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**Article**

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# Financial gradualism and banking crises in North Africa region: an investigation by a panel logit model

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**Abstract.** In order to overcome the troubles of the crisis in the seventies, North African countries have adopted financial liberalization policies to enhance their economic growth. Moreover, these policies have affected the stability of their banking systems. The purpose of this study is to test the impact of financial liberalization on the probability of appearance of banking crises which covers a sample of four countries of the North Africa region during the period 1970-2003 by using a panel logit model. The empirical analysis of this study suggests that (a) the degree of financial liberalization impact significantly the occurrence of banking crises in the countries of the region, (b) the order of financial liberalization between internal and external financial liberalization is also crucial for the emergence of banking crises.
**Keywords.** Financial liberalization, Banking crises, North African countries, Panel logit model, Order of financial liberalization, Degree of financial liberalization.
**JEL.** F36, G18, F37, G15, C33.

## 1. Introduction

Financial crises have increased in emerging countries since the seventies. These have resulted in very different explanations for their occurrence mechanisms, progress and contagion. However, since the pioneering studies of Kaminsky & Reinhart (1999), most economists are of the view to consider that these crises are related to the implemented financial liberalization policies. Thus, the study of Demirgüç-Kunt & Detragiache (1998), dedicated to banking crises concludes that financial liberalization is a significant factor in explaining banking crises. Similarly, Glick & Hutchison (1999) show that financial liberalization explains the appearance of "twin crises". Moreover, the limit of this work is the fact that they argue the similarity of liberalization process for all countries. Also, Williamson & Mahar (1998) have pointed out, from the financial liberalization experience of thirty-four countries over the period 1973-1996, the danger associated with liberalization "premature", both badly organized and poorly controlled.

For Johnston (1997), the non-compatibility of internal and external liberalization has played a predominant role in the infection and spread of the crisis in emerging countries. the crisis is linked to poor sequencing of capital account liberalization or arbitrary opening of financial markets Eichengreen (2000). These works have the merit to distinguish between: the liberalization of the domestic

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financial system, the opening of financial markets and the liberalization of the capital account. But their weakness is the fact that it is essentially a concrete analyzes of financial liberalization experiences, without considering econometric tools.

Our present study focuses on the North Africa region countries, which represents the newly exposed countries to the international finance. The study period is from 1970 to 2003 during which was largely achieved their financial liberalization. Otherwise, the intermediation function leads to a fundamental fragility of banks resulting from what they must reconcile permanently; liquid liabilities (deposits) and long commitments.

The vulnerability of banks is reinforced by misalignments in the balance sheet structures related to the development of market operations and international openness, from the perspective of the quality of receivables, assets and from the financing of foreign currency, on the liability side. This is the meaning given by Dornbusch (2001) to the "new style balance sheet crises". Concerning the macroeconomic level, this approach is based on the idea that financial liberalization promotes capital inflows, with two sets of consequences: first, a rapid expansion of bank credit and the money supply and stimulating inflation training speculative bubbles; then, with flexible exchange rates, a currency appreciation that reduces exports and slows economic growth. This unfavorable macroeconomic development makes financial officers vulnerable, brings a loss of confidence by non-residents, who suddenly withdraw their capital, causing bank failures, often amplified by a currency crisis; they represent the "twin crises" banking and currency crises that have multiplied in emerging countries Kaminsky & Reinhart, (1999).

The study of the relationship between financial liberalization and the recent banking crises shows the existence of a critical theoretical scourge, which is based on two fundamental literatures: While the first literature defends the benefits of the principle of financial liberalization with its positive and direct effect on the functioning of the banking system and hence on reducing the cost of capital, the second argues that financial liberalization has accentuated financial instability, bank failures and declining economic growth.

## 2. Literature review

The literature of financial liberalization began in the early 70s, during the building of the school of financial repression by its precursors McKinnon (1973) and Edwards (1984). These works emphasize the misdeeds of a repressed financial system, on both financial and real plans and certify that financial liberalization is the most effective way to develop banking intermediation, boost capital accumulation and promote economic growth in the path of developing countries. Other empirical works forming part of the same logic came forward a few years recently, it is essentially the work of Galbis (1977), Kapur (1976), Mathieson & Rojas-Suarez (1993), Levine & King (1993), Williamson & Mahar (1998) and others that devoted mainly to modelize the original contributions of McKinnon (1973) and Shaw (1973).

Later, and following the progress made on endogenous growth in the early 90s, new approaches supporting the interest of financial liberalization have developed including the works of Bandiera *et al.,* (2000), Caprio & Klingebiel (2000), Jbili, Enders & Treichel (1997), Harvey & Lundblad (2003), Mehrez & Kaufmann (2000) and others. Thus, seeking to establish other theoretical bases justifying the implementation of financial liberalization process, this work has generally reached similar conclusions: the financial system must be liberalized to ensure its smooth operation, increase financial savings, and promote productive investment, pushing technological innovation and supporting economic growth. Similarly, the literature of the banking crisis grew during the second half of the 90s, following the spread of bankruptcies and financial instabilities in the world and whose gravity appears unprecedented, affecting several countries. According to this literature, successful financial liberalization experiences are very rare, and in the general case, liberalization is the cause of crises in the banking and financial systems accompanied by a sharp fall in growth and a contraction of the gross domestic product. Except the benefits of financial liberalization in relation to the importance of its costs has questioned the validity of it application, especially for countries in the way of development.

Two approaches are interposed. One approach brought the banking crises of financial liberalization to macroeconomic and institutional causes and a second has linked the attacks to microeconomic causes. The first wave of empirical work argues that recent banking crises based on macroeconomic fundamentals and agrees to clarify that were particularly institutional preconditions of the financial liberalization process that were the major cause of crises and economic recessions. The second school of work argues that recent banking crises is based on microeconomic foundations and states that this is particularly, changes in the banking environment in the context of financial liberalization, which led to a deterioration of bank profitability and increased risks, which are the main causes of recent banking and economic crises.

## 3. Data and empirical methodology

### 3.1. Data

This paper considers a sample of four North African countries, Tunisia, Morocco, Algeria and Egypt. The choice of the selected countries for this study is primarily dictated by the availability of reliable data. The panel covers the period 1970–2003.

The endogenous variable that has been retained is the banking crises (Crises) which is a dummy variable.

The indicators of the degree of financial liberalization distinguish partial and total liberalization for each financial sector; domestic sector, financial markets and capital account. The partial and total liberalization are also dummies variables (dummy). The partial liberalization in each sector take the value 1 of partial liberalization periods of the sector , where at least one dimension of the sector was liberalized, and the value 0 of the control periods which represents full liberalization. Besides, total liberalization of each sector takes the value 1 of periods of full liberalization of the sector, when all the dimensions of the sector were liberalized, and the value 0 of the repression periods or partial liberalization.

The Exogenous variables of this study are: growth of real GDP per head (GDP/K), the budget (Deficit/GDP), bank credit / GDP (credit / GDP), the ratio M2 to international foreign exchange reserves (M2 / Reserve ), interest rates (rate int), and dummies variables (Dummy) which are: domestic liberalization (LIB DOM), liberalization of financial markets (LIB FIN), liberalization of the capital account (LIB CAP), partial liberalization (partial LIB), full liberalization (total LIB), domestic financial liberalization precedes external financial liberalization (1$^{st}$order), external financial liberalization precedes domestic financial liberalization (2$^{nd}$order).

With the exception of the variable of the degree liberalization that was retained from the database of Gamra & Plihon (2007), the other variables were obtained from the World Development Indicators (WDI) database of the (World Bank, 2013).

Our study uses the "*logit*" model. Besides its simplicity, this method has the advantage of measuring the contribution of a variable to the probability of occurrence of a crisis at one time, allowing to evaluate the effect of the explanatory variables on the dependent variable. Moreover, this estimation method takes account of the qualitative nature of certain variables, which usually causes crises. It responds to the problem of the empirical work that evaluates the effect of partial and full liberalization of financial variables on the probability of occurrence of banking crises.

In view of this issue, we asked the following questions:

- **$Q_1$**: Are banking crises affected by the degree of financial liberalization?
- **$Q_2$**: Are banking crises affected by the timing and order of financial liberalization measures?

To answer these questions, we have made two assumptions:

- $H_1$: Banking crises are affected by the degree of financial liberalization.
- $H_2$: The chronology of liberalization largely affects the banking crises.

### 3.2. The empirical methodology

The logistic regression is a commonly used model. It is used when the dependent variable (dependent variable Y) is qualitative, usually binary. The explanatory variables (independent variables Xi) in the contrary may be either qualitative or quantitative. The dependent variable is usually the occurrence or not of an event (crises, illness ..., or not) and the independent variables are those that may influence the occurrence of the event.

The "logit" model is the econometric method most commonly used in the analysis of banking and financial crises. Despite its simplicity, it has the privilege to measure the contribution of a variable to the probability of appearance of a crisis by calculating the vicinity of the average value of variables. In addition, it takes into account the qualitative nature of certain variables which usually cause crises. The first to use this model are Eichengreen & Leblang (2003) using data for industrialized countries over the period (1973-1993) in order to identify the common origins of currency crises and elucidate their contagious nature. Other economists have applied this method to the analysis of banking crises, mainly Demirguc-Kunt & Detragiache (1998), who performed various tests of the logit model to test the impact of financial liberalization, the institutional environment and the explicit deposit insurance on bank crises with a panel of developed and developing countries during the period (1980-1994), (1980-1995) and (1980-1997).

#### 3.2.1. The financial liberalization variable

Financial liberalization is defined as a process of dismantling all forms of quantitative or qualitative regulatory control to restrictive state imposed on institutional structures, instruments and activities of various agents on segments of the financial sector, not only in internally but also internationally Boyer, Dehove, & Plihon (2004). These policies aim to improve the efficiency of the financial systems, to reduce the risks associated with currency fluctuations and interest rates, and meet new funding needs McKinnon (1973). A liberalized financial system is characterized by a triple movement of liberalization: the domestic financial liberalization, opening of financial markets and the capital account.

##### 3.2.1.1. The domestic financial liberalization

It measures the liberalization of interest rates, credit, reserve requirements, and banking competition.

- The liberalization of interest rates on the elimination of control, fixing and capping lending rates and credit.
- The liberalization of credit represents the elimination of control, orientation towards priority sectors, capping appropriations for other sectors and the reduction or elimination of reserve requirements.
- The liberalization of banking competition consists of the removal of limitations on the installation and the participation of domestic and foreign banks, restrictions related to the specialization of banks and the establishment of universal banks.

##### 3.2.1.2. Financial markets liberalization

It means removing restrictions to the detention by foreign investors of shares of listed companies on the domestic securities market and the removal of constraints to the repatriation of capital and payment of dividends, interest and profits.

##### 3.2.1.3. The openness of the capital account

It represents the removal of barriers that prevent banks and other financial institutions to make loans abroad, removal of control over the exchange rate applied to transactions relating to the current account and capital account liberalization and capital flows. For each sector, three plans are identified: fully liberalized, partially liberalized and repressed. Thus, a financial system is considered fully liberalized if the three sectors are fully liberalized and considered partially liberalized if at least one sector is partially liberalized. Otherwise, Informations of partial and full liberalization of the sector and the dates of partial and full liberalization of the entire financial system are presented in (Appendice 1).

3.2.2. The banking crises variable

A banking crisis is a situation in which banks face an accumulation of non-performing loans and bad debts. They face serious financial problems, which cause a wave of bank runs, prolonged closures of banks, panics or bank failures, which involve a wide support for movement by the state, generalized government guarantees deposit or bank nationalization.

In this study, we adopt the definition of banking crises of Caprio & Klingebiel (1996). A banking crisis is defined as a situation in which "the whole or the majority of bank capital is eroded" It means that banks face different losses that reduce various prudential ratios, and reveal a phenomenon of financial illusion. Two kinds of crises have been distinguished by Caprio & Klingebiel (1996), systemic and non-systemic crises (Appendice 2). For systemic crises, these problems are the beginning of a cascade of similar events for the rest of the financial institutions, which implies that the wave of crises affecting a large part of the banking sector and some banks who hold most of the assets of the banking system. For non-systemic crises, these issues apply only some small or medium banks.

3.2.3. The presentation of the econometric model

On a panel of four countries in the North Africa region (Morocco, Algeria, Tunisia and Egypt) over the period (1970-2003),which represents a period that includes the highest number of episodes of banking crises and financial liberalization, noted "**t**" , the basic model is:

$$Y_{it} = âX_{it} + å_{it} \qquad (1)$$

With: $i = \{1, \ldots, N\}$ ; $t = \{1, \ldots, T\}$.

"Y" is the "Dummy" matrix variable of banking crises, "â" is a vector of "N" unknown coefficients to estimate, "X" is the matrix of explanatory variables and "å" is the residue matrix.

Since "Yit" is the matrix of "dummy" variables that takes the value 1 if there is a banking crisis and 0 otherwise, we can write:

$P\,(Y_{it} = 1 / X_{i1}, X_{i2}, \ldots, X_{iN}) = F\,(âX_{it})$ where F is the distribution function of $å_{it}$ .

By using the assumption of logistic distribution, we find the logit model:

$$F(âX_{it}) = \frac{1}{1+\exp(-\beta X_{it})} \qquad (2)$$

The probability associated with this model is:

$$L = \prod_{t=1}^{T} T \prod_{i=1}^{N} N\, P\left(Y_{it} = \frac{1}{X_{i1,}X_{i2,\ldots,}X_{iN}}\right) \qquad (3)$$

$$L = \prod_{t=1}^{T} T \prod_{i=1}^{N} N\, F(\beta X_{it})^{Yit} x[1 - F(\beta X_{it})]^{1-Yit} \qquad (4)$$

The logarithm of this likelihood is written:

$$lnL = \sum_{t=1..T} T \sum_{i=1..N} N\{Y_{it} x \ln[F(\beta X_{it})] + (1 - Y_{it}) x \ln[1 - F(\beta X_{it}]\} \quad (5)$$

So the expectation of "Y" takes only two values , we use the logistic function bellow:

$$f(x) = \frac{\exp(x)}{1+\exp(x)} = p \quad (6)$$

So: 0 <f(x) <1 and E(Y) = 0 or 1
- Y follows a Bernoulli law of "p" parameter.
The "logit" model is represented as follows:

$$Logit(p) = \ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_{i1} + \cdots + \beta_p x_{ik} \quad (7)$$

This last equation represents the function of the "logit" model.

## 4. Statistic and econometric results

The empirical study attempts to evaluate the effect of gradualism of financial liberalization initiated by the 4 predefined countries on the probability the appearance of banking crises over the period (1970-2003). This is specifically to determine if the degree and order of financial liberalization are the cause of the observed banking crises.

**Table 1.** *Featured statistics (1970-2002)*

| | CRED/PIB | CRISES | PIB.REEL | DEFICIT | M2/RESEV | TX.INT |
|---|---|---|---|---|---|---|
| Mean | 62.68 | 0.56 | 4.69 | -1.33 | 7.28 | 2.06 |
| Median | 60.53 | 1.00 | 4.70 | -1.83 | 5.67 | 1.10 |
| Maximum | 110.9 | 1.00 | 27.42 | 9.70 | 21.47 | 15.10 |
| Minimum | 27.09 | 0.00 | -11.33 | -6.74 | 1.15 | -17.08 |
| Std. Dev. | 20.65 | 0.49 | 4.37 | 2.13 | 4.40 | 5.17 |
| Skewness | 0.43 | -0.26 | 0.82 | 1.60 | 1.17 | -0.01 |
| Kurtosis | 2.37 | 1.07 | 8.80 | 8.46 | 3.71 | 4.66 |
| Jarque-Bera | 6.47 | 22.69 | 206.60 | 227.66 | 33.97 | 15.70 |
| Probability | 0.039 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sum | 8525.21 | 77.0 | 638.7 | -181.8 | 990.73 | 280.34 |
| Sum Sq. Dev. | 57590.4 | 33.40 | 2581.0 | 614.3 | 2618.16 | 3610.9 |
| Observations | 136 | 136 | 136 | 136 | 136 | 136 |

**Source** : Authors, from Eviews 2008.

**Table 2.** *Correlation between control variables*

| | CRED/PIB | CRISES | PIB.REEL | DEFICIT | M2/RESEV | TX.INT |
|---|---|---|---|---|---|---|
| CRED/PIB | 1 | 0.01 | -0.07 | -0.39 | 0.31 | 0.26 |
| CRISES | 0.014*** | 1 | -0.06 | -0.11 | 0.03 | 0.19 |
| PIB.REEL | -0.07 | -0.06*** | 1 | -0.008 | -0.012 | 0.01 |
| DEFICIT | -0.39* | -0.12* | -0.008*** | 1 | -0.23 | -0.10 |
| M2/RESEV | 0.31* | 0.03*** | -0.012*** | -0.23* | 1 | -0.08 |
| TX.INT | 0.26* | 0.20* | 0.015*** | -0.10* | -0.08*** | |

**Source**: Authors, from Eviews 2008.
**Note:** * Confidence level of 1%; ***: Confidence level of 10%

According to Table 1 and Table 2, we see that there exist correlations between the variables:

- Strong negative correlation between the variable "Deficit" and the variables "crises", "M2/reserves" and "interest rates".

- Strong positive correlation between the "credit/GDP" and the variables "M2/ reserves" and "interest rates". There is also a strong positive correlation between the crisis and the variable "interest rates".
- Low negative correlation between "GDP" and the variables "deficit" and "M2 / reserve". The latter also marks a weak negative correlation with variable "interest rates".
- A weak positive correlation between the "credit / GDP" and "crisis" and also between the variable "crisis" and the "M2 / reserves". There is also a weak positive correlation between "GDP" and the "M2/reserves".

### 4.1. Degree of liberalization and banking crises

The indicators of the degree of financial liberalization distinguish partial and total liberalization for each financial sector; domestic sector, financial markets and capital account. The partial and total liberalization are dummies variables (dummy). The partial liberalization in each sector take the value 1 of partial liberalization periods of the sector; where at least one dimension of the sector was liberalized, and the value 0 of the control periods which represents full liberalization. Besides, total liberalization of each sector takes the value 1 of periods of full liberalization of the sector, when all the dimensions of the sector were liberalized, and the value 0 of the repression periods or partial liberalization.

**Table 3.** *Binary Logit with dependant variable (CRISES) and partial liberalization*

Dependent Variable : CRISES
Method: ML - Binary Logit (Quadratic hill climbing)
Sample: 1970 2003
Included observations: 136
Convergence achieved after 3 iterations
Covariance matrix computed using second derivatives

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| CREDIT_PIB | -0.016038 | 0.011473 | -1.397821 | 0.1622 |
| CROIS_PIB_REEL | -0.004986 | 0.044515 | -0.112011 | 0.9108 |
| DEFICIT_PIB | -0.153382 | 0.098269 | -1.560834 | 0.1186 |
| LIB_PARTIEL | 1.009132 | 0.426794 | 2.364448 | 0.0181 |
| M2_RESERVE | 0.069551 | 0.052683 | 1.320179 | 0.1868 |
| RAPIDITE | 0.865462 | 0.805859 | 1.073961 | 0.2828 |
| TAUX_D_INTERET | 0.037536 | 0.045203 | 0.830392 | 0.4063 |
| C | -0.085635 | 0.737160 | -0.116169 | 0.9075 |
| McFadden R-squared | 0.095058 | Mean dependent var | | 0.566176 |
| S.D. dependent var | 0.497434 | S.E. of regression | | 0.481754 |
| Akaike info criterion | 1.356264 | Sum squared resid | | 29.70714 |
| Schwarz criterion | 1.527597 | Log likelihood | | 84.22599 |
| Hannan-Quinn criter. | 1.425890 | Deviance | | 168.4520 |
| Restr. deviance | 186.1467 | Restr. log likelihood | | -93.07334 |
| LR statistic | 17.69470 | Avg. log likelihood | | -0.619309 |
| Prob(LR statistic) | 0.013426 | | | |
| Obs with Dep=0 | 59 | Total obs | | 136 |
| Obs with Dep=1 | 77 | | | |

**Source** : Authors, from Eviews 2008.

**Table 4.** *Binary Logit with dependant variable (CRISES) and full liberalization*

Dependent Variable : CRISES
Method: ML - Binary Logit (Quadratic hill climbing)
Sample: 1970 2003
Included observations: 136
Convergence achieved after 3 iterations
Covariance matrix computed using second derivatives

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| CREDIT_PIB | -0.013826 | 0.011061 | -1.250021 | 0.2113 |
| CROIS_PIB_REEL | -0.036155 | 0.041883 | -0.863222 | 0.3880 |
| DEFICIT_PIB | -0.143412 | 0.099794 | -1.437083 | 0.1507 |
| LIB_TOTALE | 0.335783 | 0.768704 | 0.436817 | 0.6622 |
| M2_RESERVE | 0.031116 | 0.046753 | 0.665530 | 0.5057 |
| TAUX_D_INTERET | 0.090261 | 0.040309 | 2.239218 | 0.0251 |
| C | 0.682585 | 0.657557 | 1.038062 | 0.2992 |

| | | | |
|---|---|---|---|
| McFadden R-squared | 0.049371 | Mean dependent var | 0.566176 |
| S.D. dependent var | 0.497434 | S.E. of regression | 0.491518 |
| Akaike info criterion | 1.404092 | Sum squared resid | 31.16505 |
| Schwarz criterion | 1.554008 | Log likelihood | -88.47824 |
| Hannan-Quinn criter. | 1.465014 | Deviance | 176.9565 |
| Restr. deviance | 186.1467 | Restr. log likelihood | -93.07334 |
| LR statistic | 9.190194 | Avg. log likelihood | -0.650575 |
| Prob(LR statistic) | 0.163161 | | |
| Obs with Dep=0 | 59 | Total obs | 136 |
| Obs with Dep=1 | 77 | | |

**Source** : Authors, from Eviews 2008.

**Table 5.** *Binary Logit with (CRISES) and the three forms of liberalization*

Dependent Variable : CRISES
Method: ML - Binary Logit (Quadratic hill climbing)
Sample: 1970 2003
Included observations: 136
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| CREDIT_PIB | -0.010342 | 0.011539 | -0.896250 | 0.3701 |
| CROIS_PIB_REEL | -0.010441 | 0.044152 | -0.236468 | 0.8131 |
| DEFICIT_PIB | -0.164231 | 0.100151 | -1.639834 | 0.1010 |
| M2_RESERVE | 0.042636 | 0.057822 | 0.737374 | 0.4609 |
| TAUX_D_INTERET | 0.058440 | 0.045122 | 1.295162 | 0.1953 |
| LIB_CAP | -0.829684 | 0.653499 | -1.269602 | 0.2042 |
| LIB_DOM | 1.002014 | 0.444355 | 2.254983 | 0.0241 |
| LIB_FIN | 0.223753 | 0.551684 | 0.405581 | 0.6851 |
| C | -0.574843 | 0.884968 | -0.649563 | 0.5160 |

| | | | |
|---|---|---|---|
| McFadden R-squared | 0.093935 | Mean dependent var | 0.566176 |
| S.D. dependent var | 0.497434 | S.E. of regression | 0.481120 |
| Akaike info criterion | 1.372507 | Sum squared resid | 29.39751 |
| Schwarz criterion | 1.565256 | Log likelihood | -84.33048 |
| Hannan-Quinn criter. | 1.450836 | Deviance | 168.6610 |
| Restr. deviance | 186.1467 | Restr. log likelihood | -93.07334 |
| LR statistic | 17.48571 | Avg. log likelihood | -0.620077 |
| Prob(LR statistic) | 0.025431 | | |
| Obs with Dep=0 | 59 | Total obs | 136 |
| Obs with Dep=1 | 77 | | |

**Source** : Authors, from Eviews 2008.

The significant impact of the partial liberalization of the domestic financial sector in the appearance of banking crises in emerging countries, compared to total liberalization policies, referring to Table 3, Table 4 and Table 5, can be interpreted as follows: the more internal liberalization process grows, more its destabilizing effect weakens. The banking instability that accompanies the transition of an internal financial sector heavily controlled to a more liberalized and open financial system is due to the nature of the transitional phase during which the liberalization measures take place, which generates instability and banking defects for these countries. A process of adaptation and learning of banks to their new competitive environment settles gradually, as the liberalization movement accelerates by the time.

Concerning the logit analysis between "CRISES" variable and the three forms of liberalization, the regression results indicate in the table-5 that financial liberalization in all it three dimensions; the domestic sector, the financial markets and the capital account, have a statistically significant impact on banking crises and is therefore an important factor in weakening banks. Indeed, the dummy variable of the domestic financial liberalization sector affect more strongly and positively the systemic banking crises. The liberalization of the domestic financial sector increases the fragility of banking systems and is explained by the fact that the abolition of the cap interest rates and credit control and reduction of entry barriers banks causes degradation value of banks by the eagerness of competition, eroding profits and increasing incentives for excessive risks.

### 4.2. The order of financial liberalization and banking crises

This is to verify the importance of the priorities in the implementation of various reforms in the dynamics of banking crises. Two reform groups are differentiated:

- The internal liberalization measures mainly include the banking sector and the liberalization of lending rates and deposit, credit, reducing reserve requirements and increased competition;
- The liberalization of financial markets and the capital account, which comprise a majority of external liberalization, such as the removal of restrictions on capital movements and the repatriation of capital, interest and dividends.

Thus, there are two financial liberalization processes:

- 1st order: domestic financial liberalization precedes external financial liberalization;
- 2nd order: external financial liberalization precedes domestic financial liberalization.

Two dummy variables representing two sequences of financial liberalization are regressed on binary variables of banking crises. In the first sequence, the variables take the value 1 when financial liberalization begins with internal liberalization and 0 otherwise; in the second sequence, the variables take the value 1 when financial liberalization begins with external liberalization and 0 otherwise.

**Table 6.** *Binary Logit with (CRISES) and the first sequence of liberalization*

Dependent Variable : CRISES
Method: ML - Binary Logit (Quadratic hill climbing)
Sample: 1970 2003
Included observations: 136
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| 1st order | -0.045204 | 0.578543 | -0.078134 | 0.9377 |
| CREDIT_PIB | -0.012062 | 0.010302 | -1.170811 | 0.2417 |
| CROIS_PIB_REEL | -0.036490 | 0.041947 | -0.869913 | 0.3843 |
| DEFICIT_PIB | -0.138587 | 0.101476 | -1.365718 | 0.1720 |
| M2_RESERVE | 0.023165 | 0.045417 | 0.510059 | 0.6100 |
| TAUX_D_INTERET | 0.094233 | 0.039603 | 2.379441 | 0.0173 |
| C | 0.664418 | 0.680321 | 0.976624 | 0.3288 |

| | | | |
|---|---|---|---|
| McFadden R-squared | 0.048367 | Mean dependent var | 0.566176 |
| S.D. dependent var | 0.497434 | S.E. of regression | 0.491649 |
| Akaike info criterion | 1.405466 | Sum squared resid | 31.18166 |
| Schwarz criterion | 1.555382 | Log likelihood | -88.57169 |
| Hannan-Quinn criter. | 1.466388 | Deviance | 177.1434 |
| Restr. deviance | 186.1467 | Restr. log likelihood | -93.07334 |
| LR statistic | 0.173393 | Avg. log likelihood | -0.651262 |
| Prob(LR statistic) | 0.025431 | | |
| Obs with Dep=0 | 59 | Total obs | 136 |
| Obs with Dep=1 | 77 | | |

**Source** : Authors, from Eviews 2008.

**Table 7.** *Binary Logit with (CRISES) and the second sequence of liberalization*

Dependent Variable : CRISES
Method: ML - Binary Logit (Quadratic hill climbing)
Sample: 1970 2003
Included observations: 136
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| 2nd order | 1.338319 | 0.725581 | 1.844479 | 0.0651 |
| CREDIT_PIB | -0.019322 | 0.011153 | -1.732494 | 0.0832 |
| CROIS_PIB_REEL | -0.033316 | 0.042912 | -0.776392 | 0.4375 |
| DEFICIT_PIB | -0.149537 | 0.100086 | -1.494085 | 0.1352 |
| M2_RESERVE | 0.062531 | 0.049490 | 1.263493 | 0.2064 |
| TAUX_D_INTERET | 0.051089 | 0.044555 | 1.146637 | 0.2515 |
| C | 0.686224 | 0.653739 | 1.049690 | 0.2939 |

| | | | |
|---|---|---|---|
| McFadden R-squared | 0.067501 | Mean dependent var | 0.566176 |
| S.D. dependent var | 0.497434 | S.E. of regression | 0.487895 |
| Akaike info criterion | 1.379276 | Sum squared resid | 30.70732 |
| Schwarz criterion | 1.529192 | Log likelihood | -86.79078 |
| Hannan-Quinn criter. | 1.440198 | Deviance | 173.5816 |
| Restr. deviance | 186.1467 | Restr. log likelihood | -93.07334 |
| LR statistic | 12.56512 | Avg. log likelihood | -0.638167 |
| Prob(LR statistic) | 0.050486 | | |
| Obs with Dep=0 | 59 | Total obs | 136 |
| Obs with Dep=1 | 77 | | |

**Source** : Authors, from Eviews 2008.

With reference to Table-6 and Table-7, we notice that the likelihood of banking crises increases when the country opened in priority on the outside before reforming its internal financial structures and in particular its domestic banking system. This result is consistent with the theory of optimal order (sequencing) of McKinnon (1991) which says that the success of financial liberalization policies implies compliance with a timeline of reforms, beginning in particular by internal financial reforms. The reason is that if liberalization of capital movements precedes the adaptation of internal financial structures to the opening on the outside, it risks reinforcing the phenomena of distortions created by the existence of inadequate national regulations to an opened international context.

## 5. Conclusions and policy recommendations

In this study, we reviewed the various theoretical contributions for the financial gradualism as prerequisites for financial development. Thus, to reduce the development of banking and financial crises, it is essential to find the right balance of financial gradualism to reap the benefits of international financial openness.

To test the potential role of financial liberalization policies in the onset of banking crises, our empirical study sought to examine the process of financial liberalization in the north Africa region countries to contribute to a better understanding of the dynamics of recent banking crises. Thus, if there is a consensus on the role of liberalization in the explanation of financial crises in these countries, few studies have attempted to study and measure the share due to the order of financial liberalization in the initiation and appearance of crises.

Conducted tests using the logit model show that the degree of financial liberalization act significantly in explaining banking crises in these countries. Overall, partial and incomplete liberalization of internal financial sector seems more destabilizing than full liberalization. And to counteract the destabilizing misdeeds of financial liberalization policies, we would like to introduce a number of recommendations to be followed by these countries:

- Prior actions to financial liberalization: Financial liberalization must always be integrated into a comprehensive framework of structural adjustment. Stabilization efforts must precede especially liberalization, a substantial reduction in the size of the fiscal deficit and monetary growth, fueled by inflationary expectations.
- The order of financial liberalization: This sequence requires the external opening of the capital account does not precede the liberalization of the domestic financial sector. Similarly, regulation and banking supervision must always be strengthened before any liberalization of the financial sector to ensure the soundness of the banking system through a restructuring or liquidation of institutions in distress or insolvent, holding a substantial volume of non-performing credits.
- The frequency of financial liberalization: Liberalization speed must be handled with extreme caution. It is very dangerous to remove all restrictions suddenly, to the extent that banks from a controlled environment need to gradually introduce reforms in order to offer them the opportunity to adjust to the new market. The liberalization of interest rates should be gradual. Indeed,

liberalization is more likely to succeed if it was spread over a long period of time, enabling the financial system to adapt itself to the new environment.

# Appendix

**Appendice 1.** *Financial liberalization dates of the entire financial systems (by sectors)*

| Countries | Domestic financial system | | Financial markets | | Capital account | | All of sectors | |
|---|---|---|---|---|---|---|---|---|
| | partial | Full | partial | Full | partial | Full | partial | Full |
| | | | | Africa and middle East | | | | |
| South africa | 1980-1983 | 1983 | - | 1996 | 1985 | - | 1980 | - |
| Algeria | 1987-1995 | 1995 | 1995 | - | 1994 | - | 1987 | - |
| Egypt | | 1991 | - | 1992 | 1990-1991 | 1991 | 1990-1992 | 1992 |
| Ghana | 1987-1990 | 1990 | 1986 | - | - | - | 1986 | - |
| Morocco | 1980-1996 | 1996 | - | 1993 | 1990 | | 1980 | - |
| Tunisia | 1986-1996 | 1996 | 1989 | - | 1993 | - | 1986 | - |
| Turkey | 1980-1983 / 1987-1989 | 1989 | 1983-1989 | 1989 | 1984-1990 | 1990 | 1980-1990 | 1990 |
| Zimbabwe | | 1991 | 1993 | - | - | 1994 | 1991 | - |

**Source:** According to the studies of Bandiera, *et al.,* (2000); Bekaert, Harvey, & Lundblad (2003); Bekaert & Harvey (2000a-b); Caprio, Atiyas, & Hanson, (1994); Demirguç-Kunt & Detragiache (1998); Hall (2003); Henry (2000a); Jbili, Enders & Treichel (1997); Johnston, Darbar & Echeverria, (1997); Kaminsky & Schmukler (2002); Kim & Singal, (2000); Levine & Zeros, (1998); Mehrez & Kaufman (2000); Williamson & Mahar (1998).
**Notes:** A financial system is considered fully liberalized if the three sectors are fully liberalized. It is considered partially liberalized if at least one sector is partially liberalized. And it is considered suppressed if the three sectors are controlled.

**Appendice 2.** *Review of bank crisis experiences in emerging countries (1970-2003)*

| Countries | Systemic crises | Non-systemic crises |
|---|---|---|
| | Afrique et moyen orient | |
| South Africa | - | (1977) -(1989) |
| Algeria | (1990-1992) | - |
| Egypt | Début des années 80 | (1991-1995) |
| Ghana | (1982-1985) | (1997-2003) |
| Morocco | Début des années 80 | - |
| Tunisia | - | (1991-1995) |
| Turkey | (1982-1985) /(2000-2003) | (1994) |
| Zimbabwe | (1995-2003) | - |

**Source:** Caprio & Klingebiel (2003)

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