Predicting default probability and the default recovery ratio: Evidence from the Lebanese external public debt

Ghada El Khoury – Bruno Colmant – Albert Corhay[*]
HEC Management School - University of Liege
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Abstract

With a national debt exceeding 190% of the GDP at the end of 2006, the Lebanese government is in a difficult situation. The literature on emerging markets reveals the various causes that might lead to a default on their public debt. The first objective of this paper is to analyze the evolution of the credit spread for the Lebanese US Dollar Eurobonds. The second objective is to extract both the implied default recovery ratio and the risk neutral default probability term structure for the Lebanese US dollar Eurobonds between October 2001 and November 2004. Our results show that the recovery ratio is strongly related to the market reaction linked to political and economic tension within Lebanon. For the period after the Paris II conference in November 2002, the average estimates show a decline in the default probability for the long-term period accompanied by an increase in the default recovery ratio.
Keywords: implied default probability; recovery ratio; credit spread; sovereign debt; market price

JEL classification: G 12; G 15; G 33; H 63

[*] E-mail address: g.khoury@ulg.ac.be; bcolmant@hotmail.com; a.corhay@ulg.ac.be

1. Introduction

While most industrialized countries have limited their borrowing in foreign currencies, developing countries and emerging economies often rely on international financial markets to finance the shortages in their domestic reserves. This implies a vulnerability to fluctuations in exchange rates and in international interest rates.

Despite the various efforts in managing the debt of developing countries[1], the level of this debt rose steadily from around 70 to 2800 billion dollars from 1970 to 2005. During the last twenty years, there has been a succession of debt crises in emerging market countries namely the crises in Mexico (1982), Russia (1998), Brazil (1999 and 2002), Ecuador (1999), Turkey (2001), and Argentina (2002).

Several studies have dealt with the public debt of emerging countries; among these is an interesting paper by Reinhart, Rogoff, and Savastano (RRS) on debt intolerance. In the present paper, we propose to apply the RRS model to the Lebanese case, as this case appears it apply quite well to one of the scenarios described by these authors.

Indeed, RRS noticed that countries that have defaulted on their debt had a relatively low level of debt, while others with a very high level of public debt over the past several years had not systematically defaulted. With public debt indicators exceeding those of other countries that have experienced a crisis, Lebanon clearly belongs to the second group of countries.

A high level of debt servicing associated with increased government expenditure, coupled with only modest increases in revenue, led to an accumulation of a sizeable level of Lebanese public debt, which exceeded 190%[2] of Gross Domestic Product (GDP) at the end of 2006. This exceptionally high level of debt puts Lebanon in a highly vulnerable position. Thus, financing the budget deficits via borrowing has a direct impact on interest rates, inflation, and exchange rates and has a negative impact on the growth of Lebanon's Gross Domestic Product (Neaime, 2004). Similarly, the permanent need to refinance the debt creates an unfavorable crowding out[3] effect in terms of private investment.

In the light of this situation, the Lebanese authorities have committed to a significant program of structural reforms in order to straighten out the country's tough economic situation. Several reforms, including the introduction of Value Added Tax (VAT) and also an increase in privatization have substantially contributed to a decrease in the deficit levels of the Lebanese economy. However, despite these reforms, the public debt is still remarkably high, which could lead to a debt crisis. This would have an adverse effect on the banking sector, which has so far been a major contributor to the financing of Lebanese debt (Ayoub and Raffinot, 2005).

[1] Countries such as Argentina, Mexico, Turkey and South Africa, are beginning to revise the methods they apply to managing debt, and have already introduced Collective Action Clauses (CAC) into their bond issues.

[2] A classification of countries with public debt as a % of GDP in 2006, based on the CIA World Factbook, places Lebanon in first place with a 190.20%.

[3] There is an enormous contribution of claims given by banks to the government at very high interest rates on treasury bonds channeling the bulk of liquidity into the public sector at the expense of the private sector (Saleh, A-S., 2003).

The literature on public debt in emerging countries often takes into account external debt[4], because of the limited opportunities that domestic markets offer in financing deficits (Reinhart, Rogoff, and Savastano, 2003). They also point out that the calculation of the internal default is largely different[5] from the one coming from the foreign debt. It is therefore absolutely necessary to distinguish between internal and external debt.

The issue of Lebanon's external debt has become increasingly alarming due to changes in the structure and maturity of its debt since 1996. The external debt has increased from 1 to $13 billion[6] between 1996 and 2002. Although this evolution shows a favorable trend, it increases the vulnerability of the economy and accentuates its dependence vis-à-vis the change in international interest rates. Thus, we limit our study to Lebanon's external debt.

The aim of our study is to determine the causes that lead to state bankruptcy, stressing that these cases differ from one country to another. It is also important to analyze the credit spread of Lebanese borrowings, considered as a determinant of credit quality. In this paper, we also measure the probability of default by the Lebanese government on its Eurobonds denominated in U.S. Dollars.

The objective of this paper is to retrieve the implied recovery rate and implied risk-neutral default probability for Lebanese US-Dollar denominated Eurobonds by using the Merrick (2001) pricing model of default[7], based on the market price of Eurobonds. This analysis is applied to the assessment of external borrowing by the Lebanese government between October 2001 and November 2004, during which period Lebanon witnessed debt relief under the Paris II conference in November 2002.

The remainder of this paper is organized as follows. After the introduction, section 2 presents the model developed by Reinhart, Rogoff, and Savastano (2003) and the causes leading to a default on public debt. Section 3 analyzes the state of Lebanese public finances, the evolution of the Lebanese public debt and debt relief agreements including the restructuring of public debt. Section 4 introduces the pricing methodology of default risk and explains the pricing model applied in this study, the sampling method, and the data analysis. Section 5 presents the results of the quantitative analysis conducted, and section 6 concludes the paper.

[4] For more details see Durbin and Ng (1999), Kamin and Von Kleist (1999), Mauro, Sussman and Yafeh (2002) and Sy (2001).

[5] Because they are not subject to the same conditions of payments (from the viewpoint of currency, interest rates, repayment terms and maturity).

[6] Annual Reports of the Bank of Lebanon

[7] The author focused his study on the evaluation of Russian and Argentinean U.S. dollar denominated Eurobonds. The model is regarded as highly relevant to emerging countries.

2. The model of Reinhart, Rogoff and Savastano and the question of a country defaulting on debt

2.1 The model of Reinhart, Rogoff and Savastano (the RRS model)

According to these authors, a high level of debt intolerance can be explained by increased levels of default risk, even when combined with a low level of debt (to GDP or export). Thus, it is the history of the country that could play a crucial role and lead to a default situation. Indeed, almost half of the defaults since 1970 have occurred in areas where external debt relative to GDP did not exceed 60% (Sims, 2001).

Thereafter, the RRS model considers that countries are more or less vulnerable to a debt crisis, depending on their historical level of inflation and credit. In addition, their vulnerability can also be related to other factors such as the degree of dollarization, the interest rate in the short term and the debt maturity structure.

Accordingly, the RRS model has two components, which explain the debt intolerance of a country:

1 - The "Institutional Investor Ratings (IIR)" index: this gives an indication of the default risk taking values ranging from 0 to 100. These values represent the rating of sovereign debt, while recognizing that, as the rating increases and approaches 100, the risk that the country will default on its financial obligations becomes lower.

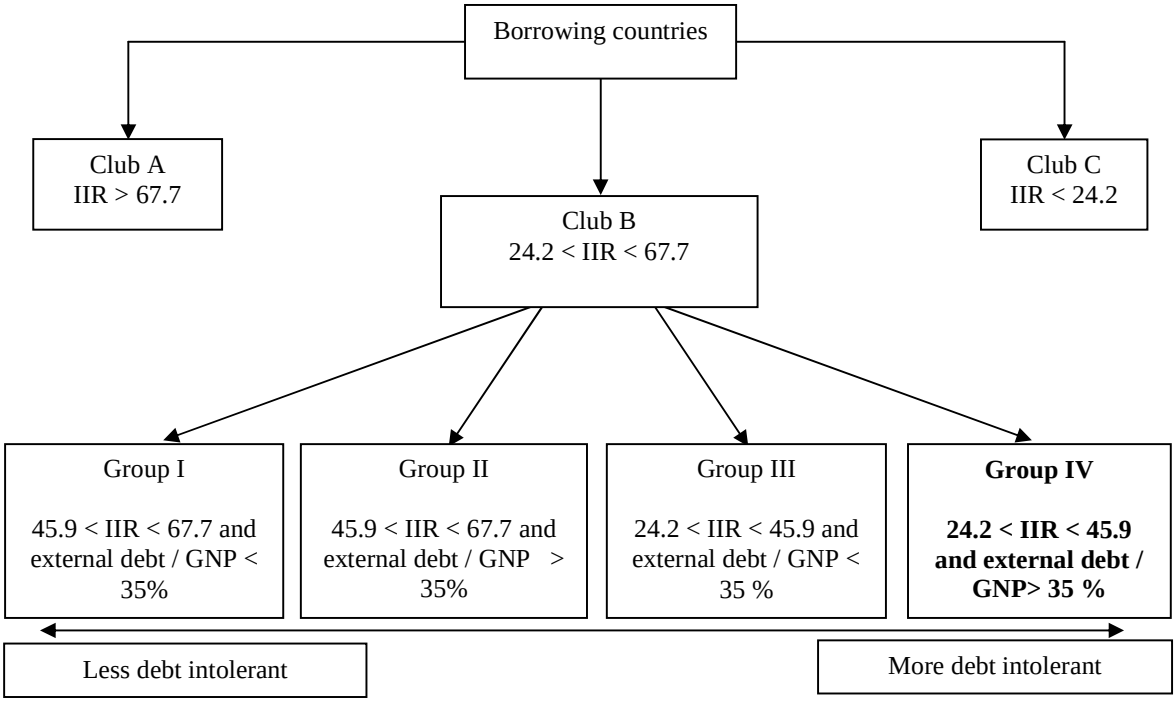
2 - The external debt relative to GDP[8]: classified from the level that the external debt to GDP is above or below 35%.

However, the authors note that when the default risk increases (rating <30), external debt increases too, and as a consequence the probability of entering the state of default follows the same trend. But this relationship is not linear, because when the risk of default is very high, the country is in a more difficult position, regardless of whether the external debt to GDP ratio is 80% or 160%.

The following figure (Fig. 1) summarizes the study by these authors by ranking 53 industrialized and developing countries, according to two criteria, namely, default risk and debt level during the period from 1979 to 2002.

[8] According to Obstfeld and Rogoff (1996), the more the external debt to GDP or export increases, the more the region becomes vulnerable to an inaccessibility to international markets. This causes a subsequent debt crisis.

Fig. 1: Ranking of selected countries with respect to IIR and external debt



Source: Reinhart, C., Rogoff, K. and Savastano, M., Debt intolerance, IMF, Brookings papers on Economic Activity, 2003

The first group of countries (club A) presents a low risk of default because the IIR is greater than 67.7%. These countries have continuous access to capital markets. The third group (club C), with an IIR of less than 24.2%, presents a high risk of default. The countries in this group cannot access the capital markets.

The second group of countries (club B) is the main focus of our analysis. This club includes four sub-groups according to the degrees of debt intolerance. This level is defined in terms of two indices, namely the criterion of default and the external debt. As we can see from Figure 1, group IV includes the most risky regions, where debt intolerance is the highest (with an IIR ranking of between 24.2 and 45.9 and a level of external debt to GDP of > 35%). These countries can easily default and fall into club C.
And in our specific case, Lebanon with an indicator of default of 39.87%[9] (below the world average of 50.28% and that of the MENA[10] with 51.36%), and with a level of external debt to GDP of 93.51% in 2006, belongs to group IV, consisting of countries with the highest

[9] Calculated from nine types of indices: political risks, economic performance indicators, indices of debt, classification of loans, access to bank financing (long term), access to financing in the short-term, access to international capital markets, and discounts on purchases. So Lebanon has obtained the following ratings in these indices respectively: 10.62, 6.05, 6.68, 10, 0.63, 0.1, 2.8, 1.25, and 1.74. Euromoney, Volume 37, Number 443, March 2006, Country risk poll.
[10] Middle East and North Africa

level of debt intolerance. As a result of this, Lebanon could be in an increasingly difficult position to access external financing which may subsequently lead to debt crisis.

2.2. Why are countries interested in repaying their external debt?

"If the default is not penalized by the markets, then the countries are not encouraged to fulfill their commitments." (Oosterlinck and Szafarz, 2005). Thus, several motivations lead countries to repay their debts[11]. Besides the reputation effect analyzed by Jorgensen and Sachs (1989) and by Eaton and Gersovitz (1981), countries that have defaulted on their debt are subject to credit rationing, and even see a deterioration in their loans. Similarly, Cole and Kehoe (1997) talk about the reputation effect considering that the default of a country affects its other economic sectors, and thus leads to a lack of confidence.

"The powers of the creditors are the main reason that borrowers pay back…, with no reason to repay, there is no sovereign debt market in the long run"[12].

Moreover, the subsequent appeal to borrowing on the one hand, and the terms of any new borrowing on the other, are the basis of a country's motivation to repay its debt (Oosterlinck and Szafarz, 2005).

2.3. Why do countries default?

There are no clear definitions of the concept of sovereign debt crisis or sovereign default. First, unlike companies, governments cannot be forced into bankruptcy. Thus, the rating agency Standard & Poor's introduced the notion of SD (Selected Default) to report the countries that are involved in some form of default or restructuring.

Indeed, the nature of economic factors leading to default decisions and restructuring plans noted in cases of default differ between sovereign and corporate debt[13] (Duffie, Pederson and Singleton, 2003).

Several authors have spoken on the issue of debt sustainability. Debt sustainability is a function of both solvency and debt liquidity. Each of these two variables can occur either independently or as a consequence of the other.

Jacquet and Severino (2004) suggest that the virtual absence of long-term financial sources that involve currency in emerging economies, leads these countries to borrow in a foreign currency, and to take on an important currency risk in the case of the sudden collapse of the national currency. However, the shortcomings of existing information in developing countries can boost the "phenomena of contagion" and prevent the establishment of a reliable diagnosis.

Several models of debt crisis have been mentioned by several authors. Cole and Kehoe (1996, 1998 and 2000), Cohen and Portes (2003) and Obstfeld (1985) talk about the self-fulfilling[14] debt crisis, namely a crisis of confidence[15] triggered by the country's fragility

[11] See Oosterlinck and Szafarz, 2005 for a general presentation on the subject.

[12] Cited by Shleifer, 2003, in Jacquet and Severino 2004: "Prêter, donner: comment aider?"

[13] Sovereign debt comes from stable macro-economic and budgetary policies, while corporate debt is analyzed from a microeconomic point of view.

[14] The increase in credit spreads leads to increased debt but not vice versa. Thus, one-third of the crises recorded in 1990 were due to the existence of wide credit spread.

[15] S & P (2007) attach great importance to qualitative factors that are the basis of sovereign default (shock of credibility, self-fulfilling expectations, political shocks, and micro-economic distortions).

indicators, (weakness of the fundamental and primary deficit). This leads to a liquidity crisis, which in turn leads to a solvency problem. This model is based on the investor's behavior in explaining the crisis of confidence. Weber (2005) also focuses on the investor's behavior in explaining the snowball effect of the debt. Thus, an increase in the risk aversion of the investor enhances the risk premiums and hardens the budgets of the sovereign nations. Refinancing at higher rates leads to an increase in the debt, which has to be refinanced in the following period, and which is likely to trigger a destabilizing debt dynamic. Colmant (2008) shows that the existence of economic constraints lead to budget deficits and heavy debts and then to an overwhelming circle of debt management (snowball effect). Krugman (1979) specifies that bad government policies and economic fluctuations lead to the primary sources of crisis. Reinhart (2002) sees a relationship between currency crisis and default probability in the emerging markets. Giavazzi and Pagano (1990) and Detragiache (1996) consider debt servicing and liquidity problems as major factors triggering a crisis.

However, the history of a country is certainly an important element that helps to predict sovereign defaults (Reinhart, Rogoff, and Savastano, 2003). Oosterling and Szafarz (2005) argue that political instability plays an important role in explaining the failure of a country[16]. Also, political factors affect the policy credibility of the government (Manasse, Roubini and Schimmelpfenning; 2003). Similarly, Manasse and Roubini (2005) show that the probability of default increases within a period of presidential elections.

[16] They recall that this has been confirmed for the following five countries: Brazil, Chile, Greece, Spain, and Turkey. Thus, several elements may compose the political aspect such as the political system, electoral system etc.

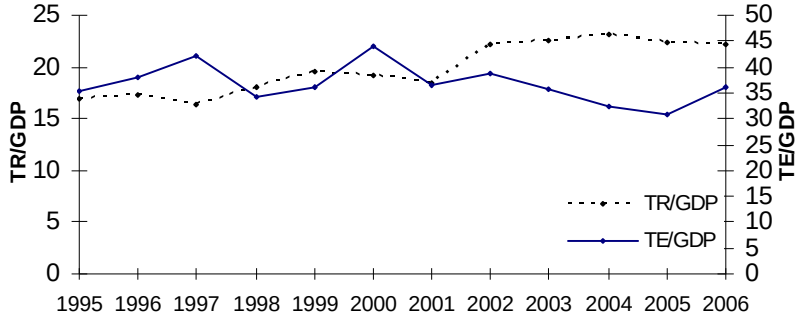
3. Lebanon's public debt and relief agreements

3.1. The state of Lebanese public finances (1995-2006)

There is no doubt that public finances are affected by the economic and political situation in Lebanon. However, the issue of debt sustainability is based on the state of the public finances. Lebanon has experienced serious periods of crisis over the past 10 years, and this is reflected in the incomes and the average standard of living of its population. Thus, it may be noted that servicing of the debt absorbs most of Lebanon's national income and therefore limits its investment capacity.

Public finances show a significant imbalance. Significant budget deficits have a negative impact on the investment and savings structure of the Lebanese economy (effect of public debt in the short-term), and also on economic growth (effect of public debt in the long-term) (Saab, S., 2005). Thus, the budget deficit relative to GDP increased by 18.35% in 1995 to 20.6% and to 25% in 1996 and 2000 respectively.

Fig. 2: Evolution of the state of public finances (TR / GDP and TE / GDP)



Notes: TR: Total Revenue. TE: Total Expenditure. GDP: Gross Domestic Product
Sources: *Ratios calculated from annual reports of the Bank of Lebanon*

From the figure above, we can see a positive evolution in the state of Lebanese public finances from 2001 onwards, due to various financial policies adopted by the government. Firstly, one can observe a decline in the servicing of debt resulting from a lower average interest rate on government debt brought about by the Paris conferences (Paris I and II) and secondly a decline in investment spending. Similarly, total income marked an increase because of the introduction of VAT (Value Added Tax), higher taxes (direct and indirect), and, in particular, tax revenues generated by the property and profits on capital and interest. Thus, the total budget deficit compared to total expenditure decreased, particularly from the year 2000, going from 56.56% in 2000 to 27.42% in 2005 (see Appendix, Table 1).
However, this positive trend was reversed in July 2006 when the war began. The budget deficit rose again in 2006 because of a decline in tax revenues accompanied by an increase in total expenditure.

3.2. Transactions with foreign countries

In macro-economic terms, the balance of trade suffers from a chronic annual deficit of 5 to 6 billion dollars. This is offset by transfers from abroad amounting to approximately 7 to 8 billion dollars annually, and also by transfers and loans at preferential rates occurring within the context of established conferences. As a result, the balance of payments is often in surplus. The Lebanese economy suffers, therefore, from the structural weakness of its productive sector, and external imbalances accompanied by a heavy dependence on imports. This provokes a strong deficit in the balance of trade and in the current account balance; it lowers labor productivity, and leads to a low level of investment.

3.3. Public debt in Lebanon: historical evolution, structure, and funding source

3.3.1. Evolution of public debt: 1970-2006

Three periods can be distinguished in Lebanon's history: prosperity, war, and restructuring. Prior to 1975 the Lebanese economy was one of the most dynamic in the Middle East, enjoying sustained economic growth and a surplus in the balance of payments. At that time, the growth of nominal gross public debt was between 3.5% and 5.4% as a percentage of GDP per year.

After that era of prosperity, Lebanon experienced 16 years of civil war from 1975 to 1990. That era witnessed fundamental changes in the Lebanese economy from both the political and economical point of view. Three serious consequences of this war resulted: i) the creation of public debt caused by the government's aim to rebuild the region; ii) the severe depreciation of the Lebanese pound (LL) from 2.3 LL / $ in 1974 to 225 LL/$ in 1987 and 1539 LL / $ in 1997; iii) the high rate of inflation is due to the consumer price index (CPI) increasing by 44% since the end of the 1990.

Recent history shows that public debt rose rapidly[17], from $2 billion (48.6% of GDP) in October 1993, to $23 billion (151% of GDP) in June 2000 and to approximately $40 billion (184% of GDP) in 2006. This brought the servicing of debt up to a level of 18% of total GDP in 2002, regarded as unsustainable by the government's official report in the Paris II meeting in November 2002. Similarly, the servicing of debt relative to export increased from 44% in 1992 to 151.70% and 390% in 1995 and 2000 respectively (See Appendix, Table 1).

3.3.2. Structure of government debt:

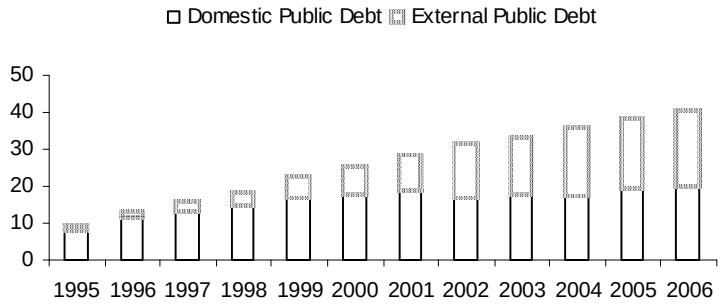
Until 1994, the Lebanese public debt was almost entirely in Lebanese pounds (LL). Since that time, public debt has undergone two major changes: the conversion of domestic debt to foreign public debt, and the conversion of short to long maturities[18]. Thus, the external debt (mainly in US dollars), by the end of 2006 was nearly half of the total public debt.

[17] This rapid rise in public debt was due to the enormous costs of restructuring the Lebanese economy, which resulted from economic policies and also payments (for political purposes) stemming from a high level of corruption surrounding the restructuring process. In addition, it was a consequence of the increase in domestic interest rates adopted by the Central Bank to avoid losses on its reserves because the anchor of the LL fixed to the dollar.

[18] The Treasury reports of 3, 6 and 12 months showed a downward trend in favor of bonds with a maturity of 24 months and more.

As a result, net domestic public debt[19] as a percentage of GDP increased by 66.56% to 96.74% from 1995 to 2002 and reached 91.54% of GDP in 2006. However, the external public[20] debt to GDP grew more rapidly. After being limited during the war period (1975-1990), the external public debt saw a rapid expansion from 11.15% to 83.57% from 1995 to 2002 and reached 93.37% of GDP in 2006. This development was also accompanied by a reduction in public debt burdens in the short term by reducing the continued pressure on public finances.

Fig. 3: Evolution of internal and external public debt in Lebanon



Source: *(Cf. Appendix, Table 2)*

3.4. Agreements to alleviate the Lebanese public debt

As the Lebanese government was not able to meet its external obligations, a series of Paris conferences of international donor[21] countries was held in Paris in order to help Lebanon to restructure its debt, change the growing trend of the debt to GDP ratio and therefore improve the country's financial and economic situation.

This external aid was taken into account in the rescheduling agreement, which converts the originally promised cash flow stream for new, more lenient terms[22]. This led to a remarkable reduction in the cost of public debt especially after the establishment of the Paris II conference (see Appendix, Table 3): a debt cancellation of $1.8 billion, a conversion of $2.7 billion before maturity, and a rescheduling of 5.6 billion dollars (See Appendix, Table 4). Table 5 in the Appendix describes the various Eurobonds issued within the framework of the Paris II and III conferences.

But the Paris II agreement did not produce the desired effect. Despite the success of its financial component, other measures were missing. Thus, monetary policy adopted by the Central Bank did not find the required flexibility to continue cutting rates in 2003, due to regional tensions and uncertainties regarding local policy on further reforms.

[19] Almost 98% of the domestic debt is financed by Lebanese treasury bonds with a maturity of between 3 and 36 months. The major holders of treasury bonds in Lebanese pounds are the Central bank, National Funds for Social Security, and the office deposit insurance.

[20] The external debt is mainly composed of Eurobonds denominated in dollars (86%), maturity varies between 3 and 15 years. The value of the Eurobonds is around 22 billion dollars. The Eurobonds denominated in euros represent 10.7% of the total external debt.

[21] Paris I in February 2001, Paris II in November 2002 and Paris III in January 2007

[22] The disbursement is conditional on the implementation of reforms that the government committed to in its Paris II program.

3.5. Country risk

The concept of country risk is very important for emerging economies. Often confused with sovereign risk[23], country risk has a broader scope insofar as it is a concept that covers macro-economic risk, political risk and the risk of the entire country (Alterwain and Camacho, 2006).

Lebanon is a country "at risk" [24], having always been classified as a speculative investment with a rating[25] on long-term foreign-currency debt of "B-" and a short-term of "C" associated with a negative outlook (see Appendix, Table 7). The risks in question are related to the condition of the country dealing with political instability and economic constraints (a persistently high budget and overwhelming debt). This can increase the probability of sovereign default. According to the economic magazine Euromoney, Lebanon occupies 98th place out of 185 countries in the world and 14th place out of 19 countries comprising the Middle East.

However, the current literature focuses the attention on two types of factor, explaining country risk ratings[26]. The most commonly cited factor is debt rescheduling agreements; the second most cited factor is the country risk rating linked in some way to the previous one[27]. The rating of a country combines quantitative and qualitative information in relation to four measures: political, economic and financial risk, with these all being associated to the fourth factor of synthetic risk, which reflects the country risk (Hoti, 2005). Table 8 in the Appendix gives an overview of the composition of country risk in Lebanon and shows its position in comparison with the average for the region.

4. Methodology and data analysis:

4.1. The evolution of Lebanese actuarial rate loans as an indicator of failure

The first objective of our study is to analyze Lebanese risk premium loans, regarded as a determinant of credit quality, and to analyze the variation in credit spreads. This gives an idea of the debtor's capacity for payment. The second objective is to extract both the implied default recovery ratio and the risk-neutral default probabilities contained implicitly in the price fluctuations of various Lebanese Eurobonds.

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[23] Sovereign risk involves the risk of financial institutions (central governments, ministries, local and regional governments). Several factors affect the sovereign risk: the level of debt and the level of international reserves, exchange risk and liquidity, etc.

[24] Due to its rich history of political unrest, civil, regional wars and geostrategic position (Saab, S., 2005).

[25] This rating is widely used in the evaluation of country risk incurred by economic entities and takes into account contracts on an international scale.

[26] The rating agencies Euromoney and Institutional Investor define country risk as a measure of the solvency of the region, such as country creditworthiness. By contrast, Moody's defines it as the ability of the Central Bank of the country to provide foreign currency in order to service the external debt of the government and other borrowers in the country. S & P limit their rating to the country, disregarding the other borrowers and defines the country risk as the ability of the government to finance its debt criterion terms. The PRS group defines it as a measure of probable change at the political level and of government intervention affecting the political climate. Howell, L.D, 2001."The Handbook of Country and Political Risk Analysis (3rd ed.), The PRS Group, New York."

[27] Hoti, S. and McAleer, M., An empirical assessment of country risk ratings and associated models, J. Econ. Surveys 18 (2004) (4), pp. 539-588

Even though models used to calculate credit risk are similar, it is necessary to take into account the differences[28] between risky corporate and sovereign debt. This can also be explained by the fact that the risk premium of sovereign debt is on average larger than that of enterprises for the same rating because of the difficulty of diversifying the idiosyncratic risk of sovereign bonds (BIS Quarterly Review, March 2007).

We start by developing the redemption yield of the sovereign bonds in our sample and the corresponding risk free yield using closing zero coupon US treasury bills as a basis for the calculation. The formula usually used to determine the redemption yield, the "Internal Rate of Return" (IRR), which equates the bond price to the present value (NPV) of all future stream, is expressed as:

$$P - \sum_{t=1}^{N} \frac{C_t}{(1+i)^t} - \frac{F_N}{(1+i)^N} = 0$$

Where

P = market price of the bond at the date on which the yield is computed;

C_t = the coupon paid on date t .

F_N = principal repayment at maturity date.

i = redemption yield;

The bond prices are provided by Data Stream for each month in the sample. Prices are the "gross prices," namely the prices adjusted to accrued coupons. The principal values returned at maturity are always at par.

For each of the bonds in our sample, we collected interest payments and repayments of principal, and applied the method of Net Present Value (NPV). Each date corresponds to the payment of the coupon and the gross price of the bond assumes that the coupon has already been already paid by that date. So, by the due date, the obligation is sold.

Our sample is composed of 6 external bullets US dollar-denominated Eurobonds, issued by the Lebanese government[29] for the period 2000 to 2016. Lebanon has already received support for this period, from the Paris II conference in 2002 and from Paris III in 2007. These Eurobonds are as follows: the 9 1/8% 29/09/2003 (Leb-2003); the 9 ½% 14/12/2004 (Leb-2004); the 9 3/8% 30/06/2005 (Leb-2005); the 9 7/8% 24/04/2006 (Leb-2006); the 10 1/8% 03/06/2008 (Leb-2008); and the 11 5/8% 11/05/2016 (Leb-2016).

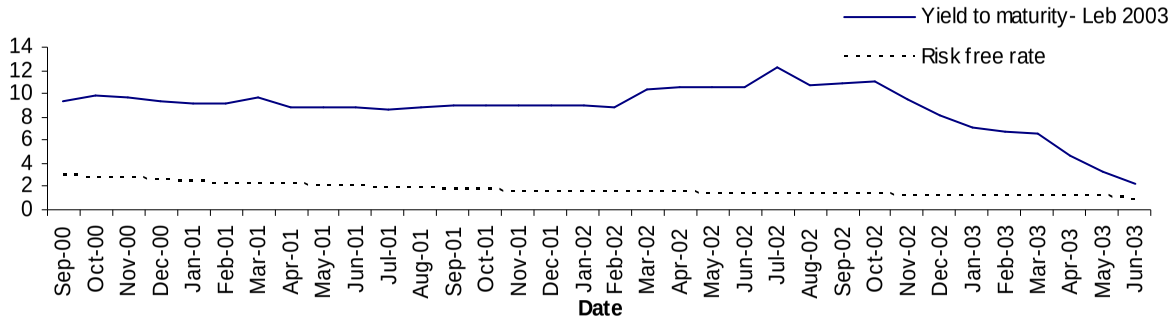
These bonds are listed on the Luxembourg Stock Exchange. The total par value of these fixed-rate Lebanese Eurobond issues is about $4.075 billion. Thus, we should still emphasize that the main purpose of the issuing of external debt by the Lebanese government is the necessity that the debt be held to maturity by the bondholders because of the constrained liquidity position of the Lebanese government. Lebanese Bonds have been

[28] The main difference between risky corporate and sovereign debt may be explained by the fact that sovereign bonds do not consider the legislative aspect, which protects the underwriter of sovereign bonds (except in the case of Collective Action Clauses under British law) (Andritzky, J., 2002).

[29] The Lebanese republic is undoubtedly subject to the non-exclusive authority of any state including New York or the federal court located in Manhattan. The application of foreign judgment in Lebanon is governed by Articles 1013, 1014, 1015 and 1016 of the code of Lebanese civil procedure.

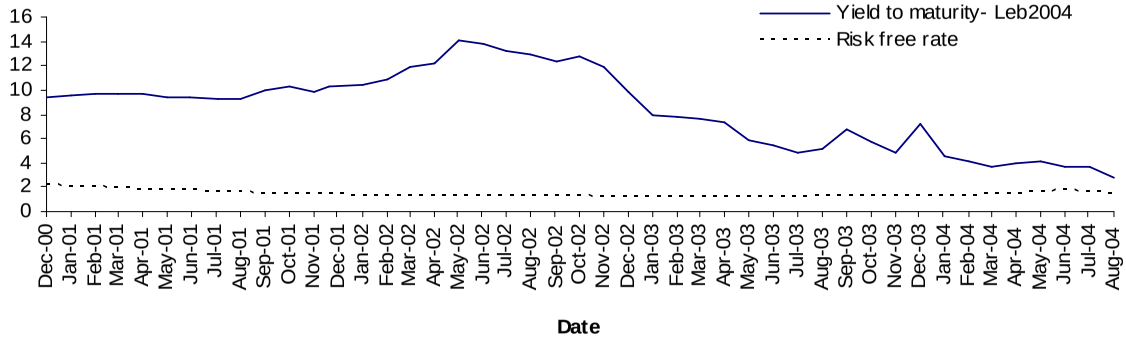
rated as B- (long term) and C (short term) by rating agencies, and they therefore belong to the group of high-risk bonds.

Fig. 4a: Credit spread of Leb-2003 bond



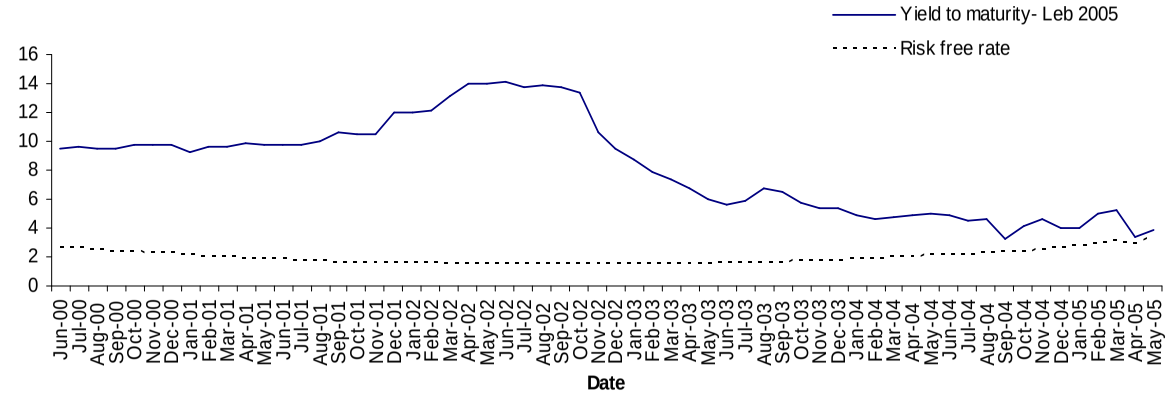
Source: *Calculated from the prospectus bond issue Leb. 2003*

Fig. 4b: Credit spread of Leb-2004 bond



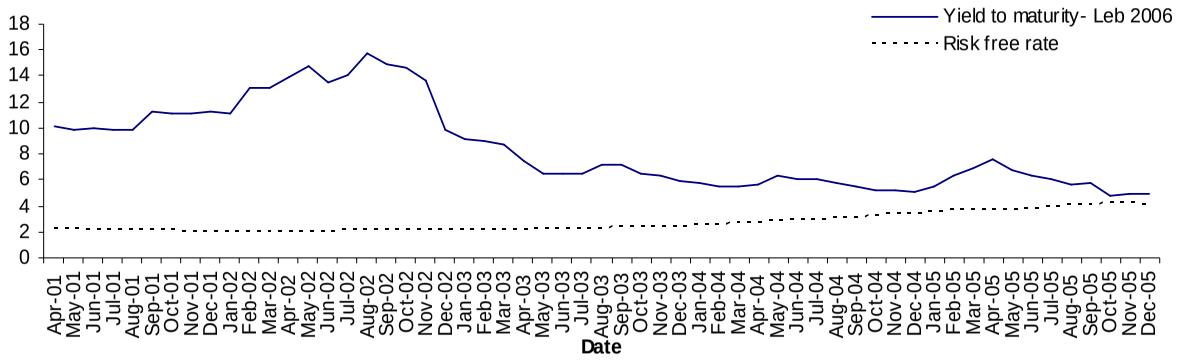
Source: *Calculated from the prospectus bond issue Leb. 2004*

Fig. 4c: Credit spread of Leb-2005 bond



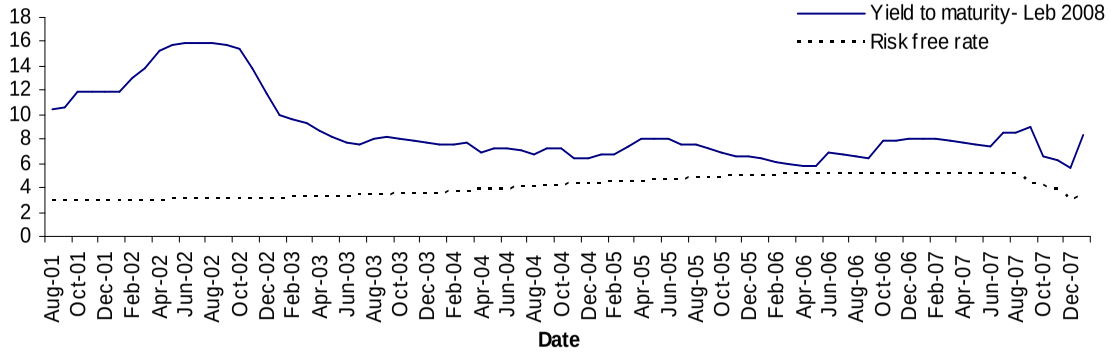
Source: *Calculated from the prospectus bond issue Leb. 2005*

Fig. 4d: Credit spread of Leb-2006 bond



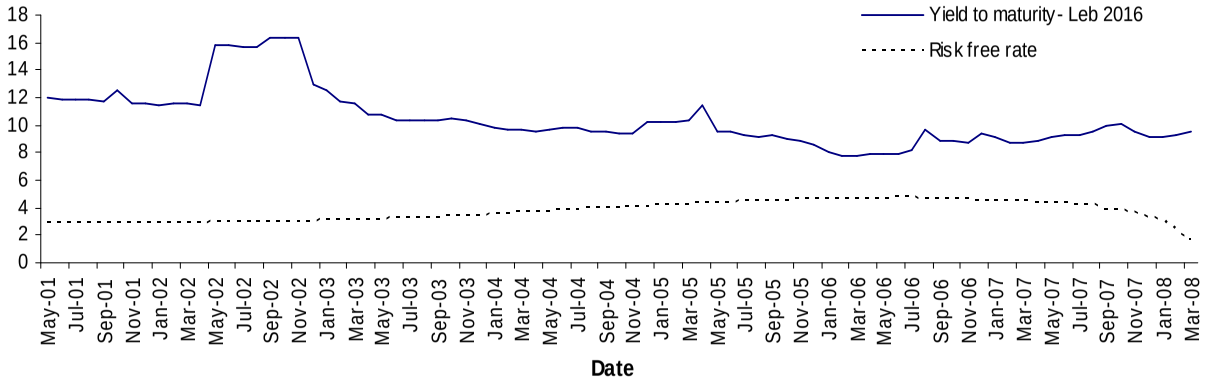
Source: *Calculated from the prospectus bond issue Leb. 2006*

Fig. 4e: Credit spread of Leb-2008 bond



Source: *Calculated from the prospectus bond issue Leb. 2008*

Fig. 4f: Credit spread of Leb-2016 bond



Source: *Calculated from the prospectus bond issue Leb. 2016*

The monthly estimated internal rates of return of the Lebanese Eurobonds are based on the technical characteristics described in Table 9. Bond prices have been collected from their first listing date on the Luxembourg stock exchange until their date of maturity or until the most recent date of activity.

Table 9: Characteristics of the obligations of the Lebanese public debt (2000-2005)

	Leb-2003	Leb-2004	Leb-2005
Issue date	23 September 2000	8 December 2000	28 June 2000
Nominal amount issued	225 000 000 USD	850 000 000 USD	850 000 000 USD
Maturity	29 September 2003	14 December 2004	30 June 2005
Coupon	9 1/8- semestriel	9 1/2- semestriel	9 3/8- semestriel
Interval Price (min; max)	(98.576 ; 105.204)	(92.13 ; 109.47)	(89.65 ; 110.48)
Price issuing	100	100	99.89
Amortization	at par	at par	at par

	Leb-2006	Leb-2008	Leb-2016
Issue date	24 April 2001	8 June 2001	5 November 2001
Nominal amount issued	1 000 000 000 USD	750 000 000 USD	400 000 000 USD
Maturity	24 April 2006	03 June 2008	11 May 2016
Coupon	9 7/8- semestriel	10 1/8- semestriel	11 5/8- semestriel
Interval Price (min; max)	(87.9601; 112.7517)	(80.0844; 115.7094)	(77.0968; 131.8542)
Price issuing	100	100	100
Amortization	at par	at par	at par

Source: *Data Stream and prospectus issue*

We note that the evolution of the redemption yield is strongly related to the Paris Conference, whose objective is to alleviate the Lebanese foreign debt, and that it is also related to the economic and financial conditions facing Lebanon during this period.
We analyze the evolution of the credit spread[30] for all the Lebanese Eurobonds, the credit spread being equal to the difference between the yield of the Lebanese bonds and the corresponding risk-free yield, (i.e. considered as a benchmark). Moreover, as noted by Krishnamurthy (2001), the risk-free rate should be extracted from a multitude of treasury bills over the corresponding life of the Lebanese Eurobonds, because there is a margin of basis points[31] (bps) approximately equal to the spread between a new (on the run) bond and an old without risk (off the run) bond already issued. This is due in principle to the difference in liquidity, the non-perfect substitution between these two obligations, and the changes in the supply of new bonds.

The credit spread reflects both expected loss[32] and the risk premium. The risk premium is seen as the most significant component of the credit spread, even if the credit spread is low. In addition, the risk premium also depends on both the risk of unexpected losses and the way that investors assess this risk[33]. We do not take into account this distinction in our study.

The development of the yield to maturity is similar for each bond. Interestingly, we notice a sharp change in the Eurobond's yield to maturity in our sample, which reached a peak in 2002 for all bonds. This can be explained by the high risk premium of these bonds. We also observe that there is a premium difference in the bonds as suggested by Duffie, Pedersen, and Singleton, 2003. This is due to the difference in the various bonds such as liquidity, duration, expected recovery rate, and the investor's expectations regarding different default

[30] For less liquid bonds, the premium also contains a liquidity premium.
[31] The spread converges to zero over time by purchasing the old risk-free bond and selling the new.
[32] Expected loss is the product of the probability of default and Loss Given Default (1 - recovery rates), which is generally linked to the historical average recovery rate.
[33] Remolona, E., Scatigna, M. and Wu, E., March 2007. Bank of International Settlements.

scenarios. We observe a growth in the yield to maturity rate reaching a peak in October 2002 of 9.48%, 11%, and 12% respectively for bonds maturing in 2003, 2004 and 2005. Similarly, the yield to maturity reached the exorbitant levels of 15.7% and 15.9% in August 2002 for bonds maturing in 2006 and 2008 and 16.4% in November 2002 for bonds maturing in 2016. This clearly shows the deterioration of Lebanese external credit, and the increased risk premiums of these Eurobonds.

The impossibility of Lebanon meeting its external commitments led to the convening of the Paris II conference in November 2002. The agreements that followed the conference helped to decrease the rate significantly, as shown in the graphs above (Figs. 4a to 4f), due to rescheduling arrangements, to measures of financial and economic restructuring and to the adjustment of external debt servicing.

4.2. The evaluation model of default (Pricing model) and the concept of recovery rate "R"

Several authors have addressed the problem of sovereign debt default through various approaches. Duffee (1999) and Duffie and Singleton (1999) estimated default probabilities of sovereign debt by promoting the products of interest rates. By contrast, Merrick (2001), Claessens and Pennachi (1996), Cumby and Pastine (2001) and Ureche-Rangau (2003) take into account the information provided by the market prices of sovereign bonds.

Two models are at the root of modeling risky debt, both sovereign and corporate. These are the reduced-form model and the structural model[34] (Westphalen, 2001). The reduced-form model differs from the structural model by the extent to which it forecasts the rate of default (Ciraolo, Berardi, and Trova, 2004). Thus, in the case of the reduced-form model, it is more difficult to predict a default, which can often occur suddenly and which is not endogenously linked to decision variables of the debt (Duffie and Singleton, 1999; Duffie, Pedersen and Singleton, 2003). Thus, the reduced-form model[35] considers the market price of the bond as a function of the default probability and future cash flows discounted at the risk-free rate.

Following the work of Merrick (2001), Andritzky, Cumby and Pastine (2001), and that of Cumby and Evans (1997), we assume a measure of default probability to be contained implicitly in the market prices of sovereign bonds. Following this, we analyze the evolution of default probabilities and recovery rates of the various bonds over time, especially during the two periods before and after the Paris conference in November 2002.
Pricing bonds, generalized by Fons (1987) under the assumption of risk neutrality show that the bond price for period t is given by the sum of discounted cash flows. In each period there would be a coupon payment, including the nominal value (face value) at maturity (in case of non-occurrence of default). One can estimate the default risk from the relationship between the bond price and the present value of its expected cash flows when the risk free rate is used as a discount factor. It is assumed in this case that all discounted payments are

[34] The structural model is more like a sovereign default decision occurring when it is optimal for the issuer to default.

[35] The reduced-form model was adopted recently by various authors such as Merrick (2001 and 2004), Duffie, Pederson and Singleton (1999 and 2002), Ciraolo, S. Berardi, A. and M. Trova, (2004) and Claessens and Pennachi (1996) in assessing the risk of default.

weighted by their probability of occurrence. Kamin and Von Kleist (1999) consider that the recovery rate is absent in emerging countries in the event of default.
At any time, the bond valuation expression under the zero recovery rate assumption will therefore be:

$$V_0 = \sum_{t=1}^{N} (P_t * d_t * C_t) \qquad \textbf{(1)}$$

C_t: The value of the bond future cash flows (principal + coupon).

P_t: Payment probability (joint probability of non-default) of cash flow at time t, i.e. the probability that the bond will not default before period t. The payment is free of risk and therefore discounted at the risk free rate.

d_t: Risk free discount factor of cash flow and principal.

With $d_t = \frac{1}{(1+y_t)^t}$; where y_t is the risk-free rate corresponding to each cash flow. Corresponding risk free discount factors applied to each cash flow date are built from US treasury bills[36] over the entire period of the life of the Lebanese Eurobonds.
The relationship between the payment probability and risk-neutral default probability δ_t is given by the following function:

$$P_t = (1-\delta_t)^t \qquad \textbf{(2)}$$

The hypothesis is that the default probabilities for two bonds are supposed to be equal for the same debtor i.e. all bonds receive the same rating. Similarly, the default probability on a given date is conditional upon the absence of default at an earlier date, and is a function of a constant α and linear time factor β . The distribution of probability used in our model is relevant in a risk-neutral approach[37].
Pricing bonds subject to default risk take into consideration both the default probability and the recovery rate (Merrick, 2001). The problems inherent in the recovery rate are quite extensive, and have been analyzed by various authors. Altman et al. (1999) determined the rate using previous defaults of U.S. companies. Merrick (2001) considered, unlike companies, sovereign bonds do not offer a history from which to assess the recovery rate. Therefore, he determined the recovery rate from Eurobond market prices based on a comparative study between Argentinean and Russian Eurobonds.

A recent report published by Standard and Poor (S&P) (2007) shows the importance of the economic situation and tax policy of a country in determining the recovery rate. The recovery rate is based on three factors: the country's ability to repay after failure, the intention of recovery, and the impact of official creditors.
Thus, the value of a bond, under the assumption of a positive recovery rate will be:

[36] Zero bills: zero-coupon treasury bills. The choice of treasury bills is justified by the fact that they have are of almost the same value as the Lebanese maturity bonds taken in the sample.
[37] The neutrality risk agents may overestimate the probability of default (Wu 1991).

$$V_0 = \sum_{t=1}^{N} (P_t * d_t * C_t) + \sum_{t=1}^{N} (p_t * d_t * R) \qquad \textbf{(3)}$$

Where

$p_t = P_{t-1} - P_t$ is the default probability of the bond during the period t. (simultaneous default on all bonds). This probability is the same for all bonds at the same time, and is a function of the increasing rate of return of the bonds.

R is the recovery rate[38]. It replaces all remaining cash flows in the event of default, and it does not necessarily depend on the coupon date of payment because of cross-default obligations. Indeed, fundamental empirical studies developed by Fons (1987) and Bhannot (2004) consider a constant default rate ($\delta_t = \delta$). However, recent studies tend to model the default rate as a linear function of time (Merrick, 2001).

$$\delta_t = \alpha + \beta t \qquad \textbf{(4)}$$

The first parameter α is an unconditional proxy for the level of default risk. The second parameter beta (β) can be interpreted as a measure of market expectations and is a function of time[39]. Thus for example, during a crisis, default probabilities are assumed to be high. However, it can be foreseen that the expectations of future default risk conditional[40] on the sovereign's ability to avoid successfully the current crisis will decline and vice versa during a period of economic growth. If default probabilities are independent of time, i.e. β=0, the intercept α is a constant probability measure and therefore we are in the same model of a flat default rate term structure as adopted by Fons (1987) and Bhannot (2004).

Equation (1) can therefore be written as follows:

$$V_0 = \sum_{t=1}^{N} [(1 - \alpha - \beta * t)^t * d_t * C_t] \qquad (\mathbf{5})$$

And equation (3) as follows:

$$V_0 = \sum_{t=1}^{N} [(1 - \alpha - \beta * t)^t * d_t * C_t] +$$

$$\sum_{t=1}^{N} [((1 - \alpha - \beta * (t-1))^{t-1} - (1 - \alpha - \beta * (t)^t) * d_t * R] \qquad \textbf{(6)}$$

In our study, we take into account two models: in the first model, we do not take into account the recovery rate and in the second, we include both the default probabilities and recovery rates. In both cases, estimations of default probabilities and recovery rates are determined using a cross-sectional analysis for each month of the period.

[38] R is the percentage of bond par value recovered by the investor after a default.
[39] The linear change in default rates as time passes.
[40] Based on the success of surviving the current crisis.

4.3. Empirical analysis

For each of the two models, we proceed to the estimation strategy as follows. We define the bond value $\hat{V}_0$, by substituting the estimates of $\hat{\alpha}$ and $\hat{\beta}$ into equation (5) in the case of an absent recovery value ($R = 0$), and into the equation (6) where $R \neq 0$. At time 0, we consider a cross section of K bonds, indexed by the subscript i with a common cross-default provision. In our analysis, we will estimate the parameters α, β *and* R such that the sum of the squared residuals (SSR) between the market price of the bond and that determined in our model is a minimum for each month of the period. We define the sum of squared residuals across the i bonds on date t as:

$$SSR_t = \sum_{i=1}^{K} (V_{i,t} - \hat{V}_{i,t})^2 \qquad \textbf{(7)}$$

Where $V_{i,t}$ is the market value at date 0 for the ith bond.

Estimates of the three parameters α, β *and* R for each date t require us to take into consideration the following three constraints:

a) The average cross-sectional residual across the K outstanding issues is equal to zero.

$$(1/K)\sum_{i=1}^{K} (V_{i,t} - \hat{V}_{i,t}) = 0 \qquad \textbf{(8)}$$

For $t = 1, ..., n$

b) The two parameters $\hat{\alpha}$ and $\hat{\beta}$ are such that the probability of payment P_t described in equation (2) is not greater than unity for all t.

c) The value of the recovery rate R cannot be negative or exceed 100%.

The procedure for the evaluation of parameters α, β and R is as follows: for each month of the period taken into account in our study, we construct the cash flow event tree for each of the K bonds. This requires the elaboration of the risk-free rate term structure for each date and each bond in our sample. Moreover, we use initial guesses for the unknown parameters α, β and R, which allow us to search the values that minimize the sum of squared residuals.

Parameters are estimated using the algorithm for nonlinear optimization subject to nonlinear constraints validated through the "Matlab" software. This method requires the setting of initial values for each parameter. We found that changing the original values had no impact on the estimation of the parameters.

Results

The sample period of the study is from October 2001 to November 2004. It is divided into two sub-periods, the first prior to the Paris II agreement in November 2002, and the second after the Paris II conference.
The following tables summarize the results. They reflect the average estimated parameters for each of the two periods, and the average risk neutral payment probability for the two models with and without the recovery rate.

Table 10: Lebanese Eurobond implied recovery ratio and default rate estimates

1st model: R=0	Default rate intercept (α)	Default rate slope (β)
Prior to Paris II conference: October 2001- November 2002		
Mean	0.084	0.004
S.D.	0.0038	0.0015
Test	Mean=0	Mean=0
T-statistic	22.05002617	2.782
P-value ( )	(*)	0.015
After Paris II conference: December 2002- November 2004		
Mean	0.026	0.006
S.D.	0.0039	0.00065
Test	Mean=0	Mean=0
T-statistic	6.659	9.494
P-value ( )	(*)	(*)

(*) <0.0001

2nd model: R≠0	Recovery ratio (R)	Default rate intercept (α)	Default rate slope (β)
Prior to Paris II conference: October 2001- November 2002			
Mean	27.3904	0.104	0.0172
S.D.	25.8843	0.0182	0.0181
Test	Mean=0	Mean=0	Mean=0
T-statistic	3.9593	21.3007	3.5369
P-value ( )	0.0016	(*)	0.0036
After Paris II conference: December 2002- November 2004			
Mean	84.9577	0.3722	-0.02
S.D.	30.2204	0.2132	0.0477
Test	Mean=0	Mean=0	Mean=0
T-statistic	13.7724	8.5523	-2.0532
P-value ( )	(*)	(*)	0.0516

(*) <0.0001

Table 11: Implied horizon payment probability

	Implied horizon payment probabilities		
Prior to Paris II conference: October 2001- November 2002	2-years	5-years	10-years
1st case: R=0	0.82	0.57	0.26
2nd case: R≠0	0.74	0.35	0.04
	Implied horizon payment probabilities		
After Paris II conférence: December 2002- November 2004	2-years	5-years	10-years
1st case: R=0	0.93	0.75	0.41
2nd case: R≠0	0.44	0.2	0.15

In the first model where $R = 0$, the average estimated parameters of the default rate are different for each of the two sub-periods: thus, the average estimates in the default rate term structure parameters imply average payment probabilities for the period prior to the Paris II conference of 82%, 57% and 26% and for the period after Paris II of 93%, 75% and 41% respectively for the horizons of two, five and ten years for the two models (Table 11).

Statistical tests show that alpha is significantly different from zero for the two sub-periods at the 5% level of significance, whereas beta is significantly different from zero only for the period after Paris II for the same level of significance. The intercept of the default rate (alpha) decreased from 0.084 to 0.026 synonymous with the reduction of the default probability after Paris II.

In the second model where $R \neq 0$, the estimated parameters of the default rate are also different for each of the two sub-periods. The tests show a significant difference for both alpha and beta parameters between the two sub-periods. This shows that this agreement had a remarkable impact on changing the parameters of the default rate. In fact, the intercept (alpha) increased from 0.104 to 0.3722 and the slope (beta) decreased from 0.0172 to -0.02. The average risk-neutral payment probabilities decreased from 74%, 35% and 4% to 45%, 20% and 15% respectively for the period prior and subsequent to the Paris II agreement for horizons of two, five and ten years.

The average recovery rate for the same period is estimated at 27.4%. This value is very close to that obtained by Merrick (2001) for Russia's Eurobonds before that country's default (27.3%). Similarly, the parameters of the default rate (alpha = 0.17 and beta = 0.0072) estimated by the author involve the average risk-neutral payment probability for the period prior to the default of Russia and are close to the results we observed for the period prior to the Paris II agreement. Although Lebanon and Russia have experienced approximately similar values of risk-neutral payment probabilities, these payment probabilities have evolved positively in Lebanon's favor in the long-run (10 years) because of the rescheduling agreement received at the Paris conference, while they have evolved negatively for Russia following its default.

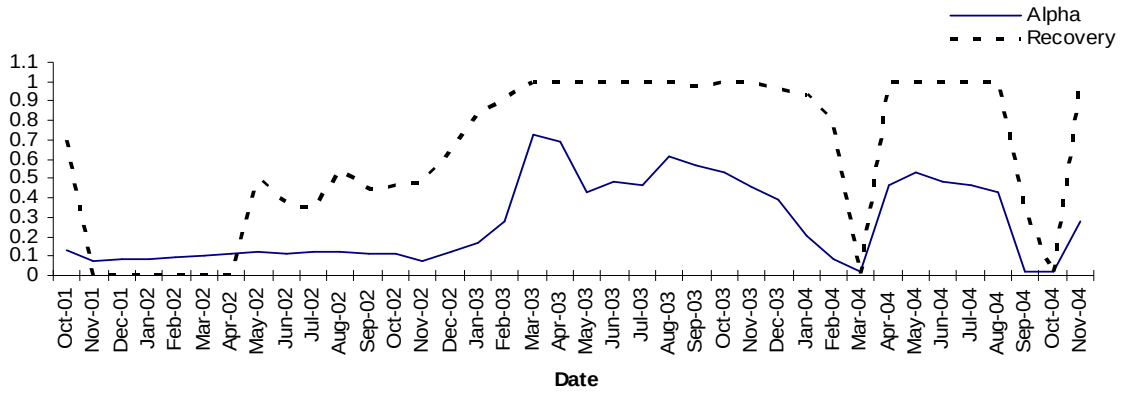
Our hypothesis testing showed that the three parameters (alpha, beta, and recovery rates) are significantly different from zero for each of the two sub-periods at a 5% level of significance[41].

The average recovery rate for the Lebanese Eurobonds increased to 84.95% for the period following the Paris II agreement. We also note that the introduction of a recovery value changes the evolution of payment probabilities. In the first case without recovery ($R = 0$), the payment probabilities increased after the Paris II agreement, whereas when $R \neq 0$, Paris II had a positive impact only on long-term payment probability (10 years) with an increase from 4% to 15%. That being said, the Paris II agreement calls for the conversion of short to long-term debt.

Figure 5 plots the estimates of the implied recovery rate and the unconditional default rate (intercept coefficient) for the Lebanese Eurobonds. The recovery rate refers to the conditional repayment of the issuer in case of default. It is noticeable that the two parameters were positively linked for the entire period.

Indeed, we noticed a zero recovery rate for the period from November 2001 to April 2002. This is due to a dramatic drop in bond prices except those of the Leb-2016 obligation. Moreover, this period was characterized by a lack of confidence in the economic situation and the national currency which resulted in higher interbank rates on the LL and a rising rate of dollarization and declining reserves of the Bank of Lebanon[42] in foreign currencies. In May 2002, the recovery rate increased to 49.5%, reflecting a loss of 29 points for the Leb-2016 obligation against stability in the price evolution of other similar obligations.

Fig. 2: Evolution of the implied recovery ratio and base default rate of Lebanese Eurobonds



During the second half of 2002, we see an increase in the level of the recovery rate. This is the consequence of the positive state of the foreign exchange market, which had seen a decline in the rate of dollarization, the interbank rate on LL and also the structure and

[41] Beta for the period after the Paris II conference is significantly different from 0 at a 5.2% level of significance.

[42] During the period in question, the Central Bank of Lebanon has continued its policy of intervention in the foreign exchange market for Open Market Operations (purchase or sale of the national currency), and in order to prevent any variation in the exchange rate of the Lebanese pound and to meet the currency needs of the market. (Associations des Banques au Liban, Rapports Annuels, 2002/2003).

growth of the money supply[43]. This allowed for some improvement in confidence in the Lebanese economic situation and the national currency. Since Paris II, reserves have shown large increases, while spreads have narrowed considerably.
The year 2003 showed a remarkable increase in the recovery rate, which reached 100%. This year had been marked by an unprecedented increase in net foreign assets[44] held by Lebanese banks as well as an increase in the money supply by 11.9% in that year with a high liquidity rate in comparison with the years 2001 and 2002. Consequently, inflation increased during this period.

The situation observed in 2003 is the consequence of the Paris II measures, which contributed to the expansion of foreign currency assets held by the Central Bank from about $5 billion at the end of 2002 to almost $11 billion at the end of 2003.
Two substantial declines were recorded in March and October 2004 when the recovery rate fell to 0%. During those two months, because of political wrangling, Lebanon witnessed tension in the markets accompanied by mass bank conversions of the national currency to currencies[45] of other more stable countries. As a result, during these two months, the Central Bank directly funded the government in LL in order to offset the decline in bank financing following the wave of conversion of LL to foreign currencies.

In March 2004, the Leb-2016 experienced a price increase against a stable price trend of other obligations. One month later, the Leb-2006 decreased by 5 points against an increase of 4 and 1.5 points respectively in the Leb-2008 and Leb-2016 bonds.
In October 2004, the Leb-2006 saw a price decrease of 4 points against a rise in prices of the Leb-2008 and Leb-2016. The following month, the Leb-2016 experienced a decline of more than 5 points against that of Leb-2006 and Leb-2008.
Moreover, the decrease in the rate of recovery in October 2004 is explained by the Central Bank's replacement of Lebanese bonds with bonds of foreign currencies. This last operation was undertaken through the release of Eurobond obligations by the Lebanese government.

[43] Following the Paris II conference, Lebanon has received in December 2002, $ 950 million and during the first half of 2003, 1500 billion dollars. Thus, the assets of Banque Du Liban increased by $ 5125 million.
[44] The share of net foreign assets in banks, with the exception of gold, at the end of 2003 amounted to more than 27% of the overall money supply (M 3). M 3 includes Lebanese currency in circulation and both LL and foreign currency deposits. (Associations des Banques au Liban, Rapports Annuels, 2002/2003).
[45] This has caused a liquidity crisis in the national currency where interbank interest rates on L.L. have increased from 3.83% to 5.22% from February to March 2004, and from 3.55% to 6.76% from September to October 2004.

Conclusion

In the present study, we focused on bonds issued abroad by the Lebanese government during the period of October 2001 to November 2004. First, having mentioned the characteristics of Lebanese bonds, we calculated the actuarial rate of these bonds as an indicator of "primary" default and we followed their evolution during their lifespan. This evolution is linked to the international conference for support to Lebanon (Paris II). A comparison between the different bonds shows a similar evolution in the actuarial rate. Nevertheless, the risk premium changes from one loan to another (difference between durations and maturity etc…). We proposed a measure of credit risk of dollar-denominated Eurobonds from the Lebanese government. We considered both cases of a zero and non-zero recovery rate. For the period following the conference on debt relief, held in November 2002, our results show that the average payment probabilities showed an increase in cases where R = 0. The introduction of the recovery rate plays a crucial role in the evolution of default probabilities. Indeed, the probability of payment for two and five years ahead has decreased, but the probability of payment for ten years into the future has increased. Similarly, we have seen an increase in the recovery rate from 27.3% to 84.95%.

The political situation led to changes in the monetary policy adopted by the Central Bank. Thus, it has been suggested to swap on a regular basis and for secondary market operations to recognize the changes of supply and demand factors in the market. This policy is justified by the necessity for the government of Lebanon to use US dollars. The pressures suffered by the foreign exchange market[46] led to a liquidity crisis in the national currency of Lebanese banks. This had an adverse effect on the level of interest rates and especially on the level of foreign reserves held by the Central Bank. The market reaction[47] to this political situation underscores the change in the evolution of default probabilities and recovery rates.

To what extent do political shocks explain Lebanon's failure? We have noticed a significant impact of political shocks leading to a manifestation of a crisis of confidence (resulting in the abandonment of the national currency). This situation has led to a liquidity crisis. Thus, it is highly probable that without the intervention of both the Central Bank and external aid, Lebanon would have experienced credit problems eventually leading to a sovereign default. However, there is a question that remains unresolved: what drives international agencies to grant loans to a country like Lebanon while political forces within the country may bring its sovereignty into the picture at any time?

Lebanon is a country "at risk," because of both macroeconomic constraints and the policies adopted by the Central Bank, which maintain a very high level of interest rates. Lebanon is now facing a very delicate situation given the unstable political situation and its excessive debt levels, which could lead to a sudden inaccessibility to international markets. Moreover, the existence of a wide credit spread in conjunction with political shocks may lead to a crisis of confidence, a deterioration in credit quality and thereafter to a self-fulfilling debt crisis. The present study shows that interest rates in Lebanon are affected by liquidity conditions as well as by a perceived sovereign risk.

[46] Where the dollar was bought at its highest price (1515 LL) or more.
[47] This may be explained by the level of confidence vis-à-vis the market and the country.

The positive results from the Paris II conference led to a favorable evolution in the state of Lebanese public finances situation and to a lower servicing of debt. Although, Lebanon presents public debt indicators far beyond those of other countries that have experienced a crisis, it has not experienced a default on its external borrowing. Following the work of Reinhart, Rogoff, and Savastano (2003) on debt intolerance, we must agree that historical factors play a fundamental role.

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Appendix

Table 1: Evolution of the Lebanese government's financial operations (1995-2006)

Billions of LBP	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
GDP	18028	20417	22880	24509	24816	24816	25188	26205	29604	32586	33010	32771
Total revenue	3033	3533	3753	4430	4868	4749	4646	5830	6654	7515	7405	7295
Total revenue/GDP	16.82	17.30	16.40	18.07	19.62	19.14	18.45	22.25	22.48	23.06	22.43	22.26
Total expenditure	6342	7732	9662	8386	8910	10932	9171	10139	10593	10540	10203	11876
debt servicing	1875	2653	3378	3214	3624	4197	4312	4622	4874	4021	3534	4636
Total expenditure/GDP	35.18	37.87	42.23	34.22	35.90	44.05	36.41	38.69	35.78	32.35	30.91	36.24
Budget deficit	3309	4199	5909	3956	4042	6183	4525	4309	3939	3025	2798	4581
Budget deficit/Total expenditure (%)	52.18	54.31	61.16	47.17	45.36	56.56	49.34	42.50	37.18	28.70	27.42	38.57
Debt servicing/Total expenditure (%)	29.56	34.31	34.96	38.33	40.67	38.39	47.02	45.59	46.01	38.15	34.64	39.04
Debt servicing/Total revenue (%)	61.82	75.09	90.01	72.55	74.45	88.38	92.81	79.28	73.25	53.51	47.72	63.55
Budget deficit/GDP	18.35	20.57	25.83	16.14	16.29	24.92	17.96	16.44	13.31	9.28	8.48	13.98

Source: *Associations des Banques au Liban, Rapports Annuels, (1995-2006)*

Table 2: Evolution of Lebanese total public debt: Internal and external (billions of $)

Billions US $	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Public debt	8	11.5	13.2	14.5	17	18.1	18.8	16.9	17.9	17.6	19.4	20
(% of GDP)	66.56	84.49	86.54	88.74	102.76	109.41	11.96	96.74	90.7	81.02	88.15	91.54
External debt	1.34	1.9	2.44	4.16	5.51	7.18	9.6	14.6	15.5	18.4	19.2	20.4
(% of GDP)	11.15	13.96	15.99	25.46	33.31	43.4	57.17	83.57	78.54	84.7	87.25	93.37
Total public debt	9.34	13.4	15.6	18.7	22.5	25.3	28.4	31.5	33.4	36	38.6	40.4
(% of GDP)	77.71	98.45	102.27	114.45	136	152.92	169.12	180.31	169.23	165.7	175.4	184.9

Source: *Associations des Banques au Liban, Rapports Annuels, (1995-2006)*

Table 3: Average cost of public debt

Date	Total debt	Domestic debt	External debt
Prior to Paris II conference (Nov- 2002)	11.97%	13.20%	9.21%
After Paris II conference (Nov- 2003)	8.36%	9.23%	7.39%
Dec-04	6.40%	5.80%	7%

Source: *Republic of Lebanon, Ministry of Finance, December 2004*

Table 4: Transactions concluded in the context of Paris II conference (in billions of US dollars)

	Amount	Debt cancellation	Conversion	Rescheduling*
Central Bank of Lebanon	4.1	1.8	1.9	0.4
Paris II	2.4			2.4
Commercial banks	3.6			
Cash	2.7			2.7
Values < 3 month	0.3		0.3	
Values > 3 month	0.6		0.6	
Total	10.1	1.8	2.7	5.6

* inclues principal and Interest

Source: *Republic of Lebanon, Ministry of Finance, December 2003*

Table 5: Eurobonds issued within the context of Paris III and II conferences

	Maturity	Amount $	Coupon
Eurobonds issued in Paris III			
XS0312416000	Jul-17	300.000.000	3.75%
XS0312416778	Jul-12	200.000.000	3.75%
Eurobonds issued Paris II			
XS0160503347	Dec-17	2.007.511.000	4%
XS0160456322	Dec-17	650.000.000	5%
XS0160456322	Mar-18	700.000.000	5%
XS0169203048	Mar-18	200.000.000	5%

Source: *Republic of Lebanon, Ministry of Finance, December 2007*

Table 6: The structure of Lebanese external debt

External debt (billions of $)	**2002**	**2003**	**2004**	**2005**	**2006**
Bilateral	0.469	1.123	1.184	1.06	1.094
Multilateral	1.072	1.236	1.319	1.277	1.421
Commercial bank	0.289	0.224	0.169	0.108	0.085
Eurobonds	12.484	12.76	15.45	16.14	17.25
Special TB in foreign currency				0.278	0.278

Source: *Republic of Lebanon, Ministry of Finance, December 2007*

Table 7: Rating of the Lebanese sovereign public debt

Agency	***Foreign currency***			***Domestic currency***		
	Rating on long run	Rating on short run	Perspective	Rating on long run	Rating on short run	Perspective
Fitch IBCA Ltd	B-	B	Stable	B-		
Moody's Investor Services Ltd	B3		Negative			
Standard and Poor's	B-	C	Negative	B-	C	Negative

Source: *Republic of Lebanon, Ministry of Finance, January 2008*

Table 8: Composition of country risk: Lebanon and region of the country

	Lebanon			Country region		
	Jun-06	Jun-07	Level of risk	Jun-07	Jun-07	Level of risk
Political risk rating	58.5	56.5	High	66.4	67.5	Moderate
Financial risk rating	31.5	31.5	Moderate	41.3	41.9	Very low
Economic risk rating	25.5	29	High	41.1	41.3	Very low
Synthetic rating reflecting Country risk*	57.8	58.5	High	74.4	74.8	Low

Source: *Rating agency: le groupe PRS (the Political Risk Services agency), Byblos research*
Note: * The synthetic rating comprises political, financial, and economic risk.
The ratings of political and synthetic risk take values from 0 to 100. 100 indicate the lower risk.
The ratings of economic and financial risk take values from 0 to 50. 50 indicate the lower risk.