Liberalization Process and Financial Instability: A Mediterranean Perspective

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Abstract

This paper revisits the debate on the financial stability implications of the liberalization process dynamics. We hold that the financial liberalization effect on exchange pressures changes beyond some threshold degrees. Therefore, we assess the ability of the threshold models to gauge financial liberalization dynamics. We provide empirical evidence from 9 MENA countries over the period of 1980 to 2008. Our results suggest that financial integration exerts nonlinear effects on speculative pressure conditionally to the dynamics of the liberalization process. Moreover, the country which maintains an optimal liberalization dynamic will be later exposed to an "exchange pressures" effect from its financial liberalization process. Alternatively, evolving within nonoptimal dynamics have led to an increase in a country's vulnerability to speculative pressures since the early stages of liberalization. From this view, the liberal reform dynamics may constitute an important determinant of a country's financial stability.

I. Introduction

The financial crises, which have been widespread among advanced economies since the subprime crisis,[1] have annihilated the conventional wisdom that exchange crises are phenomena which affect only emerging economies.[2] Most researches focus on risk factors instead of crises anomalies in the liberalization process, which is not a homogeneous process[3] across countries. Each country follows its own liberalization trajectory. Kose *et al.* (2011) suggest the nonlinearity of financial liberalization effects on speculative pressures. This may explain research unanimity toward the "exchange crisis" effect of the financial liberalization process.[4] Moreover, most major crises (United States, 2007; Thailand, 1997; Mexico, 1994) erupt during the financial liberalization process. Thus, we deem that the "exchange crises" effect of the financial liberalization process may have appeared beyond some financial integration degrees.

Edwards (2009) has shown that "financial liberalization first sequence" increases the degree of a country's vulnerability to external crises.[5] While this assumption is clearly valuable, it does not consider the time evolution of the liberalization dynamics. We argue that the analysis of exchange crises must take into account the trends of the integration process. In fact, the claim that the financial integration sequence of a country determines its financial exposure suggests that a financial integration trajectory exerts a determinant role on financial instability. This is why we need to analyze the exchange crises risks in relation with countries' liberalization dynamics. Such investigation enables us to identify critical degrees beyond which a country has perceived higher financial vulnerabilities. The determination of these degrees may help economies to take measures in order to overcome any financial disequilibrium risks. Such will be of key importance especially for emerging countries.

In this article, we test if a Mediterranean country which has evolved between 1980 and 2008 according to nonoptimal liberalization dynamics (the finance is liberalized while the trade is still regulated) could undergo higher speculative pressures relative to the one maintaining an optimal dynamic (the trade is still open once the finance is released). Mediterranean countries have implemented liberal reforms since the 1970s.[6] Indeed, their liberalization processes are accelerated by two pillars: the multilateral agreements (GATT until 1995 then WTO's commitment) and regional trade agreements under the Barcelona Process. These trade agreements' implementation has progressed since the relaunch of the Barcelona Declaration

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[1] See Reinhart and Rogoff (2009) for a further discussion.

[2] Obstfeld (2009)

[3] Ostry *et al.* (2010), Beltratti and Morana (2008), Bonfiglioli (2008), Daniel and Jones (2007), Glick *et al.* (2006)

[4] Morana and Beltratti (2008), Bonfiglioli (2008), Kimakova (2009), Baltagi *et al.* (2009)

[5] See Stiglitz (2002) for a further discussion.

[6] The association agreements (1969 to 1976), the cooperation agreements (1976 to1985), and from 1996 the Euro-Mediterranean agreement

in 2008. The Mediterranean Union has been signed by 27 members.[7] Naturally, Mediterranean countries' membership to supranational organizations has widely influenced their insertion trajectories. The dynamical nature of the liberalization process, in the same vein, implies that countries evolve according to different sequences of liberalization. Interestingly, an important component of literature views financial liberalization policies as the major cause of financial crises.[8] Such ideas may set the baseline for a new paradigm with regard to global financial stability. In this article, we develop a comprehensive regional database to investigate whether the dynamics of liberalization explain financial vulnerability. To this end, we estimate financial liberalization threshold degrees conditionally against the countries' liberalization dynamics. These thresholds in the relation (financial liberalization/speculative pressure) are estimated using the econometric procedures developed by Hansen (1999). The threshold model enables us to analyze the dynamics of the effects exerted by financial liberalization on the countries' vulnerability to currency crises. Afterwards, we consider a sensitivity analysis using two-stage logistic specifications in order to investigate the impact of the financial liberalization optimality on the exchange crisis probability.

The paper is organized as follows: In Section 1, we briefly review the financial and trade liberalization policies in the Mediterranean region in order to identify its liberal dynamics. Section 2 examines the literature on the optimal liberalization debate. Section 3 describes the data, definition of the variables, and econometric modeling. Section 4 summarizes the empirical results and provides a sensitivity analysis to the results obtained. Finally, Section 5 presents our concluding observations.

A. Financial and Trade Liberalization Dynamics in the Mediterranean Area

We investigate the liberalization process of the Mediterranean area from 1980 to 2007 compared to the regions most impacted by the crises in Europe, Southeast Asia, and Latin America. Our analysis is based on *de jure* and *de facto* liberalization indicators. The financial integration dynamics are assessed using the Chinn and Ito[9] (2006) *de jure* index as well as the Lane and Mielsi-Feretti (2006)[10] *de facto* index.[11] The first index measures the capital control's severity while the second assesses the country participation to the worldwide financial

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[7] Austria, Belgium, Denmark, Germany, Spain, Finland, France, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, United Kingdom, Sweden, Algeria, Cyprus, Egypt, Israel, Jordan, Lebanon, Malta, Morocco, Syria, Tunisia, Turkey, and the Palestine Authority

[8] Rodrik (1998), Stiglitz (2002), Mishkin (2006), Rodrik and Subramanian (2008)

[9] This index is based on principal components extracted from the disaggregated capital and the restriction measures of the current account in the AREAER (Annual Report on Exchange Arrangements and Exchange Restrictions).

[10] *(financial assets+financial liabilities)/GDP*

[11] See Table 1A. in the Appendices

market. Similarly, trade liberalization dynamics are analyzed using average applied tariffs on imports and the indicator of trade openness.[12] We observe that *de facto* financial liberalization, measured by the financial exchange volume as a percentage of GDP, increases between 1970 and 2007, recording an average growth rate of 4.6% while the institutional liberal reforms are relatively folded up during that period.[13] Despite the reimposition of barriers against free capital mobility during the 1920s, the ratio of financial exchanges and GDP has more than tripled since then. This means that financial barriers implemented by the Mediterranean economies fail to block foreign financial flows. Moreover, we remark that the financial sphere liberalization widely exceeds the trade opening. In fact, the ratio of financial exchanges to GDP is four times higher than the ratio of trade exchanges to GDP.

A regional evaluation may also inform us about the various trends in the liberalization process.[14] Similar to Edwards (2009), our investigation is based on the average applied tariffs of imports and the index of capital mobility.[15] We retain the rate "9.4%" and the score "4," respectively, as the trade and financial deregulation thresholds. Beyond those values, it can be generally agreed that the current and financial accounts are open.[16] We notice that, between 1985 and 2007, import tariffs fall by 42% (Europe), 68% (SouthEast Asia), and 77% (Latin America). However, tariffs increase by 173% in the Mediterranean area over the same period. At the same time, capital mobility has recorded an average rate of 1.7% in Europe, 3.4% in Latin America, 3.7% in Southeast Asia, and 3.3% in the Mediterranean. Despite the bilateral and Euro-Mediterranean agreements, the Mediterranean area remains the most commercially protected. This could be explained by trade barriers on agricultural trade even within the Mediterranean Partner countries[17] (Turkey, Egypt, Algeria, Tunisia, Morocco…[18]) which still also highly depend on import duties (Lebanon, Jordan, Tunisia, Morocco…[19]). Riess *et al*. (2001) also indicate that some Mediterranean economies have maintained important protectionist measures. Nevertheless, this area has continued its financial liberalization process throughout the period of 1985~2007.

In the European area, current accounts are integrated in the late 1990s and capital controls are dismantled. European economies have increased the tariffs during the period of 2004~2007. Interestingly, this area is the first severely impacted by the subprime crisis after the US market. We suggest that this sensitivity may be due to the area's liberalization trajectory. Particularly, the reregulation of trade could have caused a nonoptimal liberalization dynamic that has made

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[12] (exports+imports)/GDP

[13] Figure 1

[14] Table 1A

[15] These two indexes are published by the Fraser Institute.

[16] 9.4% and 4 are the 25th percentiles of world distribution of the legal indexes.

[17] International Trade and Development, Public Issues Division Agriculture Economics Research Institute (LEI)

[18] Femise (2002)

[19] World Development Indicators

these economies more vulnerable to exchange pressures.

Basing on the institutional liberalization thresholds, the Mediterranean area first releases the current accounts, followed by financial accounts.

Figure 1 shows a regional investigation of the effective trade openness and financial liberalization. We retain the commercial exchanges/GDP (trade component) and financial exchanges/GDP (finance component) indexes. Similarly, the respective percentage, 66.4 % and 66.7%, are the threshold degrees.[20]

Figure 1. Evolution of the Process of International Financial Integration
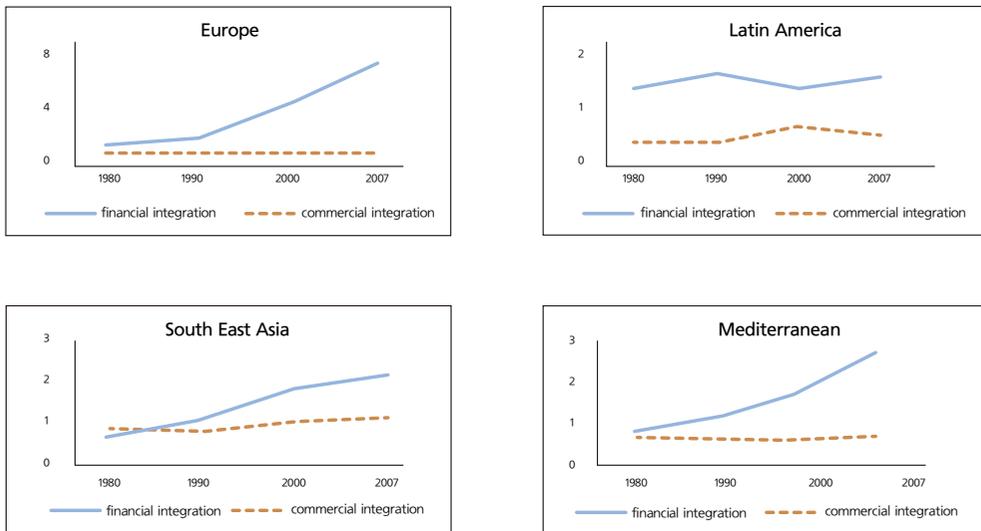
(Source) Author's calculation

We notice that the liberalization process in Latin America area is characterized by an important opening of financial accounts relative to commercial ones. The Southeast Asia area exhibits a simultaneous deregulation of the two pillars of the liberalization process. In Europe, the financial sphere was opened in the late 1970s and its extra regional trade in the mid-1980s. The pace of the financial liberalization widely preceded the commercial opening since the beginning of the 1990s. We also remark that the index of financial liberalization reached its peak in 2007. Such a phenomenon has been defined by Aglietta (2008) as an "excrescence" of financial integration relative to the rhythm of trade opening. In his analysis, Aglietta (2008) remarks that the United States exhibits such a period of financial integration excrescence before being shaken by the systemic crisis of 2007.

The Mediterranean area has maintained a gradual sequence of deregulation since the first

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[20] 66.4% and 66.7% are the 25th percentiles of the world distribution of the effective indicators.

stages of liberalization. Similarly, the threshold values of effective liberalization indicators assert that the current account has been released before financial ones. However, since the 1990s, we identify an excrescence of financial liberalization. A more detailed analysis based on the individual values of indicators illustrates that the Mediterranean area has on average closed the current accounts while the capital and financial ones remain open, particularly by the end of the 1980s and during the 1990s.

B. Optimal Liberalization Debate

Revisiting the debate on sequencing enables us to schematize both the optimal and nonoptimal liberalization dynamics. McKinnon (1973, 1991) and Edwards (1984, 2009) advocate commercial liberalization before opening capital as an optimal sequence. Financial liberalization should be achieved only when an economy consolidates its export sectors. McKinnon (1973, 1991) and Edwards (1984) suggest that opening up capital flows before trade liberalization may cause financial instabilities. Stiglitz (2002) has criticized the launch of financial liberalization since the first stages of integration based on the fact that this capital mobility will encourage speculation which increases the likelihood of exchange crises. Edwards (2009) explains that premature opening of the finances increases the vulnerability to exchange crises in view of commercial imbalance risks. In fact, the rise of capital flows is transitory and investors are likely to withdraw their assets from a country at any time, thereby inducing an exchange crisis. In such a case, a country must be able to compensate for the contraction of capital flows, which can be particularly difficult for developing countries. McKinnon (1993) argues that rapid capital inflows at the beginning of a liberalization scheme result in an exchange rate appreciation, making it difficult for domestic producers to adjust for protection removal. Thus, countries which liberalize their financial accounts after preconsolidation do not risk important financial instabilities. This could be due to short term interactions between the two accounts which insure for compensation in case of declines in external returns. Rodrik (1987) suggests that it is elementary to investigate the interactions between trade and financial integration processes because trade reform may lead to short-term recession if financial accounts have been liberalized. Thus, we propose that the dynamic nature of liberalization requires a sound redefinition of the optimal dynamic scheme according to which trade liberalization must always support financial deregulation (Figure 2). Similarly, the nonoptimal liberalization dynamic will be a scheme which leads to reregulation of trade while finance is still being released (Figure 3). Thus, a country which evolves according to that dynamic will risk financial liberalization excrescence and hence run an important risk in exchange crises (Rodrik & Rosenzweig, 2010; Edwards, 2009; Itô, 2006; Stiglitz, 2002).

Figure 2. An Optimal Liberalization Dynamic scheme

Figure 3. A Non-Optimal Liberalization Dynamic scheme
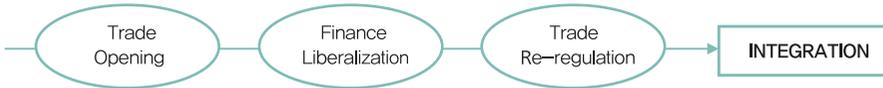
We identify the two groups of dynamics using the threshold values of *de jure* and *de facto* indicators previously discussed.[21] The optimal dynamic group respects these conditions: import tariffs remain $\leq$ 9.4% when the financial opening index is $\geq$ 4. Moreover, this group exposes an effective commercial liberalization index of $\geq$ 0.47 when finance is released (financial exchanges/GDP $\geq$ 0.66). Intuitively, the nonoptimal dynamic group has evolved during the period of 1981-2008 with regulated trade (imports tariffs $>$ 9.4%) and has opened financial accounts (international capital control index $\geq$ 4). Similarly, this group has displayed the ratio of commercial exchanges/GDP $<$ 0.47 when financial accounts are open (financial exchanges/ GDP $\geq$ 0.66). In the optimal dynamic group, we identify Tunisia, Israel, Jordan, Lebanon, and Cyprus while in the nonoptimal group we include Egypt, Malta, Turkey, and Morocco. In light of theoretical assumptions, we suppose that the first group is more vulnerable to a speculative attack.

C. Impact of the Liberalization Process on the Mediterranean Country's Vulnerability: An Empirical Investigation

In this section, we investigate whether the financial liberalization effect on speculative pressure changes beyond certain "thresholds" degrees which may vary according to the liberalization process dynamics. To test this hypothesis, we use a crisis index as measure of one country financial vulnerability. Our sensitivity analysis provides results in terms of exchange crisis probability.

1. Variable Definition and Data

We measure the crisis using the currency crisis episode index of Sachs *et al*. (1996). The Speculative Pressure Index (SPI_{it}) measures the intensity of exchange tensions. SPI_{it} is a weighted average of nominal foreign exchange rate variations and negative changes of mon-

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[21] See Section I

etary reserves working to avoid the possibility that the index be dominated by one of the variables.

$$SPI_{it} = (P_{EX_i}[EX_{it}]) - (P_{RES_i}[RES_{it}])$$

$$Where \quad P_{RES_i} = \frac{\sigma^2_{RES_i}}{\sigma^2_{EX_i} + \sigma^2_{RES_i}} \quad , \qquad P_{EX_i} = \frac{\sigma^2_{EX_i}}{\sigma^2_{EX_i} + \sigma^2_{RES_i}}$$

EX is the nominal foreign exchange rate percentage variation, *RES* is the monetary reserves variation rate while σ^2_{EX} and σ^2_{RES} are, respectively, the nominal foreign exchange rate variance and monetary reserve variance. The negative sign allotted to reserves variation enables us to obtain an index which becomes higher as we approach a crisis.

In our model, we retain macroeconomic variables in the light of the literature on theoretical and empirical exchange crises. The sample is composed of nine Mediterranean countries over the period of 1981~2008. Our choice is subject to the availability of the data (see Table 1).

Table 1. Crises Vulnerability Indicators

Category	Concept	Measure
Macroeconomic indicators	Monetary disequilibrium	*M2/Reserve*
	Banking fragilities	*Domestic Credit/ GDP*
	Fundamentals	*Inflation*
	Structure of flows	*FDI/ENG*
	Sensitivity to the fluctuations in EU	*Return of US Treasury Bond for 10 years*
Common shocks	Commercial links	*Commercial opening/GDP*
Policy of Liberalization	Financial links	*Financial exchanges/GDP, Kopen*

(Source) International Financial Statistics (IFS), International Monetary Fund, Reserves (1L.d), exchange rate (line rf), commercial balance=*(Exports-Imports)/GDP ; commercial opening=(Exports +Imports)/GDP*; exports (ligne 70..ZF), imports (ligne 71… ZF); data base of Lane and Mielsi-Feretti (2006): FDI (Foreign Direct Investment), PI (Portfolio Investment), Financial exchanges= *FDI+PI+DEBTS, GDP*; http://www.ssc.wisc.edu/~mchinn/research.html (*Kopen*) and the return of the American Treasury Bond for 10 years, BIS « International Bank of Settlements » at http://www.economagic.com/em-cgi/data.exe/fedbog/day-tcm10y

2. Econometric modeling:

1) Theoretical approach and threshold identification

We use Hansen's (1999) techniques to identify structural changes in the financial integration

impact on the speculative pressures. Our threshold variable is the financial market integration (foreign financial assets and engagements[22]/GDP), which constitutes the best available measure of countries' international financial integration. In the first stage, we sweep the threshold series to eliminate the extreme values. In fact, the identification of breaks close to the distribution tails is due to sample skews. The Hansen (1999) model takes the following form:

$$SPI_{it} = \mu_i + \alpha\, x_{it-1} + \beta'_1\, integ\_fin_{it-1} I(integ\_fin_{it-1} \leq \gamma) + \beta'_2\, integ\_fin_{it-1} I(integ\_fin_{it-1} > \gamma) + e_{it} \quad (1)$$

SPI_{it} is the speculative pressure index in country i for the period t, $integ\_fin_{it-1}$ constitutes a delayed measure of financial integration (threshold variable), x_{it-1} represents a delayed vector of the control variables, μ_i synthesizes unobserved effects specific to the country, and e_{it} is the term of error for each observation. $I(.)$ is an indicator function which considers two cases according to whether the level of financial liberalization $integ\_fin_{it-1}$ is higher (*1*) or lower (*0*) relatively to the estimated threshold ($\hat{\gamma}$).

The model variables are delayed to overcome causality problems. Otherwise, we cannot conclude if fundamental deterioration causes crises or if it is the crisis which causes the variables' degradation. β'_1 and β'_2 are the financial integration marginal effects according to the threshold value whereas μ_i is the specific effects "country "and e_{it} are supposed to identically distribute at an average of 0 and variance of σ^2. We can write:

$$SPI_{it} = \begin{cases} \mu_i + \alpha\, x_{it-1} + \beta'_1\, integ\_fin_{it-1} + e_{it}, & \text{if } integ\_fin_{it-1} \leq \gamma \\ \mu_i + \alpha\, x_{it-1} + \beta'_2\, integ\_fin_{it-1} + e_{it}, & \text{if } integ\_fin_{it-1} > \gamma \end{cases}$$

Another compact representation is: $SPI_{it} = \mu_i + \alpha\, x_{it-1} + \beta\, integ\_fin_{it-1}(\gamma) + e_{it}$

$$integ\_fin_{it-1}(\gamma) = \begin{pmatrix} integ\_fin_{it-1}\, I(integ\_fin_{it-1} \leq \gamma) \\ integ\_fin_{it-1}\, I(integ\_fin_{it-1} > \gamma) \end{pmatrix} \text{ and } \beta = (\, \beta'_1 \;\; \beta'_2\,)'$$

The observations are divided into two regimes according to whether $integ\_fin_{it-1}$ is weaker or higher than the threshold γ. We estimate the threshold and regression slopes using least squares estimation of the fixed-effects transformation model. $\hat{\gamma}$ is the value of γ which minimizes the sum of the residues' squares: $\hat{\gamma} = \arg\min_\gamma S(\gamma)$ with $S(\gamma) = \hat{e}(\gamma)'\hat{e}(\gamma)$. Hansen (1999) built confidence intervals on the basis of the likelihood ratio: $LR(\gamma) = \dfrac{(S(\gamma) - S(\hat{\gamma}))}{\hat{\sigma}^2}$.

For the threshold value identified $\gamma = \hat{\gamma}$, the LR ratio is null. The threshold test is rejected at *a* level if $LR(\hat{\gamma})$ exceeds $c_\alpha(1-a)$ where $c_\alpha(\alpha) = -2\log(1 - \sqrt{1-\alpha})$. Moreover, the confidence interval corresponds for a threshold of risk (α) to the values of γ such as in $LR(\gamma) \leq c(\alpha)$.

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[22] This index is provided by Lane and Mielsi-Feretti (2006).

2) Econometric Specifications

The exchange crises' redundancy and the classical linear models' inability to timely pre-vent their occurrence require reviewing the relevance of these models to describe the effects of financial liberalization on exchange pressures. Consequently, we propose to test the ability of the nonlinear specifications (sequential models) where we include the estimated thresholds us-ing Hansen's technique:

$$SPI_{it} = \mu_i + \beta\, integ\_fin_{it-1} + \lambda I(integ\_fin_{it-1} > \hat{\gamma}) + \theta\,(integ\_fin_{it-1} * I(integ\_fin_{it-1} > \hat{\gamma})) + \alpha\, x_{it-1} + \varepsilon_{it} \quad (2)$$

Indeed, if the financial liberalization degree is below $\hat{\gamma}$, $I(.) = 0$, $\theta = 0$, the relation (financial integration/speculative pressure) would be rather linear. However, if it exceeds $\hat{\gamma}$, $I(.) = 1$ and the financial liberalization coefficient is θ, the threshold effect would be confirmed, and the financial liberalization coefficient would move from β to θ. Thus, we use the Wald test to infer the null hypothesis ($\beta - \theta = 0$). The coefficients' constancies rejection implies that the financial liberalization degree which exceeds "the threshold" (θ) explains in a more pertinent way the effect of financial integration on speculative pressures. The statistical significance of threshold models is tested by comparing the estimations' results to those provided by the specifications using linear and nonlinear transformations of the "financial integration" variable. The nonlinear transformation retained is the one which minimizes the chi-squared value and converts the vari-able "financial integration" into a normally distributed variable. This methodology will enable us to assess the ability of the threshold model to approximate the dynamics of the financial liberalization.

Equation 1's differentiation involves a recourse to dynamic panel models. For this specific model, the standard econometric techniques (OLS, IV ...) do not provide efficient parameter es-timates[23] due to the dynamic nature of the regression.[24] Thus, the GMM techniques[25] offer more consistent and efficient estimations. Similarly, GMM procedures overcome the problems of endogeneity bias, reverse causality, and omitted variables.[26] These problems arise from the cor-relation between the lagged dependent variable, SPI_{it-1}, and error term. ε_{it} as well as between explanatory variables and the country specific term μ_i. As a consequence, Model 1 becomes:

$$(SPI_{it} - SPI_{it-1}) = \beta(integ\_fin_{it-1} - integ\_fin_{it-2}) + \alpha'(x_{it-1} - x_{it-2}) + (\varepsilon_{it} - \varepsilon_{it-1}) \quad (3)$$
$$i = 1,...,n \ , \quad t = 2,...,T_i$$

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[23] Sevestre (2002)

[24] Aguirre and Calderon (2006)

[25] Arellano and Bond (1991)

[26] Kpodar (2007)

The first order differentiation eliminates the time invariant bias.[27] However, the correlation between $(SPI_{it-1} - SPI_{it-2})$ and the differentiated error term $(\varepsilon_{it} - \varepsilon_{it-1})$ brings about a new bias. In order to overcome this bias, the GMM estimation of Equation 2 is based on the following orthogonality conditions of Arellano and Bond (1991):

$$E(integ\_fin_{it-1-s}(\varepsilon_{it} - \varepsilon_{it-1})) = 0 \quad for \quad s \geq 2 \; ; \; t = 3,...,T_i \tag{4}$$

$$E(x_{it-1-s}(\varepsilon_{it} - \varepsilon_{it-1})) = 0 \quad\quad for \quad s \geq 2 \; ; \; t = 3,...,T_i \tag{5}$$

This technique avoids the over-fitting risk by reducing the dimensionality instruments while taking into account the presence of heteroscedastic consistent standard errors. The difference estimator is obtained after a two-step procedure. In the first stage, the retained residuals provide consistent matrix estimate of variance–covariance errors. The error terms are independent and homoscedastic. Therefore, the difference estimate is asymptotically more efficient than that seen in the first step. Secondly, the presence of error terms' second-order correlations must be tested to validate the GMM estimator consistence. In fact, the GMM estimator consistency depends on the following assumption: $E(\varepsilon_{it} - \varepsilon_{it-2}) = 0$.

The test statistic is asymptotically standard normal under the null hypothesis and is given by: $N = \dfrac{\Delta\hat{\varepsilon}_{-2}\Delta\hat{\varepsilon}_*}{\sqrt{\Delta\hat{\varepsilon}}}$

$\hat{\varepsilon}_{-2}$ is equivalent to residuals' twice lagged vector and $\hat{\varepsilon}^*$ is a vector of trimmed $\hat{\varepsilon}$ to match $\hat{\varepsilon}_{-2}$.

We use the overidentifying restriction test of Sargan. Under the null hypothesis, the Sargan statistic is asymptotically distributed as a X^2 with p^{-k} degrees of freedom and is written as:

$$S = \Delta\hat{\varepsilon}' \; (\sum_{i=1}^{n} W_i' \; \Delta\hat{\varepsilon}_i \; \Delta\hat{\varepsilon}_*' \; W_i \;)^{-1} \; W' \; \Delta\hat{\varepsilon} \tag{6}$$

where W equals the instruments matrix, p represents the columns' number in W, and k pertains to the number of estimated parameters.

3. Empirical Evidences

The main results from the threshold specifications for Mediterranean countries are displayed in Table 2.[28] Our results are presented on the basis of Hansen, Wald, Fisher, and Sargan test precisions. The Wald test asserts the presence of threshold effects for the two groups. It shows that structural change on the sense of the effect exerted by financial integration on speculative pressures occurs when the financial exchanges' amount has exceeded 117% of GDP for the

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[27] It includes the omitted variable effect and the country specific effect.

[28] The detailed results are reported in Tables 2A and 3A (see Appendix).

optimal dynamic group and 78% of GDP for the nonoptimal dynamic group. These results assert that the financial integration effect on speculative pressures change beyond a certain degree (presence of nonlinear effects). Moreover, the Fisher and Sargan tests affirm the threshold models' consistency.[29] Interestingly, the threshold specification takes into account the change in the impact of financial liberalization on speculative pressures.

The results suggest that the financial integration effects on the speculative pressures undergone by Mediterranean exchange markets differ widely depending on liberalization dynamics. Therefore, liberal dynamics may have a significant impact on a country's financial stability. In fact, the threshold specifications suggest that the financial integration effect on the speculative pressures has reversed beyond the estimated thresholds for the two groups. Thus, reaching key financial integration degrees may make a country either more or less vulnerable to exchange pressure. Moreover, the threshold estimations reveal that the financial liberalization degree from which the structural change has been reached prematurely for the group of non-optimal dynamics. In fact, the inversion of the financial liberalization effect suggests that the reforms' dynamics constitute an important determinant of financial stability. The Mediterranean countries which have prematurely liberalized their financial accounts have reached a threshold when the volume of their financial exchanges has exceeded 78% of their GDP.[30] From this evidence, our results suggest that the effects of "speculative pressure" of the financial integration process is more important for the optimal dynamic group.

A more detailed analysis shows the presence of the financial liberalization's excrescence phenomenon within the optimal dynamic countries. Indeed, their financial liberalization indicator, beyond the structural change date, is 2.5 times higher than the trade openness indicator. Also, the ratio is two times higher than that of the nonoptimal dynamic group. Thus, the integration trajectory of the optimal liberalization group threatens the countries' financial stability. However, the preservation of an optimal liberalization dynamic has delayed significantly the date of structural break in the relation (speculative pressures/financial liberalization). In the same vein, the reduction of speculative pressures is more significant for the group which has evolved within the optimal reform dynamics. Indeed, a 1% rise in financial integration decreases speculative pressures by 1.48 %. However, this decrease represents a 0.12 point for the group with non-optimal dynamic. In fact, our theoretical investigation suggests that if a country evolves according to a non-optimal liberalization dynamic, the interaction between the real and financial spheres do not operate. Such a case disables the compensation between the trade and financial balances in case of external disequilibrium.

These results assert our primary hypotheses:

- Financial integration raises speculative pressures only beyond specific threshold degrees.
- The speculative pressure effect depends on the liberalization dynamics.

[29] See Tables 2A and 3A in the Appendix.

[30] In relation to speculative pressure/financial liberalization.

Interestingly, the results demonstrate that greater liberalized trade reduces the countries' exposure to exchange crises. In fact, once the financial liberalization degree of non-optimal dynamic countries exceeds 66.7% of their GDP, a 1% increase of trade openness reduces the speculative pressures by 0.063 percentage points. For the optimal dynamic countries, every increase of trade integration raises speculative pressures by 0.17. Such a result may be due to the presence of financial liberalization outgrowth relative to the trade openness level. This inadequacy may have disabled the interaction between the two balances (trade and financial) in order to reduce exchange pressures.

In the next section, we investigate the sample splits in the two groups Figures 4 and 5. The likelihood ratio is defined as a function of the financial liberalization degree. The thresholds are the values which minimize the likelihood ratio (LR) figures. The LR tends to reach 0 at the threshold degrees. These graphs assert explicitly the superiority of the two-regime specifications. The latter can seize the dynamic effects of financial liberalization on speculative pressures.

The empirical literature addressing the issues relating to financial crisis determinants and contagion mechanisms have mainly relied on linear specifications of the financial liberalization effect. However, the continued occurrence of financial crises and the difficulties in timely preventing the exchange crises episode suggest that the researches have not succeeded to identify the variable which explains the crises. In light of our empirical investigation, we suggest that the introduction of discontinuities in the effects of financial liberalization on speculative pressures may enhance the statistical significance of the crisis models. Furthermore, the evolution of the likelihood ratio (LR) for the non-optimal group seems to be more ambiguous. Its LR decreases 3 times before the structural change date.

Figure 4. Likelihood ratio evolution "Optimal dynamic group"
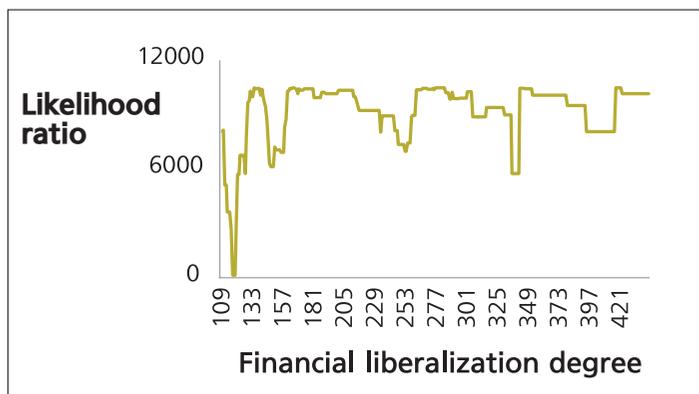
(Source) Author's calculation

Figure 5. Likelihood ratio evolution "Non-Optimal dynamic group"
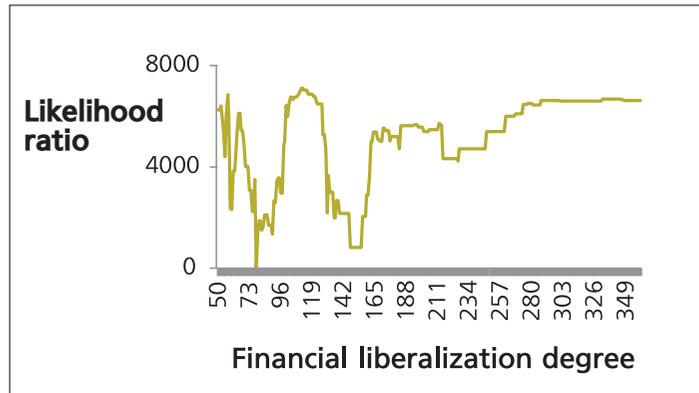
(Source) Author's calculation

Surprisingly, the *de jure* financial liberalization index (*Kopen*) does not exert a significant impact on speculative pressures for the two groups. This result supports our preliminary observation[31] : the capital controls implemented by Mediterranean countries do not efficiently restrict capital movements, especially beyond the threshold degrees. Such inefficiencies reduce the ability of those countries to use foreign flow taxation as stabilization instruments in case of contagion risks. Further, "hot money" (hedge funds) was mainly responsible for the last exchange crises since 1990. The economies must be able to adopt strict regulations in order to manage the turmoil which can be generated by free flows of "hot money." Hence, the Mediterranean countries must be able to carry out capital reforms capable to limit efficiently the movement of external capital flows in case of potential contamination risks.

Concerning the impact of other variables, few effects are worth noting. For the optimal dynamic countries, the existence of monetary disequilibrium (M2/reserves) increases the exchange disturbances. Such effect means that the Mediterranean central banks have faced some difficulties to overcome the reserve exhaustions after financial panics. The banking authorities have been unable to get through the monetary resources' decline without increasing the speculative pressures. Interestingly, these are the same countries which have been impacted by banking crises (Tunisia, 1991~1995; Israel, 1977~1983; Jordan, 1989; Lebanon, 1984~1990; Cyprus, 1986). In the same way, a unit increase of the banking disequilibrium (domestic credit/ GDP) for the optimal dynamic group raises significantly the exchange market pressures by 0.44 points. This empirical evidence supports the twin crisis argument proposed by Kaminsky and Reinhart (1996) which states that currency crises seem to be vastly correlated to banking crises. Hence, these countries are more likely to be shaken by twin crises.

Finally, our analyses show that inflation is negatively associated to speculative pressures

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[31] Section A.

for the two groups of countries. In fact, a unitary increase of inflation leads to a speculative pressure decline of 0.001 (optimal dynamic) and 0.0003 (nonoptimal dynamic). Thus, inflation targets fixed by the Mediterranean countries are not vulnerable to speculative attacks. A similar result has been found by Hutchison and Noy (2006) and Joyce and Nabar (2009). In fact, most Mediterranean countries have launched stabilization inflation plans (Egypt, 1991; Turkey, 1990s; Algeria, 1995~1998; Libya, 1988; Syria, 1980s; Tunisia, 1996; Lebanon, 1988; Jordan, 1989; Israel, 1980s; Cyprus, 1975). In general, such plans lead to currency overvaluation and trade balance degradation.[32] Also, the optimal dynamic countries have better managed their policies in order to stabilize inflation without recording higher speculative pressures.

Table 2. Results of GMM Threshold Specifications

Variables	Optimal dynamic group	Non-Optimal dynamic group
M2 / Reserve	-0.01e-02*** (-3.87)	0.00013e-02 (1.88)
finance_integ	-1.478* (-2.33)	-0.118* (-2.14)
I (finance_integ > $\hat{\gamma}$)	-1.324* (-2.03)	-0.241* (-2.35)
finance_integsup_ $\hat{\gamma}$	1.380* (2.24)	0.119* (2.25)
Domestic Credit / GDP	0.440** (3.16)	0.012 (0.57)
Return of US Treasury Bond for 10 years	0.025 (1.90)	-0.00417e-02 (-0.01)
FDI / GDP	0.713 (0.59)	0.229 (0.67)
Commercial opening / GDP	0.170** (2.89)	-0.063* (-1.96)
inflation	-0.001** (-3.24)	-0.0003*** (-4.07)
Financial exchanges / GDP, Kopen	0.818 (0.38)	-0.672 (-1.01)
Observation number	124	157
Threshold (Method of Hansen)	117%	78%
Wald Test (p-value)	0.0030	0.0280
Test of significance of Fisher (p_value)	0.0004	0.0000
Sargan test (S statistics)	0.0775	0.4483

(Note) « * » $p<0.1$, « ** » $p<0.05$, « *** » $p<0.01$

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[32] Berg and Patillo (2000)

4. Sensitivity Analysis

We investigate the results' robustness by analyzing the impacts of liberalization dynamism on currency crisis probability. To this end, we consider a Logit estimation based on the following model specification:

$$CRISE_{it} = \mu_i + \beta \, integ\_fin_{it-1} + \lambda I(integ\_fin_{it-1} > \hat{\gamma}) + \theta(integ\_fin_{it-1} * I(integ\_fin_{it-1} > \hat{\gamma})) + \alpha' x_{it-1} + \varepsilon_{it} \quad (6)$$

$CRISE_{it}$ is an exchange crisis index that is similar to Eichengreen *et al*.'s (1996). Our criterion to identify the crisis period is the following:

$$CRISE_{it} = \begin{cases} 1, if \; SPI_{it} > \mu_{SPI} + 1\sigma_{SPI} \\ 0, otherwise \end{cases}, \mu_{SPI} : \text{mean of SPI}, \; \sigma_{SPI} : \text{standard deviation of SPI}$$

We have undertaken preliminary tests ($SPI_{it} > \mu_{SPI} + 2\sigma_{SPI}$ and $SPI_{it} > \mu_{SPI} + 3\sigma_{SPI}$) which demonstrate that the choice retained maximizes the variability of the crisis index without increasing the errors of Type I. The results enable us to identify most exchange crises in the Mediterranean area.

An instrumental Logit specification for financial liberalization constitutes a way to overcome bias due to both reverse causality between financial liberalization and exchange crises. A natural technique must be to perform two sequential logistic regressions in a similar manner to two-stage least squares. In the first stage, we predict financial liberalization as a function of instruments and all explanatory variables included in Equation (6). The second stage is a regression of the crisis index based on the explanatory variables and the first stage's estimated financial liberalization.[33] There is no perfect instrument for financial liberalization, which is precisely why we adopt different approaches to cope with reverse causality issues. The reported results are chosen based on the outcome of Sargan's tests in order to avoid a situation whereby our two-stage logistic specifications are driven by endogeneity. The instruments we use are: lagged financial liberalization, country fixed effects, crisis dummies, lagged observations of some explanatory variables, and institutional variable.[34] The basic results from the two-stage logit specification estimates are reported in Table 3.[35] We discuss below the most significant findings.

Based on the significance of Fisher and Sargan's test of overidentifying restrictions, our results assert the superiority of threshold specifications relative to linear and nonlinear specifications.

The basic result from logit estimates for the optimal dynamic group is that a 1% increase

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[33] Rassen *et al*. (2009)

[34] Democracy indicators are taken from polity iv project.

[35] Tables 4A and 5A in the Annex report more detailed results.

in financial integration decreases the probability that a crisis occurs by 0.23 percentage points. This probability decreases by 2.66 percentage points for the nonoptimal dynamic group. Consequently, the two-stage logistic specifications suggest that the overall effect of financial liberalization is more advantageous for the nonoptimal sequence group. This may be due to the excrescence of financial liberalization.[36] Nevertheless, the "exchange crises" effect of the financial liberalization process is reached at the first stages of the financial liberalization for the nonoptimal dynamic economies. The optimal dynamic countries attain the threshold later in the process. These findings suggest that the interaction between the current and financial accounts has occurred later in the time after achievement of trade liberalization. Similar to the GMM specification, the two-stage logistic specifications suggest that the optimal dynamic group would undergo an increase in the crises probability of 0.22 percentage points further to a 1% rise of the ratio domestic credit in relation to GDP. This result asserts the presence of strong linkages between banking and exchange crises. This correlation arises from the fact that the expansionary bank credit policies occasion a higher demand for traded goods (implying trade balance deterioration) and nontraded goods (leading to the currency appreciation). In the same way, our estimations suggest that the probability of crisis in the optimal dynamic countries depends on the fluctuations of the American treasury bills' yields. Such a result indicates that those countries are more vulnerable to world liquidity declines.[37] Moreover, the policies of inflation stabilization undertaken by the optimal dynamic countries may explain speculative pressures undergone by their exchange markets. In fact, a 1% increase in inflation decreases the exchange crises likelihood by 0.002 percentage points.

Concerning the Foreign Direct Investment, we find an unexpected result. A 1% raise of the ratio of FDI/GDP increases the exchange crisis probability by 2.84 percentage points. Dooley *et al*. (1994) suggest that the negative impacts of FDI may be due to the multinationals firms which easily transfer funds inside and outside a country.

Likewise, the lack of a significant impact of capital controls on the likelihood of a crisis in the two groups of Mediterranean countries (the variable *Kopen*) asserts our preliminary assumption regarding the inefficiency of capital controls in these countries.

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[36] Section B

[37] Eichengreen (2001)

Table 3. Results of the two-stage Logistic Threshold Specifications

Variables	Optimal dynamic group	Non-Optimal dynamic group
M2 / Reserve	-0.0008e-02 (-0.64)	0.0004e-03 (0.10)
finance_integ	-0.023* (-2.30)	-2.663* (-1.98)
I (finance_integ > $\hat{\gamma}$)	-2.605* (-2.41)	-1.895* (-2.25)
finance_integsup_ $\hat{\gamma}$	2.363* (2.31)	2.463 (1.96)
Domestic Credit / GDP	0.219* (2.03)	0.030 (0.17)
Return of US Treasury Bond for 10 years	0.032* (2.17)	-0.019 (-0.77)
FDI / GDP	-1.378 (-1.11)	2.841* (2.60)
Commercial opening / GDP	-0.135 (-0.75)	0.918 (1.15)
inflation	-0.002 (-1.79)	-0.002 (-0.68)
Financial exchanges / GDP, Kopen	0.803 (0.31)	6.193 (1.29)
Observation number	133	137
Test of significance of Fisher (p_value)	0.0210	0.0017
Sargan test (S statistics)	0.9559	0.0952

(Note) « * » $p<0.1$, « ** » $p<0.05$, « *** » $p<0.01$

II. Concluding Remarks

This paper is a regional contribution to the classical debate on the optimal liberalization sequence in light of recent evidence asserting the correlation between the dynamisms of liberal reforms and risks of financial instability. These issues are extremely important, especially given the global dimension of the latest waves of currency crises. In this paper, we recourse to dynamic panel data models and two-stage logistic specifications using a sample of Mediterranean countries in order to investigate whether the process of financial integration exerts a nonlinear impact on exchange pressures and hence on the likelihood of exchange crises. Our theoretical and empirical frameworks enable us to apprehend the evolution of the financial

liberalization process in the Mediterranean area. We have indicated that the Mediterranean economies have primarily engaged within an optimal liberalization dynamic. Nevertheless, since the 1990s, some economies have exhibited an excrescence of financial liberalization. This phenomenon has been identified in the European (1990) and Latin American areas (1980). Our research suggests that the financial liberalization effect in the Mediterranean area is nonlinear. The empirical evidence shows that the two-regime specifications better approximate the dynamic effects of financial liberalization on the speculative pressures compared to linear and nonlinear financial liberalization modeling. Interestingly, the optimal dynamic countries reach a structural change point later in the process.

The results support that the reform dynamics constitute an important determinant of financial stability. In fact, an optimal liberalization trajectory has significantly delayed the structural breaking point in the relation (speculative pressures/financial liberalization) and enables better control of financial instability. Our non-optimal sequence results assert the argument of the short-term compensation between current and capital accounts proposed by Rodrik (1987). However, the presence of the financial liberalization excrescence within the optimal dynamic countries during the 1990s constitutes a non-optimal liberalization trajectory. Such a dynamic has in the past exposed the European and Latin American economies which are most sensitive to speculative pressures. For that group, we find that the process of trade opening enhances speculative pressures. Their central banks have also faced difficulties in overcoming declining reserves without increasing the risks of speculative pressures. Similarly, an important result of this research is that the optimal dynamic regressions support the twin crisis argument proposed by Kaminsky and Reinhart (1996). Generally speaking, even if a country evolves within an optimal liberalization dynamic, the trend to overliberalize financial accounts relative to current accounts exposes the latter to financial instabilities. Furthermore, our results assert the inefficiency of capital controls implemented by Mediterranean authorities to restrict financial flow movements. Thus, for policymakers, our analyses suggest that Mediterranean economies cannot use the taxation of foreign flows as an automatic stabilizer in case of a contagion risk.

Finally, the recent subprime crisis has shown that the impact of financial integration depends on the manner of deregulation of the accounts (current and financial). However, for Mediterranean countries, it is not a question of the initial trend, but rather the challenge of maintaining the balance between commercial and financial integration. This penultimate goal constitutes both political and economic challenges for Mediterranean countries in light of the requirements and implementation of the EuroMed Agreements.

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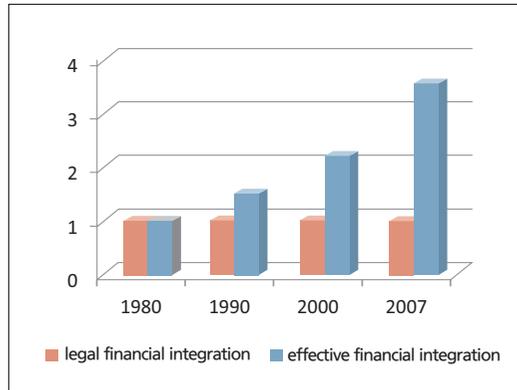
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Appendices

Figure 1A. Financial Integration "Mediterranean Area"(1980~2007)

(Source) Extended Databases of Chinn and Itô (2005) and of Lane and Mielsi-Ferretti (2006)

Table 1A. Regional Evolution of Legal Integration(1985~2007)

	Mean tariff			Financial opening index		
	1985	1995	2007	1985	1995	2007
Europe	8.073	6.990	4.638	4.381	7.218	6.502
Latin America	39.892	12.467	9.133	2.889	6.530	6.229
Asian South-East	29.422	20.600	9.385	2.000	5.317	4.614
Mediterranean	6.542	7.075	17.888	2.000	4.605	4.268

(Source) Fraser Institute and Author's calculation

Table 2A. Results of GMM Regressions "Group of Optimal dynamic"

Non-Optimal sequence Variables	Linear Regression	Non linear Regression	Threshold Regression
M2 / Reserve	-0.06e-02*** (-4.48)	-0.005e-02** (-2.97)	-0.01e-02*** (-3.87)
finance_integ	-0.084** (-3.29)		-1.478* (-2.33)
invinance_integ		0.247 (1.29)	
I (finance_integ >)			-1.324* (-2.03)

*finance_integsup_*			1.380* (2.24)
Domestic Credit / GDP	0.418*** (5.23)	0.312* (2.23)	0.440** (3.16)
Return of US Treasury Bond for 10 years	0.023* (2.09)	0.023 (1.66)	0.025 (1.90)
FDI / GDP	0.457 (0.46)	-0.450 (-0.51)	0.713 (0.59)
Commercial opening / GDP	0.136 (0.88)	0.022 (0.19)	0.170** (2.89)
inflation	-0.001 (-1.67)	-0.007e-02* (-2.24)	-0.001** (-3.24)
Financial exchanges / GDP, Kopen	-0.146 (-0.07)	-1.043 (-0.49)	0.818 (0.38)
Observation number	124	124	124
Test of significance of Fisher (*p*_value)	0.0000	0.0000	0.0004
Sargan Sstatistic	0.0740	0.1054	0.0775

Table 3A. Results GMM Regressions "Optimal dynamic group"

Non-Optimal sequence Variables	**Linear Regression**	**Non-linear Regression**	**Threshold Regression**
M2 / Reserve	0.0000256e-02 (1.12)	0.00013e-02 (1.84)	0.00013e-02 (1.88)
finance_integ	-0.002 (-0.34)		-0.118* (-2.14)
invsqrtfinance_integ		0.283 (2.10)	
I (finance_integ >)			-0.241* (-2.35)
*finance_integsup_*			0.119* (2.25)
Domestic Credit / GDP	0.079* (2.33)	0.078 (4.81)	0.012 (0.57)
Return of US Treasury Bond for 10 years	0.006** (2.88)	-0.001 (-0.30)	-0.00417e-02 (-0.01)
FDI / GDP	-0.034 (-0.15)	0.514 (1.12)	0.229 (0.67)
Commercial opening / GDP	-0.206* (-2.51)	-0.085 (-1.10)	-0.063* (-1.96)

inflation	0,071e-02** (3.07)	0.001 (2.52)	-0.034e-02*** (-4.07)
Financial exchanges / GDP, Kopen	-0.547 (-0.91)	-0.469 (-0.49)	-0.672 (-1.01)
Observation number	157	157	157
Test of significance of Fisher (*p*_value)	0.0000	0.0000	0.0000
Sargan Statistic	0.4536	0.4032	0.4483

Table 4A. Results of the 2 Stages Logistic Specifications "Optimal dynamic group"

Optimal sequence Variables	Linear Regression	Non-linear Regression	Threshold Regression
M2 / Reserve	-0.0008e-02 (-0.60)	-0.0007e-02 (-0.52)	-0.0008e-02 (-0.64)
finance_integ	-0.004 (-0.16)		-0.023* (-2.30)
invinance_integ		0.132 (0.75)	
I (finance_integ >)			-1.324* (-2.03)
*finance_integsup_*			1.380* (2.24)
Domestic Credit / GDP	0.213 (1.94)	0.237* (2.33)	0.219* (2.03)
Return of US Treasury Bond for 10 years	0.035* (2.49)	0.033* (2.24)	0.032* (2.17)
FDI / GDP	-0.950 (-0.80)	-1.176 (-0.96)	-1.378 (-1.11)
Commercial opening / GDP	-0.149 (-0.81)	-0.123 (-0.67)	-0.135 (-0.75)
inflation	-0.002 (-1.94)	-0.002* (-2.11)	-0.002 (-1.79)
Financial exchanges / GDP, Kopen	1.608 (0.63)	0.752 (0.27)	0.803 (0.31)
Observation number	133	133	133
Test of significance of Fisher (*p*_value)	0.0740	0.0620	0.0210
Sargan Statistic test	0.9625	0.9285	0.9559

Table 5A. Results of 2 Stages Logistic Specifications "Non-Optimal dynamic group"

Non-Optimal sequence Variables	Linear Regression	Non-linear Regression	Threshold Regression
M2 / Reserve	-5.47e-07 (-0.13)	-3.87e-07 (-0.09)	0.0004e-03 (0.10)
finance_integ	-0.072 (-0.46)		-2.663* (-1.98)
invsqrtfinance_integ		1.009 (1.66)	
I (finance_integ >)			-1.895* (-2.25)
*finance_integsup_*			2.463 (1.96)
Domestic Credit / GDP	-0.030 (-0.16)	0.010 (0.08)	0.030 (0.17)
Return of US Treasury Bond for 10 years	0.015 (0.78)	-0.003 (-0.16)	-0.019 (-0.77)
FDI / GDP	2.271 (1.91)	2.635 (3.40)	2.841* (2.60)
Commercial opening / GDP	-0.629 (-1.11)	0.477 (0.54)	0.918 (1.15)
inflation	0.003 (1.37)	0.0005 (0.19)	-0.002 (-0.68)
Financial exchanges / GDP, Kopen	5.932 (1.31)	4.250 (0.95)	6.193 (1.29)
Observation number	137	137	137
Test of significance of Fisher (*p*_value)	0.0039	0.0002	0.0017
Sargan Statistic test	0.0161	0.8352	0.0952