	0.0752	19.6624	0.6827
Czechos.	1990	127	0.1505	0.3369	6.1169	0.1940	0.0921	11.2760	0.1436
	1991	258	0.1451	0.3324	3.4915	0.1290	0.0887	13.4240	0.1572
	1992	220	0.1119	0.3635	7.0780	0.1290	0.0877	8.3006	0.1857
Turkey	1989	40	0.0722	0.2675	9.1189	0.3620	0.0711	25.4653	0.6159
	1990	117	0.0650	0.2690	14.6807	0.3140	0.0898	23.9839	0.5927
	1991	154	0.0610	0.2770	17.7762	0.3210	0.0885	22.8313	0.5352
	1992	138	0.0563	0.2730	15.4219	0.2880	0.0877	22.6529	0.4616

Country	Year	Spread[a]	UDB DOD[b]	OPEN[b]	RESFQ[b]	DSR[b]	RATE[b]	INV GNP[b]	DOD GNP[b]
Hungary	1989	2	0.0649	0.4774	3.9944	0.5170	0.0718	24.7472	0.7807
	1990	43	0.0647	0.4318	3.4765	0.5560	0.0897	20.9824	0.7074
	1991	144	0.0492	0.4563	2.2335	0.3940	0.0886	19.9376	0.7307
	1992	123	0.0382	0.4041	7.5857	0.3580	0.0899	17.7927	0.6756
Venezue.	1989	796	0.0967	0.3040	5.6778	0.2430	0.0620	22.7641	0.7433
	1990	798	0.0423	0.3139	6.3426	0.2050	0.0630	17.1659	0.5955
	1991	281	0.0584	0.3232	9.3287	0.1520	0.0787	14.1315	0.7915
	1992	349	0.0684	0.2707	10.7281	0.1530	0.0479	17.8243	0.6974
China	1989	31	0.2545	0.1320	9.9339	0.2530	0.0708	32.1549	0.1162
	1990	123	0.1415	0.1370	9.6416	0.2230	0.0900	26.2064	0.1125
	1991	123	0.1056	0.1287	14.4191	0.1800	0.0885	25.1443	0.1060
	1992	277	0.0579	0.1316	20.1443	0.1650	0.0858	27.7452	0.1420
India	1989	32	0.0424	0.1014	4.1875	0.2360	0.0950	21.6017	0.2198
	1990	61	0.0468	0.1110	5.2582	0.2460	0.0939	22.7979	0.2167
	1991	233	0.0393	0.1177	2.5530	0.2700	0.0790	23.0885	0.2393
	1992	322	0.0240	0.1159	3.4493	0.2490	0.0710	22.3281	0.2374
Indones.	1989	33	0.0871	0.2932	6.2594	0.3500	0.0717	31.5330	0.6898
	1990	119	0.0785	0.2871	6.3356	0.3090	0.0892	35.1892	0.6428
	1991	145	0.1054	0.2988	8.5713	0.3440	0.0887	36.5770	0.5971
	1992	177	0.0886	0.3258	10.2554	0.3140	0.0890	35.0651	0.6615
Colomb.	1990	3552	0.0662	0.2178	9.8020	0.4100	0.0554	18.0736	0.4521
	1991	1709	0.0505	0.2328	11.3020	0.3660	0.0552	16.3339	0.4512

Source: DG Bank, World Bank, IMF, BIS and Statistical Yearbooks of China and Algeria.

(a) Spread in basis points (hundred basis points are equivalent to one percentage point).
(b) The variables are lagged by one year.

Chapter 4: The Level and Volatility of External Financial Positions and the Costs of Export Credit Insurance

4.1 Introduction

This chapter investigates in more detail the costs associated with insurance of export credits to developing countries (including CEECs). International trade is not generally based on payment in cash but usually involves a credit from the exporter (or his bank) to the importer,[1] that is, an export credit. Consequently, a credit risk arises which the exporter (or his bank) regularly seeks to cover by an export credit insurance agency (ECA), the amount of export credits that are not guaranteed being indeed only marginal. Guaranteed export credits represent an important source of external financing for developing countries. For example, the long-term guaranteed export credits of developing countries amounted to 15 to 20% of their total disbursed long-term debt in 1991.[2] In particular guaranteed export credits are important for the short-term financing of developing countries' trade. For example, for some regional groups of developing countries they represented almost half of these countries total short-term financing in the beginning of the 1990s.[3] This chapter seeks to identify how a country's external financial position and its (historical) development affect the costs associated with this form of trade financing.

The direct way to address this question would be simply to ask the country risk experts in the export credit agencies (ECAs) how the economic and financial indicators characterizing a debtor country affect the premium charged for cover of export credits to that country. This, however, is unlikely to be a helpful approach because these premia are

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[1] See Brooke and Buckley (1988, p. 113).

[2] OECD, *External Debt Statistics at End-December 1991*, 1992. The share of flows of such guaranteed credits as of total credit flows to a country is difficult to assess because only net flows are reported in published sources and these net flows have been negative in many years for developing countries.

[3] OECD, *Financing and External Debt of Developing Countries*, 1992. The other important source of short-term trade financing are short-term trade credit lines provided by commercial banks.

not always set according to a structured method, or information about their determination is confidential. Typically, the ECAs use a variety of political, economic, and financial data, and other information about a country in order to place it within one of a limited number of risk categories. Then, one insurance premium is applied to all the countries falling within each risk category, such premium being determined among other factors by the premium setting undertaken at other national agencies. Thus, leaving the problem of confidentiality of the country risk assessment aside, even a detailed knowledge of the premium-setting policy at these agencies does not allow one to identify exactly how individual economic variables characterizing a debtor country will influence the actual premium applied to that country. Therefore, to get some insight into the relationship between the external financial position of a country and its trade financing costs an indirect way is chosen. Namely, a theoretical model of international export credit is developed which allows us to derive an explicit formula which indicates what the insurance premia *should* depend on. Some of the implications of this model are then tested.

The remainder of this introduction explains the theoretical approach used to price the insurance contracts and summarizes some of the results of the empirical analysis of actual insurance premium rates. The approach is explained at greater length in section 4.3.1; however, a discussion of its central aspects at this point should facilitate its understanding. In general, the crucial aspect of export credit insurance (ECI) is the uncertainty about the debtor's future ability and willingness to meet its debt-service demands. In order to concentrate on that aspect, the theoretical model abstracts from informational asymmetries and assumes that the insurer and the insured share equally such uncertainty. Under these circumstances export credit insurance, viewed as a security, is analogous to a European put option. Such a put option is a security which gives the owner the right to sell an asset to the writer of the option, at a specified date and price. Equivalently, export credit insurance gives the exporter (or his bank) the right to sell his claim against the debtor to the insurance agency at a specific date.[4] The price at which

[4] In fact, there is a difference. Namely, the put option gives the right to sell an asset *at* a specific date whereas the insurance gives the right to sell the claim at *any time after* a specific date. However, the fairly general assumption of optimizing on the part of the insured implies that the right to sell the claim is always exerted *at* the first possible date. Under these circumstances the two concepts are identical.

he can sell that claim is either equivalent to or less than the nominal value of that claim, depending on the degree of insurance against losses. The analogy described above suggests that tools from option pricing theory might help to explain the value of such an insurance and to identify determinants of its costs. For example, the Black-Scholes portfolio arbitrage concept implies that the costs of credit insurance should depend not only on the debtor's current external financial position but also on the volatility of (the rate of) changes therein.

This hypothesis is tested with observations using the example of 80 developing countries. The premium surcharges[5] applied by the private *Nederlandsche Creditverzekering Maatschappij, UK* (NCM, UK)[6] during 1992 and 1993, to these country destinations, are compared with level and development of the two financial indicators described in the appendix to chapter 2, i.e. the reserves-over-imports ratio and the debt-service ratio. To the author's knowledge a similar data set has not been collected and subjected to an empirical analysis before.

A central finding of the empirical analysis is that the premium surcharges to a country appear to be negatively related to the reserves-over-imports ratio and positively to the volatility of the rates of changes of that ratio. There is also some weak evidence for the hypothesis that these premium surcharges are positively related to the debt-service ratio and the volatility of its rate of change. These findings are in accordance with the qualitative implications of the Black-Scholes based premium valuation concept, i.e. that the premium rates for export credit insurance to a country should depend on that country's current debt-servicing capacity and the volatility of the rates of change of this capacity. The influence on the premium surcharges of the reserves-over-imports ratio appears to be stronger than the influence of the debt-service ratio on these surcharges, being reflected

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[5] As explained in a footnote to subsection 2.3.2.1, of chapter 2, the term premium surcharges which is used in the practice of ECI corresponds to the concept of premium rates in the theoretical insurance literature.

[6] The NCM, a private company, took over the responsibility of short-term credit insurance cover from ECGD and thus this short-term branch is now called NCM, UK. It continued to have access to political risk reinsurance from the public ECGD for all country destinations until 1992, and thereafter, i.e. since 1993 for selected country destinations. To the extent that such reinsurance is provided at preferential rates the NCM, UK receives official support. We believe that such support, if there is any, is very limited. For example, this reinsurance was available in 1993 for less than ten country destinations.

in a higher estimate of the point-elasticity coefficient for the former. This provides some weak support for the hypothesis that a country's liquidity is more relevant for its trade financing costs than its solvency situation.[7]

Another finding of this chapter is that the ranking of countries implied by the country specific premium-surcharges structure is consistent with the published creditworthiness ratings of these countries; however, the connection between them appears to be less close than the one between the spreads in these countries' international borrowing and their ratings. The root-mean-square-percentage-error between the rankings implied by the spreads and the ratings is significantly lower than the one between the rankings implied by the premium surcharges and these ratings.

The chapter is structured as follows. Section 4.2 contains a brief explanation of the practice of premium setting for insurance cover at ECAs. Section 4.3 then explains the concept used for our theoretical model, the model itself and the valuation formula for export credit insurance obtained from it. Subsection 4.4.1 investigates whether some of the implications of the theoretical model are indeed reflected in observable data. Subsection 4.4.2 compares the premium surcharges applied to developing countries with their published country risk rating.

4.2 The costs associated with export credit insurance (ECI)

This subsection gives a brief description of the cover policy of ECAs; some further aspects of such a policy are discussed in chapter 6. The cover policy includes all aspects of the availability of cover and the terms and conditions under which it is made available. Traditionally, the policy consisted mainly of the decision whether or not to make cover available. However, more recently the role of the price of insurance cover has increased. Indeed, since the onset of the debt crisis in 1982, the cover policy of several major agencies is characterized by a trend toward a greater differentiation between the country

[7] The two external financial indicators are discussed in the appendices 2.5.1 and 2.5.2, of chapter 2.

destination of the credit to be insured. This trend was also reflected in the decisions of Eximbank of the United States and, more recently, of Hermes of Germany to replace the uniform premium by one that is related to the country destination of the credit.[8] These changes in premium policy were accompanied by the allocation of more resources by several agencies to the assessment of the country risk. Such a country risk assessment has a pervasive influence on cover policy in general and premium determination in particular. Procedures for such assessment range from periodic reviews at annual intervals to those carried out on an *ad hoc* basis when a specific need arises. Until the debt crisis, these assessments generally focused on historical analysis and the current financial and external payments position of the debtor country, but efforts have since been made to look further ahead in such assessments. For example, some agencies, including the one whose premium rates we use for our empirical analysis, have developed quantitative techniques that systematically collect available information on debtor countries, which are then used to subdivide borrowing countries into more detailed policy categories according to their perceived relative riskiness. This information includes a large number of criteria, both economic and political. For example, variables such as the debtor country's outstanding total debt, its debt-service ratio, political stability, etc. are used as criteria to place that country into an ordinal ranking which, depending on the ECA, consists of 3 to 12 categories. Consequently, premium rates are applied to these different risk categories and, in addition, restrictive conditions are specified on a country-by-country basis. In general, the premium rates that are actually applied to individual countries are not calculated on the basis of the expected loss associated with an insurance of credits to that country, but tend to be set so that they match those rates applied by other ECAs.[9]

In general, both the premium structure and the method of premium determination applied by ECAs are confidential; however, indications of premium surcharges by NCM,

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[8] Hermes was the only remaining agency that applied such a uniform premium until recently. From the beginning of 1994 debtor countries will be placed into one of five risk categories and hence a different premium will be applied to each category. *Hermes Gebühren nach Länderrisiken gestaffelt*, Frankfurter Allgemeine Zeitung, 23.7.92.

[9] This has been pointed out in a meeting of the Berne Union by the chief economist of the Eximbank. See Bond (1992, p. 2).

UK, a private company, for a sample of developing countries were obtained for this study.[10] The information available from this institution is not sufficient for singling out the individual quantitative influence of variables, such as the debt-service ratio or reserves, etc. on the premium that is actually applied to that country.[11] Therefore, an indirect approach to this question is chosen here by asking what such a relationship *should be* according to economic reasoning and whether such theoretically implied relationships are reflected in the actual data on economic variables and premia that are applied. Furthermore, these indications were compared to the ratings published by investor's magazines, such as *Euromoney*, which explains the method of determining the individual ratings. The next section develops a model that helps to identify what the relation should be between premium surcharges to a country and its financial indicators.

4.3 An option-pricing approach to the determination of the premium rate for ECI

4.3.1 The valuation concept

This subsection is designed to explain the valuation concept used for the determination of a "fair" premium rate for export credit insurance, where fair denotes that premium rate which makes the export credit insurance contract a transaction with zero net-present value. In general the value of such an insurance contract depends on whether the debtor defaults and on what the value of recovery is in the case of such a default.[12] The uncertainty about whether the insurance contingency will occur and what the extent of the compensation payable will be are the most important single aspects of the valuation of such insurance contracts. In order to focus on that aspect it is assumed that such an uncertainty is shared equally by the insurer and the insured. The implications for the

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[10] Recently, a discussion has started on various fora, such as OECD, GATT and EC about the issue of subsidization in export credit insurance cover provided by official ECAs. One might like to speculate that ECAs are particularly concerned not to leak information about their premium setting methods because this issue has become a subject of a political debate. The issue of subsidization in export credit insurance is taken up again in chapter 6.

[11] Section 4.4.2 describes the systems used for the assessment of the country risk used by two institutions with similar concerns than ECAs.

[12] Section 1.2 of chapter 1 contains the definition of default used in the present study.

premium of informational asymmetries, leading to problems such as moral hazard and adverse selection, are mentioned at the end of this section, and some further aspects for export credit insurance of such informational asymmetries are discussed in section 6.3.

Some previous analysis of related issues exist in the literature. For example, Claessens and van Wijnbergen (1990), Clark (1991), Cohen (1990), Genotte, Kharas, and Sadeq (1987), and Klein (1991, 1994) are concerned with the valuation of debt instruments issued by a sovereign debtor. Dooley et al. (1990), Nocera (1989), and Scott (1990) value the insurance of such debt instruments and use tools that are similar to the ones used in the former studies mentioned here. The study by Nocera comes closest to the present one with respect to the aim, and the study by Klein comes closest to it with respect to the method used.

Several of the aforementioned studies rely on two key assumptions about the resources and the behaviour of the debtor country. Namely, they assume that there is an exogenously given but uncertain flow of resources available to make debt-service payments and that the debtor meets all of its contractual debt-service obligations, subject only to this resource constraint. The typical approach followed in these studies is to assume a specific probability distribution for the future realization of the country's resources available to make debt-service payments, and then to value the debt instruments issued by the debtors from that country or the insurance of these debt instruments, respectively as contingent claims, the value of which is determined by those resources.

In fact, credit insurance, viewed as an asset, represents another contingent claim, the value of which depends on the probability and extent of loss associated with the credit that is insured. It is similar in particular to a *European put option*, as the definition of such an option by Black and Scholes (1973, p. 637) suggests:

> *An option is a security giving the right to buy or sell an asset, subject to certain conditions, within a specified period of time. An American option is one that can be exercised at any time up to the date the option expires. A European option is one that can be exercised only on a specified future*

date. The price that is paid for the asset when the option is exercised is called the exercise price or striking price. The last day on which the option may be exercised is called the expiration date or maturity date.

Accordingly, an export credit insurance contract, viewed as a security, corresponds to a European put option which gives the insured the right to sell his credit claim to the ECA at its maturity date. The price at which he can sell the claim is either equivalent to or less than the nominal value of the claim insured, depending on whether the insurance is complete or partial. The correspondence between such a put option and an insurance contract is reflected in their pay-offs. For example, the pay-off from a (complete) credit insurance at the date of maturity of the credit is as follows:[13]

$$\text{pay-off from insurance} = \max \{ 0 , D - A \} , \qquad (1)$$

where D denotes the value of the (insured) contractual debt service and A denotes the debt service that is actually made. It is equal to the difference between the amount insured and the actual payment by the debtor in the case of a default on that credit and zero if there is no default. Similarly, the value of a common European put option at its expiration date is as follows:

$$\text{pay-off from put option} = \max \{ 0 , E - S \} , \qquad (2)$$

where E denotes the exercise price and S the price, at the expiration date, of the stock on which the option is written. Thus, as the value of a common European put option depends on the stochastic price of the underlying stock, S, the value of the insurance contract depends on the (stochastic) actual debt service made by the debtor, A. And as the value of the put option depends on the pre-specified exercise price, E, the value of the insurance contract depends on the nominal value of the contractual debt service that is insured, D.

By a similar reasoning Merton (1977) has interpreted the insurance of commercial bank deposits as a European put option. Such deposit insurance, as the name indicates, insures the deposits and thus protects the depositor against bank failures. It is funded from

[13] The existence of a claims waiting period is ignored.

premia levied on the banks at which deposits are insured. In general a uniform premium is applied to all banks, a procedure widely criticized in the academic literature on deposit insurance. That literature suggests the application of risk-adjusted premia instead, these to be estimated e.g. using tools from option pricing theory.

Similar approaches have recently been used to value debt instruments issued by debtors from developing countries and the insurance of these instruments, notably by some of the authors mentioned above.[14] One simple approach followed in the literature is to directly apply the textbook Black-Scholes option pricing formula to estimate such values, using historical data on the market prices of such instruments or using a proxy for the debtor's debt-servicing capacity which determines the value of such instruments. This approach has the advantage that the calculations are straightforward. However, its validity rests on strong assumptions that some authors do not always make explicit. Namely, that the portfolio arbitrage concept, which is the basis of the Black-Scholes formula, requires the existence of complete financial markets. More specifically, the basic idea of the Black-Scholes concept is that the option can be continuously replicated by appropriate transactions in the stochastic asset on which the option is written (i.e. here the debt-servicing capacity) and a riskless security, such that the option effectively becomes a redundant asset. However, unlike a stock, a country's debt-servicing capacity is not tradeable so that one requirement for the application of the Black-Scholes formula is not satisfied.

However, although one cannot trade directly in the country's debt-servicing capacity, the required replication strategy can be achieved by trading in other commodities provided their value is correlated with this capacity. For example, Claessens and van Wijnbergen (1991) identify the foreign exchange earnings as the principal component of Mexico's debt-servicing capacity and explain that, "even though the foreign exchange earnings of Mexico are non-traded assets, and as such not priced directly in the market, they are likely to be spanned by assets which are traded and whose current values are known. For example, Mexico's oil earnings can easily be spanned through forward and

[14] Claessens and Van Wijnbergen (1990), Clark (1991), Cohen (1990), Dooley at al. (1990), Genotte, Kharas, and Sadeq (1987), Klein (1991, 1994), Nocera (1989), and Scott (1990).

futures contracts traded on over-the-counter and exchange markets. Consequently, the pricing methodology underlying the option valuation, which assumed traded assets, can be used."[15] Consequently, the insurer of credits to Mexico (the writer of the put option) would have to purchase a risk-free interest bearing asset with exactly the same maturity as the credit and in addition to sell short Mexican oil. This is illustrated using a simple example in appendix 4.5.1.

In fact, the assumption of complete markets, as described above, is not necessary in order to obtain an explicit valuation formula. One could assume instead that the insurer is risk-neutral.[16] This is a common assumption for an insurer and it is justified on the grounds that the insurer can eliminate risk through pooling of a large number of risks provided these risks are independent.[17] This alternative approach is more general in the sense that it allows the average rate of change of the debt-servicing capacity to differ from the risk-free interest rate. On the other hand, the latter approach requires the equality of the risk-free rate and the rate of return on all assets, where these returns include the average rate of change of the debt-servicing capacity. Namely, consider that complete markets existed so that such debt-servicing capacity could be traded like any other asset. Then continuous arbitrage would equal the expected returns on all assets, the expected return of such capacity being its average rate of growth μ. Otherwise, the implications of the two concepts are similar; they are discussed in section 4.3.4. The present study applies both valuation concepts mentioned above to the problem of setting a premium for export credit insurance.

The valuation concepts provide benchmark premium rates, i.e. the premium per dollar insured, which would change in variations of the underlying assumptions. For example, here we follow the conventional approach[18] and assume that information about

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[15] Claessens and van Wijnbergen (1991, p. 9).

[16] This is what Claessens and van Wijnbergen (1991) effectively do.

[17] If one considered risk aversion on the part of the insurer the premium rate for insurance cover would be higher than with risk neutrality, the difference depending on the degree of risk aversion.

[18] To the author's knowledge there exist no rigorous analysis of the effects of the presence of asymmetric information on the value of the insurance against political risk.

the probability of the country's default are shared equally by insurer and insured, i.e. that information are symmetric. A situation with asymmetric information includes that the insured exporter knows more about the risk than the insurer (giving rise to the problem of adverse selection) or that he may even affect the risk through some costly effort (giving rise to the problem of moral hazard).[19] Under these circumstances, the insurance contract generally would have to specify a "deductible" - i.e. a proportion of losses to be borne by the insured - in order to reduce the inefficiency associated with these problems. For example, in the case of moral hazard this deductible should be set according to the costliness to the exporter of his efforts and his degree of risk aversion so that the exporter will find it optimal to make some efforts to reduce the risk. The case of adverse selection is more complicated. Namely, the deductible has normally the role of inducing bad risk types to sign insurance contracts at higher premium rates than good ones do. A set of contracts would have to be offered, each contract specifying a deductible and a premium rate. This set of contracts should be determined according to the information about the number of different risk categories and their specific riskiness. In general, the determination of the two parameters, i.e. the deductible and the premium rate, depends on the type of informational asymmetry.[20]

4.3.2 Contractual debt service and debt-servicing capacity

In general, the single most important aspect of insurance cover against the political risk is the uncertainty about the debtor country's future capacity to meet its debt-service demands. Three terms are introduced here which will be frequently referred to in this subsection and the ensuing ones:

D_t denotes the contractual debt service,
A_t the actual debt service, and
K_t the debt-servicing capacity.

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[19] These are widely used definitions of adverse selection and moral hazard.

[20] The concept considered here allows the inclusion of an exogenously given deductible. The changes in the valuation formula are straightforward. The premium rate would be decreasing in the amount of deductible specified.

The first two terms, the contractual debt service and the actual debt service correspond to terms used in balance of payments statistics. Namely, the contractual debt service D_t corresponds to debt service on accrual basis, and the actual debt service A_t to debt service on cash basis. Although in practice collection of data is imperfect, these variables are in principle measurable. By contrast, the debt-servicing capacity K_t is a hypothetical concept. The term debt-servicing capacity means the maximum debt service that the debtor country can meet, given its economic and political constraints. It is unobservable and its realization determines the actual debt service.

In general, credit insurance is concerned with two aspects. First, it is concerned with the probability that such debt-servicing capacity falls short of the debtor's contractual debt service, meaning that he does not meet its debt-service demands in full. Secondly, it is concerned with the level of actual debt service that the debtor meets. The first event is generally understood as default of the debtor, and the amount that the debtor actually transfers in such a situation is denoted by recovery. An insurer must estimate the probability of default and the extent of recovery based on assumptions about the dynamic behaviour of the debtor's debt-servicing capacity K_t, on the one hand, and its debt service demands D_t, on the other. Abstracting from reporting problems, it is fair to say that the future contractual debt service due is known. For example, the contractual debt service is regularly reported in the World Bank's *World Debt Tables*. On the other hand, the country's debt-servicing capacity is not known. This stylized scenario is captured in this dynamic model by assuming that the contractual debt service D_t is a deterministic variable and the debt-servicing capacity K_t a stochastic one.

What determines the debt-servicing capacity of a country is a subject of discussion in the literature. Following the points made in section 1.2, of chapter 1, one could state that for a sufficiently small ECA, i.e. one which cannot influence the probability of default, the two major explications of default, i.e. the inability and the unwillingness to pay, have identical implications. They both imply that there exists a certain exogenously given amount of resources, the debt-servicing capacity, that can maximally be extracted from the debtor country, either because it cannot or will not pay more. In general, such a capacity is influenced in a complex way by the current and the anticipated values of a

number of factors, such as export earnings, terms-of-trade, international reserves, the benefit of future access to international capital markets, the situation of lenders, and domestic and international political factors, etc.. In particular, it is related to earnings from exports and expenditures on imports. These in turn are influenced by movements in the prices of export and import commodities and in exchange rates, the stochastic dynamics of which are adequately described by a Brownian motion.[21] Therefore, the conventional assumption is that the debt-servicing capacity K_t is also governed by such stochastic process,[22]

$$d K_t / K_t = \mu\, dt + \sigma\, dW_t\,, \qquad (3)$$

where μ is the trend parameter and σ the diffusion parameter of the Brownian motion, and W_t is the standard Wiener process, with $E(dW_t) = 0$ and the variance $E(dW_t^2) = dt$.[23] This assumption is convenient because the expected value of K at any time in the future has a simple expression as shown in appendix 4.5.2. It should be noted that the application of the Black-Scholes (or complete markets) concept requires the specification of a dynamic process for the debt-servicing capacity, while the alternative concept (i.e. valuation based on risk-neutrality) would only require the assumption that this capacity is lognormally distributed at the dates of maturity.

Some important technical assumptions are made. First, the changes in the debt-servicing capacity are intertemporally uncorrelated. This does not necessarily mean that, for example, the foreign exchange earnings are intertemporally uncorrelated, but it does mean that, while anticipated changes in these earnings already form part of the country's debt-servicing capacity, unexpected ones ("shocks") are intertemporally uncorrelated. Thus "shocks" are not forecastable from past expected changes. Second, the variance of the change in value is constant through time. Third, changes in the debt-servicing capacity can

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[21] Bartolini and Dixit (1991, p.831).

[22] This assumption is regularly made in studies concerned with the valuation of sovereign debt, including those of Bartolini and Dixit (1991), Cohen (1990), Claessens and van Wijnbergen (1991), Genotte, Kharas and Sadeq (1987), Klein (1991), and Nocera (1989). However, none of these authors has tested whether the proxy used for such debt-servicing capacity is indeed lognormally distributed; such a test being regularly hindered by the limited number of available observations.

[23] More information on the Brownian motion are provided in appendix 4.5.2.

be either positive or negative, but the value of such capacity can never fall below zero when its starting value is positive. Such restriction is essential for a net debtor country because otherwise the intertemporal budget constraint will be violated.

4.3.3 Default and debt renegotiation

As explained in the previous subsection, the crucial element in this model is the debt-servicing capacity and the uncertainty about its future realization. This subsection explains what happens when such capacity falls short of the debtor's debt-servicing demands.

In general, such capacity changes continuously whereas debt is issued and becomes due at discrete intervals. For simplification it is assumed that the debt instruments have a maturity of one period, i.e. all debt becomes due after one period; consequently, the contractual debt service is identical to total debt. Consider that debt is issued at time t and becomes due at time t + 1. At that date of maturity, the debtor country repays its debt if its debt-servicing capacity exceeds its debt-servicing demands. Otherwise it is in default, and enters into debt renegotiation with its creditors.[24]

$$\begin{aligned} \text{No default} \quad & \text{if } K_{t+1} \succ D_{t+1} \ ; \\ \text{default} \quad & \text{if } K_{t+1} \prec D_{t+1} \ . \end{aligned} \tag{4}$$

In general, the agreements of such renegotiations include a variety of measures, all of which are designed to bring the contractual debt service more in line with the debtor's capacity to service it. For this purpose, two central measures are used, including the prolongation of the maturity of debt and the adjustment of contractual interest or principal. The former measure generally aims to maintain the present value of the nominal debt while the debtor is granted a liquidity relief. The latter corresponds to a reduction of the contractual debt service below the level stated in the original debt contracts. Debt and debt-service reductions (DDSR) are indeed a common feature of recent debt

[24] Note that, by assumption, the contractual debt service is identical with the total debt of the country.

restructurings of both official and private debt.[25] This scenario is reflected in the stylized rescheduling model of Claessens and van Wijnbergen (1990) which we adopt for convenience.[26] It considers that the contractual debt service of the insolvent country is reduced to its actual debt-servicing capacity, so that the actual debt service is given as follows:

$$A_{t+1} = \min \{ D_{t+1} , K_{t+1} \} . \tag{5}$$

Thus the aggregate loss of creditors at time t + 1, L_{t+1}, is given as

$$L_{t+1} = D_{t+1} - A_{t+1} = \max \{ D_{t+1} - K_{t+1} , 0 \} , \tag{6}$$

where $A_{t+1} = K_{t+1} \prec D_{t+1}$ in the case of default. In the absence of seniority provisions the aggregate losses are shared proportionally by all creditors.[27] Under such circumstances, the loss per claim is

$$\frac{L_{t+1}}{D_{t+1}} = \max \left\{ \frac{D_{t+1} - K_{t+1}}{D_{t+1}} , 0 \right\} . \tag{7}$$

The above equation describes the loss per claim and, equivalently, it describes the value of a complete insurance of one claim at time t + 1.[28] The value of such a complete insurance at time t depends on the assumption about the stochastic dynamics of the debtor country's debt-servicing capacity and the rescheduling mechanism. It will be explicitly derived in the next subsection.

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[25] As Sachs has put it already in 1989, "a partial write down is the norm, not the exception" (p.23) in debt restructurings.

[26] For the purpose of our analysis it is essential that the creditor incurs *some* loss. Otherwise an insurance (against losses) would not be required.

[27] A common principle of debt renegotiation is that the losses are equally shared among foreign creditors (Feldmann (1991, p.227 and p.771)). This principle was mentioned early in the *Leges XII Tabularum* (a Roman law published around 450 b.c.), which provides that the bodies of defaulters may be divided and distributed *pro rata* among the creditors (Winkler (1993, p.17)). It also characterizes the recent practice within the Paris Club (Plan (1985, p.37)). In general there exist no written seniority provisions. However, the behaviour of debtors in financial difficulties has revealed that there exists an implicit seniority ranking, i.e. short-term debt and official and officially supported debt are often serviced with priority over private medium- and long-term debt. As long as officially supported debt, i.e. credits insured by an official ECA, are indeed part of the senior debt, the premium valuation formulae would be identical except that D_{t+1} would represent only the senior and not the total debt. The implications of a seniority ranking for the valuation of junior debt are discussed in Bartolini and Dixit (1990) and Dooley and Stone (1992). The analysis in the fifth chapter of the present study is close to such concerns.

[28] This holds, provided that the credit risk is exogenous.

4.3.4 The premium rate valuation formula

In this subsection, an explicit formula for the price of export credit insurance is derived which allows to quantify how the costs of export credit insurance change as a result of changes in exogenous variables. The algebra is provided in appendix 4.5.3.

It is assumed that export credits are in the form of zero-coupon bonds which are continuously compounded, have a maturity of one period, and a nominal value of one at the date of maturity.[29] There exists also an alternative debt instrument which is default-free but has otherwise exactly the same characteristics as these export credits. Let B_t and R denote the value at time t of the defaultable and the default-free debt instrument, respectively,

$$B_t = e^{-b_t}, \qquad R = e^{-r}, \tag{8}$$

where b_t is the interest rate of the risky claim and r the risk-free interest rate. The presence of the default risk on B_t implies that $r \prec b_t$ and $B_t \prec R$. The debtor country's aggregate debt-service demands in period t + 1 are given as the nominal value of the claims at maturity B_{t+1} times the number of claims N_t which have been issued in the previous period, i.e. in period t,

$$D_{t+1} = N_t B_{t+1} . \tag{9}$$

Consider that there exist competitive and risk-neutral ECAs which insure the holder of a claim B_t against a loss arising from default of the debtor on that claim. Under risk neutrality (on the part of the insurer), the price of the insurance is given as its discounted expected pay-off. The pay-off at time t + 1 depends on whether the sovereign debtor which has issued the (insured) debt instrument is in default or not, where default means any failure of the debtor to meet its contractual debt service in full. As formulated in (7), the pay-off (per dollar insured) is equal to zero if $K_{t+1} \succeq D_{t+1}$, and equal to

[29] This assumption is being made in order to simplify the calculation but it is not necessary to obtain the qualitative results presented here.

$(D_{t+1} - K_{t+1}) / K_{t+1}$ if $K_{t+1} \prec D_{t+1}$. Thus, the price of the insurance per dollar insured, i.e. the premium rate is given as follows:

$$p_t = e^{-r} E_t \left[\max\left\{ 0 , \left(\frac{D_{t+1} - K_{t+1}}{D_{t+1}} \right) \right\} \right], \qquad (10)$$

where $E_t[\cdot]$ denotes the expected value at t of the insurance contract at the time of the maturity of the credit. The above equation contains, on the left-hand side, the safe return for the insurer from the insurance contract at time t and, on the right-hand side, the present value of the expected (negative) pay-offs from that contract. Competition ensures the equality of both sides.

Denote π_t the probability of default viewed from period t. Since by assumption the debt instruments are in the form of zero bonds with a face value of one (i.e. $B_{t+1} = 1$), it follows from (9) that $D_{t+1} = N_t$. Thus the above equation can be written as follows:

$$p_t = e^{-r} \pi_t E_t \left[\left(\frac{N_t - K_{t+1}}{N_t} \right) \mid K_{t+1} \prec N_t \right], \qquad (11)$$

where $E_t[\cdot|\cdot]$ denotes the expectation at t about the debtors payment conditional on the occurrence of default. In other words the price of the insurance is given as the discounted present value of the insurance in the case of default, $E_t[\cdot|\cdot]$, weighted by the probability of default π_t. The term $E_t[\cdot|\cdot]$ can be written as follows:

$$E_t [\cdot | K_{t+1} \prec N_t] = 1 - \frac{K_t}{N_t} e^{\mu} \frac{\Phi\left(- \dfrac{\ln(K_t/N_t) + \mu + \sigma^2/2}{\sigma} \right)}{\Phi\left(- \dfrac{\ln(K_t/N_t) + \mu - \sigma^2/2}{\sigma} \right)}, \qquad (12)$$

with $\Phi(\cdot)$ denoting the distribution function of the standard normal probability distribution. The probability of default π_t can be written as follows:

$$\pi_t = \text{prob}_t\{ K_{t+1} \prec N_t \} = \Phi\left\{ - \frac{\ln(K_t/N_t) + \mu - \sigma^2/2}{\sigma} \right\}. \qquad (13)$$

Thus, combining equations (11) to (13) an explicit formula is obtained for the value of the insurance at time t, in terms of variables that are all known at that time. It

allows to estimate the fair premium for export credit insurance, the value of which depends only on a limited number of exogenous variables. Namely, it is given as follows:

$$p_t = e^{-r}\left[\Phi\left(-\frac{\ln(K_t/N_t)+\mu-\sigma^2/2}{\sigma}\right)-e^{\mu}\frac{K_t}{N_t}\Phi\left(-\frac{\ln(K_t/N_t)+\mu+\sigma^2/2}{\sigma}\right)\right]. \quad (14)$$

From this equation the formula considered by Nocera (1989) is obtained as a special case; namely, if μ is set equal to r as it would hold if continuous trading were possible (as described in the last paragraph of subsection 4.3.1), the following formula obtains:

$$p_t = e^{-r}\,\Phi\left(-\frac{\ln(K_t/N_t)+r-\sigma^2/2}{\sigma}\right) - \frac{K_t}{N_t}\Phi\left(-\frac{\ln(K_t/N_t)+r+\sigma^2/2}{\sigma}\right). \quad (15)$$

Equations (14) and (15) express the price of export credit insurance as a function of a limited number of variables, which are as follows:

K_t, the debtor country's debt-servicing capacity;
N_t, the number of debt instruments issued by the debtor country
(which is, by assumption, identical to the total debt service due at time t+1, D_{t+1});
μ, the average rate of change of the debt-servicing capacity;
σ^2, the volatility of the rate of change of the debt-servicing capacity;
r, the world interest rate.

The impact of these variables on the price of credit insurance is discussed in an intuitive way using the example of the risk-neutrality concept as shown in (14). The function for p_t includes two standard normal distribution functions $\Phi(\cdot)$, which will not be distinguished in this description because they are qualitatively equivalent. The value of $\Phi(\cdot)$ is bounded between zero and one and depends on the constellation of K_t, N_t, μ, and σ. For example, if K_t is very large relative to N_t, then $\Phi(\cdot) \approx 0$ and thus the price of the insurance is close to zero. Alternatively, if K_t is small relative to N_t, then $\Phi(\cdot) \approx 1$ and thus the price of the insurance is close to the one of the risk-less asset, $R = e^{-r}$. The variables μ, r, and σ^{-1} have negative signs, thus the premium rate p_t is decreasing in μ

and r, and increasing in σ.[30] Summarizing all effects, the price of the insurance is decreasing in K_t, μ, and r, and increasing in N_t and σ.

These relations are confirmed by a simulation analysis, shown in figures 4.1 and 4.2, illustrating the sensitivity of the price of insurance with respect to the variables K_t, σ and μ.[31] For example, figure 4.1 depicts the relation between the debt-servicing capacity K_t and the volatility of the rate of change of that capacity σ and the insurance premium rate p_t. The graph is drawn on the basis of equation (14) with $r = \mu = 0.06$, $N_t = 1$, K_t ranging from 0.1 to 3, and σ ranging from 0.2 to 1.6. It illustrates that the premium rate is very high and exceeds 85 per cent for a very low K_t and a high σ. By contrast, it is very low for a high K_t and a low σ; however, it is always positive as long as the volatility σ is positive. The surface shows a sharp increase in the premium rate as K decreases through one. This sharp increase is notable when the volatility σ is low; however, when the volatility is high the surface becomes smoother. This means that in the presence of a high volatility of the rates of changes of K_t the absolute magnitude of K_t becomes relatively less important. Applying this idea to a cross-country comparison this means that the distinction between a country with a currently high and one with a low debt-servicing capacity becomes blurred in the presence of a worldwide high volatility in external financial positions.

Figure 4.2 depicts the sensitivity of the premium rate with respect to different values of μ and σ, the graph being drawn on the basis of (14) with $K_t = 1.5$, $N_t = 1$, $r = 0.06$, μ ranging from 0.08 to 0.01, and σ ranging from 0.1 to 0.8. The graph demonstrates the crucial importance of the volatility in the concept used here. Namely, there is a sharp increase in the surface at $\sigma = 0.5$, the premium being only marginal if σ is lower than 0.5 but increasing exponentially with σ increasing above 0.5. On the other hand, the effect of the growth rate is limited, an increase in that rate reducing the premium rate only linearly.

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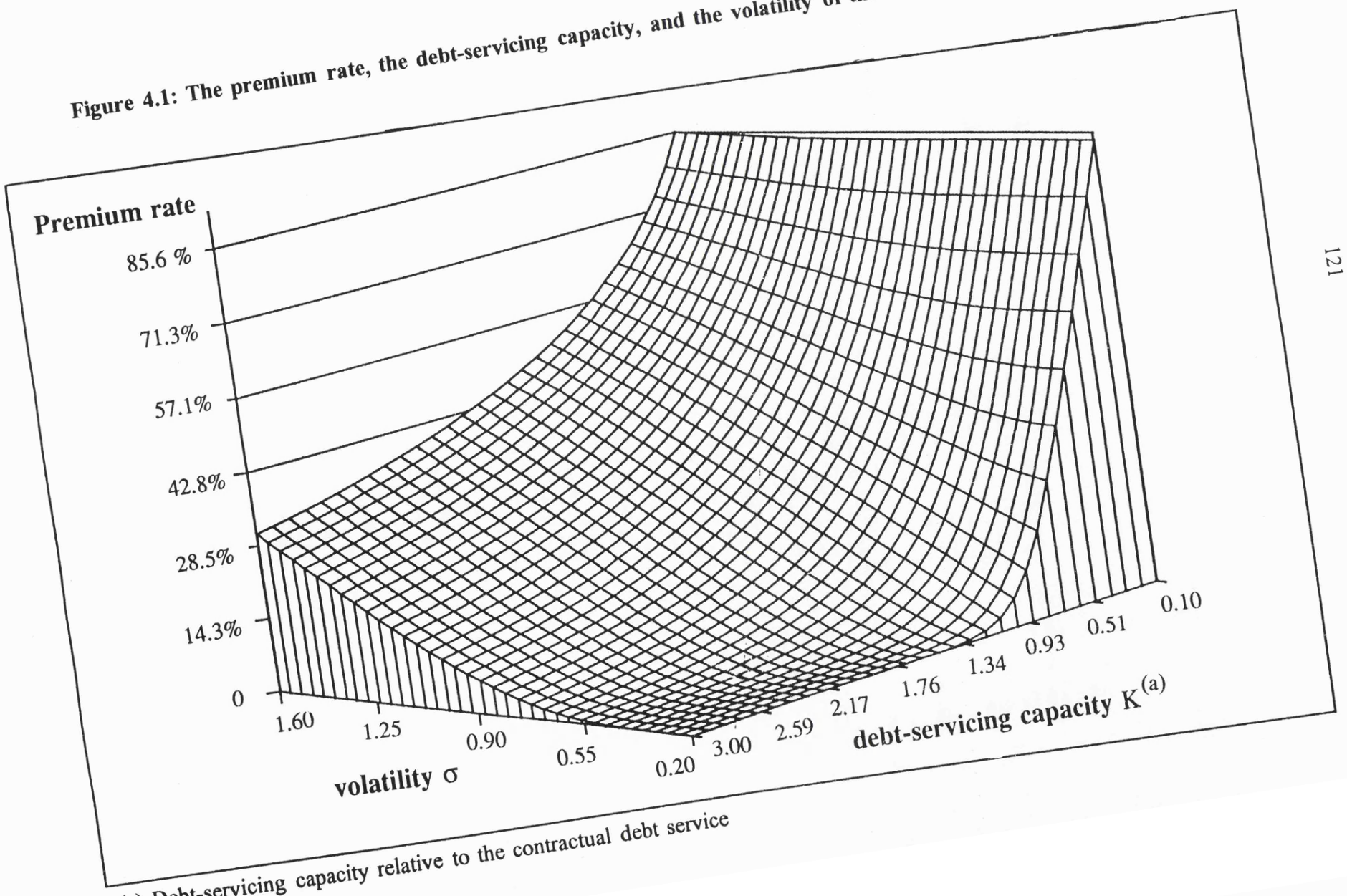
[30] The effect of σ^{-1} on p_t is dominating the one of $+\sigma^2/2$ on it.

[31] For expositional purposes, we supress, in all figures, the time subscripts of the variables used as labels for the axis.

The difference between (14) and (15) is that the latter does not include μ. This is a well-known feature of the Black-Scholes concept and it can be explained in an intuitive way as follows. As the Black-Scholes concept, owing to the assumption of continuous trading opportunities, is valid for any risk preferences, it must also be valid for the case of risk neutrality. Consequently, under risk neutrality and complete markets, the expected rate of return of any asset equals the one of the riskless asset. However, when (14) is derived, it is assumed that markets are not complete and so r and μ are allowed to differ from each other even in the case of risk neutrality. Clearly as long as μ and r have the same values both concepts imply exactly the same premium. Otherwise, the premia according to these two concepts differ. For example, if $r \prec \mu$, the premium estimated according to the Black Scholes concept would be lower than that estimated according to the alternative concept, i.e. the valuation based on risk-neutrality of ECAs.

The analysis of this subsection allows the formulation of a hypothesis in terms of the relationship between the level and the development of a debtor country's external financial position, on the one hand, and the export credit insurance costs applying to it, on the other. The less favourable the relation between a debtor country's current debt-servicing capacity and its contractual debt service and the higher the volatility of changes in that capacity, the higher are the costs associated with the insurance of export credits to that country. Furthermore, according to the risk-neutrality approach, the less favourable the rate of change of that capacity, the higher are these costs. These hypothesis are tested with observations and the results reported in the next section.

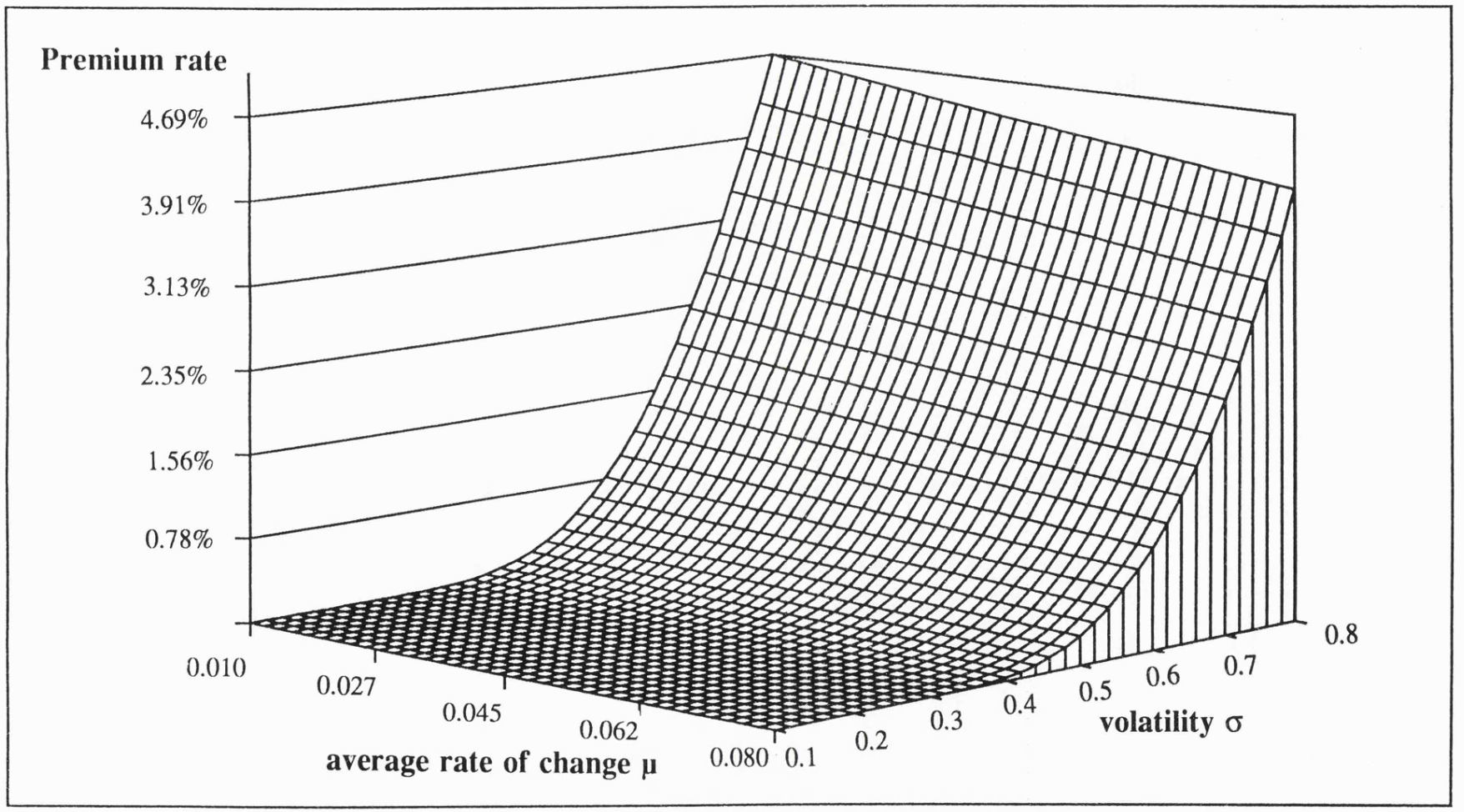
Figure 4.1: The premium rate, the debt-servicing capacity, and the volatility of the rate of changes of that capacity[a]



(a) Debt-servicing capacity relative to the contractual debt service

Figure 4.2: The premium rate, the rate of changes of the debt-servicing capacity, and the volatility of the rate of changes of that capacity

(debt-servicing capacity relative to contractual debt service being equal to 1.5)



4.4 Empirical analysis of the premium rates for ECI

4.4.1 Premium surcharges and financial indicators

The previous section explained that the premium rates for credit insurance to a country destination should be determined not only by this country's current debt-servicing capacity but also by the volatility of its rate of change. In addition, according to one of the two concepts considered there, i.e. the valuation based on the risk neutrality assumption, these premium rates would also be determined by the rate of change of such a capacity. These hypotheses are subjected to empirical tests.

We use the premium surcharges applied by the *Nederlandsche Creditverzekering Maatschapij, UK* during 1992 and 1993 as proxies for the premium rates discussed in the theoretical model.[32] These premium surcharges apply when the exporter - who is already insured under a general comprehensive policy - has credit exposure to any of the countries for which such premium surcharges are specified. Thus they represents the specific premium rate for insurance cover of the risk associated with that country destination, and thus correspond to the concept of the premium rates defined in the theoretical model. They vary between 0 and 6 %, depending on the country destination. The premium surcharges applying to developing countries are compared with two external financial indicators of those countries, i.e. their debt-service ratios and their reserves-over-imports ratios.[33] The latter are used alternatively as proxies for the debt-servicing capacity. The debt-service ratio is inverted to obtain another ratio (i.e. exports over debt service) that corresponds to the expression (K_t / N_t) contained in the premium rate formulae of the theoretical section. Data on these two indicators are obtained from the United Nations data bank. The proxies for the other variables which appear in the premium rate formulae (14) and (15), i.e. the average rate of change of the debt-servicing capacity and the volatility of that rate, are calculated from the historical development of these indicators, using

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[32] Indications of these surcharges were made available for this study by *Jardine Credit Insurance Limited*, a private insurance company in the United Kingdom.

[33] The reserves-over-imports ratio used here is calculated by dividing reserves over the equivalent of three months of imports.

standard formulae. To be included in our sample, a country must be included in the list of indications of premium surcharges, and complete data must be available for it in all of the explanatory variables. The following variables were considered, all independent ones with a lag of one period:[34]

PS = the premium surcharges as a proxy for p;
DSR = the debt-service ratio as a proxy for K;
DDSR = the average rate of change of the above ratio as a proxy for μ;
VDSR = the volatility of the rate of change of the above ratio as a proxy for σ;
RES = the ratio of reserves over three months of imports as a proxy for K;
DRES = the average rate of change of the above ratio as a proxy for μ;
VRES = the volatility of the rate of change of the above ratio as a proxy of σ.

The formulae (14) and (15) cannot be further simplified; thus the independent variables cannot be expressed separately. Therefore, two methods of testing are proposed here.[35] First, the specific structural form of this equation is tested by simulating the two terms on the right hand side and regressing the observed premium surcharges on these two terms. Secondly, the premium surcharges are regressed directly on the independent variables to test whether they are significant in the suggested direction.

Concerning the first method of testing, the following procedure was used. The external financial indicator RES (or alternatively DSR), its average rate of change DRES (or DDSR), and the volatility of that rate VRES (or VDSR) were used as proxies for (K_t / N_t), μ, and σ, respectively. They were used as inputs to calculate the value of the two terms of the premium rate formulae, denoted below by T_1 and T_2, and then the actual premium surcharges were regressed on these two terms. Ideally, their estimated coefficients would be significant and equal to one. In fact, the results of this test method

[34] The premium surcharges, PS, being applied during 1993 were used as the dependent variables. The data were neither previously subjected to an empirical analyses nor are they publicly available. The data are listed in the appendix 4.5.4. The explanatory variables are available from publicized sources. The values of the proxies for σ and μ were calculated from historical data using standard formulae. They were calculated for the past three, four, and five years. Here, only the results for σ and μ calculated for the three year period are reported, the results for the variables calculated for different periods being broadly similar.

[35] The author is indebted to A.C. Atkinson who suggested these testing methods.

were mixed. For example, using the debt-service ratio, the null hypothesis that all coefficients are equal to zero could not be rejected. The specification using the reserves-over-imports ratio performed better, i.e. the null hypothesis of all coefficients being equal to zero was rejected at the 1% probability level. The results obtained on the basis of this latter ratio are given below:

$$\begin{aligned} PS93 &= 0.96C + 0.03T_1 - 0.15T_2 \;, \qquad \bar{R}^2 = 0.29 \;, \\ &\quad (11.26)^{***}\ (0.93)\quad (-4.23)^{***} \qquad F(2,77) = 17.24^{***}, \end{aligned}$$

$$\text{with } T_1 = e^{-\tilde{r}}\,\Phi\left(-\frac{\ln(\tilde{K}/\tilde{N}) + \tilde{\mu} - \tilde{\sigma}^2/2}{\tilde{\sigma}}\right)$$

$$\text{and } T_2 = e^{\tilde{\mu}-\tilde{r}}\,\frac{\tilde{K}}{\tilde{N}}\,\Phi\left(-\frac{\ln(\tilde{K}/\tilde{N}) + \tilde{\mu} + \tilde{\sigma}^2/2}{\tilde{\sigma}}\right),$$

with $\tilde{K}$= RES, $\tilde{\mu}$= DRES, $\tilde{\sigma}$= VRES, and $\tilde{r}$= 0.05. The result suggests that there exists a significant influence of the second term on the premium surcharges; however, less than a third of the total variation in the premium surcharges are explained by the above specification.[36] In fact, the variation in the second term, T_2, of which the coefficient is significant, is dominated by the changes in the reserves-over-imports ratio in front of the bracketed expression. Thus the results point to the hypothesis that this ratio is important but that the specific structural form of the regression equation is not correct.

In the next step, it was tested whether the model's qualitative implications with respect to the influence of its central variables are consistent with the data. These implications are as follows:

$$\tilde{p}_t = \tilde{p}_t(\underset{(-)}{\tilde{K}_t}, \underset{(+)}{\tilde{\sigma}_T}) \text{ according to Black Scholes concept ,}$$

$$\tilde{p}_t = \tilde{p}_t(\underset{(-)}{\tilde{K}_t}, \underset{(-)}{\tilde{\mu}_T}, \underset{(+)}{\tilde{\sigma}_T}) \text{ according to risk neutrality concept ,}$$

with $\tilde{K}$= RES (or DSR), $\tilde{\mu}$= DRES (or DDSR), and $\tilde{\sigma}$= VRES (or VDSR). These relations were tested using parametric and non-parametric regressions.

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[36] There was no evidence of heteroscedasticity, and functional misspecification was not detected.

The results using linear OLS regressions are as follows. First, a regression specification was used which included all of the above listed explanatory variables and, in addition, a dummy variable for Argentina ARG to account for the exceptionally high premium surcharges applying to that country.[37] The estimated coefficients of DSR, RES, VRES and ARG were significant in the expected direction and the coefficients of DDSR, VDSR and DRES were insignificant. The null hypothesis that the coefficients of the variables DDSR, VDSR and DRES were jointly zero could not be rejected. These variables were eliminated and then the regression re-estimated. The following results were obtained:[38]

$$\begin{aligned} PS93 = {} & 0.97\,C + 1.20\,DSR - 1.63\,RES + 5.14\,VRES + 4.70\,ARG , \\ & (6.48)^{***} \quad (2.53)^{**} \quad (-4.74)^{***} \quad (3.07)^{***} \quad (7.92)^{***} \end{aligned}$$

$$\bar{R}^2 = 0.56 , \qquad F(4,75) = 26.35 .$$

The estimation shows that the estimated coefficients of all included variables had the expected signs, and that those of DSR, RES and VRES were significant. In particular, the coefficients of the reserves-over-imports ratio RES and the volatility of the rate of changes of international reserves VRES were significant at the 1% level (denoted by ***). The coefficient of DSR was significant at a lower level, i.e. at the 5% level (**). There was evidence for heteroscedasticity, but the estimated coefficients changed only little when a heteroscedasticity-consistent estimator was used, except that the level of significance of the coefficient of DSR was lower.[39] In both estimates the null hypothesis that all coefficients as a group were insignificant could be strongly rejected. Several tests for functional misspecification were applied, but no evidence of it was found. For example, using a test of non-nested models, the linear model was confirmed as a better

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[37] This high surcharge has been applied by the then-ECGD following the outbreak of the Falkland war between Argentina and the United Kingdom. It has been reduced only slightly since then and continues to represent the maximum surcharge applied by the private NCM, UK to any country in this sample.

[38] A logit transform of the premium surcharges would be the appropriate dependent variable because it prevents the estimated premium surcharges from becoming negative. However, using the logit transform, the explained variation was much lower and therefore an approximation (i.e. the non-transformed variable) is used instead.

[39] The degrees-of-freedom-corrected version of a heteroscedasticity-consistent estimator (White (1980)) was used to obtain the following coefficient estimates (t-ratios in brackets): 0.97 (6.45) for C, 1.20 (1.75) for DSR, -1.93 (-6.21) for RES, 5.14 (3.70) for VRES and 5.14 (27.94) for ARG. Thus, the t-ratios increased for RES, VRES and ARG but decreased for DSR, so that the latter was significant only at the 10% level.

description of the variation in the data than the linear-log (semi-log) one. Several additional variables were included in the regression specification and the extended specification re-estimated, these additional variables including the quadratic forms of the independent variables and the squares of the predictions of the original linear model. They were not found significant.

Using the estimated coefficients for DSR, RES and VRES the point elasticities of the premium surcharges with respect to these variables were calculated.[40] The estimated elasticities of DSR, RES and VRES were 0.20, - 0.38 and 0.24, respectively. In words, an increase in the debt-service ratio by one per cent increases the premium surcharges by 0.2 per cent, a decrease in the reserves-over-imports ratio by one per cent increases them by 0.38 per cent and an increase in the volatility of the reserves-over-imports ratio by one per cent increases them by 0.24 per cent. In this sense the reserves-over-imports ratio is more important for the determination of the premium surcharges than the debt-service ratio. This could be interpreted as support for the hypothesis that indicators related to the liquidity of a country are perceived by the ECA as being more important than indicators relating to its solvency.

These results, obtained from parametric regressions, were partly supported by estimates using non-parametric kernel regressions.[41] These estimates are shown in figures 4.3 and 4.5, and the associated density estimates in figures 4.4 and 4.6.[42] Figure 4.3 illustrates the relation between the premium surcharges (denoted by PS in that figure), on the one hand, and the debt-service ratio (denoted by DS) and the volatility of its rate of change (denoted by V), on the other. The figure below, i.e. figure 4.4, contains a density

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[40] The coefficients obtained from the use of the heteroscedasticity-consistent estimator were used to calculate the elasticities (see previous footnote).

[41] The kernel density estimator used is the standard bivariate one, as being described in Silverman (1986, p.76). The observation for Argentina was eliminated because we believe that the high PS applying to that country is politically motivated. The estimates for DDSR and DDSR are not reported here because they did not show clear patterns.

[42] The kernel estimator used had the optimal window width, i.e. the one which minimizes the mean square error. The effect of varying the window width is as follows. As the window width tends to zero, the surface becomes "spiky", while as it becomes large, all detail, spurious or otherwise, is obscured. A large window width generally introduces a systematic error, or bias, into the estimation. Therefore, the results that we obtained increasing the window width are not reported here.

estimate. The latter is an essential tool to interpret the surface plot shown in figure 4.3. In general the interpretation of this surface plot should concentrate on those areas where most of the density is concentrated. The areas with low density are generally poorly determined and thus unreliable. Figure 4.4 shows that the area with high density is the one in the south of the surface (viewed from the front axis, i.e. DS-axis), with most density being concentrated in the south-east. The estimates in the southern area of the surface are not unequivocal. In the area with the highest density; i.e. the one between the DS-values of 0.010 and 0.153, viewed from the DS-axis; the premium surcharges appear to be decreasing in DS, while they appear to be increasing in the remainder of the southern area. They appear to be always increasing in the volatility of the rate of change of the debt-service ratio V. Figure 4.5 illustrates the relation between the premium surcharges (denoted by PS in that figure) and the reserves-over-imports ratio (denoted by R) and the volatility of its rate of change (denoted by V). The area in the south-east of the surface plot is characterized by a high density. Starting from the origin in the south-east corner, the high-density area extends roughly up to the west to a R-value of 0.663 and to the north to a V-value larger than 0.10. In this area, PS appears to be decreasing in R and increasing in V, though only slowly. To sum up, the estimates obtained from non-parametric regressions provide some support for the hypothesis that the premium surcharges are negatively related to the reserves-over-imports ratio and positively to the volatility of its rate of change, the debt-service ratio and the volatility of its rate of change.

The elasticities calculated from the non-parametric regression estimates were consistent with those calculated from the parametric regression estimates, though the former were generally lower. For example, the density-weighted elasticity estimates were equivalent to 0.20 with respect to the reserves-over-imports ratio, 0.22 with respect to the volatility of its rate of change, 0.17 with respect to the debt-service ratio, and 0.08 with respect to the volatility of the rate of change of this ratio.

The parametric and non-parametric regression exercises convey an idea about the relation between the premium surcharges and the level and volatility of the rate of

external financial indicators.[43] However, the estimates should be treated with caution. The sample size, i.e. 80 observations, is so small that the results of the regression analysis appeared to be significantly influenced by the realization of individual observations. If one wants to summarize the empirical results, the following can be said. They do not provide support for the hypothesis that the average rate of change, i.e. the trend in the financial indicators of a country, such as the debt-service ratio and the reserves-over-imports ratio, affect the premium surcharges applying to that country.[44] They point to the hypothesis that the premium surcharges are significantly positively related to the debt-service ratio and the volatility of its rate of change. Furthermore, they provide support for the hypothesis that the reserves-over-imports ratio and the volatility of the rates of change of the reserves-over-imports ratio were negatively and positively (respectively) related to the premium surcharges. The finding that not only the current reserves-over-imports ratio, but also the volatility of the rate of changes of this ratio, affect such premium surcharges, is in accordance with the qualitative implications of the Black-Scholes based premium valuation concept, i.e. that the premium rates for export credit insurance to a country should depend on that country's current debt-servicing capacity and the volatility of the rates of change of this capacity.

[43] Deleting two outliers and re-estimating the relations, the results reported above were confirmed. The outlier were identified using scatter plots, as shown in appendix 4.5.5. Note that such scatter plots are another means to identify relations between the variables. Indeed, the picture that is emerging from them agrees with our central empirical results.

[44] According to the premium valuation concept based on the assumption of risk-neutrality of ECAs, the trend in the debt-servicing capacity of a country should be negatively related to the premium rates for insurance of export credits to that country. This implication is not reflected in the sample data used for this study, the proxy for this trend being insignificant.

Figure 4.3: Non-parametric regression of the premium surcharges on debt-service ratio and its volatility

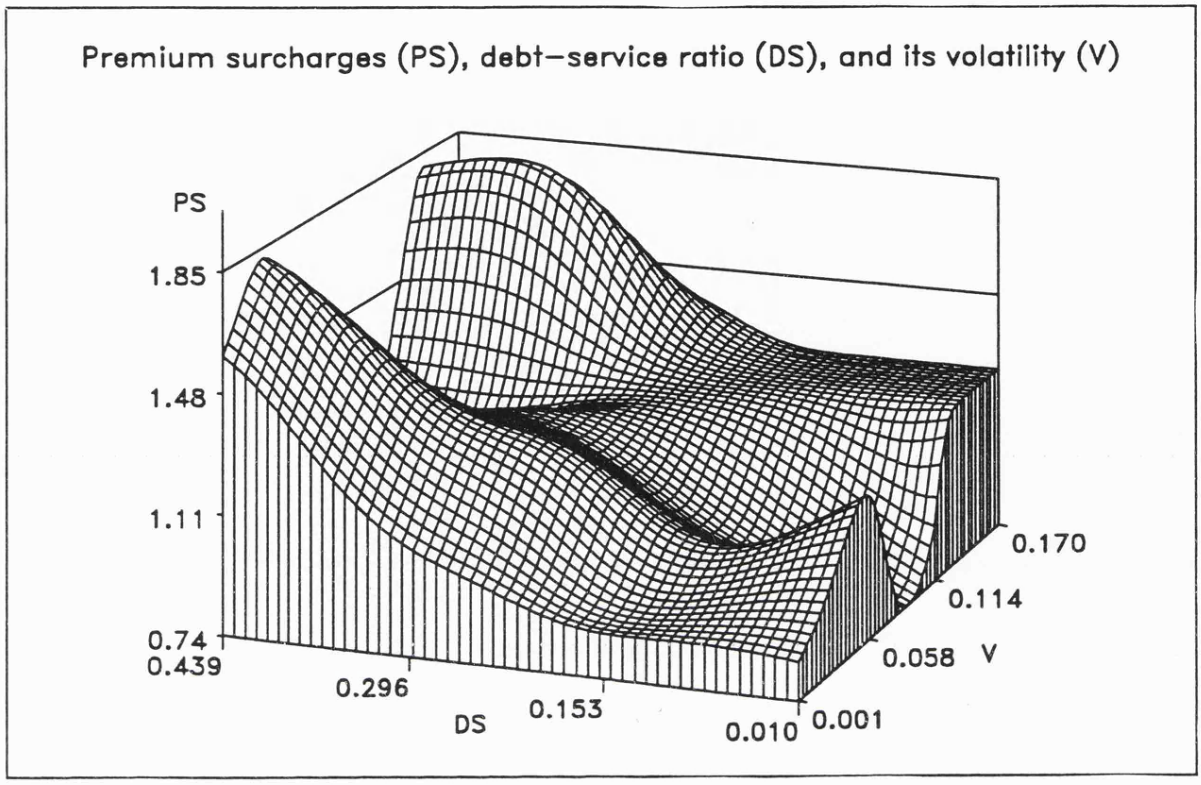


Figure 4.4: Density estimates

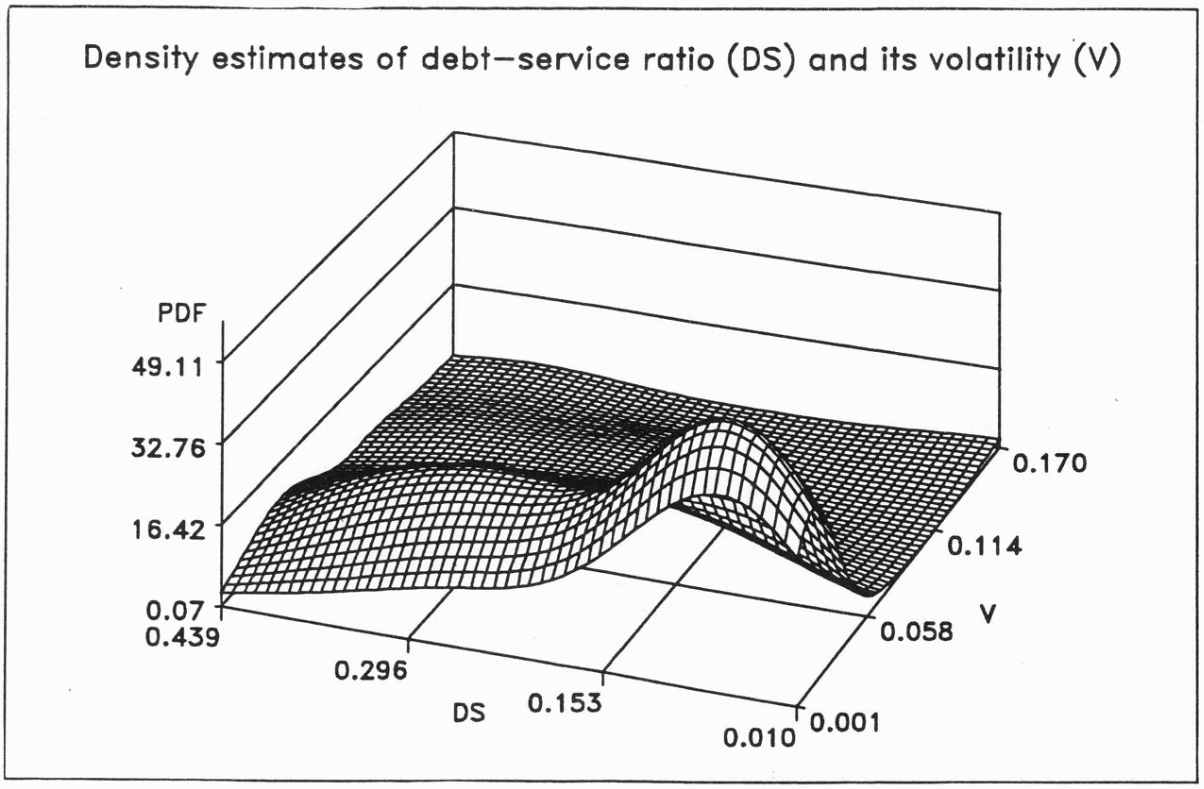


Figure 4.5: Non-parametric regression of the premium surcharges on the reserves-over-imports ratio and its volatility

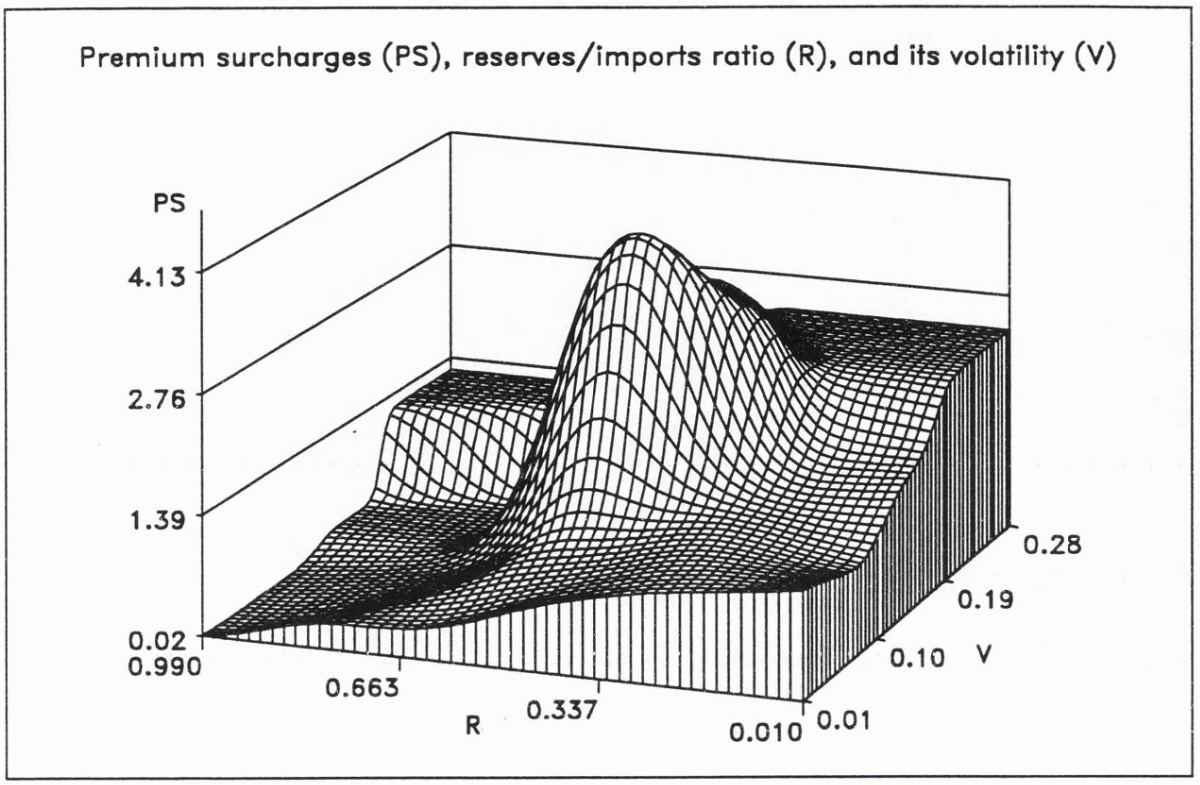
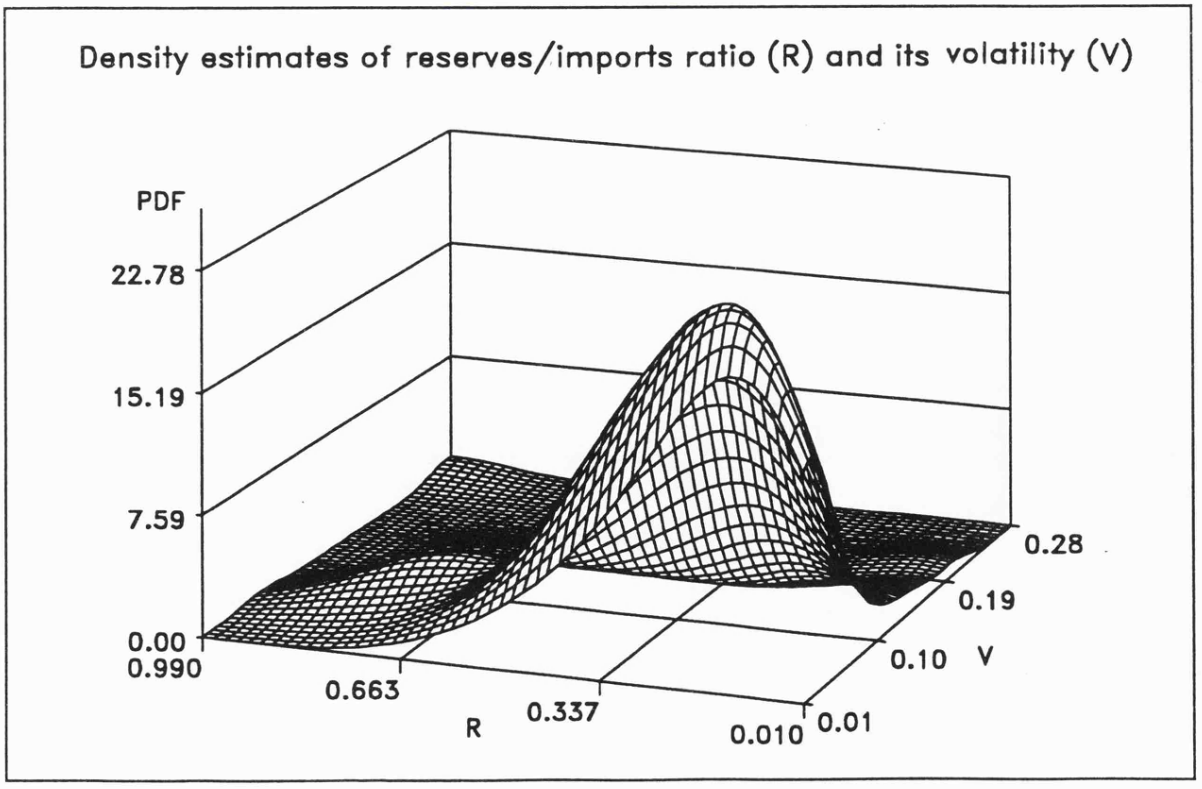


Figure 4.6: Density estimates



4.4.2 Premium surcharges and country risk ratings

It has been suggested that the country specific premium structure applied by ECAs does not reflect the differences in risk among country destinations.[45] One test to examine this hypothesis is suggested here. Namely, we examine whether the ranking of countries implied by the structure of premium surcharges is consistent with the ranking of these countries that is implied by their published creditworthiness ratings according to *Euromoney* and the *Institutional Investor*.[46] Furthermore, we compare the relation between premium surcharges and creditworthiness ratings, on the one hand, and spreads and creditworthiness ratings, on the other.[47]

The most widely used[48] country risk ratings are the ratings which are published biannually in the *Institutional Investor* (II) and annually in the *Euromoney* (EM) magazines, respectively. The methodology behind the II rating was self-described in the March 1990 issue: "The country-by-country credit ratings developed by Institutional Investor are based on information provided by leading international banks. Bankers are asked to grade each of the countries on a scale of zero to 100, with zero representing the least creditworthy countries and 100 representing those with the least chance of default. The sample for the study, which is updated every six months, ranges from 75 to 100 banks, each of which provides its own ratings. The names of all participants in the survey are kept strictly confidential. Banks are not permitted to rate their home countries. The individual responses are weighted using an Institutional Investor formula that gives more weight to responses from banks with greater worldwide exposure and more sophisticated

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[45] S. van Wijnbergen drew the author's attention to this hypothesis. This hypothesis is mainly articulated in the context of public and officially supported ECAs. Unfortunately, these ECAs, as a general rule, do not make available information about their premium structures. The ECA considered here, i.e. the NCM, UK, is private and does not appear to receive any significant official financial support.

[46] The application of a flat insurance premium to all country destinations provides evidence for such a hypothesis. A flat premium was applied by the officially supported German Hermes until recently.

[47] As appendix 4.5.6 shows, the two forms of risk premia are similar under specific circumstances.

[48] Köglmayr and Müller (1987, p.382), "Abbildung 1: Entscheidungshilfen durch und Bekanntheitsgrad von ausgewählten Risikoindikatoren".

country-analysis systems." The Euromoney risk rating consists of a weighted scheme of indicators designed to describe a country's economic, financial, and political situation, and its market access. A poll of bankers is used to assess the political situation, and the financial one is measured by a hypothetical financial indicator. It is calculated as the weighted sum of three ratios, which includes the debt-service ratio but does not include, for example, the reserves-over-imports ratio.[49] It is interesting to note, that despite their different rating systems, the published country ratings of EM and II are very similar. The interesting aspect of these ratings is that they consider in principle all determinants of the credit risk, i.e. not only economic, but also political and social determinants.[50] Clearly, one should expect that the risk premia that apply to debtor countries, such as the premium surcharges and the spreads, are negatively related to their ratings.[51] This hypothesis was tested and the results are presented in the remainder of this section.

First, it was tested whether there is statistical evidence for the hypothesis that the premium surcharges applying to country destinations were consistent with (or better influenced by) the published ratings of those countries. For this purpose, the logit transformations[52] of the premium surcharges, as applied during 1993 to 60 countries,[53] were regressed on the ratings of these countries according to the Institutional Investor and Euromoney in September 1992. The following estimation results were obtained for the EM rating, using a non-linear least square regression:

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[49] The financial indicator is calculated on the basis of the ratio of the current account balance to GNP, the debt-service ratio, and the ratio of the external debt to GNP ratio. The debt-service ratio is multiplied by two and added to the external debt-to-GNP ratio. The current account balance-to-GNP ratio is multiplied by ten and subtracted from the former term to obtain the financial indicator. The lower the resulting score, the better will be the rating of the country according to that indicator. The score enters with a weight of 10% in the total calculation. See *Euromoney*, September 1992, p.70.

[50] However, an obvious shortcoming is that neither selection nor weighting of the economic, social and political aspects is based on a consistent theoretical concept. This is reflected, for example, in the *ad hoc* chosen weights for the calculation of financial indicator. One example of such a calculation was explained in the previous footnote.

[51] Lee (1991) claims to have shown that the "credit ratings provide a reasonable measure of borrower's (i.e. countries') creditworthiness." In fact, he has shown that the rating of a country reflects the occurrence of past or present reschedulings. Indeed, in another statistical analysis, we find that the capacity of the II to predict debt-servicing problems is rather limited. One should furthermore note that the risk in export credit insurance is different from the risk in international bonds and credits, the *Institutional Investor* being geared primarily towards international investors and bankers.

[52] The logit transform was used to prevent that the estimated values of the dependent variable become negative.

[53] This is the number of countries that are common to both data sets.

$$PS_{logit} = a_1(EM)^{a_2}$$
$$a_1 = 0.58(16.64)^{***}$$
$$a_2 = -0.23(-4.35)^{***}$$
$$\bar{R}^2 = 0.25 .$$

The two estimated coefficients, a_1 and a_2, are highly significant and the direction of their joint influence is as expected. The higher the rating of a country, the lower are the premium surcharges applying to it. This can be interpreted as evidence for the hypothesis that the premium surcharges applying to debtor countries are consistent with their published creditworthiness ratings.

This result was compared with the result of a similar exercise; namely, a comparison between the spread and the *Euromoney* rating. The spread data consisted of the data set used in chapter 3, i.e. a vector of 52 pooled cross-country time-series observations. This vector was regressed on a similar vector of EM ratings, the ratings being obtained from the Euromoney issue prior to the spread observation. To be comparable with the above estimation for the premium surcharges, the logit transformation was applied to the spread as well. The following estimation were obtained:

$$Spread_{logit} = a_1(EM)^{a_2}$$
$$a_1 = 0.77(22.01)^{***}$$
$$a_2 = -0.11(-8.93)^{***}$$
$$\bar{R}^2 = 0.60 .$$

The estimated coefficients were significant, thus providing support for the hypothesis that the spread is influenced by the rating of a country.[54] The direction of their joint influence corresponds to prior expectations, i.e. a lower rating implies a higher spread. A remarkable difference between the two regressions, i.e. the one of the premium surcharges and the one of the spread, is that, the explained variation of the dependant variable is much higher in the latter than in the former one. This means that the relation

[54] There was no evidence for misspecification in neither of these two regressions, i.e. the one of the premium surcharges and the one of the spread. There was evidence for heteroscedasticity, but applying a heteroscedasticity-consistent estimator (White (1980)) the coefficient estimates did not change.

between the spreads and the creditworthiness ratings is closer than the one between the premium surcharges and these ratings.[55] This result is confirmed by another analysis where pairs of vectors are compared using the criterion of the root-mean-square-percentage-error, RMS%E. This criterion measures the deviation of two vectors, with the same number of observations, from each other. It allows the comparison of the relative deviation among any pair of vectors with that among any other pair of vectors.[56] It is defined as follows:

$$RMS\%E = \sqrt[2]{\frac{\sum_{i=1}^{n} (p_1/p_2 - 1)^2}{n}},$$

where p_1 and p_2 represent one pair of vectors and n the number of observations per vector. For example, p_1 would be either the vector of the spread or the one of the premium surcharges and p_2 either the vector of the EM or the II ratings. For convenience of comparison, the EM and the II ratings are transformed to variables indicating the relative riskiness of a country, i.e. the ratings are subtracted from 100 and then divided by 100. Thus these variables are bounded between 0 and 1, with 0 indicating the most and 1 the least creditworthy country.

The table 4.1 shows that the pair of vectors in the bottom row, i.e. the spread and the II vector, exhibits the least deviation among the five pairs considered here. This provides some weak support for the hypothesis that the premium surcharges by the ECA are less responsive to the creditworthiness of a country than the interest rate premium - the spread - in international lending.[57] The support is only weak because the two vectors

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[55] Using a linear log-log regression, the point elasticities of both, the spread and the premium surcharges with respect to the rating were estimated. They were -2.98 for the premium surcharges and -4 for the spread. This means that a decrease in the rating by one point is associated (on average) with an increase in the premium surcharge by 0.0298 per cent and the spread by 0.04 per cent.

[56] The two pairs of vectors are not required to have the same number of observations.

[57] The close relation between the spread and the creditworthiness rating that is identified here is indeed a familiar result. It appears that these ratings are not endogenous in the regression of the spreads; namely, on the one hand, bankers read the II magazine and determine their risk perception accordingly, and, on the other, they answer the II questionnaires with reference to their observation of the spread. Under these circumstances the coefficients estimated for the rating in the spread equation may not be consistent because of the problem of simultaneity.

containing the spreads and the premium surcharges are not directly comparable; they contain observations for different countries and time periods.[58]

Table 4.1: Deviation between premium surcharges, country risk rating, and spreads (cross-country data)[(a)]

Vectors compared	RMS%E
premium surcharges 1992 and II rating 1991	4.08%
premium surcharges 1993 and II rating 1992	4.13%
premium surcharges 1992 and EM rating 1991	4.42%
premium surcharges 1993 and EM rating 1992	4.44%
spread and II rating in prior year	1.19%

Source: *Euromoney*, *Institutional Investor*, Bäcker and Klein (1993).

(a) The Euromoney and Institutional Investor ratings were transformed. The ratings were subtracted from 100 and then divided by 100.

Another comparison was considered; namely, the Euromoney creditworthiness rating (EM) and the premium surcharges (PS) were alternatively regressed on a common set of explanatory variables, in order to identify the differences in the sensitivity of EM and PS with respect to those variables. These explanatory variables were selected according to the implications of the model of section 4.3, the empirical results obtained here, and those reported by Lee (1993) in connection with its empirical analysis of the determinants of country creditworthiness ratings.[59] The variables include RES, VRES,

[58] They differ in various respects, such as the form of the data set (pooled time-series and cross-country data, on the one hand, and cross-country data, on the other), the number of observations (52 and 80), and the countries for which observations are available.

[59] Lee regressed the EM ratings of 40 developing countries on economic variables and regional and other dummies. He found that the variability of the per capita GNP of a country is negatively related to its rating. This result is opposite to the author's prior expectations, who appears to have followed the argument of a typical willingness-to-pay model, i.e. that the variability of a debtor's income is positively related to its creditworthiness. To the extent that the debtor country borrows for consumption smoothing and the default penalty consists of an exclusion from future borrowing, a higher variability of income implies a higher penalty of default and thus a lower probability of default. By contrast, our theoretical model (presented in section 4.3) would predict the opposite and thus be consistent with the described empirical results - provided that the per capita GNP of the country is a sensible proxy for its debt-servicing capacity. We believe, however, that other indicators, such as the reserves-over-imports ratio or the debt-service ratio, are better suited for that purpose, and therefore give them priority over the former variable in our study.

DSR, and VDSR, and in addition the following ones:[60]

UDB	=	undisbursed credit commitments over GNP,
VUDB	=	volatility of UDB calculated over past three years.

Furthermore, four regional dummies - which were found to be significantly related to the EM ratings in the above mentioned study by Lee - are included to account for the geographical location of the developing country:

D_{Asia}	=	East Asia and Pacific,
D_{Latin}	=	Latin America and the Caribbean,
$D_{N.Africa}$	=	North Africa and Middle East,
D_{Europe}	=	Europe and Mediterranean.

The creditworthiness rating of each country is subtracted from the maximum obtainable score of 100 in order to obtain a measure of the riskiness of the country, denoted EMR. The results for the two dependent variables, PS and EMR, can thus be compared, the expected signs of estimated coefficients being the same. The logistic transformation is applied to the two variables PS (denoted PS_{Logit}) and EMR (denoted EMR_{Logit}) to prevent the estimates of the dependent variable from becoming negative. Using OLS these two variables are alternatively regressed on the logarithms of the explanatory variables, the results being given in table 4.2.[61]

Some results are singled out for special attention. The adjusted R^2 is higher in the regression of EMR_{Logit} than in the one of PS_{Logit}, and a greater number of variables are significant in the former than in the latter one. In the former of these regressions, the regional dummies for Europe, Asia and North Africa are significantly negative, thus

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[60] The data set consists of 60 observations for developing countries. To be included in the sample, a country must be a developing country with complete data available in all of the dependent and explanatory variables.

[61] The specification in logarithmic form was preferred to one which included the variables with their absolute values because for the former (but not the latter) the hypotheses of misspecification could be rejected and heteroscedasticity did not appear to be a problem. The results of tests of non-nested regressions were inconclusive, except for the information criterion which favours the non-logarithmic model because it explains more of the variation in the dependent variable.

confirming the result of Lee (1993). He interpreted that result as evidence for the hypothesis that developing countries from (left-out) Sub-Saharan Africa receive a lower creditworthiness rating than those from Europe, Asia and North Africa. In the regression on EMR_{Logit}, the coefficient of the ratio of undisbursed credits over GNP (UDB) is highly significantly negative, and the one of the volatility of the rate of changes of that ratio positive at the 10% level of significance. The latter coefficient is positive at the 5% level of significance in the regression on PS_{Logit}. The significantly negative relation between EMR_{Logit} and UDB is not astonishing. On the one hand, bankers are asked to provide the political risk assessment for the EM creditworthiness rating, and thus such assessment enters into the total score of the rating, i.e. with a weight of 20%. On the other hand, they decide about the credit commitments to a country and, thus, have an influence on the undisbursed credit commitments as well. Clearly, there might be a simultaneity problem in that regression but we believe that it is not a serious problem. The volatility of the rate of changes of the ratio of undisbursed credits over GNP (VUDB) is significantly positive in the regressions at the 5% and 10% level, respectively. To the extent that this liquidity-related ratio is correlated with the debt-servicing capacity of a country, these results would be consistent with the implications of our theoretical model of the determination of a risk premium explained in section 4.3.3.

Another important finding is that the influence of liquidity-related indicators such as RES, VRES, UDB, and VUDB appears to be stronger than the influence of solvency-related indicators such as DSR and VDSR, the level of significance of some of the former variables being much higher.

Table 4.2: Estimation results of OLS regression of *Euromoney* rating and premium surcharges on logarithmic variables and regional dummy variables

	EMR_{Logit}		PS_{Logit}	
constant	0.672	(24.762)***	0.943	(8.549)***
RES	- 0.019	(- 4.109)***	- 0.078	(- 4.035)***
VRES	0.011	(1.817)*	0.063	(2.587)***
DSR	- 0.006	(- 1.269)	0.012	(0.627)
VDSR	- 0.837E-3	(- 0.189)	0.041	(2.275)**
UDB	- 0.008	(- 2.538)***	0.007	(0.575)
VUDB	0.006	(1.810)*	0.024	(1.944)**
D_{Europe}	- 0.053	(- 3.799)***	0.066	(1.154)
$D_{N.Africa}$	- 0.023	(- 2.128)**	0.092	(2.011)**
D_{Asia}	- 0.036	(- 3.108)***	0.060	(1.281)
D_{Latin}	- 0.013	(- 1.228)	0.074	(1.677)*
Adj. R^2	0.45		0.28	
F(10,49)	5.767***		3.343***	

Explanation: OLS estimation results with dummy variables representing geographical location of borrowers. Other independent variables are in logarithmic form. The dependent variables are the logistic transformation of the premium surcharges (PS_{Logit}) and logit transformation of the riskiness of a country according to *Euromoney* (EMR_{Logit}). The figures in parentheses denote t-statistics, and levels of significance are denoted as follows: *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

To sum up, the results reported here confirm those reported in the previous subsection, i.e. that the reserves-over-imports ratio is significantly negatively related and the volatility of that ratio significantly positively related to the premium surcharges. The results reported here *do not* provide evidence for the hypothesis that the premium rates fail to reflect the differences in risk among credit destination countries.

4.5 Appendix

4.5.1 The principle underlying option valuation

This appendix is designed to illustrate the fundamental economic principle of option valuation by arbitrage methods using a simple numerical example.

The fundamental principle of modern option pricing theory is the absence of arbitrage opportunities. An arbitrage opportunity is when one or a set of trades results in a positive cash flow at one point in time and in zero cash flows in all other points in time. The absence of arbitrage opportunities means that this is not possible. The valuation of a put option is based on the following idea. If one could establish a portfolio of long and short positions in the underlying commodities, i.e. the commodities on which the option is written, and risk-free debt instruments in such a way that the pay-offs of a put were completely replicated (by that portfolio), then to prevent riskless arbitrage opportunities from occurring, the current values of these positions and the put option would have to be identical.

This idea is illustrated using a simple example, which follows Cox, Ross and Rubinstein (1979), p.331. Consider two periods, denoted period 1 and 2. In period 1 the ECA writes a European put option on Mexican oil. The price of oil per barrel in period 1 is $Price_{Oil}$ = \$20, and in period 2 it is either \$10 or \$40. The option expires in period 2 and has an exercise price of E = \$20. Consider that one can trade either in these options, directly in oil or borrow and lend at the riskless interest rate of 5.3 per cent. Under these circumstances, the following hedge helps to determine the price of the put in period 1:

(1) Write 3 puts at price π each,
(2) sell short 1 barrel of oil at \$20,
(3) lend \$38 at 5.3 per cent to be paid back in period 2.

The tabulation below gives the pay-offs from this hedge for each possible level of the oil price in period 2.

Tabulation: Pay-off Structure of Riskless Hedge

	Period 1	Period 2	
	$Price_{Oil}$ = \$20	$Price_{Oil}^{*}$ = \$10	$Price_{Oil}^{*}$ = \$40
Write 3 puts	+ 3 π	- 30	0
Sell short 1 barrel oil	+ 20	- 10	- 40
Lend \$38 at 5,3%	- 38	+ 40	+ 40
Total	0	0	0

Regardless of the outcome concerning the oil price, the (riskless) hedge exactly breaks even in period 2. Therefore, the no-arbitrage condition requires the following equation to hold: $3 \pi + 20 - 38 = 0$. Thus the value of the put in period 1 must be equal to \$6. If its price differed from \$6, a sure profit would be possible. For example, if π = \$10 the above hedge would yield an additional cash flow of \$12 in period 1 and would experience no further gain or loss in the second period.

4.5.2 Stochastic dynamics of the debt-servicing capacity

This appendix is designed to explain the basic assumption about the stochastic dynamics governing the debtors' debt-servicing capacity and the implications of that assumption for the expected value and the variance of the level and logarithm of that capacity.[62] This is needed for the actual derivation of the pricing formula in the next appendix and also helps to understand the characteristics of the assumed stochastic process.

[62] Our exposition follows partly the example of Dixit (1992).

We follow recent studies in the sovereign debt literature and assume that the debt-servicing capacity can be described as a geometric Brownian motion.[63] A Brownian motion[64] is a continuous-time stochastic process that can be understood (approximately) as the cumulation of independent identically distributed increments. Namely, it can be obtained from a symmetric random walk by increasing the number of unit steps to the limit. The geometric Brownian motion is a variation of such a process, its characteristics being that it is not the absolute but the relative (percentage) changes that are independent identically distributed. Consider that the debt-servicing capacity, K_t, follows such a geometric Brownian motion process, being described by the following stochastic differential:

$$dK_t/K_t = \mu dt + \sigma dW_t \text{ with } K_0 > 0 , \qquad \text{A.(1)}$$

where the parameter μ represents the drift coefficient and σ the diffusion parameter, and W_t the standardized Brownian motion (Wiener process) whose increment dW_t is normally distributed with zero mean and variance dt, and is assumed to start in zero, $W_0 = 0$. Equivalently, μ measures the instantaneous rate of change of K_t and σ the volatility of the rate of change in K_t. More formally,

$$\mu = \lim_{h \to 0} \frac{1}{h} E\left[\frac{K_{t+h} - K_t}{K_t} \mid K_t\right],$$
$$\sigma^2 = \lim_{h \to 0} \frac{1}{h} \text{Var}\left[\frac{K_{t+h}}{K_t} \mid K_t\right]. \qquad \text{A.(2)}$$

Equation A.(1) can be transformed to obtain the stochastic differential of the logarithm of the debt-servicing capacity, $\ln K_t$. Let $f(K_t) = \ln K_t$. Using Itô's Lemma, the following equation is obtained:

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[63] See also footnote 22 in the text of subsection 4.3.2.

[64] The Brownian motion is the most renowned, and historically the first stochastic process that was investigated in depth. It is named after the English botanist, Robert Brown, who in 1827 observed that small particles immersed in a liquid exhibited ceaseless irregular motion. The theory of Brownian motion was given a rigorous mathematical formulation by Norbert Wiener in his 1918 dissertation and in later papers. This is why the Brownian motion is also called the Wiener process. The first application of Brownian motion in economics was made by Louis Bachelier in his dissertation "Théorie de la spéculation" in 1900. In the early 1970s, Merton, in a series of papers, established the use of stochastic calculus as a tool in financial economics. See Palgrave (1992).

$$df(K_t) = \mu K_t f'(K_t)dK_t + \sigma^2 K_t^2/2 f''(K_t)dt \ . \qquad \text{A.(3)}$$

Since $f'(K_t) = 1/K_t$ and $f''(K_t) = -1/K_t^2$, the stochastic differential of $\ln K_t$ can be written as follows:

$$d\ln K_t = (\mu - \sigma^2/2)dt + \sigma dW_t \ . \qquad \text{A.(4)}$$

Thus, while K_t follows the geometric Brownian motion, $\ln K_t$ follows the ordinary Brownian motion. Suppose K_t follows the process described in A.(1) and starts at $t = 0$ in the known position K_0. We know that $\ln K_t$ follows the Brownian motion as described in A.(4). Then at any positive time t, $\ln K_t$ is normally distributed with mean $(\ln K_0 + (\mu - \sigma/2)\ t)$ and variance $\sigma^2 t$:

$$\ln K_t = \ln K_0 + (\mu - \sigma/2)t + \sigma W_t \ . \qquad \text{A.(5)}$$

By assumption, the dates of maturity of the debt are located at discrete intervals. Consequently we are interested in the evolvement of $\ln K_t$ between these intervals. From the above equation we obtain the stochastic equation in differences which is as follows:

$$\ln K_t = \ln K_{t-h} + (\mu - \sigma^2/2)h + \sigma w_t \ , \qquad \text{A.(6)}$$

where h denotes any discrete time interval and w_t is defined as $(W_t - W_{t-h})$. These increments w_t are independent random variables characterized by a normal distribution with mean zero and variance h. Consequently, the expected value and conditional variance of $\ln K_t$, respectively, are given as follows:

$$E[\ln K_t \,|\, \ln K_{t-h}] = \ln K_{t-h} + (\mu - \sigma^2/2)h \ , \qquad \text{A.(7)}$$

$$Var_{t-h} \ln K_t = \sigma^2 h \ . \qquad \text{A.(8)}$$

While $\ln K_t$ is normally distributed, K_t is lognormally distributed. Transforming A.(4), the value of K_t at any time t, $t > 0$, can be expressed in terms of its starting value as follows:

$$K_t = K_0 e^{(\mu - \sigma^2/2)t + \sigma W_t} \ . \qquad \text{A.(9)}$$

Equivalently, the value of the debt-servicing capacity at time t viewed from time (t - h) can be written as follows:

$$K_t = K_{t-h} e^{(\mu - \sigma^2/2)h + \sigma w_t} . \qquad \text{A.(10)}$$

Given $w_t \sim N(0,h)$, the expected value and variance of K_t can be obtained using well-known formulae for the expected values and variances of lognormally distributed variables.[65] They are given as follows:

$$E[K_t | K_{t-h}] = K_{t-h} e^{(\mu - \sigma^2/2)h + \sigma^2 h/2} = K_{t-h} e^{\mu h} , \qquad \text{A.(11)}$$

$$Var[K_t | K_{t-h}] = K_{t-h}^2 e^{2\mu h}(e^{\sigma^2 h} - 1) . \qquad \text{A.(12)}$$

Thus, μ can be interpreted as the average rate of change of the debt-servicing capacity and σ^2 as the volatility of the rate of change of that capacity. Since we have assumed that the debt instruments become due exactly after one period, we can set h = 1. Under these circumstances the expected value and variance of the debt-servicing capacity at time t + 1, viewed from time t, can be written as follows:

$$E[K_{t+1} | K_t] = K_t e^{(\mu - \sigma^2/2) + \sigma^2/2} = K_t e^{\mu} , \qquad \text{A.(13)}$$

$$Var[K_{t+1} | K_t] = K_t^2 e^{2\mu}(e^{\sigma^2} - 1) . \qquad \text{A.(14)}$$

---

[65] For $X \sim N(m,s^2)$, $E[e^X] = e^{E[X] + 1/2 Var[X]} = e^{m + s^2/2}$
and $Var[e^X] = E[e^X - e^{E[X]}]^2 = e^{2m}(e^{s^2} - 1)$

4.5.3 Algebraic derivation of the premium rate formula

This appendix explains how the formula for the fair premium for export credit insurance is obtained. In order to obtain such explicit formula we have to make two important assumptions; namely, that the insurer is risk neutral and that the debtor country's debt-servicing capacity follows a geometric Brownian motion. As a result the fair premium, that is the one which makes the contract a zero expected profit transaction, can be expressed in terms of its discounted expected (negative) pay-offs as follows:

$$p_t = e^{-r} E_t\left[\max\left\{0, \left(\frac{D_{t+1} - K_{t+1}}{D_{t+1}}\right)\right\}\right] = e^{-r}\pi_t E_t\left[\left(\frac{D_{t+1} - K_{t+1}}{D_{t+1}}\right) \mid K_{t+1} \prec D_{t+1}\right], \quad \text{A.(15)}$$

where π_t is the probability of default in period t + 1 viewed from period t. Considering the stochastic dynamics of K_t, as explained in the previous appendix (see particularly A.(6)), this probability is given as follows:

$$\begin{aligned}
\pi_t &= \text{prob}\{K_{t+1} \prec D_{t+1}\} \\
&= \text{prob}\{\ln K_{t+1} \prec \ln D_{t+1}\} \\
&= \text{prob}\{\ln K_{t+1} \prec \ln N_t\} \\
&= \text{prob}\{\ln K_t + \mu - \sigma^2/2 + \sigma\omega_{t+1} \prec \ln N_t\} \\
&= \text{prob}\left\{\omega_{t+1} \prec \frac{\ln N_t - \ln K_t - \mu + \sigma^2/2}{\sigma}\right\} \\
&= \Phi\left(-\frac{\ln(K_t/N_t) + \mu - \sigma^2/2}{\sigma}\right),
\end{aligned} \quad \text{A.(16)}$$

where $\Phi(\cdot)$ denotes the standard normal distribution function

$$\Phi(\omega) = \int_{-\infty}^{\omega} \phi(v)dv \,, \quad \text{A.(17)}$$

$$\text{with density } \phi(\omega) = \frac{1}{\sqrt{2\pi}} e^{-\frac{\omega^2}{2}} .$$

The expected loss, conditional on the event of default, is as follows:

$$
\begin{aligned}
& E_t\left[\left(\frac{D_{t+1} - K_{t+1}}{D_{t+1}}\right) \mid K_{t+1} \prec D_{t+1}\right] \\
& = E_t\left[\left(\frac{N_t - K_{t+1}}{N_t}\right) \mid K_{t+1} \prec N_t\right] \\
& = 1 - E_t\left[\frac{K_{t+1}}{N_t} \mid K_{t+1} \prec N_t\right] \\
& = 1 - \frac{K_t}{N_t} E_t\left[\frac{K_{t+1}}{K_t} \mid \frac{K_{t+1}}{K_t} \prec \frac{N_t}{K_t}\right] \\
& = 1 - \frac{K_t}{N_t} E_t\left[e^{\ln K_{t+1} - \ln K_t} \mid \ln K_{t+1} - \ln K_t \prec \ln N_t - \ln K_t\right] \\
& = 1 - \frac{K_t}{N_t} E_t\left[e^{\mu - \sigma^2/2 + \sigma\omega_t} \mid \mu - \sigma^2/2 + \sigma\omega_t \prec \ln(N_t/K_t)\right] \\
& = 1 - \frac{K_t}{N_t} e^{\eta} E_t\left[e^{\sigma\omega_t} \mid \omega_t \prec -\frac{\ln(K_t/N_t) + \eta}{\sigma}\right],
\end{aligned}
\qquad \text{A.(18)}
$$

with $\eta = \mu - \sigma^2/2$,

where A.(4) has been used. The expected value of $e^{\sigma\omega_t}$ on the condition that $\omega_t \prec -(\ln(K_t/N_t) + \eta)/\sigma$ can be calculated using standard algebra. Namely, it is given as follows:

$$
E_t\left[e^{\sigma\omega_t} \mid \omega_t \prec \frac{\ln(K_t/N_t) + \eta}{\sigma}\right] = e^{\sigma^2/2} \frac{\Phi\left(-\frac{\ln(K_t/N_t) + \mu + \sigma^2/2}{\sigma}\right)}{\Phi\left(-\frac{\ln(K_t/N_t) + \mu - \sigma^2/2}{\sigma}\right)}. \qquad \text{A.(19)}
$$

Thus,

$$E_t\left[\left(\frac{D_{t+1}-K_{t+1}}{D_{t+1}}\right)\middle| K_{t+1}<D_{t+1}\right] = 1-e^{\mu}\frac{K_t}{N_t}\frac{\Phi\left(-\dfrac{\ln(K_t/N_t)+\mu+\sigma^2/2}{\sigma}\right)}{\Phi\left(-\dfrac{\ln(K_t/N_t)+\mu-\sigma^2/2}{\sigma}\right)} \quad \text{A.(20)}$$

and

$$p_t = e^{-r}\left[\Phi\left(-\frac{\ln(K_t/N_t)+\mu-\sigma^2/2}{\sigma}\right)-e^{\mu}\frac{K_t}{N_t}\Phi\left(-\frac{\ln(K_t/N_t)+\mu+\sigma^2/2}{\sigma}\right)\right], \quad \text{A.(21)}$$

which is contained in section 4.3.4 as equation (14).

4.5.4 The premium surcharges data for 1993[a]

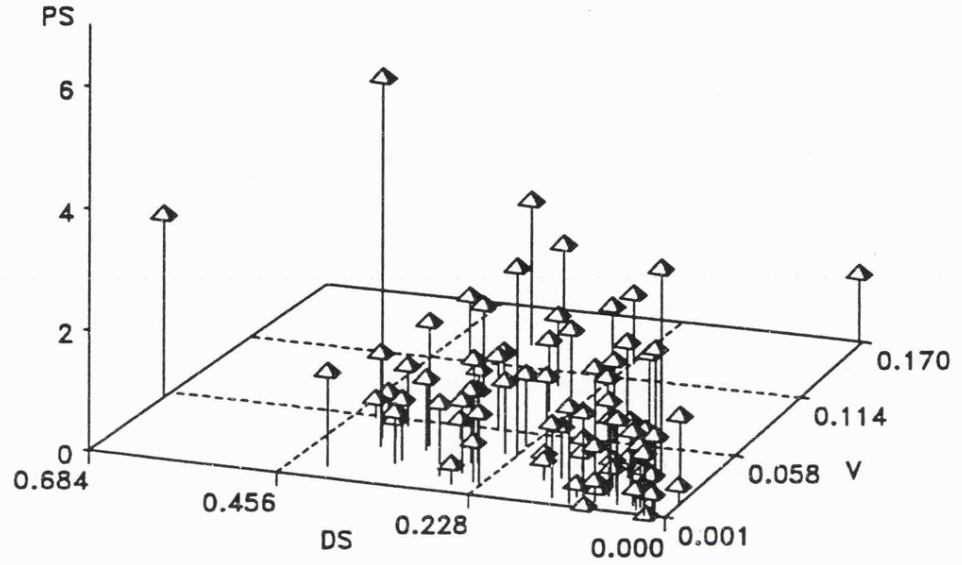
Algeria	3.15	Equat.Guinea	0.37	Panama	2.35
Argentina	6.00	Ethiopia	2.10	Papua N.Guinea	1.05
Bangladesh	1.24	Fiji	1.60	Paraguay	1.24
Barbados	0.90	Gabon	1.60	Peru	1.42
Belize	0.37	Ghana	0.37	Philippines	1.24
Benin	1.24	Grenada	1.24	Poland	3.50
Bhutan	0.37	Guatemala	1.24	Romania	1.24
Bolivia	1.24	Honduras	2.55	Rwanda	0.37
Brazil	1.24	Hungary	1.05	Sao Tome	1.24
Burkina Faso	1.24	India	1.24	Senegal	1.24
Burundi	0.37	Indonesia	0.37	Seychelles	0.90
Cameroon	1.60	Jamaica	1.24	Solomon Isld.	0.37
Cape Verde	1.24	Kenya	0.90	Sri Lanka	1.60
Ctl. Africa	1.24	Lesotho	0.37	St.Kitts Nevis	1.05
Chad	1.24	Madagascar	1.60	St. Lucia	1.24
Chile	0.37	Malawi	1.24	St. Vincent	1.05
China	0.25	Malaysia	0.00	Swaziland	1.42
Colombia	0.37	Maldives	0.37	Tailand	0.37
Comoros	0.37	Mali	1.60	Togo	1.42
Congo	1.60	Malta	0.00	Tunisia	0.70
Costa Rica	1.24	Mauritania	1.24	Turkey	1.42
Côte d'Ivoire	1.60	Mauritius	0.37	Uruguay	0.37
Cyprus	0.00	Mexico	1.24	Vanuatu	0.37
Czechosl.	0.00	Nepal	0.37	Venezuela	1.24
Dominica	1.24	Niger	1.24	West.Samoa	0.37
Ecuador	1.24	Nigeria	3.15		
Egypt	1.24	Pakistan	1.24		

Source: Jardine Credit Insurance Ltd.

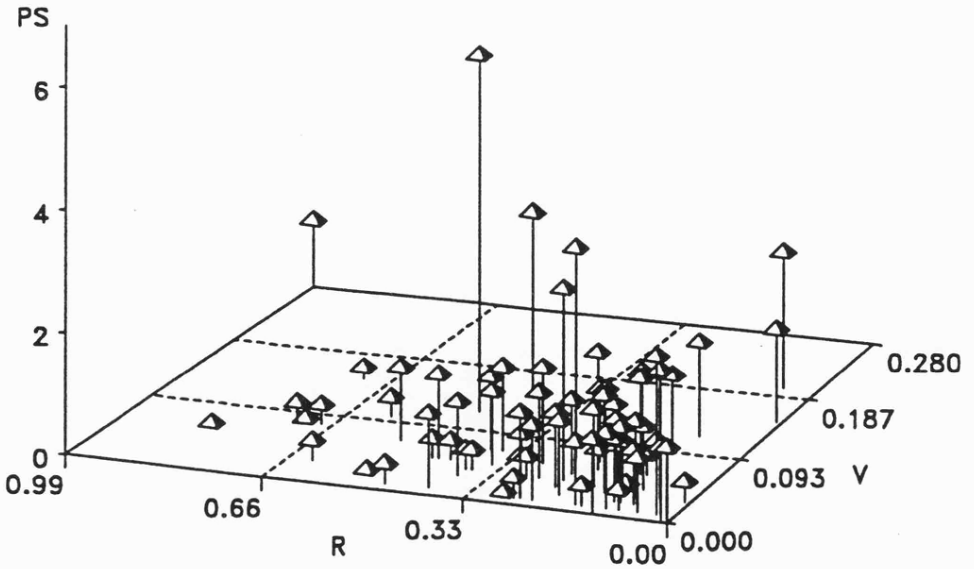
(a) Premium surcharges in per cent of amount insured.

4.5.5 Scatter plots of selected variables

Scatter plot of debt–service ratio (DS), its volatility (V), and premium surcharges (PS)



Scatter plot of reserves/imports ratio (R), its volatility (V), and prem. surcharges (PS)



4.5.6 The insurance premium rate and the spread

This appendix is designed to show that the concept of the premium rate could be applied to the spread as well. The basic idea is that the interest rate spread and the insurance premium rate are both risk premia, which are analogous under specific circumstances. The idea is similar to the one which has been expressed by Galiani already in 1750. Namely, in his justification of the presence of an interest rate on credits, he presented the following argument.[66] Since a credit is exposed to the danger of default, the interest rate associated with that credit represents a form of an insurance premium. As he puts it, the interest rate might be more properly called the price of insurance (*prezzo dell' assicurazione*). It should be noted that Galiani referred to the total interest rate, i.e. he did not differentiate between a risk-free interest rate and the risk premium. By contrast, we distinguish between them and describe a situation where the latter is analogous to the price of the insurance of a debt instrument, that is the insurance premium. Thus,our approach and the one by Galiani would be identical only in situations where the risk-free interest rate is equal to zero.

The spread s_t can be defined, as explained in section 3.2, of chapter 3, as the differential between the yield of a defaultable debt instrument and the one of a (benchmark) default-free debt instrument. Let denote the nominal value of the former instrument by B_t and the nominal value of the latter one by R, then the spread is given as $s_t = b_t - r$, where b_t is the nominal yield of the defaultable and r the yield of the default-free debt instrument.[67] Now, consider the following two alternative investment strategies in a world where all arbitrage opportunities are exhausted:

1. The purchase of a default-free debt instrument at price $R = e^{-r}$. This gives the safe return of one at the date of maturity of that debt instrument.

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[66] Galiani, *Libro V - Del Frutto della Moneta* (1750, pp. 249-259).

[67] Again, it is assumed that all debt instruments are in the form of zero-coupon bonds with a maturity of one period and a face value of one.

2. The purchase of a portfolio consisting of a defaultable debt instrument at price $B = e^{-b_t}$ and of a complete insurance of that debt instrument at price p_t. This portfolio gives the safe return of one at the date of maturity of that debt instrument.

Since the returns of the two alternative investment strategies are identical, the absence of arbitrage opportunities requires that their prices are also identical. Thus the following must hold:

$$R = B_t + p_t \, . \qquad \text{A.(22)}$$

Dividing equation (22) by R and rearranging yields

$$e^{-b_t+r} = (1 - p_t e^r) \, . \qquad \text{A.(23)}$$

Taking the logarithm of equation (23) and multiplying through by (-1), an expression of the spread is obtained, i.e.

$$s_t = b_t - r = -\ln(1 - p_t e^r) \, . \qquad \text{A.(24)}$$

Thus, it has been shown that, under specific circumstances, the spread s_t can be expressed as a function of the premium rate p_t. The function is continuous and monotonic. In the following chapter the spread is analyzed, where use is made of a similar approach than the one explained in the present chapter.

Chapter 5: Seniority Rules and the Valuation of Public and Private Foreign Debt

5.1 Introduction

In general, the countries in transformation which have maintained access to the international capital markets, including Hungary and the Czech Republic, continue to use this source of external finance to a considerable extent. To date almost all such borrowing is done by public entities but not by private ones, the latter being discouraged by the prevalence of restrictive legal conditions.[1] This chapter describes aspects of a regime where both public and private entities from the same country issue debt on the international capital markets, and when debt owed by the public sector is serviced with priority over the debt owed by the private sector, i.e. official debt is senior to private debt.[2] Thus, this chapter is designed to contribute to the understanding of the consequences resulting from a further liberalization of the foreign borrowing regime in these countries.[3]

The remainder of the chapter is organized as follows. The following section provides an overview of the current practices of major debt rating agencies and their impact on the cost of debt finance. It also discusses the rating practices applied to sovereign debtors versus private debtors. A key feature is that the rating of sovereign debt

---

[1] At the time of writing, only two countries had liberalized their foreign borrowing regime considerably, namely Hungary and the Czech Republic. Commercial banks in Hungary were allowed to enter into deferred payment arrangements on behalf of their clients without restrictions for up to one year, but for deferred payment over one year, permission from the National Bank of Hungary was required. Czechoslovakian enterprises and entrepreneurs were allowed to freely obtain suppliers credits while buyers' credits could only be obtained with the approval of the countries' State Bank. Private enterprises or banks from the two countries were not allowed to issue bonds on the international capital markets. See IMF, *Exchange Arrangements*, 1993.

[2] The reader may be unfamiliar with this definition of seniority. The standard one refers to the ranking of claims of various debtors with respect to payments made by the debtor in the case that it does not meet all its debt obligations in full. See also next footnote.

[3] This chapter provides a framework for a comparative static analysis of the valuation of debt and the costs of external finance associated with different borrowing regimes. There exists some related theoretical literature on that subject. Eaton (1987) investigates the behaviour of private capital in the debtor country when all foreign debt of that country is either public or publicly guaranteed. Other studies address explicitly aspects related to the seniority ranking between different types of foreign debt, i.e. debt owed to official and to private creditors (Bartolini and Dixit (1989)) or between public foreign and public domestic debt (Dooley and Stone (1992)).

is the ceiling for the ratings of private debtors of the same country because sovereign debt is generally regarded as senior to private debt. Furthermore, it briefly analyses the spread in private and public bond issues from developing countries during the period from 1989 to mid-1992. One important finding therefrom is that the weighted average spread of debtor countries' foreign bonds are lowest for those countries with exclusively official debt, i.e. with centralized government borrowing. In section 5.3, a model of spread determination is developed that is able to capture the effects of seniority and that agrees with the empirical observations explained in the section 5.2. The model is based on the widely used rescheduling model of Claessens /van Wijnbergen (1990) which is explained in section 4.3.3, of chapter 4. It yields closed-form expressions for the spreads on public and private foreign debt, where we assume that the former is senior to the latter. The major implications of the model are:

(i) Private (junior) debt is more expensive than public (senior) debt.

(ii) The costs of issuing private debt rise both with an increasing stock of private debt and an increasing stock of public debt. A key result of the model is that the external effect of public debt on the costs of private debt is considerably more significant than the effect of private debt on its own costs.

(iii) The average spread of external borrowing for a country is a non-monotonic function of the share of public borrowing. The minimum spread is obtained for either a 0 percent or 100 percent public share. Points between these extremes lead to higher spreads.

Section 5.4 considers an extension of the theoretical model to account for bankruptcy of private debtors and inefficiency of public debt. The modifications generate the following additional results:

(iv) The relation between the spread costs of external financing and the government debt share depends on the country's debt-servicing capacity. For example, for relatively low and intermediate values of debt-servicing capacity, the

relation between the weighted average spread, on the one hand, and the share of public debt, on the other, resembles that of a "laffer curve".[4] It has an absolute maximum and decreases monotonically from that point when the public debt share is either increased or decreased.

(v) The average value of a country's total external debt and its maximum disbursement obtained from issuing debt depend on the share of public debt in a non-monotonic way.

5.2 Debt rating and the costs of debt finance

The present chapter is concerned with the valuation of foreign debt when two types of debt exist, namely senior and junior debt. By senior and junior we mean that senior debt is serviced with priority over the junior debt in the case when the total debt-service demands cannot be met in full. Provided that the government has control over all foreign exchange transactions, it can exert discretion over debt-servicing flows and direct foreign exchange reserves, giving priority to the servicing of the public and publicly guaranteed debt over the servicing of private debt.

The view that there exists these two types of debt has been questioned in the theoretical literature. For example, in his analysis of public debt guarantees and private capital flight, Eaton (1987) assumes that all foreign debt of developing countries is public or publicly guaranteed debt. Even when there is no explicit public guarantee for the private debt, lenders will successfully hold governments accountable for the debts of that country's private borrowers so that the private debt is de facto publicly guaranteed. An

[4] The laffer curve was first used as an expository device that illustrates one aspect of how changes in taxation could affect behaviour. It is an inverted U and illustrates the proposition that any given amount of revenue can be obtained with a high tax rate on a small tax base or a low tax rate on a large tax base. Movement along the inverted U from left to right to the apex reaches the revenue-maximizing rate. Beyond that point, revenues fall off as rates rise. The origins of the laffer curve are unclear. It is often credited to Art Laffer who supposedly drew the curve on a napkin in a restaurant in Washington. Earlier in 1971, however, the *Journal of Political Economy* (JPE 79, 1971, pp.1105-1118) published an article by Boulakia about Ibn Khaldun, a 14th-century Arab who had stated the Laffer curve relationship.

example which provides support for this view is Chile in 1983.[5] In contrast to other developing countries borrowers, a large share of pre-1982 capital inflows to Chile went directly to private banks and companies. Even though the Chilean government explicitly rejected to guarantee foreign loans to the countries private debtors, foreign creditors did eventually not accept the separation of private and public debt. They demanded and received payment from the government when private banks became insolvent. This meant that effectively the private debt had an implicit government guarantee.

However, there is no evidence to believe that this is a common feature of private debt of developing countries or those in transformation. In practice it is almost taken as an axiom that public and publicly guaranteed debt is senior to private non guaranteed debt. This view is reflected in the debt rating system of the major rating agencies, such as *Moody's* and *Standard and Poors* (S&P). These regard a country's sovereign rating as the ceiling for the rating of companies from that country, except for structured issues such as securitized receivables which provide an independent debt-servicing capability outside that country.[6] These ratings consist of the assignment of a debt instrument to one out of a number of categories, according to the perceived riskiness of that instrument. For example, as *Moody's* puts it, category Aaa includes bonds of which the "principal is secure and interest payment is protected by a large or exceptionally stable margin whereas category B includes those bonds which lack characteristics of the desirable investment."[7]

These ratings have a bearing on the access and the costs of borrowing of the (rated) debtor. For example, international institutional investors regularly set themselves minimum ratings below which they do not invest as illustrated in the graph below.

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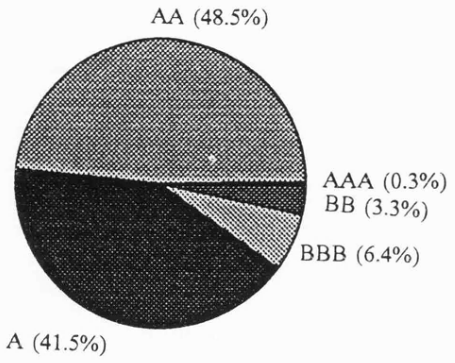
[5] See Díaz-Alejandro (1985).

[6] This holds for foreign currency debt but not for debt denominated in local currency. However, recently smaller rating agencies such as *Fitch* have assigned some Latin American private borrowers a better rating than the sovereign one for their country.

[7] See table 5.3 in the appendix for the definition of the categories of Moody's debt ratings.

Figure 5.1: The minimum ratings of institutional investors



Source: *Euromoney* (September, 1991)

The above graph illustrates that 90% of institutional investors do not invest at all in bonds that have a rating below single A. Other investors, including retail investors, generally follow less restrictive investment strategies and consider the whole spectrum of rated bonds; however, they require, like institutional investors, lower rated bonds to offer higher yield spreads. Consequently, the costs of issuing debt are higher the lower the rating of the debt instrument. This is illustrated in the table 5.1.

Table 5.1: Estimated average yield spread on rated bonds (spreads over Aaa, in % per year)

Moody's rating	*S&P* rating	Average spread
Aa	AA	0.25%
A	A	0.45%
Baa	BBB	2.00%
Ba	BB	3.50%
B	B	8.00%
Caa	CCC	n.a.

Source: Bond (1992)

In sum, the major rating agencies regard a country's sovereign (or public) rating as the ceiling for the one which is assigned to the debt instruments issued by private entities from that country. Consequently, the latter is generally associated with higher costs than the former. The remainder of this section presents further findings from the analysis of developing countries' private and public bond issues on international capital markets between 1989 and mid-1992. During this period, 18 developing countries have raised finance from that source, seven of which through both public (and sovereign) and private issues and ten exclusively through public (and sovereign) issues. One country, i.e. Czechoslovakia, raised finance exclusively through public bonds in 1990 and 1991, but through private bonds as well in 1992. For 11 of the mentioned 18 countries, spread data is available (see table 5.4 in the appendix). The data show the following:

(i) The weighted annual average spread in private external bonds[8] is mostly, but not always,[9] higher than the weighted annual average spread in public external bonds of the same country (see figure 5.2). In some cases the private spread is considerably higher than the public one (Mexico 1991 and 1992, Venezuela 1990 and 1991, Brazil 1991).

(ii) In the cases when a country has no private external debt, its annual average spread is generally lower than in the cases when a country has both private and public foreign debt. For example, a country's weighted annual average spread, defined as the weighted average of its private and public issues during that year, ranges between 67 and 281 basis points in the former cases and between 190 and 814 basis points in the latter cases. The mean value of the weighted annual average spread is 152 basis points in the former cases, and 362 basis points in the latter cases. Thus the mean spread of cases with exclusively public foreign borrowing is significantly

[8] External bonds include both foreign and international bonds; i.e. all bonds which are issued on other markets than the domestic one.

[9] Exceptions include Argentina in 1992, Mexico in 1989, and Turkey in 1989, where the annual average spread in private borrowing was slightly lower than the one in public issues.

lower than the one of cases with a mixed regime.[10] Figure 5.3 shows the weighted annual average spreads.

(iii) For some of the countries with both private and public external borrowing, a decrease in the government share in the economy's total external debt was accompanied by a decrease in the average spread on external borrowing (Mexico and India); however, for other countries of that group there appeared to be no such relation (Turkey and Venezuela).

(iv) The ratio of public debt over GNP decreased in several countries during the observation period. In the cases of Mexico between 1989 and 1992, Venezuela between 1990 and 1991, and Argentina between 1991 and 1992, such a reduction was associated with a decrease in the annual average spread in private issues (see figure 5.4). By contrast, the case of Turkey between 1989 and 1992 is an example where such reduction was associated with an increase in this spread.

The following sections present a theoretical framework for the analysis of the observed relations.

[10] A small-sample test was used which compares the means of two normal populations that posses equal variances (see Mendenhall et al. (1986, pp. 407-408)). It suggested that the means are different at the 1% level of significance. The test statistics obtained was 3.99, and thus greater than the critical value for the 1% level of significance, which is 2.80 (i.e. for a total number of observations of 26).

Figure 5.2: The spread on private and public bonds of countries with both private and public external foreign borrowing

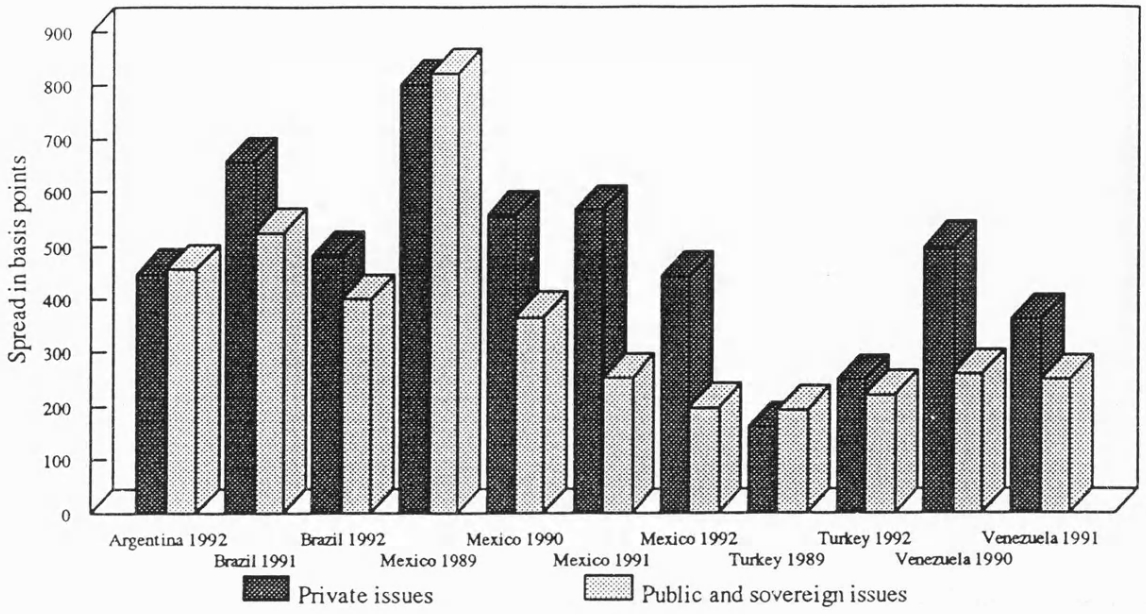


Figure 5.3: The weighted average spread of countries with public external debt only and with both public and private external debt

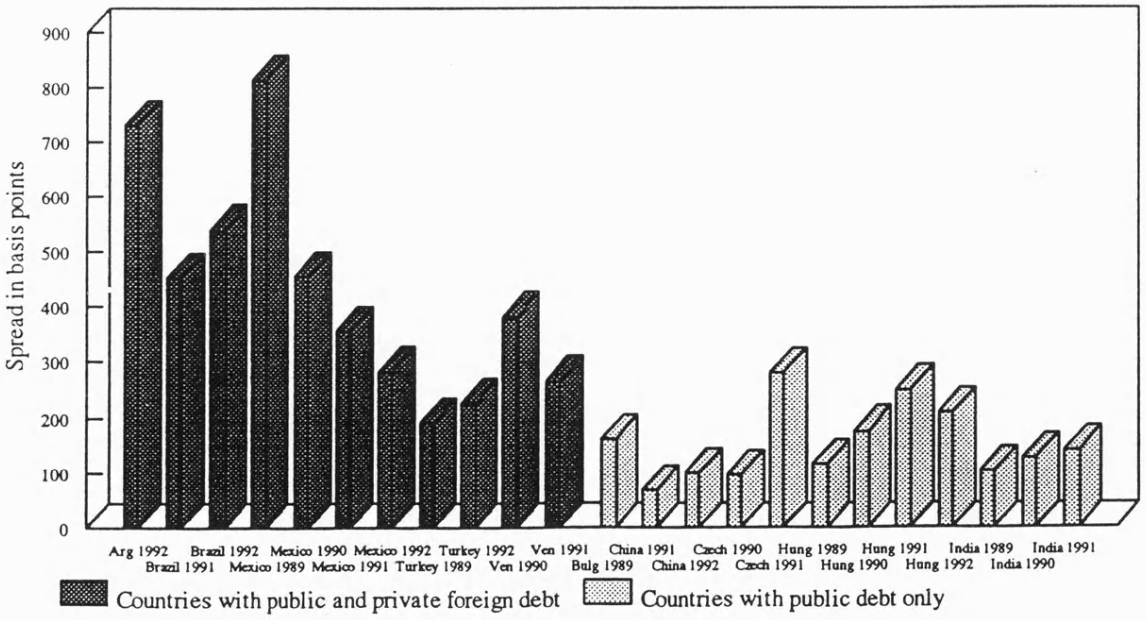
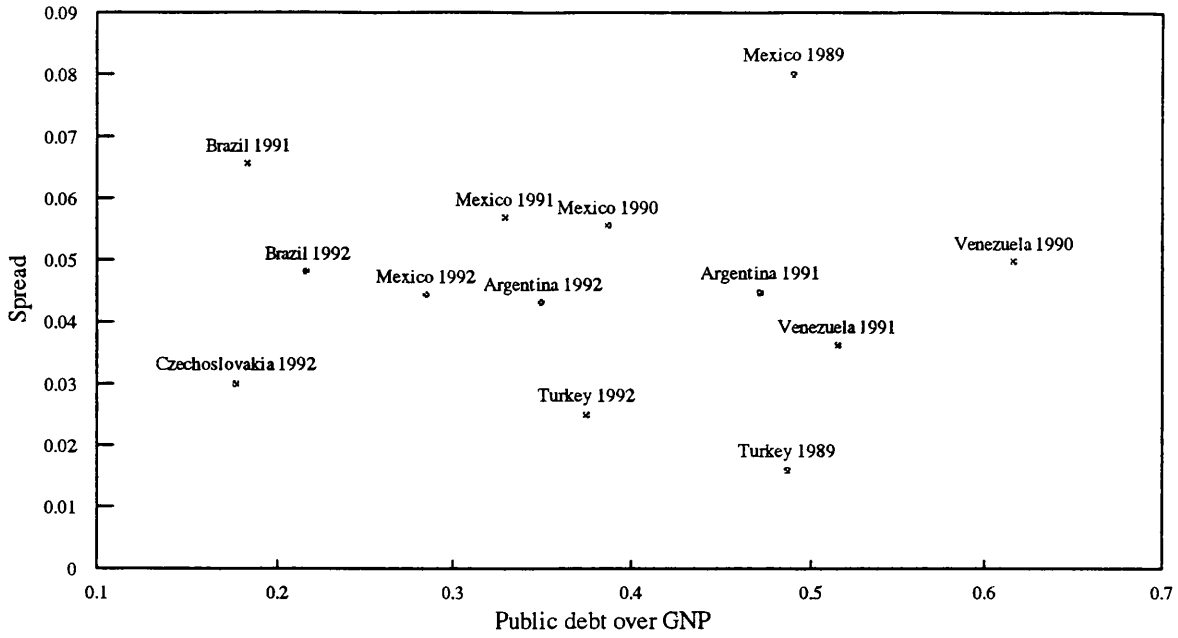


Figure 5.4: Plot of public debt over GNP against the spread in private bonds



5.3 Seniority and the costs of external finance

5.3.1 The Costs of Private and Public External Finance

In this section, a model of spread determination is developed that is able to capture the effects of seniority and explain the observations discussed in the previous section.

Denote the stocks of official and private debt by G_t and F_t, respectively, and assume that all debt has the form of continuously compounded zero-coupon bonds with a maturity of one period and a face value of 1 foreign currency unit per bond. The sum $F_t + G_t$ then denotes the total stock of bonds issued by borrowers in the country as well as the country's total debt service due in period $t + 1$. Insolvency in period $t + 1$ occurs if the country's debt service due exceeds its (stochastic) debt-servicing capacity in that period, K_{t+1}:

$$F_t + G_t \succ K_{t+1} , \tag{1}$$

the stochastic dynamics of K_t being conventionally approximated by a Geometric Brownian motion.

The stylized rescheduling model of Claessens/van Wijnbergen (1990), which is introduced in the previous chapter, assumes that under insolvency a country receives debt relief in the amount of the difference between its debt service due and its debt-servicing capacity. The country's actual aggregate debt service payments A_{t+1} are as follows:

$$A_{t+1} = \begin{cases} F_t + G_t \text{ if } F_t + G_t \preceq K_{t+1} , \\ K_{t+1} \quad \text{if } F_t + G_t \succ K_{t+1} . \end{cases} \tag{2}$$

This pay-off schedule is depicted by the row of bars in the background in figures 5.5a and 5.5b.

Consider that public bonds are senior to private bonds, meaning that the former are serviced with priority over the latter. The pay-off schedule of senior public bonds is then as follows:

$$A^G_{t+1} = \begin{cases} G_t \quad \text{if } G_t \preceq K_{t+1} , \\ K_{t+1} \text{ if } G_t \succ K_{t+1} . \end{cases} \tag{3}$$

Figure 5.5a shows that this pay-off schedule is qualitatively the same as (1) albeit reduced and shifted to the left by the amount of private bonds. The pay-off schedule of junior private bonds is more complicated:

$$A^F_{t+1} = \begin{cases} F_t \qquad \text{if } F_t + G_t \preceq K_{t+1} , \\ K_{t+1} - G_t \text{ if } G_t \preceq K_{t+1} \prec F_t + G_t , \\ 0 \qquad \text{if } K_{t+1} \prec G_t . \end{cases} \tag{4}$$

Figure 5.5a: Actual debt service and the debt-servicing capacity (relative share of public foreign debt 50%)

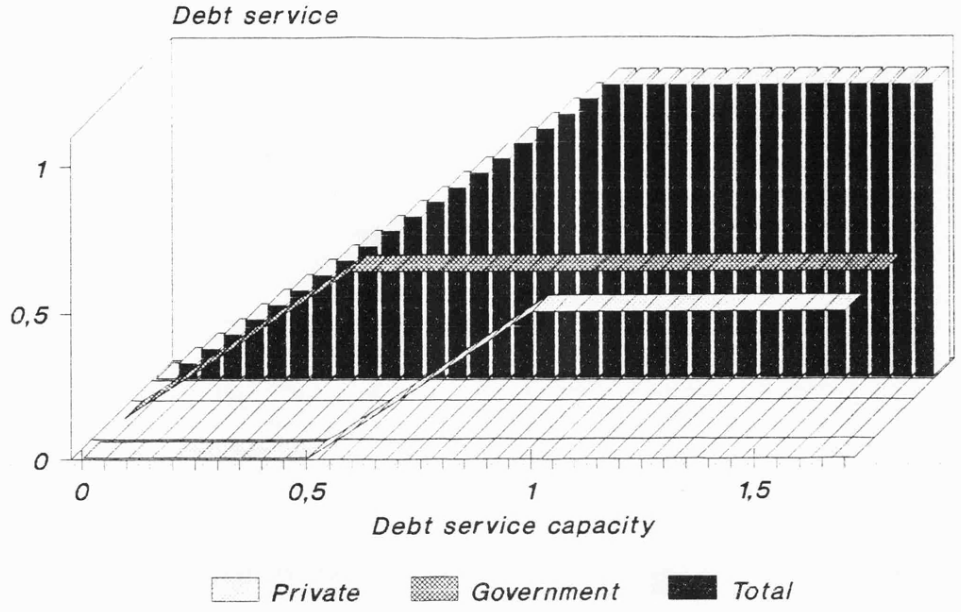
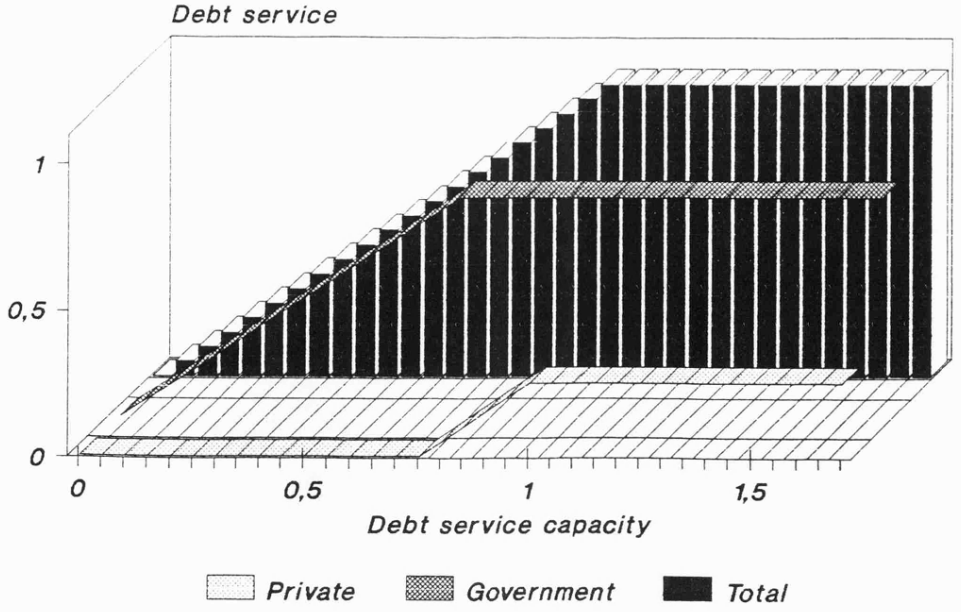


Figure 5.5b: Actual debt service and the debt-servicing capacity (relative share of public foreign debt 75%)



The key differences between the pay-off schedules of junior private bonds and senior public bonds are as follows. If private bonds are serviced at all, either fully or partially, then public bonds are necessarily serviced fully. Conversely, if public bonds are not serviced in full, payment on private bonds has ceased completely.

How would risk-neutral investors value these two types of bonds? In answering this question first a univariate approach, as in Claessens and van Wijnbergen (1990), will be taken. Let r denote the risk-free interest rate. Then $R = e^{-r}$ is the price of a risk-free bond with a maturity of one period and a face value of unity. Under risk neutrality, the value of a government bond is the discounted present value of its expected pay-off at maturity,

$$Z_t^G = RE_t[a_{t+1}^G] , \tag{5}$$

where $E_t[\cdot]$ is the expectations operator, and $a_{t+1}^G = A_{t+1}^G / G_t$ denotes the pay-off per bond. With similar notation the valuation formula for a private bond is:

$$Z_t^F = RE_t[a_{t+1}^F] . \tag{6}$$

Using the assumptions about the stochastic dynamics of K_t, the explicit valuation formulae can then be calculated.[11] For senior public bonds it is:

$$Z_t^G = R\left[\Phi(a_1) + e^{\mu}\frac{K_t}{G_t}[1 - \Phi(a_1 + \sigma)]\right] , \qquad \text{with } a_1 = \frac{\ln(K_t/G_t) + \mu - \sigma^2/2}{\sigma} . \tag{7}$$

[11] These assumptions are explained in chapter 4. The notation used in the present chapter follows the one used in that chapter.

For junior private bonds it is:

$$Z_t^F = R\left[\Phi(a_2) - \frac{G_t}{F_t}[\Phi(a_1) - \Phi(a_2)] + e^{\mu}\frac{K_t}{F_t}[\Phi(a_1 + \sigma) - (a_2 + \sigma)]\right], \tag{8}$$

$$\text{with } a_2 = \frac{\ln(K_t/(F_t + G_t)) + \mu - \sigma^2/2}{\sigma}.$$

The above valuation formulae show that the two types of bonds are priced differently. By assumption, the bonds (including the riskless alternative) are zero-coupon bonds, i.e.

$$Z_t^F = e^{-z_t^F}, \; Z_t^G = e^{-z_t^G}, \; R = e^{-r}, \tag{9}$$

so that their yields can be written as follows:

$$z_t^F = -\ln Z_t^F, \; z_t^G = -\ln Z_t^G, \; r = -\ln R. \tag{10}$$

Using equations (7) to (10) the following statement can be made. Since junior private bonds are priced lower than senior public bonds, the yield of the former is higher than the yield of the latter provided that G is positive:

$$z^F \succ z^G \succ r. \tag{11}$$

5.3.2 The share of public and publicly guaranteed debt

This subsection is concerned with the implications for the country's costs of external finance of different allocations between private and public external borrowing, the model developed above being used as the theoretical basis.

To begin with, we look at the costs of private external finance. A key implication of the valuation formulae found above is that - at a constant stock of total debt (and other things equal) - the value of private debt falls as the relative share of government bonds increases. This is equivalent to saying that the disbursement obtained from issuing private bonds decreases with an increasing relative share of public foreign debt.

Proposition 1: *The more external debt the government issues, the more expensive external finance becomes for private debtors.*

Proof: Consider two alternative situations characterized by different shares of public external debt, ω_L and ω_H, with $0 \preceq \omega_L \prec \omega_H \preceq 1$, all other things being identical. Now consider the pay-off of a private bond in the two alternative situations. The pay-off function (4) implies that, in situations when ω is equal to ω_H, a private bonds' pay-off will be either equal to or smaller than its pay-off in situations when ω is equal to ω_L. Denoting the former by $a_{t+1}^F(\omega_H)$ and the latter by $a_{t+1}^F(\omega_L)$, the formal representation of this inequality is as follows: $a_{t+1}^F(\omega_H) \preceq a_{t+1}^F(\omega_L)$. The pay-offs are equal for values of K_t which satisfy $K_t \succ F_t + G_t$, but smaller otherwise, i.e. if $K_t \preceq F_t + G_t$. Since K_t is lognormally distributed, the probability $\pi_t = \text{prob}\{K_t \preceq F_t + G_t\}$ is strictly greater than zero. Thus the expected value of $a_{t+1}^F(\omega_H)$ is strictly smaller than that of $a_{t+1}^F(\omega_L)$, and the price of a bond associated with the former expected pay-off, $Z_t^F(\omega_H)$, is strictly lower than that of a bond associated with the latter expected pay-off, $Z_t^F(\omega_L)$, i.e. $Z_t^F(\omega_H) \prec Z_t^F(\omega_L)$.

The relationship between the relative share of public external debt and the value of a private bond is illustrated in figure 5.6. The graph illustrates that the value of private foreign bonds decreases with the relative share of public external debt.[12] This is equivalent to saying that the disbursement obtained from issuing one private foreign bond decreases with such share. For example, in the cases where the public share is greater than 0.8, the disbursement obtained from issuing private bonds goes to zero.

A different example for the same problem is provided by a situation where the government guarantees private debt which thus becomes senior to non-guaranteed private debt. Issuing non-guaranteed debt then becomes more expensive. However, the allocation of the country's foreign debt among its private and public sector does not affect its total disbursement obtained from issuing foreign debt in period t for a given level of contractual debt service in period t + 1.

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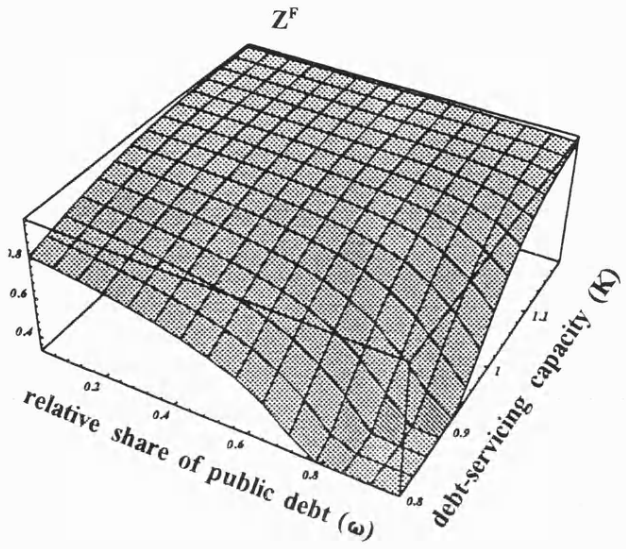
[12] The graph is drawn on the basis of the following numerical values: $r = 0.05$, $\mu = 0.04$, $\sigma = 0.01$, and the ratio of K_t relative to D_t ranging between 0.8 and 1.2.

Figure 5.6: The relative share of public external debt and the costs of private external financing



Proposition 2: *The total disbursement obtained from issuing foreign debt,* $F_t Z_t^F + G_t Z_t^G$ *, is independent from the ratio* F_t/G_t .

The **proof** is straightforward. From (7) and (8) we have

$$\begin{aligned} G_t Z_t^G + F_t Z_t^F &= R[G_t \Phi(a_1) + e^{\mu} K_t[1 - \Phi(a_1 + \sigma)]] + \\ &\quad R[F_t \Phi(a_2) - G_t[\Phi(a_1) - \Phi(a_2)] + e^{\mu} K_t[\Phi(a_1 + \sigma) - \Phi(a_2 + \sigma)]] \qquad (14) \\ &= R[(G_t + F_t)\Phi(a_2) + e^{\mu} K_t[1 - \Phi(a_2 + \sigma)]]. \end{aligned}$$

From equation (8) we see that a_2 only contains the term $G_t + F_t$, i.e. the *sum* of F_t and G_t. Thus the whole expression in (14) depends only on the sum of F_t and G_t as well. This implies that the allocation of the economy's total outstanding debt into public and publicly

guaranteed debt, on the one hand, and non guaranteed private debt, on the other, is irrelevant for the country's maximum disbursement. Equivalently, such allocation has no influence on the economy's total costs of external finance. This neutrality result is similar to the well-known Modigliani-Miller theorem which shows the irrelevance of aspects of a company's external financing policy in a world without taxes, transaction costs, or other market imperfections.

Corollary: *If the total disbursement obtained from issuing debt is independent of the mix of private and public foreign debt, then the average price of external bonds is independent of that mix as well.*

The **proof** is similar to the one for proposition 2, i.e.

$$\frac{G_t Z_t^G + F_t Z_t^F}{F_t + G_t} = \frac{1}{F_t + G_t}\Big(R[G_t \Phi(a_1) + e^{\mu} K_t[1 - \Phi(a_1 + \sigma)]]$$

$$+ R[F_t \Phi(a_2) - G_t[\Phi(a_1) - \Phi(a_2)] + e^{\mu} K_t[\Phi(a_1 + \sigma) - \Phi(a_2 + \sigma)]]\Big) \qquad (15)$$

$$= R[\Phi(a_2) + \frac{e^{\mu} K_t}{F_t + G_t}[1 - \Phi(a_2 + \sigma)]] \; .$$

However, the country's weighted average spread is not independent of the mix of private and public foreign debt. This is reflected in the following proposition.

Proposition 3: *The country's weighted average spread is minimal when the share of public debt is either 0 or 1. Intermediate shares lead to higher spreads.*

The **proof** draws on the above corollary. It will be explained in two steps.

First Step: Define a synthetic average bond (i.e. the weighted average of private and public bonds) and denote its price by Z_t^{Avg} and its spread by s_t^{Avg}. Recall that $F_t + G_t = D_t$, where D_t is the given level of total external debt. Set $F_t = D_t$. The value of the average bond Z_t^{Avg} is then identical with the average value of private bonds Z_t^F because the share of public bonds is zero. Then set $G_t = D_t$. The value of the average bond, Z_t^{Avg}, is then

identical with the average value of public bonds Z_t^G. Comparing Z_t^F as in (8), evaluated at $F_t = D_t$ (or $G_t = 0$), with Z_t^G as in (7), evaluated at $G_t = D_t$ (or $F_t = 0$) shows that

$$Z_t^{F,F_t=D_t} = Z_t^{G,G_t=D_t} = Z_t^{Avg}, \tag{16}$$

which implies

$$-\ln Z_t^{F,F_t=D_t} - r = -\ln Z_t^{G,G_t=D_t} - r = -\ln Z_t^{Avg} - r. \tag{17}$$

This can be rewritten as an expression in spreads:

$$s_t^{F,F_t=D_t} = s_t^{G,G_t=D_t} = s_t^{Avg}. \tag{18}$$

Thus, for relative shares of public debt of either 0 or 1, the spread of the (synthetical) average bond is identical to the average spread on external bonds.

Second step: It will be shown that, for intermediate shares of public foreign debt, the average spread is higher than the spread of a (synthetical) average bond, s_t^{Avg}. This follows directly from the convexity of the spread-transformation, i.e.

$$\begin{aligned} s_t^{Avg} &= -\ln Z_t^{Avg} - r \\ &= -\ln\left[\frac{G_t}{F_t+G_t} Z_t^G + \frac{F_t}{F_t+G_t} Z_t^F\right] - r \\ &< \frac{G_t}{F_t+G_t}(-\ln Z_t^G) + \frac{F_t}{F_t+G_t}(-\ln Z_t^F) - r \\ &= \text{average spread}. \end{aligned} \tag{19}$$

The characteristics of convex functions is that the functional value of the weighted average of arguments is lower than the similarly weighted average of the functional values of these arguments. Applying this idea to the spread, the following statement holds. The spread of a (synthetical) average bond is lower than the average spread of the two individual bonds.

5.4 Public debt inefficiency and private debt default sunk costs

So far the valuation of official and private debt was based on the assumption that the risks associated with the two types of debt instruments are identical except for the seniority ranking. However, private debt, unlike public debt, is in general not only subject to a political but also commercial risk[13], i.e. the former is characterized by a different type of risk than the latter. Another important aspect that has been ignored so far is that the country's debt-servicing capacity may depend on the allocation of debt between the private and public sector. For example, it has been argued that public debt may be associated with some kind of efficiency loss so that a country's debt-servicing capacity would be reduced as a result of public debt. These two aspects have often been mentioned in discussions about the liberalization of the foreign debt regime. This section incorporates them into the present theoretical model.

5.4.1 The risk of bankruptcy of individual borrowers

To the extent that private debt is not publicly guaranteed, the two types of debt, i.e. private and public debt, are associated with different risks of default. An important difference is that the costs of default are likely to be higher in private than in public debt. There are various reasons for this, two of which are singled out for special attention. To the extent that there exist some fixed (transaction) costs of default, such costs may be higher if there are a number of (private) debtors involved than if there is just one single (public) debtor.[14] Such transaction costs include the costs of communication, travelling, information gathering, etc.. They are likely to be particularly high for international debt because for such debt, unlike for domestic one, there exists no bankruptcy legislation. This may induce the creditors to use some of their resources to secure their claims against those of other creditors ("grab race"). Another argument has been brought forward by Winkler (1933, p.11) in his classical account of foreign bond lending: "Since time

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[13] These categories of risks are distinguished in the practice of export credit insurance. See also section 6.2.1.

[14] Another explanation of the differences in risks between these two types of debt refers to the willingness-to-pay aspect. Namely, international lenders may have no penalties at their disposal which deters an individual borrower because they have only penalties to invoke against a country as a whole, the effect of which potentially being negligible at the level of that individual borrower. See Eaton (1987).

immemorial the state appears to have been the most popular debtor. Its ability and capacity to meet payments were always regarded as superior to those of individuals or private corporations. The reason resides in all probability in the fact that corporate entities may disappear, in which case their obligations become valueless. The same is true of individuals. Governments, on the other hand, stay on forever." This does not mean that governments do not default, but that the probability that a country disappears is almost equal to zero, whereas the probability that a company disappears is significantly different from zero. In other words, the risk of a complete loss to the creditor is higher with private than with public debt.

A possible way to model this feature would be to follow an approach along the lines of Merton (1976). Let all debt be private non-guaranteed debt, the possibility of a complete ruin of debt could be modelled by specifying a stochastic process for the debt-servicing capacity which includes a "jump component" in the form of a Poisson process in addition to the standard Brownian motion. In particular, each time the Poisson event occurs, the value of the debt-servicing capacity goes immediately to zero (immediate ruin).[15] Merton (1976) has shown that under specific assumptions, i.e. the assumption of immediate complete ruin and that of risk neutrality, one could obtain a closed-form solution for the value of debt instruments and options written on them. For example, the value of a put option on such a debt instrument is almost identical with the value of the commonly analyzed put option, where the underlying asset follows the standard Brownian motion, except that the former would be characterized by a larger interest rate, i.e. $r' = r + \lambda$ as opposed to r for the latter, with λ denoting the mean number of events (immediate ruins) per unit of time. This approach appears not to be helpful for the present problem because it would require us to specify two different debt-servicing capacities, i.e. one for private and another one for public debtors. This would not be compatible with our definition of the debt-servicing capacity and it would run against several conceptual problems, including the one of the interaction among the two. The analysis would become very complicated. Thus, the following alternative to represent the possibility of a complete and immediate ruin of private debt is suggested here.

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[15] This particular assumption about the "jump" is necessary to obtain closed-form solutions. More generally, the direction and size of the "jump" would be a stochastic variable.

Assume that in case of default on a private bond, the transaction costs of any renegotiation would be so high that effectively the value of the bond is identical to zero. In other words, default on a private bond is associated with default costs of 100%.[16] Thus, the pay-off schedules of a private bond changes to the following,

$$A_{t+1}^{F} = \begin{cases} F_t \text{ if } F_t + G_t \leq K_{t+1} , \\ 0 \text{ if } F_t + G_t > K_{t+1} . \end{cases} \qquad (20)$$

The valuation of such a bond is straightforward; its discounted present value is given as the product of its face value and the probability that no default occurs:

$$Z_t^{F} = R\Phi(a_2) . \qquad (21)$$

The value of the above private bond is lower than the one of a private bond without default sunk costs. The value of a public bond is unaffected. Thus the weighted average value of private and public foreign debt is lower with sunk costs than without them, provided private debt is positive. The implications of such default costs for the weighted average value of external debt are illustrated in figures 5.7 and 5.8. Figure 5.7 shows the case where there are no default costs in private debt. It illustrates the point made in the corollary to proposition 2; namely, that in the absence of any default costs, the average price of debt is independent of the mix of private and public foreign debt. Figure 5.8 shows the case when there are such costs. It illustrates that the disbursement depends on ω, the share of public debt in total external debt. The following proposition can be formulated.

Proposition 4: *The presence of 100% sunk default costs in private bonds implies that the country's disbursement is not independent of the relative share of public debt. The disbursement is maximal when this share is equal to 1.*

[16] This is assumed for analytical convenience. The qualitative results do not change if another percentage, i.e. lower than 100%, is assumed, as long as the default costs are strictly greater with private than with public debt.

Proof: The benchmark situation is one where there are no private debt sunk default costs, so that the disbursement is independent of the relative share of public debt (as shown in the proof to proposition 2). Consider a situation in which such costs exist, and all other things are equal to the above benchmark situation. The value of a public bond Z_t^G remains unaffected, since the bonds' pay-off is the same as in the benchmark situation. By contrast, the pay-off from a private bond is either equal to, or, in the case of a default, smaller than in the benchmark situation. Since the probability of a default is positive, the price of a private bond in the presence of private bond sunk default costs, $Z_t^{F,\ \text{sunk costs}}$, is strictly lower than the price of a private bond in the absence of such costs, Z_t^F. Thus the total disbursement is strictly lower than in the benchmark situation, provided that F_t is positive, i.e. $F_t Z_t^{F,\ \text{sunk costs}} + G_t Z_t^G \prec F_t Z_t^F + G_t Z_t^G$. The additional costs are monotonically increasing in F_t and are minimal when the relative share of private foreign debt is equal to zero, i.e. when $\omega = 1$.

Figure 5.7: The average value of foreign debt without private debt default costs (debt-servicing capacity relative to contractual debt service)

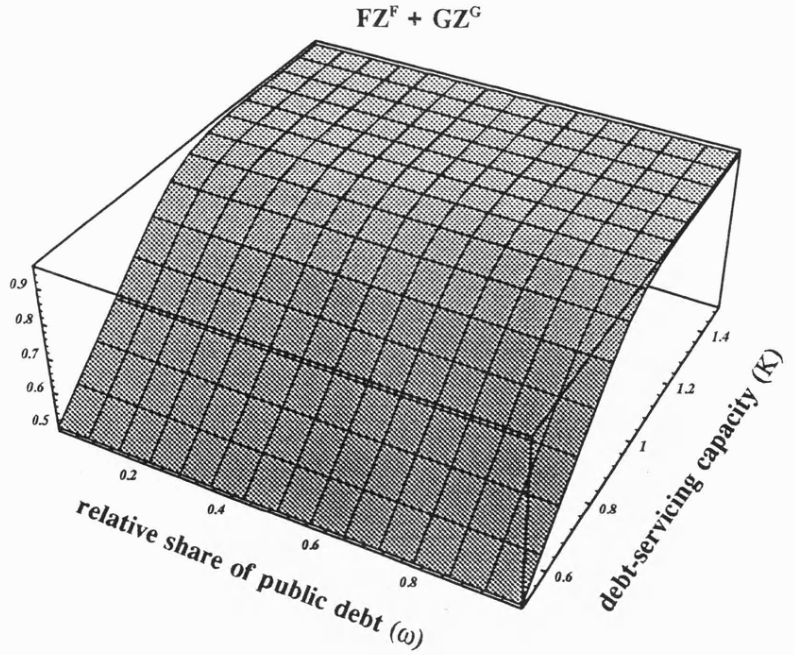
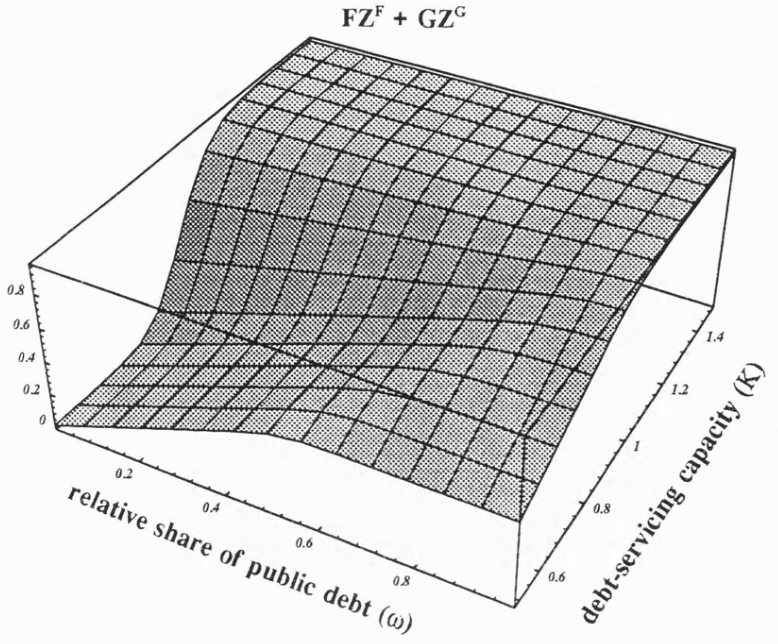


Figure 5.8: The average value of foreign debt with private debt default costs (debt-servicing capacity relative to contractual debt service)



5.4.2 Public debt inefficiency

It has been suggested in the literature that public debt is associated with some kind of efficiency loss. The existence of such losses has been justified by incentive effects. For example, consider the possibility that foreign public debt does not directly benefit private investors, because it is used for government consumption and that investors anticipate higher tax obligations from the government's need to raise the resources for its debt service. As a result they either reduce their domestic investment (Helpman (1989b)) or place their funds abroad (capital flight, Eaton (1987)). Both measures reduce the country's debt-servicing capacity - in the case of capital flight in the short-run and in the case of an investment reduction in the medium- or long-run.[17]

This subsection introduces the assumption that public debt is associated with efficiency losses that reduce the debtor country's debt-servicing capacity. More

[17] An alternative explanation for the reduction in the debt-servicing capacity due to public debt could be that there are frictional costs involved in the process of tax collection and administration by the government.

specifically, it is assumed that these losses are a monotonically increasing function of the share of public debt in total debt. Denote by ζ the proportional reduction of K_t due to public debt inefficiency, then $\zeta = \zeta(\omega)$ is a monotonically decreasing function of ω which maps the interval [0,1] onto itself. The pay-off schedule of senior bonds is

$$A_{t+1}^{G} = \begin{cases} G_t & \text{if } G_t \preceq \zeta(\omega)K_{t+1}, \\ \zeta(\omega)K_{t+1} & \text{if } G_t \succ \zeta(\omega)K_{t+1} \end{cases} \tag{22}$$

and that of junior bonds

$$A_{t+1}^{F} = \begin{cases} F_t & \text{if } F_t + G_t \preceq \zeta(\omega)K_{t+1}, \\ \zeta(\omega)K_{t+1} - G_t & \text{if } G_t \preceq \zeta(\omega)K_{t+1} \prec F_t + G_t, \\ 0 & \text{if } \zeta(\omega)K_{t+1} \prec G_t. \end{cases} \tag{23}$$

The calculation of the valuation formulae for private and public debt is straightforward. They are identical to (7) and (8) except that $\zeta(\omega)\, K_t$ replaces K_t. To the extent that $\omega \succ 0$ and $\zeta(\omega) \prec 1$, the country's disbursement obtained from issuing bonds is lower in the presence of the described costs than in their absence. The average value of foreign debt is maximal and the spread minimal when the relative public share is equal to zero. This is illustrated in the figures 5.9 and 5.10.[18]

[18] The figures were drawn on the basis of a cost function of the form $\zeta(\omega) = (1 - 0.2\omega)^{0.5}$. The basic results concerning the value of foreign debt do not change when other cost functions are considered, as long as the costs are related to the government debt share as described before.

Figure 5.9: The average spread with public debt inefficiency (debt-servicing capacity relative to contractual debt service)

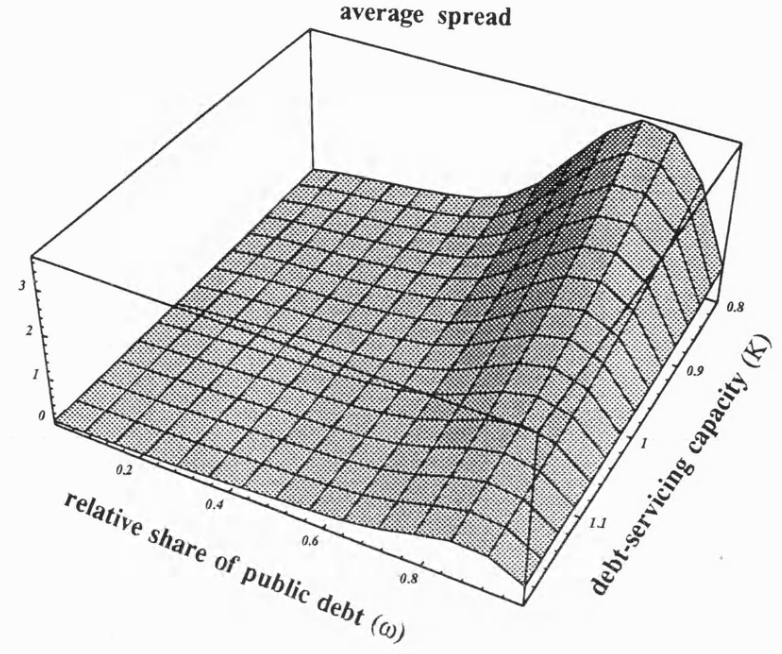
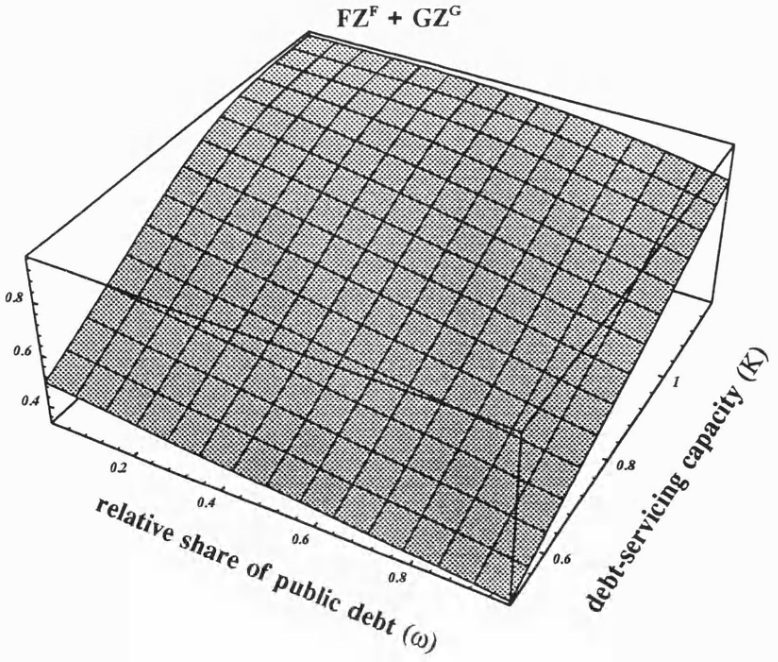


Figure 5.10: The average value of foreign debt with public debt inefficiency (debt-servicing capacity relative to contractual debt service)



5.4.3 Private debt default costs and public debt inefficiency

This subsection combines the two aspects of public debt which were dealt with separately in the previous two subsections. Considering both private debt default costs and public debt inefficiency, the pay-off schedules of senior bonds and junior bonds, respectively, are as follows:

$$A_{t+1}^{G} = \begin{cases} G_t & \text{if } G_t \preceq \zeta(\omega)K_{t+1}, \\ \zeta(\omega)K_{t+1} & \text{if } G_t \succ \zeta(\omega)K_{t+1}, \end{cases} \tag{24}$$

$$A_{t+1}^{F} = \begin{cases} F_t \text{ if } F_t + G_t \preceq \zeta(\omega)K_{t+1}, \\ 0 \text{ if } F_t + G_t \succ \zeta(\omega)K_{t+1}. \end{cases} \tag{25}$$

Thus, the value of senior public bonds and junior private bonds, respectively, are as follows:

$$Z_t^{G} = R\left[\Phi(a_3) + e^{\mu}\zeta(\omega)\frac{K_t}{G_t}[1 - \Phi(a_3 + \sigma)]\right], \quad \text{with } a_3 = \frac{\ln(\zeta(\omega)K_t/G_t) + \mu - \sigma^2/2}{\sigma}; \tag{26}$$

$$Z_t^{F} = R\Phi(a_4), \quad \text{with } a_4 = \frac{\ln(\zeta(\omega)K_t/(F_t + G_t)) + \mu - \sigma^2/2}{\sigma}. \tag{27}$$

The behaviour of the weighted average spread with respect to ω and K_t is illustrated in the figures 5.11a and 5.11b, the surfaces of the two graphs being identical, but viewed from two different perspectives. The relation between the relative share of public debt and the spread resembles a laffer curve. Namely, the spread attains an absolute maximum at a point between the lowest and the highest value of ω. Any increase or decrease of the public debt share from that value is associated with a reduction in the weighted average spread. The figures also illustrate that there exists no unique share of

government debt that achieves a minimum spread for *any* K_t, the spread-minimizing allocation of foreign debt depending on the actual realization of K_t as well. For high values of K_t, a minimum obtains for $\omega = 0$, and for low values of K_t, it obtains for $\omega = 1$. The following intuitive explanation for this behaviour of the spread is suggested here. If the debt-servicing capacity is high and thus the default probability very low, the private debt sunk costs in default are of little concern to the creditors. More important is that the public debt inefficiency raises the probability of default by reducing the debt-servicing capacity. Under these circumstances the spread can be minimized by reducing the public share to zero. Conversely, when the debt-servicing capacity is very low and thus private debt default likely, the costs associated with it become a primary concern of foreign creditors. To minimize the risk premium that they charge for the presence of these sunk costs, all foreign debt has to be public.

We will turn to the weighted average value of foreign debt. It is given as follows.

$$G_t Z_t^G + F_t Z_t^F = R[G_t \Phi(a_3) + F_t \Phi(a_4) e^{\mu} \zeta(\omega) K_t [1 - \Phi(a_3 + \sigma)]] \ . \qquad (28)$$

The following proposition can be formulated:

Proposition 5: *In the presence of sunk default costs in private debt and public debt inefficiency, the total disbursement from issuing debt depends on the allocation of foreign debt between the private and public sector in a non-monotonic way.*

Thus, the proposition 2 which stated a Modigliani-Miller-like result, i.e. that the maximum disbursement (or average value of debt) is independent from the mix between private and public debt, is not longer valid. The relation between the two variables ω and K_t, on the one hand, and the average value of debt, on the other hand, is illustrated in figures 5.12a and 5.12b.[19] Figure 5.12a shows that the share of public foreign debt ω, that is maximizing the average value of the country's external debt, varies with its debt-servicing capacity. The functional relation between this capacity and the value-maximizing

[19] The two graphs differ in that the latter is drawn on the basis of a higher σ, the volatility of the rate of changes in K_t. The surface of the latter is smoother. This reflects a phenomenon mentioned in the previous chapter, i.e. that in the presence of a high σ, the differences between a country with a currently high debt-servicing capacity and one with a currently low capacity becomes blurred.

share of public debt is non-monotonic and discontinuous. This is illustrated in table 5.2, which shows the average value of foreign debt as a function of K_t and ω. The value maxima in each column are shown in boldface. If we read the table from the rightmost column to the left, we can trace the evolution of the value-maximizing share of government debt as a function of the debt-servicing capacity. The results can be summarized as follows.

- If the debt-servicing capacity is clearly in the solvency range, i.e. higher than 1 in the context of the table, the value maximizing share of government debt is zero, indicating that the advantages of government debt do not outweigh the efficiency losses from its financing. The reason for this is that insolvency is a fairly improbable event in this range so that the expected high costs of private defaults are given only a small probability weighting; on the other hand, the efficiency losses from the financing of government debt occur immediately and are positive even at the margin.

- As the debt-servicing capacity drops to 1, which means that it is at the edge of the insolvency range, the value-maximizing government share exhibits a discontinuous jump to a fairly high value (0.8 or 80% in the example). This reflects the fact that an increase in the government's debt share reduces the expected default costs of the economy which - at this low level of debt-servicing capacity - have become a factor to reckon with.

- As the debt-servicing capacity drops further the value-maximizing share of government falls slowly. This reflects the fact that, at a low level of debt-servicing capacity, it is less useful to reduce such capacity further through the efficiency losses from financing government debt.

Another approach to the data in table 5.2 is as follows. For sufficiently high values of the debt-servicing capacity there are two local maxima for the share of government debt, namely $\omega = 0$ and a value of ω close to 1. The "non-government-intervention" value of $\omega = 0$ is the global maximum as long as K_t is in the solvency range. But as K_t drops

to 1, the situation is reversed. The value of debt with $\omega = 0$ drops quickly to zero and the global optimum is now found at the other value of ω, i.e. close to 1. The reason for the discontinuous switch away from "non-government-intervention" to a positive level of intervention is that the advantages of "non-intervention" disappear rapidly as the debt-servicing capacity gets close to the insolvency range - and this in turn is due to the high costs of private defaults.

One should bear in mind that the numerical values, that are referred to above, are the result of our specific assumptions about the functional form of the inefficiency losses and the values of the parameters, such as σ, etc.. Changing these assumptions implies different values for the debt-maximizing share of public debt. The purpose of the estimates presented here is to illustrate that the relation between the mix of public and private debt, on the one hand, and the average value of foreign debt (or the maximal disbursement obtained from issuing bonds), on the other, may be non-monotonic.

Figure 5.11a: Average spread with private debt default costs and public debt inefficiency (standard perspective)

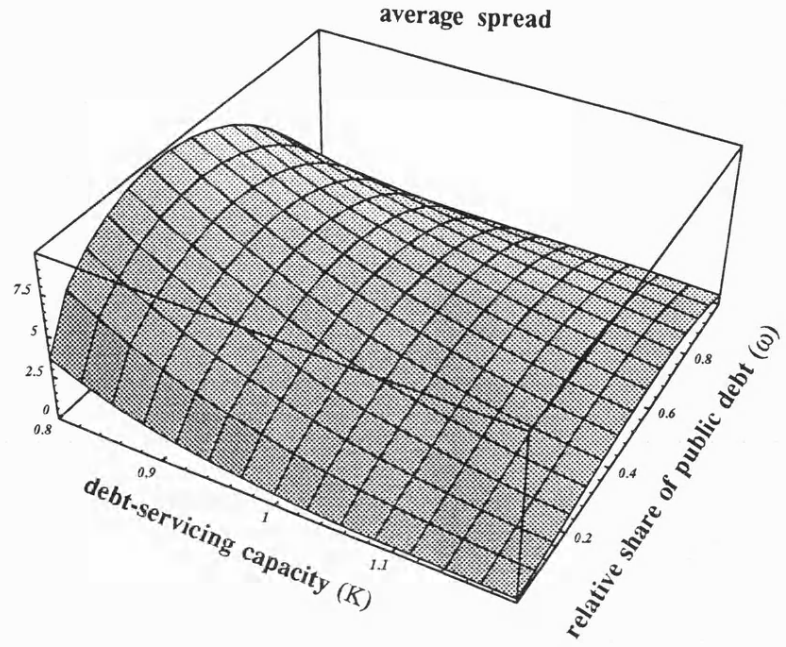


Figure 5.11b: Average spread with private debt default costs and public debt inefficiency (graph rotated by 90 degrees)

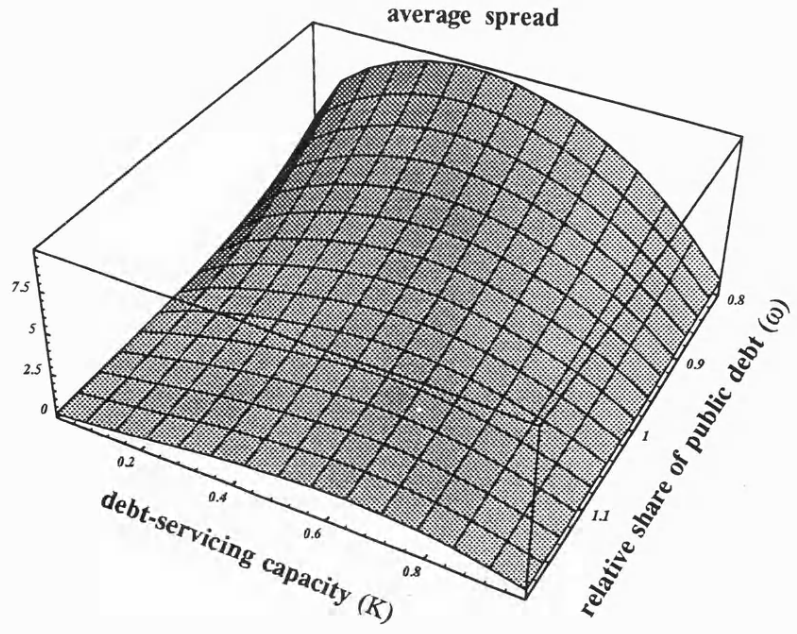


Figure 5.12a: Average value of foreign debt with private debt default costs and public debt inefficiency (for moderate values of the debt-servicing capacity)

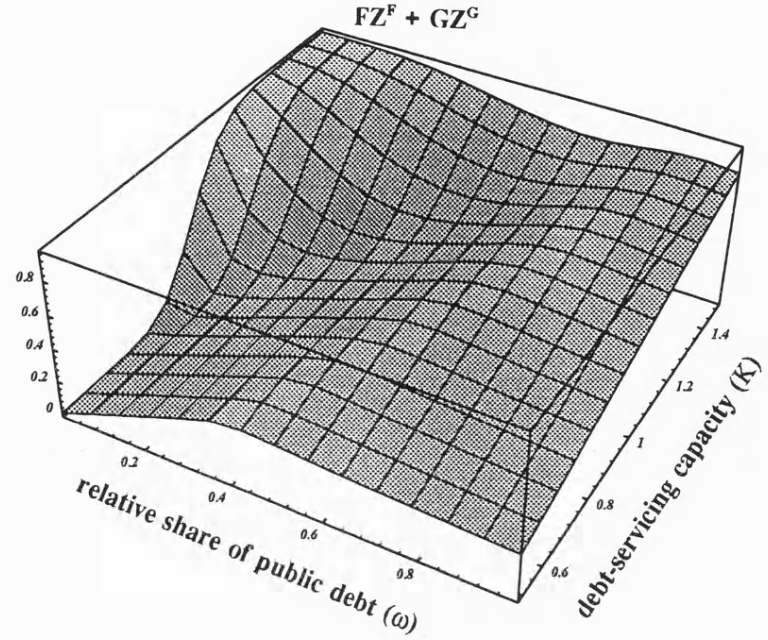


Figure 5.12b: Average value of foreign debt with private debt default costs and public debt inefficiency (for high values of the debt-servicing capacity)

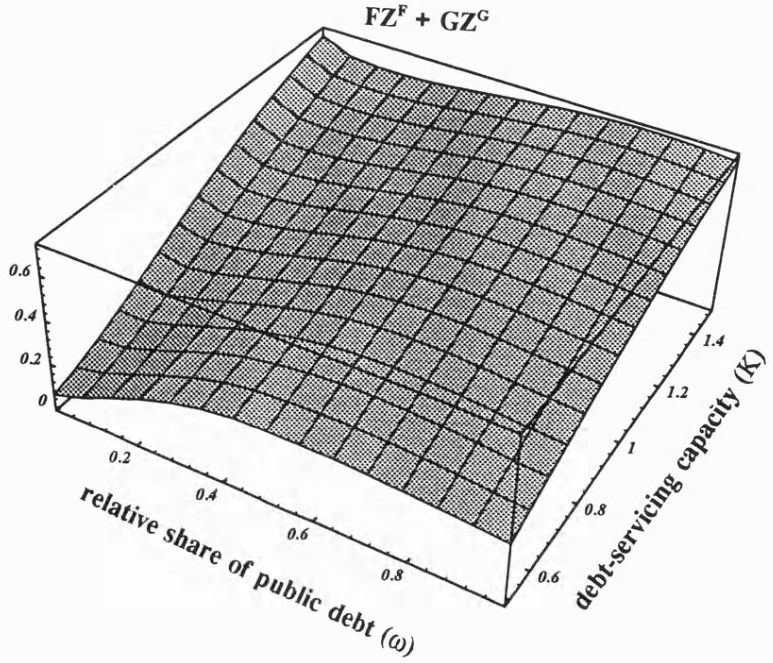


Table 5.2: Estimates of the weighted average value of external debt[a]

K_t

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3
0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.029	0.228	0.605	**0.859**	**0.936**	**0.949**
0.1	0.091	0.095	0.095	0.095	0.095	0.095	0.095	0.107	0.229	0.538	0.815	0.924	0.947
0.2	**0.093**	**0.180**	0.190	0.190	0.190	0.190	0.190	0.194	0.261	0.490	0.763	0.905	0.944
0.3	0.090	0.180	**0.265**	0.285	0.285	0.285	0.285	0.286	0.318	0.469	0.711	0.878	0.937
0.4	0.087	0.174	0.261	**0.344**	0.378	0.380	0.380	0.380	0.394	0.481	0.671	0.845	0.925
0.5	0.084	0.168	0.252	0.336	**0.418**	0.467	0.475	0.475	0.480	0.523	0.653	0.812	0.909
0.6	0.081	0.162	0.243	0.324	0.405	**0.485**	0.546	0.567	0.571	0.590	0.665	0.789	0.889
0.7	0.078	0.156	0.234	0.312	0.391	0.469	**0.546**	**0.615**	0.653	0.670	0.707	0.787	0.874
0.8	0.075	0.150	0.225	0.300	0.376	0.451	0.526	0.601	**0.672**	**0.727**	0.766	0.813	0.873
0.9	0.072	0.144	0.216	0.289	0.361	0.433	0.505	0.578	0.650	0.721	0.787	0.842	0.888
1	0.069	0.138	0.207	0.277	0.346	0.415	0.485	0.554	0.623	0.693	0.719	0.827	0.883

(a) The numbers are estimates of the value of debt with a nominal value of one. They are based on the assumptions about functions and parameters as described in section 5.4. The numbers in boldface indicate the maximum value of each column.

5.5 Concluding remarks

The previous sections have shown that the three indicators related to the costs of external financing for a country, i.e. its average spread costs, the average value of its debt, and the maximum disbursement obtained from issuing debt may depend in a complex way on a number of factors. These factors include the country's debt-servicing capacity relative to the amount of debt outstanding, the share of public debt in its total external debt, the extent of the bankruptcy costs on private debt, and the efficiency losses associated with public debt and public debt guarantees.

Which of the above mentioned indicators should be focused on? Two of them are almost equivalent, i.e. the average value of external debt and the disbursement obtained from issuing external debt. The latter is obtained as the product of the former and the number of debt instruments issued, thus, they are linearly related to each other. By contrast, the average spread is a non-linear function of the value of a country's debt instruments. As has been shown, this explains why the relation between the average spread and the share of public debt in a country's total external debt can be similar to a laffer curve. One should, however, be careful not to dismiss this as a pure "technical" phenomenon. This is only true if spreads are purely technical indicators without economic meaning. If, on the other hand, a country's average spread carries economic meaning; for example, as an information variable affecting creditors' risk assessment of the country, then the laffer curve may be an important economic relationship.

Another indicator is the average value of debt. The option pricing theory which underlies the present economic concept is concerned with prices. Applying this idea to the issue of the costs of external financing for a country, such costs could be interpreted as the difference between the value of the debt instrument issued and the repayment associated with it. Similarly, the additional costs of external financing could be interpreted as the difference between the value of its debt instruments and the value of the same number of default-free debt instruments. A strategy aimed at reducing such additional costs is therefore equivalent to one aimed at maximizing the weighted average value of external debt or the disbursement obtained from issuing external bonds.

As illustrated in the previous section, the value of a country's debt instruments (and the disbursement obtained from issuing debt) can be complex functions of several variables. These variables include but are not restricted to the country's debt-servicing capacity, the volatility of its rate of change, and the mix between private and public external debt. Given the specific assumptions made here, it appears to be a quite robust result that all debt should be private as long as the country's debt-servicing capacity is high, compared to its contractual debt service, i.e. as long as the country is characterized by a relatively low probability of default. The optimal, i.e. debt value-maximizing share of public debt, may be relatively high when the country's debt-servicing capacity is relatively low, and therefore the default costs are a factor to reckon with. Thus, if one wants to make a policy conclusion, it could be the following one.[20] Prior to the discussion of the decentralization of the foreign borrowing regime of a country, one has to assess the factors bearing on its external financial situation, i.e. its debt-servicing capacity, the volatility of the rate of change of that capacity, etc.. As long as the debt-servicing capacity is high and the volatility low, there may be some theoretical support for the hypothesis that external borrowing should be private rather than public.

Finally, it should be mentioned that the seniority rules as described above have recently been modified in some countries. Private issuers of bonds have provided offshore collateral to back their bond issues, such issues being commonly referred to as "enhanced" bond issues.[21] This "enhanced" private debt ceases to be "junior" to public debt in the sense defined above. This kind of enhancements have enabled the issuers of such bonds to obtain a higher rating than the rating of their governments. This may change the implications for the debt value-maximizing share of public debt.

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[20] This statement is derived from the present comparative-static analysis, and it may have to be qualified if dynamic aspects are considered.

[21] The collateralization is either based on existing assets (such as real estate, gold, etc.) or on the assignment of future income streams.

5.6 Appendix

Table 5.3: Moody's bond ratings

Aaa Bonds which are rated Aaa are judged to be of the highest quality. Interest payments are protected by a large or by an exceptionally stable margin and principal is secure. While the various protective elements are likely to change, such changes as can be visualized are most unlikely to impair the fundamentally strong position of such issues.

Aa Bonds which are rated Aa are judged to be of high quality. They are rated lower than the best bonds because margins of protection may not be as large as in Aaa securities, or fluctuation of protective elements may be of greater amplitude, or there may be other elements present which make the long-term risk appear somewhat larger than the Aaa securities.

A Bonds which are rated A posses many favourable investment attributes and are considered as upper-medium-grade obligations. Factors giving security to principal and interest are considered adequate, but elements may be present which suggest a susceptibility to impairment some time in the future.

Baa Bonds which are rated Baa are considered as medium-grade obligations (i.e. they are neither highly protected nor poorly secured). Interest payments and principal security appear adequate for the present but certain protective elements may be lacking over any great length of time. Such bonds lack outstanding investment characteristics and in fact have speculative characteristics as well.

Ba Bonds which are rated Ba are judged to have speculative elements; their future cannot be considered as well-assured. Often the protection of interest

and principal payments may be very moderate, and thereby not well safe-guarded during both good and bad times over the future. Uncertainty of position characterizes bond in this class.

B Bonds which are rated B generally lack characteristics of the desirable investment. Assurance of interest and principal payments, or of maintenance of other terms of the contract over any long period of time may be small.

Caa Bonds which are rated Caa are of poor standing. Such issues may be in default or there may be present elements of danger with respect to principal or interest.

Ca Bonds which are rated Ca represent obligations which are speculative in a high degree. Such issues are often in default or have other marked shortcomings.

C Bonds which are rated C are the lowest rated class of bonds, and issues so rated can be regarded as having extremely poor prospects of ever attaining any real investment standing.

Source: Bond (1992).

Table 5.4: The spread data[a]

	Spread in private issues	Spread in public and sovereign bonds	Weighted average spread in external bond issues[b]
Public and private foreign debt			
Argentina 1990	..	730	730
Argentina 1991	447	456	453
Argentina 1992	430	..	430
Brazil 1991	655	523	540
Brazil 1992	480	401	448
Chile 1991	..	210	210
Czechoslovakia 1992[c]	300	..	300
Mexico 1989	800	820	814
Mexico 1990	555	366	455
Mexico 1991	566	251	357
Mexico 1992[c]	442	195	282
Turkey 1989	160	192	190
Turkey 1992	250	221	224
Venezuela 1990	496	260	382
Venezuela 1991	362	250	265
Public foreign debt only			
Bulgaria 1989	-	160	160
China 1991	-	67	67
China 1992[c]	-	98	98
Czechoslovakia 1990	-	96	96
Czechoslovakia 1991	-	281	281
Hungary 1989	-	116	116
Hungary 1990	-	176	176
Hungary 1991	-	250	250
Hungary 1992[c]	-	209	209
India 1989	-	101	101
India 1990	-	127	127
India 1991	-	140	140

Source: IMF, *Private Market Financing* (Dec. 1992), World Bank, *Financial Flows* (April 1993), own calculations.

(a) Yield spread measured as the difference between the bond yield at issue and the prevailing yield for industrial country government bonds in the same currency and of comparable maturity. All are weighted averages. Public bonds include public sector bonds and sovereign bonds.

(b) The average spread is the weighted average spread of private and public issues, the weights being the amounts issued, as recorded in IMF (see above).

(c) First half of 1992.

Chapter 6: A Brief Note on Officially Supported Export Credit Guarantee Agencies and Subsidized ECI

6.1 Introduction

All major developed countries have export credit guarantee agencies (ECAs) which provide insurance or guarantee for export credits. Traditionally, the major agencies are official institutions or they act on behalf of the government. Private competition is almost absent, in particular in political risk insurance. It has been suggested in the literature on export credit insurance that, to the extent that the government is providing a service that private markets are not supplying, at least some element of subsidy is involved.[1] It is not necessarily the case that private insurers are unwilling to provide similar services. The absence of such competition points to the presence of some element of subsidy and therefore it has been suggested by Eaton (1989) that the presence of official or officially supported ECAs "is very likely to have discouraged the establishment of private institutions providing similar services."[2]

It is necessary to clarify what the aims of such institutions are. For example, as the *International Union of Credit and Investment Insurers (Berne Union)*, of which all major official agencies are members, puts it in their report of activities: "After the First World War the perceived need of many European countries to protect and expand their external reserves and to stimulate employment through the promotion of export activity added a new dimension to the conception of export credit insurance...From that time to the present day a steadily increasing number of countries in both the developed and developing world have seen in the establishment and development of an export credit insurance scheme an important tool for promoting their export trade, increasing employment opportunities, and improving the credit side of their balance of payments."

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[1] Abraham (1990), Boyd (1982), Eaton (1989) and Melitz and Messerlin (1987).

[2] See Eaton (1989, p.116).

This description reflects the two major objectives of such agencies, that of providing insurance and that of promoting exports. One means to fulfil these goals might be the subsidization of export credit insurance policies. In addition these subsidies might benefit the importing, i.e. borrowing country. For example, as has been illustrated in the present study, the trade financing costs are particularly high for countries with external financial difficulties. Subsidizing the financing of exports to these countries might be a means to reduce their trade financing costs - according to the view that "borrowers (i.e. importers) cannot lose from accepting export credit subsidies."[3] Under these circumstances, subsidized export credit insurance could be a form of development aid. Although controversial this argument is sometimes brought forward by politicians and by representatives of ECAs, and it is therefore considered here as a (potential) third goal.

This chapter asks whether official ECAs are the appropriate means to achieve these three goals - the provision of insurance, the promotion of exports and development aid (through subsidized insurance).[4] In an attempt to answer these questions, the present chapter interprets the literatures on the economics of insurance and on trade under imperfect competition in the specific context of export credit insurance. The following tentative answers are suggested. As for any insurance there is some theoretical support for public provision of export credit insurance (ECI). For example, in the presence of aggregate risk, the perfect pooling of risks within a given period is impossible. Thus the absence of well functioning options and future markets might justify public ECI - but not *subsidized* ECI. The inherently individual insurance problems such as moral hazard and adverse selection provide only limited theoretical support for public provision of ECI because in general public institutions are not in a better position to cope with the typical insurance problems faced by private insurers. Again, there is no support for subsidized ECI.

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[3] See Fleisig and Hill (1983, p.3). In fact, this holds under perfectly competitive conditions.

[4] The author is not aware of any studies which have treated these aspects together in a detailed or rigorous way. It is important to note that this is not to claim that in practice all ECAs are pursuing these three goals together but that they pursue either one or more of these goals. The present discussion adopts the perspective of *one* government, i.e. one country. World welfare questions are ignored.

As to the second goal, there are two theoretical lines of argument in favour of export subsidies. However, they rely on rather specific assumptions (discussed in section 4) which do not appear to be appropriate for the practice of ECI. Moreover, it appears that the ECAs are not the appropriate means to provide such subsidies because they only reach a small proportion of exports and might induce allocative distortions. As to the third goal, some recent articles on trade under imperfect competition (Carmichael (1987) and Gruenspecht (1988)) point to the hypothesis that subsidization through ECAs is more likely to harm rather than benefit the importing countries. The intuitive explanation for this hypothesis is that the subsidization of the exporters of one country may relax the price competition between them and exporters from other countries. This means that the two goals of export promotion and development aid would be in fact conflicting.

This chapter also contains an attempt to define and - using two different methods - to measure the extent of the subsidies provided through ECAs in 16 countries during the period from 1981 to 1990. The first method was developed by Abraham (1990) and the second one is proposed here. Both methods are based on the same idea; namely, that the subsidy in any year can be defined as the difference between expected net claims - the difference between claims and recoveries - and the premium income. Ideally, one should apply these concepts to individual transactions and compare the premium paid, the claims, and the ultimate recovery (or ultimate loss) for the same transaction to obtain estimates of transaction specific losses.[5] This is not feasible because the relevant data are not published by the ECAs. The estimation results obtained here show considerable differences across the agencies considered. Several of them provide large subsidy rates - defined as the subsidy per value of exports insured - while others seem to tax their exports. Examples for the former are SACE of Italy, GIEK of Norway, CECSE of Spain, and ERG of Switzerland, and examples for the latter are EDC of Canada and EXGO of New Zealand. All major agencies, except for the latter two and EFIC of Australia, OKB of Austria, and Eximbank of the United States, provide notable subsidies.

[5] One should mention that in individual transactions, the premium payment, claims, and ultimate recoveries could be spread over a time period of several years.

The structure of this chapter is as follows. Section 6.2 provides a description of the common institutional aspects of ECI. There might be some repetition of aspects mentioned in previous chapters; however, it is useful because it facilitates the understanding of the empirical relevance of the theoretical discussion that follows. In sections 6.3 and 6.4, the theoretical literature on insurance and the one on export promotion, respectively, are reviewed and interpreted in the specific context of ECI. In section 6.5, the interaction of the different goals of ECAs are discussed. Section 6.6 contains estimates of the effective subsidies.

6.2 The practice of export credit insurance

6.2.1 The risks covered

This subsection explains what types of risks are covered by ECI contracts.[6] The fundamental risk involved in export credits is that of non-payment by the buyer resulting in a loss on the part of the creditor. The event causing such a loss can either be of a commercial or of a political nature. It is called commercial if the loss arises through the inability of the buyer to make the contractual repayment because of his insolvency or bankruptcy. It is called political if an event in the buyer's country prevents him from meeting his contractual obligation. These events include the whole spectrum from civil war to the non-availability of foreign exchange because of government policy intervention.

In practice, several agencies distinguish between the commercial and the political risks and offer separate insurance policies for them.[7] However, it is true that these risks

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[6] ECI is given in form of an insurance or a guarantee. They differ from each other with respect to the contractual relations involved but they are economically equivalent in that the ECA provides the creditor with an insurance in exchange for the payment of a premium where the insurance is contingent on the event of default.

[7] Some other insurance schemes are in operation, including for example pre-credit cover and exchange rate fluctuation insurance. Pre-credit cover is a conditional indemnification of the insurer for losses arising between the date of actual dispatch of the goods, such losses being the costs and other expenses incurred by the insured when its contract is frustrated. It is available only as an addition to credit risk cover. Exchange risks arise when the exporter performs a contract that is denominated in a currency which is different from that of its inputs. It appears to be less relevant in practice.

are to some extent interrelated. For example, the business cycle in a country influences the financial and economic situation of each individual firm in that country and thus the risk associated with lending to those firms.

Another classification of risks is considered in section 6.3 because it is more appropriate for the presentation of results of the theoretical insurance literature; namely, the terms firm specific risk, country specific risk, and aggregate risk. The firm specific risk is the risk that is characteristic of a particular firm and differs between firms located in the same country. The country specific risk is the one which is characteristic of a particular country and differs between countries of the same region or political group, etc.. The aggregate risk is the risk that is neither firm nor country specific and which the insurer cannot eliminate through diversifying his portfolio among firms or countries.

6.2.2 The insurance contract and the information structure

ECI contracts can take on various forms. However, a general pattern is common to all contracts; namely, the insurer provides the insured creditor with a loss insurance in exchange for the payment of a premium, where the insurance is contingent on the event of default by the debtor and on the compliance of the insured with his obligations arising from the insurance contract. Therefore, such insurance is referred to as a "conditional indemnification".

In general, an ECI policy involves a special relationship between underwriter and the insured which has two central aspects. First, each part owes a duty of utmost good faith[8] to the other which includes in particular the full disclosure by the insured of all the facts material to the risk covered. Secondly, the insurer relies on the insured to practice effective credit control.[9] In general, it might reasonably be expected that the exporter has an intimate knowledge of the buyer's economic and financial situation, in particular if

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[8] For example, as a practitioner's handbook on credit insurance puts it, "a credit insurance is a long-term risk sharing partnership between underwriter and insured. The underwriter relies on the insured to act in their best mutual interest at all times". Briggs and Edwards (1988).

[9] Credit control includes the forecasting and reporting of receivables, assessments of customer risk, meeting with customers, checking daily orders and shipments, the monitoring of accounts, etc..

exporter and buyer have a long-term trading relationship. Despite his obligations, the insured might sometimes be able and have an incentive to misreport or hide some of this information.[10] This is referred to as the problem of asymmetric information. Section 6.3.2 discusses how this problem is dealt with optimally.

The form of the insurance is global or specific or, most commonly some hybrid of the two. Under a global (comprehensive or turn-over) policy, the exporter nominates all his export orders for cover, within the parameters set in his insurance policy, and pays a premium on the amount of claims outstanding. A specific policy is designed to cover a particular export contract. Because of the higher transaction costs associated with such specific contract, it is in general only used when the size of the contract is large, the order unique, or the credit period substantial. Clearly, under a global policy, the insurer does not know at the beginning of the insurance period the exact composition of risks, but can only estimate them from the exporter's previous exporting activity. Some constraints are built into such global insurance contracts to limit the extent of the possible total risk involved including the distribution of risks. Global as well as specific policies may cover short-term or medium- and long-term credits under one policy, or under separate ones.[11] In practice, all medium-term policies are specific.

6.2.3 Institutional aspects of export credit insurance

No two national export credit systems are identical. However, one similarity is the involvement of the government in credit insurance.[12] Such an involvement is particularly

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[10] There are legal instruments designed to ensure that the exporter meets its obligations. Namely, if the exporter fails to do so, the insurer might be entitled to *avoid* the insurance contract, that is to refuse to pay indemnification and repay the premium to the insured. For example, in English law, this principle has been codified in the Marine Insurance Act 1906 which the English case authorities have considered equally appropriate for the non-marine insurance field.

[11] A widely-agreed definition of short- term export credit insurance is the cover of up to 24 months credit risks including 12 months pre-credit risks.

[12] In general, four different types of institutions providing export credit insurance can be distinguished. This includes the state owned corporation (e.g. COFACE in France) which has exclusive access to government support for its activities; namley, the privately-owned corporation underwriting political risk on behalf of the government (NCM in the Netherlands and Hermes of Germany), the government department as a direct provider (ECGD of the UK, confined to long-term activity) and the privately-owned corporations who takes export credit risks including political risks for their own account (Trade Indemnity in the UK). Reports of the Commission of the European Communities have demonstrated that, in all the then-12 member countries, the public insurers (first three types of institutions) receive

evident in the sector of medium- and long-term credit insurance. By contrast, short-term credit insurance is generally provided not only by official agencies but also by private ones. However, even then the political risk is reinsured by the government in some countries. It appears that private insurers usually charge premia that are well above those that official agencies charge for similar risks.

The role of the government with regard to ECI in general and short-term insurance cover in particular is currently reviewed within the Commission of the European Union, focusing specially on the competition between private and official insurers. There appears to be a general consensus that private insurers are at a comparative disadvantage as opposed to official ones as a result of the financial support and guarantee backing of the latter by the government.

Most official ECAs have been incurring significant losses since the 1980s. Figure 6.1 shows the net cash flows of selected agencies - defined as the premium income plus recoveries less payments of claims - which is a commonly used indicator of an ECA's profit.[13] The figure demonstrates that several major ECAs have experienced a continuing worsening in their cash flow balances. The net cash flows of ECAs show two other interesting developments. First, a few agencies were exempt from the general trend of continuously worsening performances and managed to break even or make a profit. Examples are the Eximbank of the United States (as shown in the figure) and the ECAs of Austria, Canada and New Zealand (not shown in the figure). Secondly, the only agency which continued to apply a flat premium until the beginning of the 1990s, the German Hermes, performed significantly worse than the average of the ECAs between 1987 and 1990. This points to the hypothesis that the losses reflect the cover policy in

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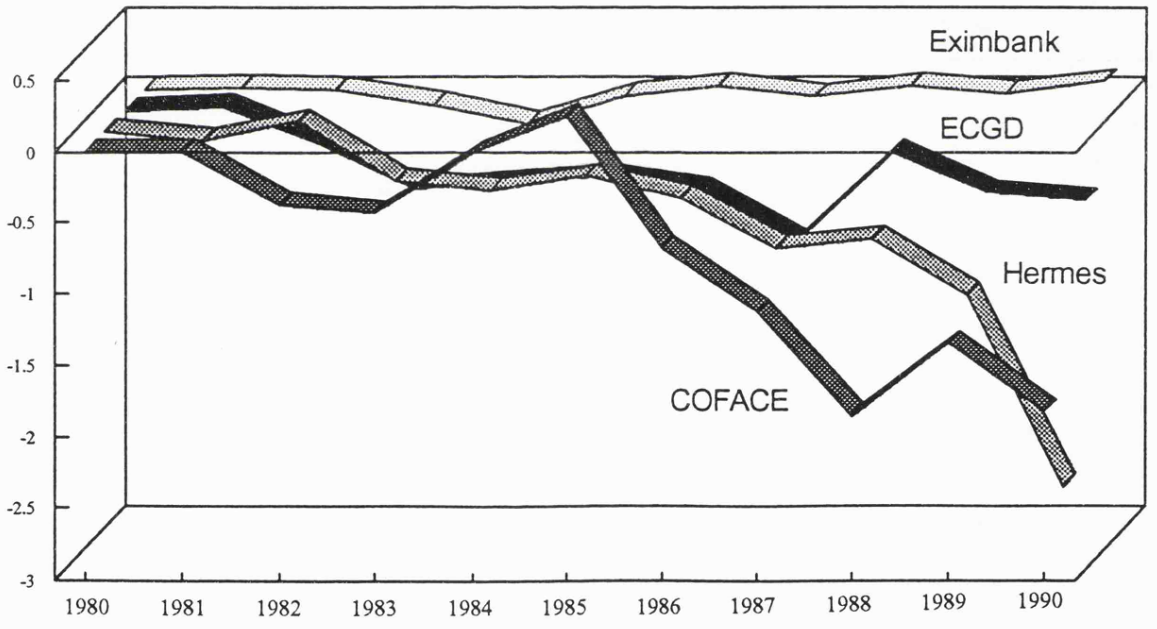
certain types of backing from their governments.

[13] This indicator needs to be interpreted with considerable caution for a number of reasons. First, a cash flow deficit does not necessarily imply that the ECA operates at a loss, as claims payments made under insurance policies may subsequently be recovered in full. Second, comparisons among agencies are hampered by differences in the accounting treatment of arrears and restructured debts. Third, intertemporal comparisons of the performance of an individual ECA might be hampered by the developments in their accounting practices that have taken place during recent years at several of them. For example, some agencies have begun to make direct payments to the original lender when guaranteed debt was restructured and have taken the restructured asset on their balance sheet instead of recording a contingent liability as before. This has tended to increase agencies' cash flow deficits.

general and the policy of premium determination in particular.

Recently, there have been discussions within EU and GATT about whether the observed losses, i.e. the negative cash flows might reflect subsidies provided to exporters to promote national exports. While other types of subsidies have been deemed to be unfair exporting measures for a long time, this type of subsidy has not been an issue in international fora until recently. The reason for this might be that it has not been fully recognized as such or not addressed because of the apparent problems associated with its definition and measurement, or because it is considered as forming part of the industrial policy which falls under the sole responsibility of national authorities.

Figure 6.1: Cash flows of selected ECAs (in billion US dollars)



Source: *Trade Finance*, various issues between 1985 and 1992.

However, it has been recognized in the GATT. For example, the agreement which followed the Tokyo Round included the specification that signatories should refrain from granting export subsidies and in addition a list containing material of what can be interpreted as "export subsidies". This includes under section (j),

The provision by governments (or special institutions controlled by governments) of export credit guarantee or insurance programmes, of insurance or guarantee programmes against increases in the costs of exported products or of exchange risk programmes, at premium rates, which are manifestly inadequate to cover the long-term operating costs and losses of the programmes.[14]

So far, however, there have been very few legal cases with respect to such subsidization. It appears that this is due not only to the problems associated with its measurement[15] but also to a general insensitivity among export insurers, politicians and the public about the problems associated with subsidization. In the following section the issue of ECI is discussed from a theoretical perspective. To the author's knowledge there exists no rigorous or formal literature of export credit insurance. Therefore, the general insurance literature is referred to in the next section. Section 6.5 includes an estimation of the effective subsidies associated with the observed profit/loss performances.

6.3 The insurance goal: some lessons from insurance theory

As described in the introduction, the main goal of most ECAs is to offer insurance against export risks associated with the economic and political situation of foreign trading partners. In this section, the insurance goal is considered separately from the export promotion and the development assistance goals.[16] First, some of the relevant theoretical literature is reviewed in the search for economic justifications of government intervention in the market for ECI. More specifically, the main findings of insurance theory on the following questions are reviewed: (i) Is the market likely to fail in offering ECI efficiently? (ii) Would the government be able to improve on the market outcome?[17] (iii) Which would be the best policy for the government? After this brief literature review, we

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[14] Annex (*Illustrative List of Export Subsidies)* to the *Agreement on Interpretation and Application of Articles VI, XVI and XXIII of the General Agreement on Tariffs and Trade,* GATT, Geneva 1979.

[15] Section 6.6 contains two proposals for the measurement of such subsidies.

[16] Section 6.4 looks at the export promotion goal and section 6.5 considers the interaction of different goals.

[17] Throughout this chapter, it is assumed that the government is benevolent and seeks to implement a Pareto-efficient allocation. This assumption is not made for realism but is a standard and convenient benchmark.

evaluate the relevance of the general theoretical results of that literature for the specific situation in ECI. Throughout most of the theoretical considerations, attention is restricted to the case of specific insurance policies in the sense described in the introduction.

In general, insurance is valuable to exporting firms because it allows them to reduce their risk and the associated costs of administration, financing, legal procedures, and other adjustments. Therefore exporters can be seen as risk averse investors who prefer a sure return to a risky return with the same expected value; this is the reason why they are willing to pay for insurance. To the extent that the risks of different exporters are uncorrelated, they can be pooled by an insurer, i.e. good and bad realizations will average out and the aggregate return will be a certain amount equal to the sum of the individual expected values. An insurer can then offer to a large number of exporters a riskless revenue in return for their risky assets. If the insurance contracts are 'actuarially fair', the revenue guaranteed to the exporter will be equal to the expected value of the returns (minus, in practice, a fee to cover the insurer's administrative cost). Therefore, as long as there is a large number of exporters who are prepared to pay premia which cover the administrative costs, there will be scope for an insurance market to develop and all exporters to benefit from this. Under ideal conditions, the free market will work efficiently; namely, profit maximizing insurance companies, that are competing with each other, will offer actuarially fair insurance contracts, and there will be no need for any government intervention or a public ECA. However, at least two problems can appear. Firstly, there is the problem of aggregate risk, and secondly, that of asymmetric information.

6.3.1 Symmetric information and the problem of aggregate risk

Some importers may have a good reputation on the credit market, i.e. are expected to fulfil the contract with a high probability. To the extent that there is information available about a particular importer, the insurer can take this firm specific risk into account when calculating the insurance premium. The knowledge about the political and economic situation in the importer's country leads the insurer to assign a country specific component to any particular loan to a firm in that country. Even if a particular importer

has a very good reputation, the fact that he is based in a country with a bad reputation will have an effect on the estimate of his default probability. In other words, it is generally believed that there are country specific factors that affect the risk. By definition, these factors are uncorrelated across countries. There may exist other factors that are expected to affect all firms and countries in the same way. To the extent that they are not known in advance, they represent aggregate risk.

When insuring an individual case, the insurer - whether it is a private or a public one - will consider all available information, in order to estimate the default probability on the basis of its knowledge of that specific importer, and of the industry and country in which the latter operates, and the world economic situation. One theoretical benchmark is the case where, at any point in time, exporters and insurers have the same information about the risk, i.e. the parties involved in the insurance contract have symmetric information before and after the contract is signed. Under symmetric information and in the absence of aggregate risk, one can expect a competitive insurance market to develop, covering all firm and country specific risks at the lowest possible cost. In this case, there is no obvious role for any government intervention in ECI.

In the presence of aggregate risk, the perfect pooling of risks within any given period is impossible, i.e. aggregate risks cannot be insured within one period. In this case, well functioning future markets would be needed to achieve efficiency. Their absence might justify a public ECA, but not the provision of *subsidized* insurance. The absence of such markets is indeed often cited as a major justification for ECAs in developing countries;[18] however, the same argument does not appear to be valid for developed countries where future markets are more complete. And wherever some of these futures markets did not develop, it might be precisely *because* of the subsidies provided by the government (e.g. through officially supported ECAs).

[18] See UNCTAD, 1991a,b.

6.3.2 Asymmetric information

In practice, exporters often know more about the risk and may even be able to affect the amount and the probability of repayment. For example, the exporter may know more about the economic situation of his trading partners and will therefore be able to estimate the probability of default more accurately than the insurer. Also, the exporter may have the possibility to reduce the risk of default by maintaining a claim recoveries section or by threatening to seek legal or economic sanctions, all these actions being often unobservable to the insurer. The first example is one of adverse selection, whereby the asymmetry of information is already present at the time when the contract is signed. The second example is one of moral hazard, where the asymmetry of information arises after the contract has been signed.

The adverse selection problem arises in the case where an exporter (before signing the contract) knows more than the insurer about the risk to be covered by the insurance contract. The exporter may have an incentive to hide or misreport some information in order to get a more advantageous contract. The insurer is likely to know only the overall distribution of default risks but not the default risk of each specific contract. He is therefore not able to immediately offer each exporter the actuarially fair premium because, in order to calculate that premium, the insurer would have to know the default probability on each specific export agreement.

The problem of moral hazard arises if the exporter can take some measures to reduce the probability of default, and these measures are unobservable to the insurer. In this case, the insurance contract must be designed to provide the exporter with the incentive to exert the optimal risk-reducing effort. In general, a thus designed contract will not cover the entire risk, i.e. the contract will specify a deductible amount so that the exporters will have to bear part of the risk themselves.

In principle, asymmetric information represents a problem for a government precisely in the same way as it does for a private insurer, and neither of them will achieve full efficiency. The relevant question is, therefore, whether the free market would create

more inefficiencies than those which are unavoidable in the presence of the information asymmetry. In other words, the question is whether a competitive ECI market can achieve a second-best (or constrained efficient) outcome for any given distribution of risks in the population of exporters. In the next two subsections, the problems of adverse selection and of moral hazard are reviewed, and then, in the third subsection, the relevance of these problems are discussed with respect to specific example of the ECI market.

6.3.2.1 Adverse selection

This subsection is based on Henriet and Rochet (1988) and Wilson (1977), where the interested reader can turn to for more details and formal demonstrations of the results. Given the risk distribution in the population (of exporters), the realised allocation of contracts is determined by the set of contracts that are offered in the market. Each single contract from this set specifies a loss amount to be covered (or, equivalently, the deductible to be borne by the insured) and a premium to be charged. Given that each individual is free to sign any contract from this set, it will sign that contract which gives it the highest expected utility. A set of individuals facing the same loss probability is often called a 'risk type'. Different risk types will have different preferences over combinations of cover and premium.[19] A first-best (or fully efficient) outcome would consist of full insurance cover for all risk types at premia that ensure that the insurance sector breaks even. However, in general, such an outcome is not feasible because the insurers do not know the risk types of individuals. Thus the constrained efficient (or second-best) outcomes have to be considered.

It can be shown that a second-best allocation requires full insurance for the worst risk type (call it type 1, the next better risk type 2, etc.). All other types should not receive full insurance cover. Each type i (with i = 1, 2, etc.) will have to accept deductibles which are designed so that they just deter type i - 1 from signing the same contract as type i. These deductibles represent a welfare loss which is unavoidable. It is

[19] For example, bad risk types will tend to have a higher marginal rate of substitution between cover and premium (i.e. flatter indifference curves in the cover/premium-space) than good risk types, meaning that they are prepared to pay a relatively higher premium than good risk types to obtain additional coverage.

the result of the asymmetry of information. An equilibrium can be obtained by offering all types their fair premium and by determining subsequently the corresponding deductibles according to the above mentioned principle. This equilibrium is characterized by a so-called cross-subsidy-free set of contracts. However, it is not always efficient. To see why, take the example of just two risk types, good risk types and bad ones, with a very small proportion of the latter types in the population. An optimal cross-subsidy-free set of contracts specifies the fair premium for both types and a deductible for cover of the good risk type which is designed so that it just deters the bad risk type from choosing the same contract. This deductible represents a welfare loss which might be avoided. Namely, if the proportion of bad risk types in the total population is sufficiently small, then a pooling of all types by offering just one type of contract with full cover and the premium slightly above the fair premium for good risk types allows the insurer to break even. This pooling results in a higher welfare for both risk types than the cross-subsidy-free set of contracts.

This explains why, under some circumstances, efficiency requires the premium for the high risk types to be subsidized by the low risk types. Competitive market forces, however, will tend to eliminate these cross-subsidies. To see this, consider a welfare optimum with cross-subsidies. In such a situation, an insurer may offer better contracts just for the good risk types; namely, ones without cross-subsidies but with small deductibles, the latter being designed to prevent bad risk types from choosing those contracts. This would allow that insurer to make profits. It would force other insurers to increase their premium because they would be left with only the bad risk types, i.e. an "adverse selection" of the population. This illustrates that under adverse selection a competitive market may well fail, i.e. lead to more than just the unavoidable inefficiencies implied by the asymmetry of information. Before turning to the implications of this result for the regulation of ECI, the case of moral hazard is considered.

6.3.2.2 Moral hazard

This section is based on Shavell (1979) and Arnott and Stiglitz (1986) which are standard references on insurance theory under moral hazard. As already mentioned, moral hazard makes it necessary for the insured to bear part of the risk himself, i.e. full insurance cover is not optimal. As in the case of adverse selection, the asymmetry of information leads to an unavoidable welfare loss. Wether an unregulated market leads to additional losses depends crucially on the prevalence of exclusivity. The following situations can be distinguished:

(i) If each insured deals with one insurer exclusively (i.e. exclusivity prevails), then this insurer - either a private or a public one - is in the position to offer him an optimal (i.e. second-best) contract. To the extent that the government faces the same information problem as private insurers, no government policy can improve on the competitive market outcome.

(ii) If there is the possibility for individuals to insure completely against loss (i.e. exclusivity does not hold), e.g. by signing contracts with several insurers, they will do so. Nothing prevents individuals from insuring themselves completely against loss.[20] Clearly, if individuals are completely insured, they will not undertake any risk-reducing effort.[21] Consequently, insurance premia will increase substantially. This outcome is clearly Pareto-dominated by the one where exclusivity prevails. If competitive market conditions lead to the elimination of exclusivity, and therefore to full insurance, the government can improve on the market outcome by enforcing exclusivity through a monopolistic insurance agency.

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[20] If an insurer does not offer them full insurance (i.e. specifies a deductible), then they will buy insurance for the excess amount elsewhere. Therefore the insurer will presumably offer them full insurance in the first place. Even in situations where no other insurance company is available to insure the exporter, he may be able to 'self-insure' against the equivalent of the deductibles by diversifying his portfolio, or by sharing the risk with his employees or his shareholders or his creditors.

[21] Arnott and Stiglitz (1986) argue that this no-effort-full-insurance outcome is the normal outcome in the absence of exclusivity. But they also discuss other possibilities. Namely, the insurance market may either break down completely, or it may lead to rationing.

6.3.2.3 Implications of asymmetric information for the regulation of ECI

The previous two subsections have concluded that, under both moral hazard and adverse selection, there may exist circumstances under which competitive insurance markets will fail to result in a second-best allocation. What can be the role of the government in ECI? If the government wants to assure efficiency, it can establish a monopolistic ECA and directly implement a second-best set of contracts. As long as the government is not assumed to be intrinsically inefficient, it can do at least as well as the market. Moreover, there are reasons why it might be able to improve on the (second-best) market outcome. For example, the government may have better access to information about political risks and other aggregate figures. The government may receive information from its controls at the borders or through its administration of international payments, and therefore, it may be more difficult for exporters to hide relevant information from a monopolised public agency than from a private insurer. Furthermore, a monopolistic ECA will be able to sanction false reports from exporters more effectively when it discovers them.

On the other hand, there are several arguments suggesting that the problems of asymmetric information are not particularly relevant to ECI. One might argue that the problem of adverse selection is negligible in the case of ECI since the exporter does not have a significant information advantage compared to the insurer. The insurer normally knows to which country and industry the credit is given. And there may be only little reason to believe that exporters know more about country or industry-specific risks. The exporters may, of course, have an information advantage with respect to firm specific risk, but it could be argued that this is small compared to the total risk. As to the case of moral hazard the following can be said. If exporters find ways of self-insuring for the deductibles, then even a monopolistic ECA can not do better than the competitive market. However, it has to be emphasized that the possibility of exporters insuring their deductibles elsewhere is not perceived as a problem in the practice of ECI. There appear to be two main reasons for this, apart from the lack of recognition of the problem. First, in most countries, there is not a free market operating anyway. When ECI is practically

monopolized, then it is clearly difficult to find another insurer to cover the remaining risk. Second, provided optimizing behaviour in the presence of moral hazard, the fact that deductibles are indeed observed points to the hypothesis that exclusivity holds. If it would not hold, it would not be rational for an insurer to offer a contract with deductibles in the first place. This suggests that the problem of moral hazard, like that of adverse selection, does not offer a clear-cut justification for public ECAs.

A more convincing argument for public ECAs might be found on the basis of the government's political relations with the debtors. If the government can use its political relations to reduce the risk, and if it can do this more effectively when representing a large number of creditors, then this would provide another justification for a public ECA, independent of the arguments discussed in this section. Thus, the government could improve on the market, even where the latter does not fail (i.e. where it achieves a constrained efficient outcome). Again it is very difficult to judge the practical relevance of this argument, but it seems that there is a potential for governments to coordinate the interest of all the creditors from their country, possibly through an ECA. At the same time, it is important to emphasize that all this does not justify any subsidies to the ECA nor to the exporters.

6.4 The export promotion goal

The second main goal of public ECAs is to promote national exports. There are basically two ways in which they can achieve this goal. The first one coincides with the insurance goal discussed in the previous section. To the extent that a public ECA is more efficient than a private one, it can provide cheaper ECI to domestic exporters, and thus may enhance their competitiveness on the world markets. The second way consists of offering ECI at subsidized premium rates. This can also increase the competitiveness of its exporters relative to foreign competitors, and - under certain conditions - national welfare will also be enhanced. This second case is the main focus of the present section.

In a couple of recent articles, export subsidization has been justified in the context of trade under imperfect competition. As soon as one departs from the framework of perfectly competitive markets, many different assumptions can be adopted and the theoretical implications turn out to depend heavily on the particular assumptions made about the type of competition (in prices or in quantities), the timing of the intervention (ex post or ex ante), the type of the subsidies (on quantities or on prices), the number of firms in the market, the type of barriers to entry (large or small, endogenous or exogenous), foreign governments' reactions, etc.[22] There are two special constellations which can generate the result that (optimally set) export subsidies will increase social welfare in the exporting country compared to the free trade outcome. They are reviewed in the next two subsections.

6.4.1 Ex ante subsidization and quantity competition

This subsection presents the standard justification for export subsidies as formalized elegantly by Brander and Spencer (1985).[23] It is based on two key assumptions about the timing of the subsidization and the strategic interaction between exporters. First, the exporters take the subsidy rates as given when they compete on the market. Second, their strategic variable is the quantity of goods they choose to export.

Consider two profit-maximizing exporters from different countries who compete on a third market for a homogenous good. Each firm chooses the quantity of goods it wants to export, taking as given the competitor's quantity and the government's subsidy scheme. The price is determined in the market by the demand side. The Nash equilibrium is defined as a quantity of exports for each competitor which ensures that no exporter can individually deviate from the equilibrium in a profitable way. The subsidy affects the equilibrium price, the market shares, and the profits. The subsidizing government

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[22] For a review of the literature on trade policy under imperfect competition, see e.g. Dixit (1984) or Neary (1988). Most of the literature on strategic trade policy concludes that, if any deviations from free trade is beneficial, then the optimal policy required the imposition of an import tariff rather then the provision of an export subsidy. It should be emphasised here that here all models are ignored which *do not* justify export subsidies. Thus the focus is on the "best possible constellation" for a justification of subsidized ECI.

[23] A related model, but with differentiated export goods, is Dixit (1988). Dixit's model is more complex and leads essentially to similar conclusions. It is used by Abraham (1990) in the context of ECAs.

anticipates that its subsidy gives a competitive advantage to its firm. It chooses the subsidy so that national welfare is maximized, trading off the additional profits for exporters with the costs of financing the subsidy. The equilibrium is explained below. For expositional purposes, first the case without foreign government reaction and second the case with strategic interactions between domestic and foreign government are discussed.

Consider the case where only one government provides a subsidy. The subsidy increases the market share and the profits of the subsidized firm while lowering the price of the good and the profits of the competitor. The export expansion of the subsidized firm more than compensates for the other firm's export contraction, so that the price fall is associated with an increase in the total sales. Social welfare in the subsidizing country - i.e. home profits net of the subsidy expenses - is increased. This occurs despite the fact that the contribution of the subsidy to the domestic exporter's profit exactly offsets the cost of the subsidy to the government. Intuitively this can be explained as follows. The subsidy *deters* foreign companies from competing on a larger scale for lucrative markets because they recognize that the domestic company has a cost advantage due to the subsidy. The foreign competitor is forced to restrict his output and leave a larger market share for the subsidized firm. This is the essence of the *profit-shifting* argument for export subsidization.

Clearly, such a situation will induce the foreign government to retaliate by setting up its own subsidy scheme. This leads to a situation of strategic trade policy where each government chooses its optimal subsidy, taking as given the other government's subsidy scheme and correctly anticipating the effect of policies on the market equilibrium. The resulting non-cooperative policy equilibrium is characterized by positive export subsidies in both countries. The crucial feature of this equilibrium is that the subsidies are too high, i.e. both countries would benefit from a bilateral reduction in subsidy levels. Policy cooperation (i.e. joint welfare maximization), as opposed to individually optimal policies, would call for substantially lower subsidies.[24]

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[24] In fact, when the subsidized good is not consumed in the producer countries, then joint welfare maximisation entails taxation of exports.

6.4.2 Ex post subsidization and price competition

The argument outlined in the previous subsection has recently been challenged by Carmichael (1987). He argued that the practice of the United States' Eximbank and other ECAs is to decide on the subsidy only after the export contracts are signed. Moreover, the subsidy is not given in form of a production (or output) subsidy but rather as a price subsidy. This means that the assumptions discussed in the previous subsection may not be the appropriate ones, but would have to be modified. As will be explained in the following paragraphs, which are based in part on articles by Carmichael (1987), Gruenspecht (1988), and Neary (1989), these modifications change the conclusions from the previous subsection completely.

Consider the case where firms from two countries export differentiated products and engage in price competition, i.e. they set their prices optimally, and the quantities are determined by the demand side in the market of the third country. Suppose that the governments choose optimal price subsidies after all export contracts have been signed.[25] Each government is assumed to maximize its national welfare which is equal to its exporters' total profits minus the cost of the subsidies. Denote by δ the opportunity cost of public funds and note that the home exporters' profits are increasing in the subsidy. With a positive δ, the optimal subsidy will not be arbitrarily high since subsidization is costly for the government.

Rational firms will anticipate the governments' policies. The subsidy scheme gives the subsidized firms an incentive to charge higher prices in order to benefit from a higher subsidy. This effectively *relaxes* price competition between the firms from the two countries. As long as demand is sufficiently inelastic, this will lead to higher prices and higher profits in both exporting countries. Thus, the subsidy scheme implemented in one country increases profits and welfare at home and in the competing country. Profits of firms in both exporting countries are increased at the expense of the consumers in the importing country.

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[25] Eaton and Grossman (1986) have shown that if the government moves first (ex ante policy), its optimal export subsidy is negative, i.e. the optimal policy is to tax exports.

The subsidy scheme has two effects. On the one hand, as in the Brander-Spencer model, it shifts oligopoly rents to the subsidized firm. On the other, it weakens price competition, instead of intensifying quantity competition, as in the Brander-Spencer model. The optimal subsidy depends on two factors, the opportunity cost of public funds δ and the elasticity of demand. For expositional purposes, the special case of perfectly inelastic demand (i.e. of pure market share rivalry) is considered. In this case, home welfare is increasing in the level of δ.[26] For example, for very low values of δ, the subsidy scheme lowers home welfare because the firms can use their first mover advantage to "exploit" their government by charging excessively high prices. The government is then forced to pay a high subsidy in order to maximize national welfare, given such excessively high prices. For moderate (and according to Gruenspecht, more realistic) values of δ, the subsidy program increases both home profits and welfare. In such a situation, home firms can extract less subsidy from their government because the latter values the costs of these subsidies higher. This leads to more moderate, i.e. lower price markups and subsidies than in cases where δ is low.[27]

Thus, this model leads to conclusions which are diametrically opposed to the standard view on export subsidization expressed in the previous subsection. A subsidy scheme in one exporting country increases profits and welfare in the other exporting country. This is in sharp contrast to the widespread view of subsidies, according to which the subsidy provided by one government hurts the other government and provokes retaliation in form of a subsidy. Here, each country benefits from the other country's subsidies. The precise strategic situation between the two governments depends on the shadow costs of public funds in both countries.

For example, given moderate opportunity costs of public funds in both countries, each government prefers the other country to run a subsidy scheme so that it can free-ride

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[26] Clearly, with elastic demand the result is weakened. The subsidy will tend to have a smaller effect on equilibrium prices.

[27] For very large values of δ, the government will find it optimal to tax exports because they represent an efficient tax base.

on it.[28] Each government has an incentive to start a subsidy scheme when there is none, but it prefers the other government to do it. If one government runs a subsidy scheme, the other one does not have an incentive to introduce such a scheme. The situation is different if there are relatively high δ in both countries. There will be an incentive for both governments to run a subsidy scheme irrespective of what the other one does. The intuition is that, due to its high δ, the foreign government tends to choose a relatively low level of subsidies. Knowing this, the home government will realize that, by providing itself a low subsidy, it can increase home welfare. The fact that it has a high δ itself assures it that it will not have to pay excessively high subsidies. Therefore, for relatively large shadow costs of public funds in both countries, the model predicts that both governments will set up a subsidy scheme and reach a higher welfare than under free trade, i.e. without any subsidization. Table 6.1 summarizes the predictions of the model for different constellations of δ in both countries.

Table 6.1: Noncooperative policy equilibria in a model with export subsidization and price competition

	low foreign δ	moderate foreign δ	high foreign δ
low home δ	no subsidy program	foreign subsidy	foreign subsidy
moderate home δ	home subsidy	home subsidy or foreign subsidy ("Chicken Game")	foreign subsidy
high home δ	home subsidy	home subsidy	home subsidy and foreign subsidy

Source: Gruenspecht (1988).
Explanation: home subsidy = home country government establishes subsidy scheme, foreign subsidy = foreign country government establishes subsidy scheme, δ = opportunity cost of public funds.

[28] In terms of the literature of game theory, the strategic policy described here can be viewed as a 'chicken game' while the one described by Brander and Spencer can be viewed as a 'prisoner's dilemma game'. An introduction to the prisoners' dilemma game and the chicken game can be found in Rasmussen (1989).

The conclusions from this section could be summarized as follows. The Brander-Spencer model captures the most widespread view on export subsidies. It predicts that subsidization increases profits and welfare in the subsidizing countries, although competing governments are induced to choose too high levels of subsidies. Importing countries do benefit from those subsidies. All governments of exporting countries have a common interest to agree on multilateral subsidy reductions. This view is challenged by the Carmichael-Gruenspecht model. It is based on more realistic assumptions about export subsidization through ECAs; namely, that the subsidy level is set after export contracts have been signed and that firms use the price as a strategic variable when competing for export contracts. The model predicts that subsidization would increase profits and welfare in the exporting countries. In situations where the governments in several exporting countries have established subsidy schemes, none of them would benefit from multilateral subsidy reductions. However, the importing countries may benefit from such reductions; namely, if they suffer from the existence of these subsidy schemes.

6.5 The interaction of goals

The two previous sections discussed separately the two roles of ECAs in offering insurance and promoting exports, respectively. This section discusses how these goals interact, i.e. whether they are complementary or conflicting when pursued simultaneously. As mentioned earlier, this question is very important for evaluating the involvement of ECAs in export promotion, since the arguments discussed in section 6.4 - while giving some justification for export subsidies - do not imply that these subsidies should be provided through the insurance contracts. The third goal mentioned in the introduction, i.e. development assistance, is considered as well.

6.5.1 Insurance and export promotion

Insurance against the risk of default enables some exporters to make export deals which they could not make without the insurance because of the costs associated with the

risk. This aspect, reflecting the efficiency gain from insurance, is of course very important. However, as noted in section 6.3, the private sector may achieve a similar outcome as public ECI, even in the presence of asymmetric information.

Moreover, although the models on export promotion reviewed in section 6.4 do provide a justification of general export subsidization in some specific circumstances, they do not imply the necessity to subsidize *particularly* through an ECA. A general export subsidy may be a more appropriate means than subsidization through ECI. The problem of the latter form of subsidization is that only those exporters benefit from it which buy insurance contracts. Given that most ECAs insure less than 25% of the exports from their country, it seems ineffective to promote only such a small subgroup of exporters. Moreover, this might result in allocative distortions.

Thus, in order to justify export subsidization specifically through an ECA, one has to show that export subsidies can be used to offset other distortions inherent in ECI. The cases of moral hazard and adverse selection discussed in section 6.3 are examples of such distortions. The question therefore is whether export subsidies can improve efficiency by relaxing the incentive compatibility constraints on the insurance contracts offered by the ECA. As it turns out, this is not possible. In two recent papers, Dixit (1987 and 1989) shows that free trade is optimal for a small open economy even in the presence of moral hazard or adverse selection in the export sector. This means that, as long as the world markets are competitive, the problems of asymmetric information in export credit insurance do not constitute a justification for any export subsidies.

Dixit's analysis implies that, if export promotion is to provide a reason for subsidizing ECAs, this has to be as a third-best argument, i.e. the intervention in the ECI market has to alleviate some distortions other than those created by the asymmetry of information. Such a case could be constructed using one of the models discussed in section 6.4, where the additional distortion is due to the oligopolistic structure of the export market. The question then is, whether, in the presence of asymmetric information in ECI, the optimal subsidies derived from these models should be provided through the insurance contract and not directly on the export contract. The following argument in

favour of subsidization through the insurance contract could be developed: The incidence of direct subsidies on each export contract will be uniform across all exporters while subsidization through an ECA allows the government to differentiate among them. A differentiated subsidization could allow it to set better incentives, i.e. by rewarding risk-reducing efforts under moral hazard and easing self-selection under adverse selection.

6.5.2 Export promotion and development assistance

Probably the most controversial goal of ECAs is that of development aid for the importing countries. There are basically two ways in which benefits may arise in the importer's country. First, it is clear that importers, in general, will also share some of the efficiency gains from insurance. But again this holds independently of any subsidization. Second, it is often argued that the export subsidy is - at least to some extent - passed on to consumers in the importing country in the form of lower prices. This effect is much less clear than the first one. As already discussed in the previous section, it is not necessarily the case that a subsidy scheme will lead to lower prices.

It is very important to note that the effect of a subsidy on prices depends particularly on the elasticity of demand and the form of competition, i.e. price or quantity competition and the timing of the subsidy provision. For example, the Brander-Spencer model supports the view that subsidies lead to price reductions and therefore to benefits for the consumers in the importing country, which in many cases is a developing one.[29] However, as mentioned before, for the description of export credit insurance the Carmichael-Gruenspecht model appears to be more appropriate. It suggests the opposite of the Brander-Spencer model; namely, that subsidies may induce prices to go up and that consumers in the importing countries may suffer from the subsidy schemes set up by the exporting countries. Thus there may exist a logical conflict between the goals of export promotion and development aid. Under these circumstances, no government could rationally claim to pursue both goals simultaneously through a subsidized ECA. It could either claim to promote exports, implying a Carmichael-Gruenspecht-type scenario, in

[29] Again, this does not justify the subsidy provision particularly through an ECA.

which case the importing countries will be harmed; or it could claim to provide development assistance, implying a Brander-Spencer-type scenario.

6.6 An estimation of the effective subsidies

6.6.1 An adaptive expectations method

The discussion in the previous sections showed that there is no general theoretical justification for export subsidization through an ECA. This section is concerned with an estimation of the actual export credit subsidies provided by selected official ECAs. Two different methods are used, both relying on the assumption of symmetric information. The first was developed by Abraham (1990) and assumes that ECAs form adaptive expectations about the occurrence of claims. He estimates the effective subsidy for a sample of ECAs from four countries during the period between 1973 and 1987. The present study applies his method to data containing a sample of ECAs from 16 countries during the period between 1984 and 1990. Furthermore, another estimation method is developed here which yields estimates from 1981 to 1990. The data used here include claims, recoveries, premium income, and exports insured for 16 ECAs during the period from 1981 to 1990. They are collected from various issues of *Euromoney's* "Guide to Export Finance" and *Trade Finance.*

In general, when the insurer provides subsidized ECI, the cost saving to the exporter (or his bank extending the export credit) amounts to the difference between the actual insurance contributions and the insurance premium income that would allow the insurer to break even. This income should be generated by an actuarially fair premium rate[30] - which is the one that guarantees that the premium income exactly covers the expected losses from an insurance contract - corrected by a markup compensating for the expenses associated with the insurer's operations. Since data about such operational expenses are difficult to collect, this study follows Abraham and uses just the fair

[30] A distinction is made here between the premium rates, i.e. the charges expressed in terms of a percentage of the credit value insured, and the premiums or premium income which corresponds to the amount paid by the insured.

premium rate (i.e. excluding operational expenses) for the estimation of the subsidies. Consequently, the figures underestimate the zero-profit premium rate and thus underestimate the true subsidies.[31] In any year t, the actuarially fair premium rate p_t could be defined as

$$p_t \equiv \frac{C_t - R_t}{V_t}, \qquad (1)$$

where C_t represents the total claims, R_t denotes the recoveries, and V_t the insured volume, all in year t. However, this definition poses several problems for the estimates. The main problem arises from the fact that due to aggregate risk, at the time the insurance contracts are signed and premia are paid, the future total claims are not known but can only be estimated. Thus a short-term mismatch between claims and premia might not be the result of a subsidization policy, but of expectational errors due to an unanticipated shock. By contrast, the accumulation over a long period of sustained losses can be interpreted as an indicator of subsidization. Thus the estimation of subsidies requires that the expectation formation of the insurer is taken into account, so that a distinction can be made between expected losses (= effective subsidies) and unexpected losses. Following Abraham, the actuarially fair premium rate $\tilde{p}^A$ in any period t is estimated as follows:

$$\tilde{p}_t^A \equiv \left(\frac{C_{t-1} - R_{t-1}}{V_{t-1}} + \frac{C_{t-2} - R_{t-2}}{V_{t-2}} + \frac{C_{t-3} - R_{t-3}}{V_{t-3}} \right) / 3 , \qquad (2)$$

with C_{t-i} denoting the actual claims in year t - i, R_{t-i} the actual recoveries in year t - i, and V_{t-i} the value of the outstanding insurance contracts in year t - i, for i = 1,2,3. This estimate of a fair premium, which is based on information about past claims and insurance contracts, embodies the concept of adaptive expectations. The fair premium in any particular year is computed as the average of the net claims - the difference between claims and recoveries - of the last three years, as a percentage of insured contracts. Note that the concept of adaptive expectations implies that any new information which is not reflected in historical data is ignored. For example, an ECA with such an expectation formation mechanism would fully account for the effects of a shock such as the outbreak

[31] The operational expenses (or administrative costs) are normally said to account for 15 to 30% of the insurer's premium income.

of the debt crisis only after three years. A "subsidy-equivalent amount", $\tilde{s}^A$, is then obtained as follows. The fair premium rate, $\tilde{p}^A$, is multiplied by the value of the newly insured contracts of a particular year, V_t, to obtain expected future net claims. The observed premium income, P_t, is subtracted from this.[32] Formally,

$$\tilde{S}_t^A = \tilde{p}_t^A V_t - P_t. \qquad (3)$$

The "subsidy-equivalent rate", $\tilde{s}^A$, is defined as the subsidy-equivalent amount divided by the insured value, i.e.

$$\tilde{s}_t^A = \tilde{p}_t^A - P_t / V_t . \qquad (4)$$

Table 6.2 lists the estimates of the subsidy-equivalent rates for the 16 countries of our sample. The following observations are singled out for special attention. First, the subsidy-equivalent is notable for almost all ECAs with the exceptions of Austria's OKB, Canada's EDC, and New Zealand's EXGO.[33] These latter seem to slightly tax their exports. Second, there is an increase in the subsidy-equivalent during the second half of the 1980s for most agencies considered. The simple arithmetic average of subsidy-equivalent rates of all agencies considered rose from 1.4% in 1984 to 3.7% in 1990.[34] This finding is remarkable because the outbreak of the debt crisis can be dated back to 1982. Thus, the results of the estimation give some support to the hypothesis that the ECAs did not adopt the appropriate restrictive policies as a response to the increased risk but tolerated higher losses. Even more, the results seem to point to an increase of the importance of such expected losses during the 1980's. Thus, the results confirm the findings of Abraham who used data for the ECAs of Belgium, France, Germany, and the United Kingdom, covering a period from 1973 until 1987.

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[32] It is important to note that the subsidy-equivalent that is estimated for an ECA can exceed the actual negative cash-flow of that ECA in the same year.

[33] The results are qualitatively equivalent if only premium income and claims (and not recoveries) are used. Clearly the estimated subsidy-equivalents increase.

[34] In fact, the subsidy-equivalent increased for all of the large ECAs. Consequently, the average subsidy equivalent would be even higher if it was weighted by the amounts insured.

Table 6.2: Estimates of subsidy-equivalent rates of selected ECAs, 1984 - 1990 (adaptive expectations method)[a]

	1984	1985	1986	1987	1988	1989	1990	ϕ 84-90
EFIC, Australia	-0.5	-0.6	-0.6	-0.4	0.3	1.9	1.9	0.3
OKB, Austria	-0.8	0.2	-2.2	-0.8	-1.2	1.7	-0.3	- 0.5
OND, Belgium	1.3	1.7	2.2	1.8	2.2	2.5	3.7	2.2
EDC, Canada	-0.4	-0.2	-0.3	-0.5	-0.5	-0.5	-0.4	- 0.4
FGB, Finland	1.6	1.9	1.8	3.0	3.1	2.0	1.1	2.1
COFACE, France	0.0	0.4	-0.7	0.7	2.5	4.3	4.3	1.7
Hermes, Germany	0.9	1.8	2.9	3.3	3.9	4.9	5.7	3.3
SACE, Italy	1.8	5.3	7.2	9.0	12.1	15.6	13.5	9.2
NCM, Netherlands	0.4	1.3	2.4	2.5	2.1	0.8	0.9	1.5
EXGO, New Zealand	-0.2	0.1	-0.1	-0.2	-0.2	-0.2	-0.3	- 0.2
GIEK, Norway	10.2	12.4	9.4	7.9	7.2	8.5	6.5	8.9
CESCE, Spain	0.2	1.9	3.7	7.1	11.4	13.7	12.7	7.2
EKN, Sweden	1.9	2.9	2.4	2.4	1.8	2.0	1.9	2.2
ERG, Switzerland	4.8	6.2	5.5	6.8	10.5	10.0	9.3	7.6
ECGD, Utd. Kingdom	1.3	1.7	1.9	2.2	2.3	2.3	2.6	2.1
EXIM, United States	0.4	1.6	1.6	1.2	0.1	-0.3	0.2	0.7

Source: own calculations based on data from *Euromoney* and *Trade Finance.*

(a) As a percentage of total exposure.

An important assumption which underlies this method must be mentioned. Premium payments, claims, and recoveries are assumed to materialise in the same period. In reality, claims on individual medium- and long-term insurance contracts might materialise only some years after the premium payments, and recoveries only some years after the payment of claims.[35] However, this problem is not too serious because the time pattern of premium payments, claims, and recoveries appears to be relatively stable, and

[35] In addition, claims are generally paid only after the so-called *claims-waiting period,* which is the period between the actual materializing of losses and the payments of claims by the ECA.

because most insurance contracts are short-term, anyway.[36] In addition, the literature on export credit insurance suggests that insurance companies normally do not attempt to match premia and claims on an individual contract basis and that official ECAs in particular focus on annual aggregate amounts of claims, premium income, etc..

6.6.2 An interagency comparison method

ECAs systematically collect data concerning economic, political, and legal factors, both from public sources and from their own experience. This subsection describes an alternative approach of estimating subsidy-equivalent rates, which is based on the hypothesis that all agencies derive their forecasts of the risk, making the best use of all information available to them. In other words, they do not make any "avoidable" or systematic errors, they form rational expectations. To calculate the fair premium rates, one should ideally use the same information as the agencies. Since this detailed information is not available, the following indirect approach is taken here. It is assumed that ECAs are symmetric in the sense they have (i) the same abilities and resources for the forecasting of default on the export credits insured by them and (ii) sufficiently diversified portfolios, so that, in each year, they face only the aggregate risk, which is the same for all. These assumptions imply that, in any given year, if some agencies manage to avoid losses, then all other agencies could have done the same. Additional losses must then be interpreted as intentional. Thus one can define the subsidy-equivalent of any agency as the excess losses compared to those incurred by the best performing ECAs. Consequently, the subsidy-equivalent rate $\tilde{s}^B$ for agency i (i = 1,...,16) is calculated as follows:

$$\tilde{s}^{B}_{i,t} \equiv \frac{C_{i,t} - P_{i,t} - R_{i,t}}{V_{i,t}} - \frac{1}{4}\sum_{j=1}^{4} \frac{C_{j,t} - P_{j,t} - R_{j,t}}{V_{j,t}} \quad , \qquad (5)$$

whereby Australia's EFIC, Austria's OKB, Canada's EDC, and New Zealand's EXGO are chosen as reference group (j = 1,..,4). The results of these estimations are shown in table 6.3.

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[36] For example, Abraham (1990, p.30) reports that 75 to 90% of all transactions during the 1980's on account of the Belgian official ECA were short-term.

The main findings are the following ones. There are some agencies with a systematically higher loss rate than the agencies of the reference group. Examples are COFACE of France, SACE of Italy, GIEK of Norway, and ERG of Switzerland. Hermes of Germany, CESCE of Spain, and ECGD of the United Kingdom are also characterized by significant subsidy-equivalent rates in most years. By contrast, the results for EFIC of Australia, OKB of Austria, EDC of Canada, EXGO of New Zealand, and Eximbank of the United States seem to suggest that losses are the result of expectational errors, rather than intentional.

The agencies which are relatively large in terms of the proportion of exports insured are characterized by substantial subsidy-equivalent rates. The relative importance for their countries of the subsidies provided by ECAs could be measured as follows. By multiplying the share of insured exports in total exports of a country with the subsidy-equivalent rate for its ECA, one obtains a measure of the subsidy-equivalent in relation to total exports. According to this measure, the subsidies are relatively important for Spain (0.60%), France (0.51%), the United Kingdom, and Italy (both 0.43%) but less for Germany (0.19%). Thus, while the estimates for the subsidy-equivalent rates for Hermes of Germany are comparatively high (as shown in table 6.3), the relative importance of subsidies for German total exports appears to be relatively low because only a fairly small portion of these exports are insured by Hermes. This is illustrated in table 6.4.

The subsidy-equivalent rates are minimal only for those agencies which are relatively small in terms of exports insured.[37] The following tentative interpretations are suggested here. If an agency insures only a small portion of its country's exports, it is unlikely to become an effective tool of trade policy anyway. Another related explanation could be that those agencies which are used by their governments as tools for trade policy have attracted more exporters and thus became larger, precisely because their rates are subsidized. Since the present study does not have access to the detailed information available to the agencies, any further interpretation of the obtained estimation results would be highly speculative and is therefore omitted here.

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[37] This includes the Eximbank of the United States which insures only an equivalent of 10 to 15% of the amount insured by COFACE of France.

6.6.3 The two methods revisited

This subsection briefly compares the two methods in the light of their estimation results. Comparing tables 6.2 and 6.3, one can see that the results of the two methods are broadly similar, i.e. the overall picture of the relative importance of subsidies among agencies, is similar according to both methods. The estimates of the averages of the subsidy-equivalent rates per agency during the period from 1984 to 1990 (last column in table 6.2 and second-last in table 6.3) are similar.[38]

The interagency comparison method appears to be particularly attractive because it allows to use the complete time series of data, unlike the adaptive expectations method which "looses" some observations at the beginning of the time series. This is an important advantage of the former method, since the number of available observations is limited anyway. The estimates obtained using the latter method show that the average subsidy-equivalent rate for most agencies are sensitive to the time period considered. The estimates of average subsidy-equivalent rates obtained for the period from 1981 to 1990 are higher for most agencies than the ones obtained for the period from 1984 to 1990. This difference is more significant than the one between the estimates according to the two alternative methods for the same time period. In sum, the results obtained from any one of the two methods are similar; both point to the hypothesis that the major officially supported ECAs provide their insured exporters with notable subsidies.

[38] The Pearsonian correlation coefficient is 0.99.

Table 6.3: Estimates of subsidy-equivalent rates of selected ECAs, 1981 - 1990 (interagency performance comparison)[a]

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Average 1984-90	Average 1981-90
EFIC, Australia[b]	0.3	- 0.8	- 0.7	- 0.5	1.3	- 2.3	3.8	3.8	- 0.1	- 2.0	0.3	0.6
OKB, Austria[b]	- 0.3	0.6	0.6	0.7	- 1.6	4.1	- 4.6	- 1.8	- 0.4	1.6	- 0.1	- 0.3
OND, Belgium	0.7	0.7	2.1	2.2	3.3	- 0.2	4.9	2.1	4.2	1.2	2.1	2.5
EDC, Canada[b]	0.4	- 0.6	-0.1	- 0.5	1.2	- 2.7	1.2	- 2.7	0.7	- 1.2	- 0.4	- 0.6
FGB, Finland	1.2	0.7	1.9	2.1	4.5	4.1	4.5	- 0.7	6.6	- 3.0	2.2	2.6
COFACE, France	0.6	0.8	1.0	0.1	1.0	0.6	5.2	3.5	4.4	3.3	2.0	2.6
Hermes, Germany	1.0	- 0.7	2.4	4.1	4.4	1.5	7.0	3.1	7.5	8.2	3.9	5.1
SACE, Italy	0.8	0.8	6.8	6.7	12.1	8.4	16.4	16.7	5.8	1.0	7.6	9.6
NCM, Netherlands	0.0	- 0.4	1.6	3.0	4.0	- 0.5	2.9	- 1.0	2.3	- 0.2	1.2	1.5
EXGO, New Zealand[b]	0.5	- 0.4	- 0.3	0.0	1.7	- 2.3	1.6	- 2.4	0.7	- 0.4	- 0.1	- 0.2
GIEK, Norway	0.2	11.0	15.5	8.0	5.2	8.5	8.8	6.1	5.0	5.5	7.4	6.7
CESCE, Spain	- 0.3	- 1.1	1.1	5.4	5.5	7.6	21.9	8.9	8.6	4.9	6.3	9.0
EKN, Sweden	3.5	3.5	2.7	2.0	3.5	- 0.5	4.9	- 0.4	4.1	4.8	2.8	2.6
ERG, Switzerland	2.6	6.1	4.4	2.6	9.5	4.5	18.2	4.4	6.9	3.6	6.3	7.1
ECGD, Utd. Kingd.	0.5	0.4	1.8	2.1	3.9	0.1	5.2	0.0	3.4	1.0	1.8	2.2
EXIM, United States	0.5	- 0.2	1.2	3.6	2.5	- 2.6	2.4	- 2.6	1.7	- 2.3	0.4	0.4

Source: own calculations based on data from *Euromoney* and *Trade Finance.*

(a) As a percentage of total exposure (b) Agencies representing the reference group.

Table 6.4: The relative importance of the estimated subsidy rates using the example of France and Germany

(in per cent)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
France										
s_F	0.6	0.8	1.0	0.1	1.0	0.6	5.2	3.5	4.4	3.3
ι_F	32	33	34	24	25	23	22	23	24	25
m_F	0.20	0.26	0.34	0.02	0.25	0.13	1.17	0.80	1.06	0.84
Germany										
s_G	1.0	-0.7	2.4	4.1	4.4	1.5	7.0	3.1	7.5	8.2
ι_G	9	9	8	7	6	5	5	5	4	4
m_G	0.10	-0.07	0.19	0.27	0.25	0.07	0.32	0.14	0.32	0.32

Source: own calculations based on data from *Trade Finance.*

Explanation: s_F and s_G denote the subsidy rates of COFACE of France and Hermes of Germany, ι_F and ι_G denote the share of insured exports as of total exports in France and Germany, respectively, m_F and m_G denote the subsidy rate in terms of total French and German exports.

Chapter 7: Conclusion

The analysis finds support for the hypothesis that unfavourable external financial indicators and deteriorating creditworthiness of debtor countries tend to saddle their imports with increased transaction costs, as greater use is made of more expensive financing and payment arrangements. The rise in transaction costs appears to be particularly evident in the increases in the interest rate spreads in debt instruments issued by borrowers from such countries in international capital markets. However, the price at which insurance cover was available for export credits to those countries, i.e. the premium rates for export credit insurance, from officially supported export credit agencies seemed to have varied only very little. Unfortunately, a detailed analysis of these premium rates was not feasible because of the lack of data.

We analyzed in greater detail the determination of the export credit insurance premium rates for a cross-section of developing countries by a private export credit insurer, which appeared not to have received any significant official support. The empirical results are in line with some of the implications of our theoretical premium determination concept. For example, the empirical results provide support for the hypothesis that the solvency and the liquidity indicators of a debtor country determine the premium rates applying to it. The less favourable these indicators, the higher are such premium rates. This is reflected in the results of regression analyses; specifically, the premium rates applying to debtor countries are significantly positively related to the debt-service ratio (included as a solvency indicator) and significantly negatively related to the reserves-over-imports ratio (included as a liquidity indicator) of those countries. There is some support for the hypothesis that the liquidity indicator is more important than the solvency one; the coefficients estimated for the former are greater, and significant at higher levels, than those for the latter ratio.

There is also evidence for the hypothesis that the volatility of the rate of change of the liquidity and solvency positions of debtor countries determines the premium rates for export credit insurance applying to them. This implies that the more volatile such rates

of change, the higher are the premium rates. This is reflected in positive and significant estimates of the coefficients for the (historical) volatility of the rates of change of these external financial ratios in the regressions for premium rates. The volatility of the rate of change of the liquidity indicator appears to be relatively more important than that of the solvency indicator, the estimated point elasticity with respect to the former being higher than that with respect to the latter.

If one wants to draw a policy implication from our empirical results, it is that if a country is concerned about minimizing its costs of external financing, it should aim at a smooth development of its external financial ratios. But the conceptual analysis reported in this thesis does not allow us to make suggestions about ways to achieve such smoothing, since the development of the debt-servicing capacity is taken as exogenous.

The distinction between private debt and public (and publicly guaranteed) debt is relevant when the government of a debtor country does not extend guarantees for parts of the private external debt and gives priority to the servicing of the public or publicly guaranteed debt over the private debt if the total external debt service obligations of the country cannot be met in full. Provided that the government has control over all foreign exchange transactions, it can exert discretion over debt-servicing flows and direct foreign exchange reserves, giving priority to the servicing of the public and publicly guaranteed debt over the servicing of private debt. Under these circumstances private debt is more expensive than public debt. The costs of issuing private debt rise both with an increasing stock of private debt and with an increasing stock of public debt, but those of issuing public debt rise only with an increasing stock of public debt. If additional assumptions are introduced in the form of inefficiency losses on public debt, meaning that public activity reduces the country's debt-servicing capacity, and in the form of the higher default costs generally associated with private debt than with public debt, the costs of a country's external financing may be a non-monotonic and discontinuous function of the share of public debt in total external debt. For example, as long as the debtor country's debt-servicing capacity is high compared to its contractual debt service, the minimum of the external financing costs may be obtained when all external debt is private. The reason is that default is fairly unlikely in this situation, so that the expected high costs associated

with private debt defaults are given only a small probability weighting by the country's creditors; on the other hand, the efficiency losses from the financing of government debt occur immediately and are positive even at the margin. If the debt-servicing capacity is relatively low, the cost-minimizing share of public debt in total external debt may well be much higher, since raising the government's debt share reduces the expected default costs associated with the private debt of the country which - at a low level of debt-servicing capacity - is a factor to reckon with.

The conceptual analysis of export credit insurance is based on the idea that the premium rates should match the present discounted value of the expected loss associated with the transaction, i.e. the concept is based on the idea of the "fair" premium rate. This concept may be used by an ECA which wants to calculate risk-based credit insurance benchmark premium rates. It can be applied to each individual country destination on a consistent basis, and the actual premia calculation can be done on a routine basis using standard software packages such as SAS. The concept can be extended further. It may take into account the differences in the probability of return and the recoveries in default between private debt, on the one hand, and public and publicly guaranteed debt, on the other.

However, in the practice of the major officially supported export credit guarantee agencies such expected losses appear *not* to determine the premium rates that are actually applied. There is evidence for the hypothesis that the premium rates are often lower than the discounted expected net losses associated with the insurance, i.e. that their export credit insurances are provided at subsidized rates. For example, as Daniel Bond, the vice-president and chief economist of the United States Eximbank puts it in his report about the estimation of the subsidy element in Eximbank's insurance activity, "until recently no attempt was made to explicitly estimate the potential magnitude of such losses for each transaction. Rather the fee structure was designed so that Eximbank fees would be highly competitive with the fees charged by other export credit agencies" (Bond (1992, p.2)). While other types of subsidies in international trade and trade financing have been deemed to be unfair measures of export promotion for a long time, this type of subsidy has not been an issue in international fora until recently. The reason may be a failure of

recognition or the apparent problems associated with the subsidy's measurement. In his above mentioned report, Daniel Bond explains one approach to the measurement of the subsidy element in export credit insurance. It is based on the idea of using as reference rates the risk premia that can be observed on the markets for other debt instruments, such as the spreads in international bond issues. The underlying hypothesis is that these spreads reflect the perception of the risk associated with the bond-issuing country.[1] However, there are several limitations to this concept, of which we would like to single out for special attention that it cannot be applied to all debtor countries on a consistent basis. A large number of countries for which exporters seek an export credit insurance have not issued any bonds.

Our concept of fair premium rates provides another approach to measuring the subsidy element in any individual insurance contract. If the country-specific (risk-based) benchmark premia were subtracted from the premia that are actually applied by any officially supported ECA to those countries, it would be possible to obtain estimates of the subsidy elements in the transactions with each of these countries. Unfortunately, data on the premium rates that were actually applied by the different ECAs to individual country destinations and on the debtor country-specific losses, exports insured, etc. were not available. Therefore, the subsidies provided by these agencies were estimated on the basis of their annual net cash-flow results. Two methods were used, one by Abraham (1990) and our own method, and the results obtained from them were broadly similar. They seem to justify the hypothesis that most of the major officially supported ECAs provide their exporters with considerable subsidies.

One specific justification for the provision of subsidies in export credit insurance is that they reduce the costs of import financing by debtor countries in adverse external financial situations - in accordance with the view that importers cannot lose from accepting export credit subsidies (Fleisig and Hill (1983)). This argument indeed holds under perfect, but not under, imperfect competition. In the latter case, and if account is

[1] It should be noted that this concept is valid only if markets are information-efficient. Furthermore, it requires that the risks associated with export credits and Eurobonds are similar because otherwise the two types of risk premia would not be comparable.

taken of the institutional circumstances under which export credit insurance cover is provided, such subsidization may harm rather than benefit the importing country. The reason is that the subsidization of exporters, from one or from many exporting countries, may relax the price competition between exporters on the market of the importing country (Carmichael (1987), Gruenspecht (1988)).

List of symbols

Chapter 2:

B_t = price in period t of defaultable bond with face value one

b_t = interest rate on defaultable bonds in period t

C_t = consumption in period t

D_t = stock of debt in period t

D_t^X = exceptional financing in period t

DS_t/X_t = debt-service ratio in period t

I_t = foreign exchange spending on imports in period t

F_t = number of default-free foreign securities purchased in period t

KB_t = balance of capital transactions in period t

LB_t = current account balance in period t

N_t = number of bonds issued abroad in period t

NT_t = net transfer in period t

R = price of foreign securities

r = interest rate on default-free foreign securities

X_t = foreign exchange earnings from exports in period t

Chapter 3:

b = nominal yield of defaultable debt instruments

β = social preference rate

C_t = consumption in period t

D = total nominal value of debt instruments issued

D^C = debt ceiling

γ = default penalty parameter

I = investment

I^C = investment ceiling

ι = rate of return on investment

π = probability of default (in period t + 1, viewed from period t)

r = interest rate on default-free debt instrument

$\tilde{r}$ = stochastic return on a debt instrument

$U(\cdot)$ = utility from consumption

X_t = endowment of transferable resources in period t

$\tilde{X}$ = stochastic resource endowment

Chapter 4:

A_t = actual debt service in period t

B_t = price (value) of risky (i.e. defaultable) claim in period t

b_t = interest rate of risky (i.e. defaultable) claim in period t

D_t = contractual debt service in period t

E_t = expectational operator, i.e. expectation conditional on the information available in period t

p_t = price (value) of insurance of one risky claim in period t

P_t = price (value) of insurance of risky outstanding debt in period t

N_t = number of claims issued at time t

r = interest rate of risk-less claim

R = price (value) of risk-less claim

W_t = Wiener process

K_t = debt-servicing capacity in period t

μ = trend growth rate of K_t

π_t = probability of default in period t + 1, viewed from period t

σ^2 = volatility of rate of changes in K_t

$\Phi(\cdot)$ = standard normal distribution function

Chapter 5:

A_t = actual debt-service (payments) in period t

A^F_t = actual debt-service (payments) on public bonds in period t

A^G_t = actual debt-service (payments) on private bonds in period t

a^F_t = pay-off per public external bond in period t

a^G_t = pay-off per private external bond in period t

F_t = stock of private external debt (zero-coupon bonds with face value one) in period t

G_t = stock of public external debt (zero-coupon bonds with face value one) in period t

R = price of risk-less bond

s^{Avg}_t = spread of a (synthetical) average bond in period t

s^F_t = spread of a private external bond in period t

s^G_t = spread of a public external bond in period t

Z^{Avg}_t = average value (price) of external bonds in period t

Z^F_t = value (price) of a private external bond in period t

Z^G_t = value (price) of a public external bond in period t

z^F_t = nominal yield of private external bonds in period t

z^G_t = nominal yield of public external bonds in period t

ζ = public debt inefficiency parameter

K_t = debt-servicing capacity in period t

μ = trend growth rate of K_t

σ^2 = volatility of rate of changes in K_t

$\Phi(\cdot)$ = standard normal distribution function

ω = share of public in total external debt

Chapter 6:

C_t = total claims in period t

p_t = actuarially fair premium in period t

$\tilde{p}_t$ = estimated actuarially fair premium in period t

R_t = recoveries in period t

$\tilde{s}_t$ = estimated subsidy-equivalent rate

V_t = insured volume in period t

δ = opportunity costs of public funds

Bibliography

Abraham, F., *The Effects on Intra-Community Competition of Export Subsidies to Third Countries: The Case of Export Credits, Export Insurance and Official Development Assistance*, Document prepared for the Commission of European Communities, Office for Official Publications of the European Communities, Luxembourg 1990.

Aizenman, J., "Investment, Openness and Country Risk", *IMF Working Paper* WP/87/72, October 1987.

Aizenman, J., "Trade Dependency, Bargaining and External Debt", August 1988, mimeo.

Aizenman, J., "Inward Versus Outward Growth Orientation in the Presence of Country Risk", *Economica*, February 1991.

Altmann, F., and H. Clement, *Die Kompensation als Instrument im Ost-West Handel*, München, 1979.

AMEX, "International Debt - Banks and the LDCs", *The Amex Bank Review Special Papers* 10, March 1984.

Applegate, C., "An External Cost Arising from Private Sector Foreign Debt", *The Australian National University Working Papers in Economics and Econometrics* 245, August 1992.

Armendariz de Aghion, B. and F. Ferreira, "The World Bank and the Analysis of the International Debt Crisis", *STICERD Development Economics Research Program Paper* 51, November 1993.

Arndt, S.W. and J.D. Richardson (eds.), *Real-Financial Linkages Among Open Economies*, Cambridge, Massachusetts 1987.

Arnott, R. and J.E. Stiglitz, "The Welfare Economics of Moral Hazard", *Queens University Discussion Paper* 635, 1986.

Avramovic, D., *Economic Growth and External Debt*, Baltimore 1964.

Bäcker, A., "Country Balance Sheet Data versus Traditional Macro Variables in a Logit Model to Predict Debt Rescheduling", *Economic Letters* 38, 1992, pp.207-212.

Bäcker, A. and M. Klein, "Länderrisiko und Schuldendienstkapazität", *Discussion Paper*, University of Halle, April 1993.

Bäcker, A. and M. Klein, "Bonitätspräfung bei Länderrisiken - Ein Fallbeispiel", *Discussion Paper*, University of Halle, October 1993.

Balimo, J.S., "Countertrade: Praxis, Theorie und Perspektiven", *Beiträge zur Wirtschafts- und Sozialpolitik* 161(4), 1988.

Bank for International Settlements/Organisation for Economic Cooperation and Development, *Statistics on External Indebtedness: Bank and Trade-related Non-bank External Claims on Individual Borrowing Countries and Territories*, Paris, semi-annual publication, various issues.

Bank for International Settlements (BIS), *International Banking and Financial Market Developments*, Basle, semi-annual, various issues (a).

BIS, *The Maturity and Sectoral Distribution of International Bank Lending*, semi-annual, various issues (b).

Baron, D.P., "Fluctuating Exchange Rates and the Pricing of Exports", *Economic Inquiry* 14, 1976, pp.425-438.

Bartolini, L. and Dixit, A., "Market Valuation of Illiquid Debt and Implications for Conflicts Among Creditors", *IMF Staff Papers* 38(4), December 1991.

Bates, P.S. and K.G. Saini, "A Survey of the Quantitative Approaches to Country Risk Analysis", *Journal of Banking and Finance* 8, 1984, pp.341-356.

Batliwalla, C.J., I.N. Mukherji, V.R. Panchamukhi, V.L. Rao, K.C. Reddy and P. Thomas, *Export Financing in India*, Interest Publications, New Delhi 1991.

Baumann, R. and H.C. Braga, "Export Financing in LDCs: The Role of Subsidies for Export Performance in Brazil", *World Development* 16(7), 1981, pp.821-833.

Baxmann, U., "Zur Bewertung risikobehafteter Auslandsforderungen mittels Sekundärmarktpreisen", *Zeitschrift für Betriebswirtschaftslehre* 5/6, 1990, pp.497-522.

Becker, G.S., "A Theory of Competition Among Pressure Groups for Political Influence", *The Quarterly Journal of Economics* 98 (3), August 1983, pp.371-400.

Beltratti, A., "Empirical Estimates of the Capacity to Repay a Foreign Debt: A Vector Autoregressive Methodology", in: O'Neill (ed.), 1990, pp.45-59.

Berg, A., and J. Sachs, "Debt Crisis: Structural Explanations of Country Performance", *NBER Working Paper* 2607, New York 1988.

Berne Union, "International Union of Credit and Investment Insurers", (Report of Activities), February 1988.

Berthélemy, J.C. and E. Girardin, "Crise de la Dette et Nouvelles Stratégies Financières", *DELTA Document de travail* 90(16), November 1990.

Black, F., "The Pricing of Commodity Contracts", *Journal of Financial Economics* 3, January - March 1976, pp.24-28.

Black, F. and Scholes, M., "The Pricing of Options and Corporate Liabilities", *Journal of Political Economy* 81, 1973, pp.637-654.

Böhm-Bawerk, E.von, *Capital und Capitalzins - Geschichte und Kritik der Capitalzins-Theorien*, Zweite Auflage, Innsbruck, 1900.

Boehmer, E. and W. Megginson, "Determinants of Secondary Market Prices for Developing Country Syndicated Loans, *Journal of Finance* 45(5), 1990, pp.1517-1540.

Bolz, K., U. Harms, P. Pissula, and H. Schmidt, *Gold, Platin und Edelmetalle in der sowjetischen Handelspolitik*, Hamburg 1985.

Bond, D.L., "From Ordinal to Cardinal Measures of Country Risk", paper presented at the Berne Union Workshop on Country Underwriting and Treatment of Sovereign Risk, held in Cape Town, South Africa, 13-16 April 1992.

Borenzstein, E. and G. Panacchi, "Valuing Interest Payment Guarantees on Developing Country Debt", *IMF Working Paper* WP/90/18, 1990.

Boulakia, J.D., "Ibn Khaldun: A 14th-century Economist", *Journal of Political Economy* 79, 1971, pp.1105-1118.

Boyd, J.H., "Eximbank Lending: A Federal Program That Costs Too Much", *Federal Reserve Bank of Minneapolis Quarterly Review*, Winter 1982, pp.1-17.

Brada, J.C., E.A. Hewett, and T.A. Wolf (eds.), *Economic Adjustment and Reform in Eastern Europe and the Soviet Union. Essays in Honor of Franklyn D. Holzman.* Duke University Press, Durham, NC, 1988.

Brander, J. A. and B. Spencer, "Export Subsidies and International Market Share Rivalry", *Journal of International Economics* 18, 1985, pp.83-100.

Briggs, D. and B. Edwards, *Credit Insurance - How to Reduce the Risks of Trade Credit*, Woodhead-Faulkner, Cambridge 1988.

Brooke, M.Z. and P.J. Buckley, *Handbook of International Trade*, Chippenham, Wilts., 1988.

Bulow, J. and K. Rogoff, "The Buyback Boondoggle", *Brookings Papers on Economic Activity* 2, Brookings Institution, Washington, 1988(a).

Bulow, J. and K. Rogoff, "Multilateral Sovereign Debt Reschedulings", *IMF Staff Papers* 35, 1988(b), pp.644-57.

Bulow, J. and K. Rogoff, "A Constant Recontracting Model of Sovereign Debt", *Journal of Political Economy* 97(1), February 1989(a), pp.155-178.

Bulow, J. and K. Rogoff, "Is to Forgive to Forget?", *American Economic Review* 79 (1), March 1989(b), pp.43-50.

Bulow, J. and K. Rogoff, "Multilateral Negotiations for Rescheduling Developing Country Debt - A Bargaining-Theoretic Framework", in: Frenkel et al., 1989, pp. 195-207.

Bulow, J. and K. Rogoff, "Sovereign Debt Repurchases: No Cure for Overhang", *LSE Financial Markets Group Discussion Paper Series*, August 1990.

Bulow, J.I. and J.B. Shoven, "The Bankruptcy Decision", *Bell Journal of Economics* 9(2), Autumn 1978, pp.437-456.

Calvo, G., "A Delicate Equilibrium: Debt Relief and Default Penalties in an International Context", *IMF Working Paper* WP/89/10, January 1989.

Calvo, G., "Servicing the Public Debt: The Role of Expectations", *American Economic Review*, September 1988, pp.647-661.

Calvo, G., R. Findlay, P. Kouri and J. B. de Macedo (eds.), "Debt, Stabilization and Development", Cambridge Massachusettes 1989.

Carmichael, C. M., "The Control of Export Credit Subsidies and its Welfare Consequences", *Journal of International Economics* 23, 1987, pp.1-19.

Chang, R., "Private Investment and Sovereign Debt Negotiations", *New York University C.V. Starr Center for Applied Economics Research Reports* 91(47), September 1991.

Cho, I. and D.M. Krebs, "Signalling Games and Stable Equilibria", *Quarterly Journal of Economics* 102, May 1987, pp.179-222.

Claessens, S. and S.von Wijnbergen, "Secondary Market Prices Under Alternative Debt Reduction Strategies: An Option Pricing Approach with an Application to Mexico", *CEPR Discussion Paper* 415, April 1990.

Clark, E.A., *Cross-Border Investment Risk*, Euromoney Books, London 1991.

Cloes, R., *Das Länderrisiko bei internationalen Kapitalbewegungen - Analysekonzepte und Bewältigungsstrategien*, Cologne 1988.

Cohen, D., "How to Evaluate the Solvency of an Indebted Nation?", *Economic Policy* 1, 1985, pp.139-156.

Cohen, D., "A Valuation Formula for LDC Debt", *CEPR Discussion Paper* 460, September 1990.

Cohen, D., "The Solvency of Eastern Europe", *CEPR Discussion Paper* 539, March 1991 (a).

Cohen, D., *Private Lending to Sovereign States: A Theoretical Autopsy*, MIT Press Cambridge Massachusettes 1991(b).

Cohen, D. and R. Portes, "The Price of LDC Debt", *CEPR Discussion Paper Series* 459, September 1990.

Cohen, D. and J. Sachs, "LDC Borrowing with Default Risk", *Kredit und Kapital*, Special Issue on International Banking 8, 1984, pp.211-235.

Cohen, D. and J. Sachs, "Growth and External Debt Under Risk of Repudiation", *European Economic Review* 30, 1986, pp.529-560.

Cohen, D. and T. Verdier, "Secret "Buybacks" of LDC Debt", *DELTA Document* 91(18), May 1990.

Cole, H.L., Dow, J. and W.B. English, "Default, Settlement and Signalling: Lending Resumption in a Reputational Model of Sovereign Debt, mimeo, Institute of Finance and Accounting, London Business School, December 1989.

Commission of the European Communities, *PHARE "Progress Report on G-24 Assistance to Central and Eastern Europe"*, Brussels, 1991.

Cottarelli, C. and M. Mecagni, "The Risk Premium on Italian Government Debt, 1976-88", *IMF Working Paper* WP/90/38, April 1990.

Cox, J.C. and S.A. Ross, "A Survey of Some New Results in Financial Option Pricing Theory, *The Journal of Finance* 31(2), May 1976, pp.383-402.

Cushman, D.O., "The Effects of Real Exchange Rate Risk on International Trade", *Journal of International Economics* 15, 1983, pp.45-63.

Cushman, D. O., "Has Exchange Risk Depressed International Trade? The Impact of Third-Country Exchange Risk", *Journal of International Money and Finance* 5, 1986, pp.361-379.

Deaton, A., "Data and Econometric Tools for Development Economics", Research Program in Development Studies, Princeton University, Draft, October 1992.

De Grauwe, P., "Exchange Rate Variability and the Slowdown in Growth of International Trade", *IMF Staff Papers* 135, 1988, pp.63-84.

Delamaide, D., *Debt Shock - The Full Story of the World Credit Crisis* (chapter 4: The Umbrella Myth), New York, 1984.

Diamond, D., "Reputation Acquisition in Debt Markets", *Journal of Political Economy* 97(4), 1989, pp.828-862.

Diamond, D. and P.E. Dybvig, "Bank Runs, Deposit Insurance, and Liquidity", *Journal of Political Economy* 91(3), June 1983, pp.401-409.

Díaz-Alejandro, "Good-Bye Financial Repression, Hello Financial Crash", *Journal of Development Economics* 19 (1/2), September/October 1985, pp.1-24.

Diwan, I. and T. Verdier, "External Adjustment Generate Domestic Conflicts", *DELTA Document* 91(20), March 1991.

Dixit, A., "International Trade Policy for Oligopolistic Industries", *Supplement to the Economic Journal* 94, 1984, pp.1-16.

Dixit, A., "Trade and Insurance with Moral Hazard", *Journal of International Economics* 23, 1987, pp.201-220.

Dixit, A., "Anti-Dumping and Countervailing Duties under Oligopoly", *European Economic Review* 32, 1988, pp.55-68.

Dixit, A., "Trade and Insurance with Adverse Selection", *Review of Economic Studies* 56, 1989(a), pp.235-248.

Dixit, A., "Trade and Insurance with Imperfectly Observed Outcomes", *Quarterly Journal of Economics*, 1989(b), pp.195-203.

Dixit, A., "A Simplified Treatment of the Theory of Optimal Regulation of Brownian Motion", *Journal of Economic Dynamics and Control* 15, 1991, pp.657-673.

Dixit, A., "The Art of Smooth Pasting", Handout to "Topics in Economic Analysis" lectures at London School of Economics, Michaelmas term, June 1992.

Dommen, E., "Lightening the Debt Burden - Some Sidelights from History", *UNCTAD Review* 1(1), 1989, pp.75-82.

Dooley, M.P., "Market Valuation of External Debt", in: Frenkel et al., 1989, pp.75-82.

Dooley, M.P., "Buy-Backs, Debt-Equity Swaps, Asset Exchanges, and Market Prices of External Debt", in: Frenkel et al., 1989, pp.130-150.

Dooley, M.P., D. Folkerts-Landau, S.A. Symansky, and R.W. Tyron, "Debt Reduction and Economic Activity", *IMF Occasional Paper* 68, March 1990.

Dooley, M. and M.R. Stone, "Endogenous Creditor Seniority and External Debt Values", *IMF Working Paper* WP/92/57, July 1992.

Dornbusch, R., "Exchange Rates and Prices", *The American Economic Review* 77, 1987, pp.93-106.

Duffie, D., *Security Markets*, Boston, Academic Press, 1988.

Dunford, C. (ed.), *The Handbook of International Trade Finance*, Cambridge, 1991.

Dunn, A. and M. Knight, *Export Finance*, Euromoney Publications, London, 1982.

Eaton, J., "Public Debt Guarantees and Private Capital Flight", *World Bank Economic Review* 1 (3), 1987, pp.377-395.

Eaton, J., "Credit Policy and International Competition", in Krugman (ed.), 1989, pp.115-145.

Eaton, J., "Sovereign Debt, Reputation and Credit Terms", *NBER Working Paper Series* 3424, August 1990.

Eaton, J., "Sovereign Debt: A Primer", *World Bank Economic Review* 7(2), May 1993, pp.137-172.

Eaton, J. and M. Engers, "Sanctions", *Journal of Political Economy* 100, pp. 899-928.

Eaton, J. and M. Gersovitz, "LDC Participation in International Financial Markets: Debt and Reserves", *Journal of Development Economics* 7, 1980, pp.3-21.

Eaton, J. and M. Gersovitz, "Debt with Potential Repudiation: Theoretical and Empirical Analysis", *Review of Economic Studies* 48, 1981(a), pp.289-309.

Eaton, J. and M. Gersovitz, "Poor-Country Borrowing in Private Financial Markets and the Repudiation Issue", *Princeton Studies in International Finance* 47, June 1981(c).

Eaton, J. and M. Gersovitz, "Country Risk and the Organization of International Capital Transfer", in: Calvo et. al. (eds.) 1989, pp.109-130.

Eaton, J., M. Gersovitz, and J.E. Stiglitz, "The Pure Theory of Country Risk", *European Economic Review* 30, June 1986, pp. 481-513.

Eaton, J. and G.M. Grossmann, "Optimal Trade and Industrial Policy Under Oligopoly", *Quarterly Journal of Economics* 101(2), May 1986, pp.383-406.

Edwards, S., "LDC Foreign Borrowing and Default Risk: An Empirical Investigation", 1976-80, *American Economic Review* 74, 1984, pp.726-734.

Edwards, S., "The Pricing of Bonds and Bank Loans in International Markets - An Empirical Analysis of Developing Countries' Foreign Borrowing", *European Economic Review* 30, 1986, pp.54-589.

Eichengreen, B. and R. Portes, "Settling Defaults in the Era of Bond Finance", *Birkbeck College Discussion Papers in Economics* 88(8), June 1988(a).

Eichengreen, B. and R. Portes, "Foreign Lending in the Interwar Years: The Bondholders' Perspective", *Birkbeck College Discussion Papers in Economics* 88(11), June 1988(b).

Eichengreen, B. and R. Portes, "Dealing with Debt: The 1930s and the 1980s", in: Husain and Diwan (eds.), 1989, pp.69-88.

Eichengreen, B. and R. Portes, "After the Deluge: Default, Negotiation and Readjustment in the Interwar Years", in: *The International Debt Crisis in Historical Perspective*, edited by Barry Eichengreen and Peter Lindert, MIT Press, 1990(b).

Eichler, Gabriel, "A Banker's Perspective on Poland's Debt Problem", in: Marer P. and W. Siwiński (eds.), 1988, pp.201-214.

Euromoney, *The Guide to Export Finance*, Euromoney Publications, London 1986 and 1990.

Euromoney Trade Finance, monthly publication, various issues.

Feder, G. and R.E. Just, "A Study of Debt Servicing Capacity Applying Logit Analysis", *Journal of Development Economics* 4, 1977(a), pp. 25-38.

Feder, G. and R.E. Just, "An Analysis of Credit Terms in the Eurodollar Market", *European Economic Review* 9, 1977(b), pp.221-243.

Feder, G. and R.E. Just, "A Model for Analysing Lenders' Perceived Risk", *Applied Economics* 12, 1980, pp.125-144.

Feder, G., R.E. Just, and K. Ross, "Projecting Debt Servicing Capacity of Developing Countries", *Journal of Financial and Quantitative Analysis* 16 (5), December 1981, pp.651-669.

Feder, G. and K. Ross, "Risk Assessment and Risk Premiums in the Eurodollar Market", *Journal of Finance* 37(3), June 1982, pp. 679-691.

Feinberg, R.E., *Subsidizing Success - The Export-Import Bank in the U.S. Economy*, Cambridge University Press, Cambridge 1982.

Feldmann, H., *Internationale c im 19. und 20. Jahrhundert - Eine Analyse ihrer Ursachen, Techniken und Grundprinzipien*, Duncker und Humblot, Berlin 1991.

Financial Market Trends, see OECD.

Fisher, L., "Determinants of Risk Premiums on Corporate Bonds", *The Journal of Political Economy* 67, June 1959, pp.217-237.

Fleisig, H. and C. Hill, "The Benefits and Costs of Official Export Credit Programs of Industrialized Countries: An Analysis", *Staff Working Paper* 659, World Bank, 1984.

Folkerts-Landau, D., "The Changing Role of International Bank Lending in Development Finance", *IMF Staff Papers* 32(2), June 1985, pp.317-363.

Frenkel, J., "International Liquidity and Monetary Control", Working paper 1118, National Bureau of Economic Research, May 1983.

Frenkel, J.A., M.P. Dooley and P. Wickham (eds.), *Analytical Issues in Debt*, IMF, Washington, 1989.

Froot, K.A., D.S. Scharfstein, and J.C. Stein, "LDC Debt: Forgiveness, Indexation, and Investment Incentives", *Journal of Finance* 44(5), December 1989, pp.1335-1350.

Fuss, W., *Finanzierungen im Ost-West-Geschäft - Fakten, Formen, Risiken*, Frankfurt/M., 1979.

Gabrisch, H., "Gegengeschäfte im Ost-West Handel", *Osteuropa-Wirtschaft* 31(3), 1986, pp.171-187.

Gabrisch, H., and J. Stankovsky, "Special Forms of East-West Trade", *Soviet and Eastern European Foreign Trade* 25(1), 1989, and 25(2), spring and summer 1989.

Galiani, F., "Della Moneta" (1750), in: *Ferdinando Galiani - Opere*, F. Diaz and L. Guerci (eds.), Milan/Naples 1975, pp.1-314.

Genotte, G., H. Kharas, and S. Sadeq, "A Valuation Model for Developing Country Debt", *World Bank Economic Review* 1(2), 1987, pp.169-176.

Godfrey, L.G. and M.H. Pesaran, "Tests of Non-Nested Regression Models: Small Sample Adjustments and Monte Carlo Evidence", *Journal of Econometrics* 21, 1983, pp.133-154.

Gottlieb, D., "On the Determinants of a Country's Creditworthiness - The Case of Israel: 1971 -1983", *IMF Working Paper* WP/87/82, December 1987.

Gotur, P., "Effects of Exchange Rate Volatility on Trade: Some Further Evidence", *IMF Staff Papers*, 32, 1985, pp.415-512.

Griffith-Jones, S., "Creditor Countries' Banking Regulations and Third World Debt: The Technical, Political and Institutional Issues", *UNCTAD Review* 3, January 1992, pp.1-14.

Grossman, H.I. and J.B. Van Huyck, "Sovereign Debt as a Contingent Claim: Excusable Default, Repudiation, and Reputation", *American Economic Review* 78(5), December 1988, pp.1088-1097.

Group of Thirty, "The Outlook for International Bank Lending", Study group report, New York 1981.

Gruenspecht, H.K. (1988) "Export Subsidies for Differentiated Products", *Journal of International Economics* 24, pp.331-344.

Guttentag, J.M. and R. Herring, "Commercial Bank Lending to Developing Countries: From Overlending to Underlending to Structural Reform", in: *International Debt and the Developing Countries*, G. W. Smith and J.T. Cuddington (eds.), The World Bank, 1985.

Gwiadzda, A., "The Revival of Countertrade in East-West Economic Cooperation", *World Competition - Law and Economics Review*, 13(3), March, 1990.

Hannan, T.H. and G.A. Hanweck, "Bank Insolvency Risk and the Market for Large Certificates of Deposit", *Journal of Money, Credit and Banking* 20(2), May 1988, pp.203-211.

Heffernan, S.A., *Sovereign Risk Analysis*, Unwin Hyman, London, 1988.

Heffernan, S.A., "Country Risk Analysis: The Demand and Supply of Sovereign Loans", *Journal Of International Money and Finance*, 1985, pp.389-413.

Hellwig, M.F., "Recent Developments in the Theory of Competition in Markets with Adverse Selection", *Discussion Paper*, Bonn University, 1986.

Helpman, E., "The Simple Analytics of Debt-Equity Swaps", *American Economic Review* 79(3), June 1989(a), pp.440-451.

Helpman, E., "Voluntary Debt Reduction: 'Incentives and Welfare' ", in: Frenkel et al., 1989(b), pp.279-309.

Helpman, E. and A. Razin (eds.), *International Trade Policy*, 1989.

Henriet, D. and J.-C. Rochet, "Équilibres et optima sur les marchés d'assurance: une illustration des phénomènes d'antisélection", in: *Essais en l'honneur de E. Malinvaud*, 1988.

Hooper, P. and S. Kohlhagen, "The Effect of Exchange Rate Uncertainty on the Prices and Volume of International Trade", *Journal of International Economics* 8, 1978, pp.483-511.

Husain, I. and I. Diwan (eds.), "Dealing with the Debt Crisis", The World Bank, Washington 1989.

International Monetary Fund (IMF), *Exchange Arrangements and Exchange Restrictions*, annual reports, various issues.

IMF, *International Capital Markets - Developments, Prospects, and Policy Issues*, various issues.

IMF, "Private Market Financing for Developing Countries", *IMF World Economic and Financial Surveys*, Washington, December 1992.

IMF, *International Capital Markets, Part II - Systemic Issues in International Finance*, Washington, August 1993.

IMF, *International Financial Statistics*, various issues.

James, C., "Some Evidence on the Uniqueness of Bank Loans", *Journal of Financial Economics* 19, 1987, pp.217-235.

James, C., "Empirical Evidence on Implicit Government Guarantees of Bank Foreign Loan Exposure", *Carnegie-Rochester Conference Series on Public Policy* 30, Spring 1989, pp. 129-160.

Johnson, G.G., M. Fisher, and E. Harris, "Officially Supported Export Credits - Developments and Prospects", *IMF World Economic and Financial Survey*, May 1990.

Judge, G.G., W.E. Griffiths, R.C. Hill, H. Lütkepohl, and L. Tsoung-Chao, *The Theory and Practice of Econometrics*, Second edition, New York 1985.

Kaletsky, A., *The Costs of Default*, A Twentieth Century Fund Paper, Priority Press Publications, 1985.

Kane, E.J., *The Gathering Crisis in Federal Deposit Insurance*, MIT Press, 1985.

Kareken, J.H. and N. Wallace, "Deposit Insurance and Bank Regulation: A Partial-Equilibrium Exposition", *Journal of Business* 51(3), 1978, pp.413-438.

Katz, E., J. Paroush and N. Kahana, "Price Uncertainty and the Price Discriminating Firm in International Trade", *International Economic Review* 23, 1982, pp.389-400.

Kenen, P. B., "Organizing Debt Relief: The Need for a New Institution", *Journal of Economic Perspective* 4(1), Winter 1990, pp.7-18.

Kharas, H., "The Long-Run Creditworthiness of Developing Countries: Theory and Practice", *Quarterly Journal of Economics* 99, 1984, pp.415-439.

Kindleberger, C.P., *Maniacs, Panics and Crashes - A History of Financial Crises*, Macmillan Press, London 1978.

Klein, M., "Bewertung von Länderrisiken durch Optionspreismethoden", *Kredit und Kapital*, 24(4), 1991(a), pp. 484-507.

Klein, M., *Bewertung von Länderrisiken*, Wissenschaftliche Arbeit zur Erlangung der Promotion, Rheinische Friedrich-Wilhelms Universität Bonn, 1991(b).

Klein, M., *Bewertung von Länderrisiken* (forthcoming), Duncker & Humblot, Berlin 1994.

Kletzer, K.M., "Asymmetries of Information and LDC Borrowing with Sovereign Risk", *The Economic Journal*, June 1984, pp.287-307.

Knetter, M., "Price Discrimination by U.S. and German Exporters", *The American Economic Review* 79(1), March 1989, pp.198-210.

Köglmayr, H.-G., "Erfassung und Handhabung von Länderrisiken", *Wissenschaftliches Studium* 4, April 1986, pp.211-214.

Köglmayr, H.-G. und S. Müller, "Bewertung von Länderrisiken", *Die Bank* 7, 1987, pp.378-384.

Krayenbuehl, T.E., *Country Risk*, Lexington Books, 1985.

Krugman, P.R., "International Debt Strategies in an Uncertain World", in: *International Debt and the Developing Countries,* G. W. Smith and J.T. Cuddington (eds.), 1985.

Krugman, P.R., "Pricing to Market When the Exchange Rate Changes", in: Arndt and Richardson (eds.), 1987, pp.49-70.

Krugman, P.R., "Financing versus Forgiving a Debt Overhang", *Journal of Development Economics* 29, pp.253-268.

Krugman, P.R., *Strategic Trade Policy and the New International Economics* (ed.), MIT Press, Cambridge Mass., 1989.

Kuhn, M.G. and J.P. Guzman, "Multilateral Official Debt Rescheduling - Recent Experience", *IMF World Economic and Financial Surveys*, November 1990.

Lee, S.H., "Are the Credit Ratings Assigned by Bankers Based on the Willingness of LDC Borrowers to Repay?", *Journal of Development Economics* 40, 1993, pp.349-359.

Leland, H.E. and D.H. Pyle, "Informational Asymmetries, Financial Structure and Financial Intermediation", *Journal of Finance* 32(2), May 1977, pp.371-387.

Lewis, M.K. and K.T. Davis, *Domestic and International Banking*, The MIT Press, 1987.

Lloyd-Ellis, G.W., G.W. McKenzie, and S.H. Thomas, "Using Country Balance Sheet Data to Predict Debt Rescheduling", *Economic Letters* 31, 1989, pp.173-177.

Lloyd-Ellis, G.W., G.W. McKenzie, and S.H. Thomas, "Predicting the Quantity of LDC Debt Rescheduling", *Economic Letters* 32, 1990, pp.67-73.

Lomax, D.F., *The Developing Country Debt Crisis*, MacMillan Press, London 1987.

Lummer, S.L. and J.J. McConnell, "Further Evidence on the Bank Lending Process and the Capital Market Response to Bank Loan Agreements", *Journal of Financial Economics*, 25, 1989, pp.99-122.

Maddala, G.S., *Limited-Dependent and Qualitative Variables in Econometrics*, Cambridge University Press, 1983.

Mann, C.L., "The Effects of Exchange Rate Trends and Volatility on Export Prices: Industry Examples from Japan, Germany, and the United States", in: *Weltwirtschaftliches Archiv,* 1989.

Marcus, A.J. and I. Shaked, "The Valuation of FDIC Deposit Insurance Using Option-pricing Estimates", *Journal of Money, Credit, and Banking* 16(4), November 1984.

Marer, P. and W. Siwiński (eds.), "Creditworthiness and Reform in Poland - Western and Polish Perspectives", Indiana University Press 1988.

McDonald, D., "Debt Capacity and Developing Country Borrowing", *IMF Staff Papers*, December 1982, pp.603-646.

Melitz, J. and P. Messerlin, "Export Credit Subsidies", *Economic Policy* 4, April 1987, pp.150-175.

Melvin, M.T. and D. Schlagenhauf, "Risk in International Lending: A Dynamic Factor Analysis Applied to France and Mexico", *Journal of International Money and Finance* 5, 1986, pp.31-48.

Mendenhall, W., R.L. Schaeffer, and D.D. Wackerly, *Mathematical Statistics with Applications*, third edition, Duxbury Press, Boston 1986.

Merton, R.C., "Theory of Rational Option Pricing", *Bell Journal of Economics and Management Science*, 1973, pp.141-183.

Merton, R.C., "An Analytic Derivation of the Cost of Deposit Insurance and Loan Guarantees", *Journal of Banking and Finance* 1, 1977, pp.3-11.

Merton, R.C., *Continuous-time Finance*, revised edition, Cambridge 1992.

Meyer, M., "Was taugen Länderrisikokonzepte?", *Harvard-Manager* 3, 1987, pp.64-73.

Mills, R.H., "Foreign Lending by Banks: A Guide to International and U.S. Statistics", *Federal Reserve Bulletin*, October 1986, pp.683-694.

Minsky, H.P., *Inflation, Recession and Economic Policy*, Wheatsheaf Books, London 1982.

Minsky, H.P., *Stabilizing an Unstable Economy*, A Twentieth Century Fund Report, Yale University Press, New Haven 1986.

Neary, P., "Export Subsidies and National Welfare", *Empirica - Austrian Economic Papers* 15, 1988, pp.243-261.

Neary P., "Export Subsidies and Price Competition", in: Helpman and Razin (1989).

Newbery, D. and N. Stern (eds.), *The Theory of Taxation for Developing Countries,* A World Bank Research Publication, Washington 1987.

Niehans, J., "International Debt with Unenforceable Claims", *Economic Review of Federal Reserve Bank of San Francisco*, June 1985.

Nocera, S., "Pricing an Interest Payment Guarantee - A Contribution to Debt Reduction Techniques", *IMF Working Paper* WP/89/65, 1989.

O'Connell, S.A. and S.P. Zeldes, "Rational Ponzi Games", *International Economic Review* 29(3), August 1988, pp.431-450.

O'Driscoll, G.P. and E.D. Short, "Safety-Net Mechanisms: The Case of International Lending", *Cato Journal* 4(1), Spring/Summer 1984, pp.185-204.

O'Neill, H. (ed.), *Third World Debt: How Sustainable are Current Strategies and Solutions?*, Frank Cass, London 1990.

Organization of Economic Co-operation and Development (OECD), *Financial Market Trends*, Paris, various issues.

OECD, *The Export Financing Systems in OECD Member Countries*, third edition, Paris, 1987.

OECD, *Financing and External Debt of Developing Countries*, annual surveys, various issues.

Özler, S., "On the Relation Between Reschedulings and Bank Value", *American Economic Review* 79(5), December 1989, pp.1117-1131.

Özler, S., "The Evolution of Credit Terms - An Empirical Study of Commercial Bank Lending to Developing Countries", *Journal of Development Economics* 38, 1992, pp.79-97.

Palgrave, *The New Palgrave Dictionary of Money and Finance*, Newman, P., Milgate, M. and J. Eatwell (eds.), The MacMillan Press Ltd. London, 1992.

Penati, A. and A. Protopapadakis, "The Effect of Implicit Deposit Insurance on Banks Portfolio Choices with an Application to International 'Overexposure'", *Working Paper of Federal Reserve Bank of Philadelphia*, 86(16), July 1986.

PHARE, see Commission of the European Communities.

Plan, R., *External Debt Rescheduling*, Manzsche Verlags- und Universitätsbuchhandlung, Wien 1985.

Pudney, S., "Income, Wealth and the Life-Cycle: A Non-Parametric Analysis for China", The Development Economics Research Program, CP 16, November 1991.

Ramakrishnan, R.T.S. and A.V. Thakor, "Information Reliability and a Theory Financial Intermediation", *Review of Economic Studies,* 1984, pp.415-412.

Rasmussen, E., *Games and Information - An Introduction to Game Theory*, Cambridge 1989.

Rasmussen, E., "The Strategy of Sovereign Debt Renegotiation", *Indiana Center for Global Business Discussion Paper* 88, August 1992.

Raynauld, A., *Financing Exports to Developing Countries*, OECD Development Centre Studies, Paris 1992.

Riley, J. G., "Informational Equilibrium", *Econometrica* 47(2), 1979, pp. 331-359.

Ritchken, P., *Options - Theory, Strategy and Applications*, Harper Collins Publishers, 1987.

Ronn, E.I. and A.K. Verma, "Pricing Risk-Adjusted Deposit Insurance: An Option-Based Model, *The Journal of Finance* 16(4), September 1986.

Rosenthal, R.W., "On the Incentives Associated with Sovereign Debt", *Journal of International Economics* 30, 1991, pp.167-176.

Rothschild, M. and J.E. Stiglitz, "Equilibrium in Competitive Insurance Markets", *Quarterly Journal of Economics* 11, 1976, pp.629-649.

Sachs, J.D., "Theoretical Issues in International Borrowing", *Princeton Studies in International Finance* 54, 1984.

Sachs, J.D., *Developing Country Debt and the World Economy*, University of Chicago Press, Chicago 1989.

Sachs, J.D., "A Strategy of Efficient Debt Reduction", *Journal of Economic Perspective* 4(1), Winter 1990, pp.19-30.

Saini, K.and P.S. Bates, "A Survey of Quantitative Approach to Country Risk Analysis", *Journal of Banking and Finance* 8, 1984, pp.341-356.

Samuelson, P.A., "Rational Theory of Warrant Pricing", *The Collected Scientific Papers of Paul A. Samuelson* 3, Merton, R.C. (ed.), (originally in *Industrial Management Review*, Spring 1965), 1972, pp.791-810.

Saunders, A., "The Determinants of Country Risk - A Selective Survey of Literature", *Studies in Banking and Finance* 3, 1986, pp.1-38.

Schich, S., *Entwicklung und Stand der Kreditbeziehungen zwischen der Sowjetunion und den westlichen Industrieländern*, Freie wissenschaftliche Arbeit zur Erlangung des Diplom-Volkswirtes, Freie Universität Berlin, October 1986.

Schich, S., "Indebtedness, Sovereign Risk and the Spread: The Example of Hungary and the Euromarkets", *UNCTAD Discussion Paper* 45, July 1992(a).

Schich, S., "Indebtedness, Creditworthiness and Trade Financing and Payment Arrangements", *UNCTAD Discussion Paper* 51, December 1992(b).

Schich, S., "Short-term Trade Finance for Developing Countries - Its Role and the Determinants of its Supply and Costs", mimeo, UNCTAD, June 1993(a).

Schich, S., "The Level and Volatility of External Financial Positions and the Costs of Export Credit Insurance", *UNCTAD Discussion Paper* 69, September 1993(b).

Schmidt, R., "Early Warnings of Debt Rescheduling", *Journal of Banking and Finance* 8, 1984, pp.357-370.

Scott, L., "Pricing Floating-rate Debt and Related Interest Rate Options", *IMF Working Paper* WP/90/7, 1990.

Selten, R., "The Chain Store Paradox", *Theory and Decision* 9, 1978, pp.127-159.

Shavell, S., "Risk Sharing and Incentives in the Principal and Agent Relationship", *Bell Journal of Economics* 10(1), spring 1979, pp.55-73.

Silverman, B.W., *Density Estimation for Statistics and Data Analysis*, London 1986.

Simonsen, M.H., "The Developing-Country Debt Problem", in: Smith and Cuddington (1985), pp. 101-126.

Smith, G.W. and J.T. Cuddington (eds.), *International Debt and the Developing Countries*, The World Bank, Washington 1985.

Spiegel, M.M., "Sovereign Risk Exposure with Potential Liquidation: The Performance of Alternative Forms of External Finance", *New York University C.V. Starr Center for Applied Economics Research Reports* 92(03), January 1992.

Stern, N., "Experience with the Use of the Little/Mirrlees Method for an Appraisal of Smallholder Tea in Kenya", *Bulletin of the Oxford Institute of Economics and Statistics* 34, April 1972, pp.93-123.

Stern, N., "The Effects of Taxation, Price Control and Government Contracts in Oligopoly and Monopolistic Competition", *Journal of Public Economics* 32, 1987(a), pp.133-158.

Stern, N., "Aspects of the General Theory of Tax Reform", in: Newbery and Stern (eds.), 1987(b), pp.60-92.

Stern, N., "The Economics of Development: A Survey", *Economic Journal* 99, September 1989, pp.597-685.

Stiglitz, J.E., "Credit Rationing in Markets with Imperfect Information", *American Economic Review* 71(3), June 1981, pp.393-410.

Stiglitz, J.E., "Risk, Incentives, and Insurance: The Pure Theory of Moral Hazard", *Geneva Papers on Risk and Insurance* 8(26), January 1983, pp.4-33.

Stone, M., "The Sensitivity of Secondary Sovereign Loan Market Returns to Macroeconomic Fundamentals", *IMF Working Paper*, June 1990.

Strack, D. and S. Schönherr, "Debt Survey of Developing Contries - An Improved Reporting System Approach", IFO Development Studies Special Series 'Information and Documentation' No. VII, Weltforum Verlag, München 1989.

Thomas, J. and T. Worall, Foreign Direct Investment and the Risk of Expropriation, *Warwick Economic Research Papers* 342, January 1990.

Thomas, V., A. Chibber, M. Dailami and J.D. Melo (eds.), "Restructuring Economies in Distress - Policy Reform and the World Bank, Washington 1991.

Townsend, B.D., *The Financing of Countertrade*, London, 1986.

Trade Finance, *Exim and Jexim: A Duopoly of ECA Initiative*, April 1992.

Ullah, A., "Non-Parametric Estimation of Econometric Functionals", *Canadian Journal of Economics* 11 (3), August 1988, pp.625-658.

UNCTAD, *Trade Relations Among Countries Having Different Economic and Social Systems and all Trade Flows Resulting Therefrom - Trends and Policies in Trade and Economic Co-operation Among Countries Having Different Economic and Social Systems*, Report by the UNCTAD Secretariat (TD/1243/Add.1), 15 February 1990.

UNCTAD, *Trade and Development Report*, Geneva, annual publication, various issues.

UNCTAD, *Consideration of the Present Situation and Current Problems in the Field of Trade Financing - Trade Financing for Developing Countries: Some Aspects of Current Difficulties and Policy Responses*, Study by UNCTAD Secretariat (TD/B/C.3/212), 11 July 1986.

UNCTAD, *Evaluation of Performances and Issues of Trade Financing in the Developing Countries: The Case for and the Viability of an Interregional Facility*, Report by the UNCTAD Secretariat (UNCTAD/ECGD/MISC.89), 8 July 1991(a).

UNCTAD, *Trade Financing in Developing Countries: An Assessment and Evaluation of Existing Schemes and Future Requirements*, Study by the UNCTAD Secretariat (TD/B/1300), 2 August 1991(b).

United Nations, *World Economic Survey 1991*, New York 1991.

United Nations, Committee on the Development of Trade, *Non-traditional Financing of Equipment Leasing in East-West Trade: The Role of Compensation-based Financing*, (Trade/Sem.9/R.3), 3 July 1989.

United Nations Economic Commission for Europe (UN ECE), *Economic Bulletin for Europe*, New York, semi-annual publication, various issues.

UN ECE, *Economic Survey of Europe*, New York, annual publication, various issues.

Watson, A., and R. Altringham, *Treasury Management - International Banking Operations*, London 1986.

Watson, A., *Finance of International Trade*, second edition, London 1981.

Waxman, L., *Finance of International Trade*, London 1985.

White, H., "A Heteroskedasticity-consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity", *Econometrica* 48, 1980, pp.817-838.

Williams, C.A., and R.M. Heins, *Risk Management and Insurance*, Fifth Ed., Mc Graw-Hill Book Company, New York 1985.

Wilson, C., "A Model of Insurance Markets with Incomplete Information", *Journal of Economic Theory* 16, 1977, pp.167-207.

Winkler, M., *Foreign Bonds, An Autopsy: A Study of Defaults and Repudiations of Government Obligations*, Roland Swain Company, Philadelphia, 1933.

Wolfram, S., *Mathematica - A System for Doing Mathematics by Computer*, second edition, Addison-Wesley Publ. Co., 1991.

World Bank, *Financial Flows to Developing Countries*, quarterly review, Washington, various issues.

World Bank, *World Debt Tables*, Washington, annual publication, various issues.

World Bank, *World Tables*, Washington, annual publication, various issues.

World Bank, *Historically Planned Economies - A Guide to the Data*, The World Bank, Washington 1993.

World Bank, IMF, BIS, and OECD, *External Debt - Definition, Statistical Coverage and Methodology*, Paris 1988.

Zloch, I., "Finanzierungsformen im Ost-West-Handel", *Osteuropa-Wirtschaft*, 31(2), 1986.

Zloch-Christy, I., *East-West Financial Relations - Current Problems and Future Prospects*, Cambridge University Press, Cambridge 1991.

Addendum

Export Credits and the Costs of Trade Financing

Sebastian Thomas Schich

Ph.D. thesis (Economics)

London School of Economics

Page 73: Replace in the paragraph (i) 'were always' by 'was almost always'.

Page 95: Replace in the last paragraph the text after '...appeared to be a problem of multicollinearity,' by the following text.

..., among some regressors, particularly among those of the countries without rescheduling history. The multicollinearity among some of them is largely due to the specific way they were generated. They were obtained as the product of the original data vector and a dummy vector, so that the zero elements were identical among the regressors of each group of countries. To eliminate this effect, the full data set was divided into two subsets, one containing 25 observations for countries with a rescheduling record and the other one containing 27 observations for those without such a record. Thus, collinearity among pairs of regressors did not appear to be a serious problem, the adjusted R^2 in regressions of one explanatory variable on another being usually well below 15%, except for the debt-service ratio and the reserves-over-IMF quota of countries without a rescheduling history, where it was close to 50%. OLS regressions were applied to each group separately, in which the two mentioned variables were not jointly included. The estimated coefficients for the regressors in each group were very similar to those shown in equation 2b of table 3.4 and the coefficients were relatively robust among different specifications.

The presence of collinearity may have been the result of the specification of the regressors as ratios. Thus it may be eliminated if we decompose the ratios into their numerators and denominators and include them as separate regressors. However, the variables that we are particularly interested in, such as the reserves, the debt-service, and the exports are highly correlated in both groups of countries, the simple correlation coefficient among some of them amounting to almost 0.80. Thus, when being jointly included, most variables were insignificant. The reserves were always negatively significant. We do not further discuss the statistical analysis of these variables, because we did not obtain any satisfactory results and, more importantly, because we believe that the ratios are more important determinants of the spreads than these absolute variables anyway. This is suggested in particular by our analysis in the second chapter.

The standard suggestion for overcoming the problem of collinearity is to try to increase the information content of the data by obtaining additional observations. This is not a helpful approach because we cannot obtain additional observations that are compatible with those included in our data set. Although the multicollinearity problem did not appear to be very serious, the results must be treated with some caution. Since the effect of multicollinearity is to increase the probability of type II error compared with the case in which the regressors are not correlated, its presence may have prevented the identification of some determinants of the spread.

The conceptual approach to the spread suggested that the country-specific macroeconomic variables are exogenous. However, some empirical variables may not be completely exogenous. Therefore, we estimate the determinants of the spread for each group of countries in an interdependent system with two-stage least squares. The instruments we used were the two-period lagged openness, the London interbank offered rate, the two-period lagged ratio of reserves-over-imports, the two-period lagged debt-service ratio and the time dummies. The results were similar to the ones obtained from OLS regressions. In particular, the openness was significant positively and the reserves-over-IMF quota significant negatively related to the spreads of countries with a rescheduling record, while the openness of countries without such a record was significant negatively related to their spreads. The simultaneity problem, if it exists, does not seem to be serious.

Page 215: Add the following after the last paragraph:

We divided the countries into two groups, one group containing the countries with no substantial subsidy-equivalent rate estimates (Australia, Austria, Canada, New Zealand and the United States) and those with such estimates (all other countries). We then analysed whether there are different patterns among the two groups as regards the underlying developments in net claims (claims net of recoveries), premium incomes, and amounts insured. The data on these variables are listed in table 6.5 (pages ix to xi of this addendum). A graphical analysis of them does not reveal any considerable differences between the patterns for the two groups of countries, except that the instances in which an agency's annual net claims exceed its premium income are particularly concentrated among

those countries for which we have estimated substantial subsidy-equivalent rates. The identification of differences in the patterns is difficult because the data on net claims, premium incomes, and amounts insured fluctuate considerably during the observation period for most agencies of both groups. However, an analysis of the average rates of change in these variables during the observation period reveals the following. Both groups experienced on average a similar upward trend in premium incomes, though there were considerable differences among the individual countries of each group. The average upward trend in the premium income for the countries with substantial subsidy-equivalent rates was slightly smaller than the average upward trend in their net claims. The latter in turn was slightly higher than the upward trend in the claims for countries without substantial subsidy-equivalent rates. For most agencies, the upward movement in the premium income reflected both an upward trend in their activities, i.e. a positive rate of change in the volumes insured, and an improvement of the ratio of premium income to amounts insured. When focusing on the countries with substantial subsidy-equivalent rates, the former effect was more important than the latter. If the focus is on those without substantial subsidy-equivalent rate estimates, the latter was more important than the former. The improvement in the ratio of premium income to amounts insured was on average higher for the countries without substantial subsidy-equivalent rates than for those with such estimates. This suggests the hypothesis that the premium policy was an important factor possibly contributing to low subsidy-equivalent rate estimates. The Eximbank of the United States is a case in point. Its premium income was characterized by a positive trend while its total activity was characterised by a negative one. We found no evidence for the hypothesis that increases in activity were a dominant factor explaining the low subsidy-equivalent rate estimates for one group of agencies. This is supported by the finding that the Pearsonian correlation coefficient between the average rates of change of business activity and the average subsidy-equivalent rates is not significant.

Page 218: Replace the last two paragraphs by the following two:

The relative importance for a country of the subsidy-equivalent rates provided by its ECA could be measured as follows. By multiplying the shares of insured exports in total exports of a country with the subsidy-equivalent rate of its ECA, a measure of the subsidy-

equivalent in relation to total exports is obtained. Table 6.4 (pages vii to viii of this addendum) shows the subsidy-equivalent rates, the share of insured exports as of total exports and the measure of the relative importance of the subsidy-equivalent rates, i.e. the product of these two variables, for each agency and each year of the observation period. As can be seen from that table, the amount of exports being insured as a percentage of a country's total exports varies for the countries and years considered between 1.9% and 45%; thus, the relative importance of the subsidy-equivalent rates differ from the absolute subsidy-equivalent rates. According to the former measure, the subsidy-equivalents are particularly important for Spain, Italy, France, and the United Kingdom, the average of the annual measures during the observation period (not shown in table 6.4) being 0.83%, 0.56%, 0.53%, and 0.47%, respectively. They are less important for Switzerland (0.33%), Germany (0.24%), Netherlands (0.14%), Finland (0.13%), Sweden (0.12%), and Belgium (0.11%), and only marginally important for Australia (0.03%), and the United States (0.01%), while they are negative for Austria, Canada, and New Zealand. In general, the higher the subsidy-equivalent rates, the higher tend to be the relative importance of the subsidy-equivalents. The correlation between the two measures is highly significant positive, the simple Pearsonian correlation coefficient being equal to 0.80. It is not perfect, though. Thus, while the estimates of the subsidy-equivalent rates may be comparatively high for an agency - such as for Hermes of Germany - the relative importance of subsidies for that country may be relatively low, because only a small portion of its exports are insured by that agency.

The subsidy-equivalent rates are minimal only for those agencies which are relatively small in terms of exports insured. The following tentative interpretations are suggested here. If an agency insures only a small amount of exports, it is unlikely to become an effective tool of trade policy anyway. Another related explanation could be that those agencies which are used by their governments as tools for trade policy have attracted more exporters, and thus become larger, precisely because their rates are subsidised. However, our data do not allow us to establish clear-cut evidence supporting this hypothesis. For almost no country with notable subsidy-equivalent rates, except for Spain, does a significantly positive relationship (measured by the Pearsonian correlation coefficient) exist between the share of its exports insured and the current or one-year lagged

subsidy-equivalent rates of its ECA. Similarly, the subsidy-equivalent rates did not seem to 'Granger-cause' the share of exports insured. Since the present study did neither have a sufficient number of observations to justify a further statistical analysis nor the access to the detailed information available to the agencies, any further interpretation of the relation between these variables would be highly speculative and is therefore omitted here.

Page 221: Replace table 6.4 in the text by the one shown on the pages vii to viii of this addendum. After this table add the new table 6.5 which is shown on pages ix to xi of this addendum.

Table 6.4: The relative importance of the estimated subsidy rates
(in per cent)

		1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Australia	s	0.3	-0.8	-0.7	-0.5	1.3	-2.3	3.8	3.8	-0.1	-2
	t	13	11.6	12.2	8.7	11.2	11.9	12	13	10	8.9
	m	0.04	-0.09	-0.08	-0.04	0.14	-0.27	0.46	0.49	-0.01	-0.18
Austria	s	-0.3	0.6	0.6	0.7	-1.6	4.1	-4.6	-1.8	-0.4	1.6
	t	45	40	30	30	27	23	21	22	23	23
	m	-0.13	0.24	0.19	0.21	-0.44	0.95	-0.97	-0.39	-0.08	0.38
Belgium	s	0.7	0.7	2.1	2.2	3.3	-0.2	4.9	2.1	4.2	1.2
	t	7.3	7.4	5.5	5.1	5.1	4.6	4.7	4.8	3.3	4.1
	m	0.05	0.05	0.12	0.11	0.17	-0.01	0.23	0.10	0.14	0.05
Canada	s	0.4	-0.6	-0.1	-0.5	1.2	-2.7	1.2	-2.7	0.7	-1.2
	t	3.1	2.2	1.9	2	2	2.1	2.8	3	4.1	3.3
	m	0.01	-0.01	0	-0.01	0.02	-0.06	0.03	-0.08	0.03	-0.04
Finland	s	1.2	0.7	1.9	2.1	4.5	4.1	4.5	-0.7	6.6	-3
	t	7.6	8.7	7	6	4.2	4	4.8	4	6	6.7
	m	0.09	0.06	0.13	0.13	0.19	0.16	0.21	-0.19	0.40	-0.20
France	s	0.6	0.8	1	0.1	1	0.6	5.2	3.5	4.4	3.3
	t	32	33	34	24	25	23	22	23	24	25
	m	0.20	0.26	0.34	0.02	0.25	0.13	1.17	0.80	1.06	0.84
Germany	s	1	-0.7	2.4	4.1	4.4	1.5	7	3.1	7.5	8.2
	t	9	9	8	7	6	5	5	5	4	4
	m	0.10	-0.07	0.19	0.27	0.25	0.07	0.32	0.14	0.30	0.34
Italy	s	0.8	0.8	6.8	6.7	12.1	8.4	16.4	16.7	5.8	1
	t	14.3	12.3	7.7	7.8	6.7	4.2	2.4	5.7	7.2	8.4
	m	0.11	0.09	0.52	0.52	0.81	0.35	0.39	0.95	0.42	0.08
Netherlands	s	0	-0.4	1.6	3	4	-0.5	2.9	-1	2.3	-0.2
	t	10.3	11.8	12	10.8	9.8	11.4	12.2	12.7	12.9	14.2
	m	0	-0.04	0.19	0.32	0.39	-0.05	0.35	-0.13	0.30	-0.03
New	s	0.5	-0.4	-0.3	0	1.7	-2.3	1.6	-2.4	0.7	-0.4
Zealand	t	9.3	9.5	9.5	9.9	10.4	9.3	8.5	7.5	7.2	7
	m	0.04	-0.04	-0.03	0	0.17	-0.21	0.14	-0.18	0.05	-0.03

(For source and explanation see end of the table)

Table 6.4: The relative importance of the estimated subsidy rates
(in per cent)
(concluded)

		1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Norway	s	0.2	11	15.5	8	5.2	8.5	8.8	6.1	5	5.5
	ι	3.7	3.2	3.5	2.4	5.5	5	5	5	3.6	3.6
	m	0.01	0.35	0.54	0.19	0.29	0.43	0.44	0.30	0.18	0.20
Spain	s	-0.3	-1.1	1.1	5.4	5.5	7.6	21.9	8.9	8.6	4.9
	ι	22.6	24	13	11.8	12	11.4	9.2	9.5	8.9	11.1
	m	-0.07	-0.27	0.14	0.64	0.63	0.70	2.08	0.85	0.77	0.55
Sweden	s	3.5	3.5	2.7	2	3.5	-0.5	4.9	-0.4	4.1	4.8
	ι	7.4	6.1	4.4	3.1	3.5	5	3.3	4	3.5	2
	m	0.26	0.21	0.12	0.06	0.12	-0.03	0.16	-0.02	0.14	0.10
Switzerland	s	2.6	6.1	4.4	2.6	9.5	4.5	18.2	4.4	6.9	3.6
	ι	11.2	6.4	10.4	6.2	4.7	3.5	2	2.3	2.5	2.6
	m	0.29	0.39	0.46	0.39	0.45	0.16	0.36	0.10	0.17	0.09
United	s	0.5	0.4	1.8	2.1	3.9	0.1	5.2	0	3.4	1
Kingdom	ι	36.2	33.9	29.6	25.3	23.3	19.6	20.4	20	18.7	26
	m	0.20	0.15	0.54	0.52	0.91	0.03	1.05	0	0.63	0.27
United	s	0.5	-0.2	1.2	3.6	2.5	-2.6	2.4	-2.6	1.7	-2.3
States	ι	3.5	3	3.7	3.1	3.3	2	2.5	2.5	2.5	2.5
	m	0.02	-0.01	0.04	0.11	0.08	-0.05	0.06	-0.07	0.04	-0.06

Source: own calculations based on data from *Trade Finance*.
Explanation: s denotes the estimated subsidy rates;
ι denotes the share of insured exports as of total exports;
m denotes the estimated subsidy rates in terms of total exports.

Table 6.5: Data on net claims, premium income, and amount of insured contracts, 1981-1990
(in millions of US dollars)

	Net claims (claims net of recoveries)									
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Australia	5	0	5.8	2.5	0	8.9	87.4	301.8	-0.4	10.3
Austria	0.9	125.7	99.7	96.7	-29.6	313	-43.3	161.6	93.5	395.5
Belgium	56.5	67.8	90.5	75.6	81.9	99.9	187.5	219.5	196	164.2
Canada	5.8	5.7	21.8	4.5	-0.6	0.6	3.5	-4	3	19.9
Finland	19.9	21.5	28.7	22.5	19.7	48.6	47.6	-5.6	104.7	11.3
France	336.1	705.4	792.5	384.2	198.2	1249.2	1652.8	2240.9	1880.1	2291.9
Germany	315.2	225.2	570.2	585	559.1	727.8	1135.7	1039.2	1494.4	2989.4
Italy	152.4	234.2	451	393.7	716.7	545.1	966.9	1046.7	769.8	512.1
Nethlds.	33.8	67.4	210.8	272	218	227.3	244.6	198	370.3	419.7
New Zeal.	1.3	1.7	1.8	1.6	0.2	0.9	2.3	0.1	-0.7	5.5
Norway	29.9	77.3	108.6	43.9	24.7	64.1	51	53.8	37.2	57
Spain	39.3	80.3	99.4	178.1	180.2	367.8	745.7	476.7	339.7	391.4
Sweden	105.1	102.3	77.1	54	57.6	74.5	104.9	84.6	100.2	124.1
Switzerl.	132.4	163.1	166.3	131.6	124	133.9	219.1	95.4	128.3	122.9
Utd.Kingd.	449.4	840.1	810	735.4	711.4	833.2	1177	484.7	950.4	970.6
Utd. States	14.9	27.3	123.7	262.1	65.2	-3.7	66.4	-1.9	49.2	-34.8

(For source see end of the table)

Table 6.5: Data on net claims, premium income, and amount of insured contracts, 1981-1990
(in millions of US dollars)
(continued)

	Premium income									
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Australia	12.9	11.3	10.1	11.1	15	15.03	15.6	32.6	57.2	44.5
Austria	64.4	81.9	72.9	77.1	106.5	123.7	187.1	151.3	219.1	147.8
Belgium	53.9	32.8	29.7	23	35	31.4	44.9	42.1	68	47.2
Canada	12.3	12.7	17.9	15.5	11.8	12.6	15.2	19.7	22	22.8
Finland	13.6	11	10.6	6	4.6	8.7	17.3	17.6	25.8	38.8
France	331.9	336.2	360.5	376.2	448.1	569.5	530.7	381.7	534.5	469.8
Germany	247.4	299.2	222.8	172.6	248.9	261.4	310.9	282.9	336.7	496.7
Italy	133.4	142.6	111.2	111.4	105.5	120	141	108.41	196.1	189.1
Nethlds.	79.6	76.2	69.7	65.3	74.4	81.5	90.9	62.1	190.8	222.9
New Zeal.	2.3	2.4	2.4	2	1.4	2	2.5	2.2	2.19	1.8
Norway	15.4	13.7	10.7	7.5	6.5	6.3	4.6	4.9	7.9	5.6
Spain	81.8	123.1	56.2	41.16	63.35	50.47	29.63	49.13	43.3	66.2
Sweden	43.8	41.6	41.5	35.9	39	51	48.6	57.6	54	49.4
Switzerl.	69.8	59.6	42.6	32.5	25.5	36.5	25.5	22.5	33.6	39.6
Utd.Kingd.	475.3	608.7	259.6	240.1	252	283	248.9	191.1	370.7	341.2
Utd. States	25	26.3	17.6	21.6	23.2	22.2	20.3	28.5	26.4	22.8

(For source see end of the table)

Table 6.5: Data on net claims, premium income, and amount of insured contracts, 1981-1990
(in millions of US dollars)
(concluded)

	Amount of insured contracts									
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Australia	2362	2250	2301	2073	2499	2684	3285	4649	4363	4046
Austria	7049	5175	3166	2930	3886	3054	3668	3812	8093	8844
Belgium	4037	3874	2599	2399	3245	3613	4378	4332	4286	5022
Canada	2661	1853	3142	2024	1810	1967	2710	3402	4286	5021
Finland	1066	1138	873	794	576	647	1074	877	1446	1531
France	39400	35100	35310	22377	28364	25838	31273	33818	41665	40444
Germany	16106	16152	13043	10200	12346	12983	15428	14664	18456	26700
Italy	10818	9017	4872	4251	5975	4065	5583	5012	12412	15065
Nethlds.	7078	7824	7869	7066	6682	9158	12697	12979	16137	21034
New Zeal.	642	577	556	453	563	533	664	584	562	496
Norway	668	564	624	458	542	547	647	604	778	770
Spain	4631	4998	3250	2570	3209	3283	3543	3904	3977	5341
Sweden	2113	1639	1213	917	1182	1528	1713	1666	1600	1257
Switzerl.	3208	1626	2668	1599	1293	1477	1170	1139	1669	1759
Utd.Kingd.	35100	33400	26930	24484	22564	24984	26505	14575	26500	28598
Utd. States	8221	6841	7523	6825	7061	4430	6400	5165	4366	4881

Source: *Trade Finance.*