A MATHEMATICAL APPROACH OF DETERMINING BANK RISKS PREMIUM

Jyoti Gupta and Philippe Spieser

Département Finance, Groupe Ecole Supérieure de Commerce de Paris, 79 avenue de la république, 75011 Paris, France.

Abstract: The theory of options allows to establish a system of specific risk premiums designed to insure a bank against bankruptcy on a logic and rational basis because basically, paying a premium transforms a risky deposit into a riskless investment. The basic mechanism is that the payment of a premium is equivalent to the purchase of a put on the assets of the bank. The impact of different parameters on the value of that put is analyzed: level of debts, value of the market of the bank, volatility, pay-out ratio of dividend distribution. Conclusions related to the management of the firm are drawn from the different simulations.

Keywords: Banking system, risk premium of deposits, bankruptcy, call, put.

INTRODUCTION

The growing number of banks bankruptcies since the middle of the 1970s, the growing volatility of interest rates in the world, and the deregulation process in developed countries have pushed national monetary authorities and international control organisations onto making mandatory steps in bank management (see BRI-Bank for International Settlements reports). It can be noticed that in the USA, the number of banks going bankrupt amounted to 6 per annum between 1945 and 1980 with a maximum 17 in 1976, but since then, this number has dramatically increased:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N.1</td>
<td>14 400</td>
<td>14 200</td>
<td>13 700</td>
<td>13 600</td>
<td>12 700</td>
<td>12 878</td>
</tr>
<tr>
<td>N.2</td>
<td>120</td>
<td>138</td>
<td>184</td>
<td>200</td>
<td>206</td>
<td>169</td>
</tr>
</tbody>
</table>

(continued)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N.1</td>
<td>11 920</td>
<td>11 200</td>
<td>10 100</td>
<td>9 850</td>
<td>9 600</td>
</tr>
<tr>
<td>N.2</td>
<td>127</td>
<td>114</td>
<td>71</td>
<td>37</td>
<td>44</td>
</tr>
</tbody>
</table>

N.1 Number of banks insured by the FDIC
N.2 Number of bankruptcies

What's more, the number of the banks which may set a problem to the FDIC (Federal Deposit Insurance Corporation, which insures banks in the US) stands to about 10% of all the banks covered by this institution in 1991. But one can nevertheless notice that after 1991 the situation has improved due to two factors:

- the government took measures to reorganize banks and sometimes even save them from bankruptcy
- there has been a big movement of mergers and acquisitions within the banking industry at the beginning of the nineties.

In France, the agreements of 4 banks were canceled by the Bank Commission and a procedure of "redressement judiciaire" (legal bankruptcy regulation) was undertaken against the Banque de participation et de Placement, United Banking Corporation, Lebanese Arab Bank and the Société Anonyme de Crédit rural de Seine Maritime.

The Commission has pronounced the same sanction against the Industrial Bank of Monaco at the beginning of 1990. Other banks have gone through paramount difficulties, which are now almost got over with the French and Portuguese Bank, the International Bank for West Africa, the French Bank of Trade and Saudi European Bank; moreover, during the first term of 1991, three banks were deprived of their agreement. Since then, the number of bankruptcies has also decreased.

Eventually in Germany, although no bank has gone bankrupt since the Herstatt Bank, the new bank regulation of 1985 determined the rules of the business, under the control of the Federal Office of Bank Controle.

The monetary authorities took two kinds of measures:

- on the one hand, the creation of a guarantee funds to which each bank-member contributes and a system of insurances that enables the members to be paid back whatever occurs, up to a determined threshold. For instance in the U.S, the F.D.I.C is warrant up to 100 000$ by deposit (1990). The premium paid by each bank is determined in proportion to deposits, regardless of the real value of their assets,

- on the other hand, the organization of a set of rules to increase the safety of the banks: indicators like the liquidity ratio, a minimum amount of capital, the division of risks etc. are now used.

The cornerstone of the system proposed is the prudential ratio adopted by the council of European Communities on the 18th of December 1989 and simultaneously by the B.R.I by the name of Ratio Cooke.

In France, the supervision of credit institutions is on the responsibility of the "Banking Commission" (Commission Bancaire") according to the law issued on the 24th of January 89. The features of the French system is the existence of a