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# **The Role Of Macroeconomic Stability In The Finance-Growth Nexus**

## Threshold Regression Approach

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# The role of Macroeconomic Stability in the Finance- Growth nexus. Threshold regression approach\* .

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February 4, 2014

## Abstract

The purpose of this research paper is to analyse the link between Finance and Growth (or Development) and, in particular, if this link is variable in respect to the variations of “Macroeconomic Stability”. This topic has been studied by many authors without any definite conclusion being reached. This work considers the theoretical and the empirical problem in two ways: first, the evolution of the empirical literature, and a new empirical perspective to analyze that link. The research presented here attempts to answer this question using threshold methodology. It confirms previous analysis in respect to non-linearity of the relationship between finance and growth in international comparisons. The use of two different threshold variables confirms the complexity of this link and also the different mechanisms of transmission that operate inside different groups of countries. The use of the bank’s liquidity reserve ratio as a “stability” indicator suggests that probably the link between wealth and stability is not always enjoyed.

Keywords: Financial Development, Economic Development, Macroeconomic Stability, Threshold Effects

JEL classification G00, E44, E06, O16

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# **1. Introduction**

## **1.1 Research Background**

The link between finance and growth is one of the most important fields of research in economics. In the last two decades the development in econometric techniques has allowed researchers to answer some questions related to the nature of this link and to correctly evaluate its relationship.

Several studies have offered strong support to the hypothesis that a good financial system offers a basis for a long-term growth (Levine 2004) and consider the absence of the finance-growth link as a result of specific idiosyncratic shocks. Other works consider the nature of shocks to evaluate correctly the cause and effect of financial changes and suppose that this relationship is not strictly caused by differences between countries (Rousseau and Watchel 2002).

The empirical evidence is quite wide in terms of techniques and results (Eschembranch 2004) but many consider that the link should be variable if we consider rich or poor countries, because they need different types of financial support. The financial system is always based on “confidence” (Tobin 1965) and the level of confidence depends on “Macroeconomic Stability”.

This paper attempts to offer new evidence to support the hypothesis that the level of Macroeconomic Stability has a strong impact on the determination of the effect of finance on growth. This evidence is offered by the use of threshold estimation and by the introduction of another indicator of stability, namely the liquidity reserve ratio of banks.

## **2. Brief Literature Review**

### **2.1 Finance and growth: overview and perspectives**

The empirical literature on the link between financial and economic development is vast and there is no single way to classify it. An extensive scrutiny of all aspects that are discussed

in the literature is beyond the scope of this paper<sup>1</sup>. If we consider the evolution of empirical studies and results we can classify the studies on finance and growth from a new viewpoint:

- Studies that find a strong and robust relationship between finance and growth and go on to find the mechanism of transmission between the financial sector and the economic system.
- Studies that find the link but that take into account the differences among countries in respect to the different level of economic development and consider the link between finance and growth that is found to vary depending on both the context and through time (long run and short run effects).
- Studies that ignore the link between finance and growth. In these kinds of studies the effect of finance on growth is caused by other factors (such as macroeconomic stability, the legal system, international trade and degrees of freedom<sup>2</sup>).

The first generation of empirical studies started from the theoretical intuition of Schumpeter (1911). According to this point of view finance can help growth by the allocation and diversification of savings. Savings go from family to firms via banks (bank based) or via financial markets (market oriented), in any event the role of the financial system is to aid the accumulation and allocation of investments. The final effect is an increase of fixed capital and the growth rate. The financial system from this viewpoint represents the link that closes the circle between savings, investment and capital in the economic system.

The empirical studies related to this viewpoint use some indicators of financial development and some indicators of economic growth to show that a financial system can be a good predictor of future economic growth. These studies show that some aspects of differences in economic growth can be explained by the differences in financial indicators. In particular the work of King and Levine (1993) is a cornerstone of this viewpoint. The authors using OLS conclude that countries that have a good financial sector have experienced more growth in the subsequent periods.

Similar results are present in Levine and Zervos (1998). In this work the authors confirm the link between finance and growth after control for the specific differences related to a “country effect”<sup>3</sup>.

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<sup>1</sup> The most recent and complete survey is Levine (Levine 2004). Another interesting point of view is presented in Watchel (2004).

<sup>2</sup> Index of political rights and civil liberties (Freedom House).

Another example of this viewpoint is Rousseau and Sylla (2001) who find a strong correlation between financial factors and economic growth that is consistent with a leading role for finance for 17 countries with data from 1850 to 1997.

This conclusion is further supported by Harrison, Sussman and Zeira (1999) who find a feedback effect between the real and the financial sector that helps to explain international differences in output per capita<sup>4</sup>.

Luintel and Khan (1999) using the VAR technique find two cointegrating vectors identified as long-run financial depth and the output relationship linking financial and economic development. They also find a negative contemporaneous correlation between the level of financial development (depth) and growth in per capita income in 7 out of 10 countries and a strong positive correlation between the levels of financial depth and per capita output in all sample countries. Beck, Levine and Loayza (2000) in their panel study of 77 countries from 1960 to 1995 confirm an economically large and statistically significant relationship between financial development and both real per capita GDP growth and total factor productivity growth.

In their study the positive link between financial intermediary development and both physical capital accumulation and private savings rates is however ambiguous since it is not robust to alterations in estimation techniques and to measures of financial intermediary development.

The evolution of the empirical literature (in terms of methodology and availability of data) has had a strong impact in respect of a range of results (Eschenbanch 2004). There are several plausible reasons for this variety.

First of all, the differences in a long run relationship and short-run dynamics in the finance and growth nexus was explained by Fisman and Love (2003) and Loayza and Ranciere (2002). The latter used a regression on 17 countries and find that a positive long-run relationship between financial intermediation and output growth coexists with a, mostly, negative short-run relationship.

Secondly, new techniques have shown the possibility of non-linearity in the relationship. This fact was not picked up as significant by standard estimation techniques. Deidda and

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<sup>3</sup> In this debate some authors believe that the link between finance and growth can vary according to the economic context, Levine and Zervos (1998) use indicators of crises, public expenditure and inflation to verify that the link found is robust.

<sup>4</sup> This is an example of “reverse causation” explained by the famous words of J. Robinson (1952), “firms lead finance follows”. This problem is particularly difficult to solve and most researchers have sought to develop methods to avoid it (La Porta et al 1999, Rajan and Zingales 1998).

Fattouh (2002) with a threshold regression find a positive relationship between the level of financial depth and economic growth for countries with high income per capita but no significant relationship for lower-income countries, which is consistent with the non monotonic relationship implied in the model. The same result was found in the same period by Rioja and Valev (2003) and Favara<sup>5</sup> (2004). The analysis of Favara is very interesting because it starts from the same assumptions as King and Levine (1993) and shows that if we analyze different groups of countries (by income) the link between finance and growth is variable with respect to the development phase. These authors also show that the use of different econometric techniques can lead to different results, and the link shown by King and Levine can disappear. Some questions remain open in this literature. For instance, if the link depends on particular characteristics of the economic system, is it possible to find them? When we identify common characteristics of countries in which finance has a positive role on growth, can we synthesise these characteristics into a single indicator?

Rousseau and Watchel (2002) following the intuition of Minsky (1977,1982) and using threshold regression, focus their attention on “macroeconomic stability”. If one country is stable, then there is a relative investment prospect and savers can decide about what investment forms there should be with respect to the expected returns. In stable countries it is simple to transform savings into investment with the help of banks or markets. If the degree of “stability” declines the elasticity of substitution between various forms of investment, the link between finance and growth, can disappear (for a certain “critical value” of stability). In this case we can indirectly explain why rich countries demonstrate this link, not because they are rich but because they are stable.

Rousseau and Watchel (2002) used the inflation rate as an indicator of stability and conclude that a country can be considered “stable” if the inflation rate is lower than 15% per year.

One possible element of criticism in respect of this approach is the effective mean rate of inflation, because we can suppose that inflation is not only an effect of instability but in fact can be a cause of it.

We end this brief survey by focussing on some key points at this stage of the finance-growth empirical literature.

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<sup>5</sup> This author used the Pooled Mean Group technique intended by Pesaran et al. (1999) to take into account the heterogeneity of the financial development coefficients.

The first is that the relationship between finance and growth is not linear if we analyze it by international comparison [Deidda and Fattouh (2002), Rioja and Valev (2003) and Favara (2004)], this empirical result is in agreement with the intuition of Rybczynsky (1988). Countries at different stages of development need different types (and amount) of financial services.

Secondly, the link between finance and growth is not always present, at least in the short run (Loayza and Ranciere 2002 and Favara 2004).

Macroeconomic Stability can have a strong impact on the finance-growth link (Rousseau and Watchel 2002) and can explain why it is always present in rich countries.

Starting from these results the object of this work is to analyze the finance-growth nexus by threshold regression. To do so we will carry out two experiments: following the Deidda and Fattouh (2002) specification we will see if the absence of linearity in the finance-growth relationship is confirmed with updated data, if there are still threshold effects on this function and if the same variables are able to explain the finance-growth nexus in today's economy.

After that we will estimate, with threshold methodology, a general production function augmented with some indicators of financial development (common in literature) including a new indicator of macroeconomic stability. This exercise will be done in order to verify the existence of threshold levels in wealth and stability that could affect the link between finance and growth.

### **3. Methodology and empirical analysis**

The empirical part consists of two types of analyses. The first in section 3A, is based on work of Deidda and Fattouh (2002) who focus on the period 1960-1989. Using the same variables we analyze the period 1992-2008 to compare the results for these two different periods. In particular we want to control whether the non-linearity of the finance-growth relationship is confirmed and furthermore, if the variables used in that work are adequate to represent today's economies and the increased level of economic (and financial) complexity. The analysis of Deidda and Fattouh (2002) and Favara (2004), have suggested that the impacts of the financial sector on growth depends on the development stage, but we do not know the "level" of development that can split a sample of countries into a high income group and a low income group. Also, to consider the effects of macroeconomic stability we have to

suppose a priori if one country is “stable” or “unstable”. To overcome this problem and verify the existence of threshold levels in finance-growth nexus we will use threshold regression. The second analysis in section 3B is based on the work of Levine and Zervos (1998), in particular we apply threshold regression to analyze whether the response of common financial variables is influenced by threshold effects. To do so we use two variables as a threshold variable, the initial GDP value and one indicator of macroeconomic instability, namely the bank’s liquidity reserve ratio.

### 3.1.1 Threshold Methodology

In the first analysis we use cross-country data to test the non monotonic relationship between financial depth and growth.

We estimate the same model as Deidda and Fattouh (2001) who follow King and Levine (1993) in that the real growth of per capita income is regressed on initial real income per capita, the initial secondary enrolment rate and the ratio of liquid liabilities to GDP serving as an indicator of financial depth. In addition to this base regression, Deidda and Fattouh include the ratio of trade to GDP, the ratio of government spending to GDP, the average inflation rate and an index of civil liberties to control for other economic phenomena. We use a dataset which covers 122 countries over the period 1980-2008.

The model is estimated using a threshold regression model that takes the form

$$\begin{cases} y_i = \theta_1' x_i + e_i & (q_i \leq \gamma), & (3.A.1) \\ y_i = \theta_2' x_i + e_i & (q_i > \gamma), & (3.A.2) \end{cases}$$

where  $q_i$  is the threshold variable used to split the sample into two different regimes;  $y_i$  is the dependent variable;  $x_i$  is an  $m$ -vector of regressors and  $e_i$  is the error term. This model allows the regression parameters to switch between regimes depending on the value of  $q_i$ . By defining a dummy variable  $d_i = \{q_i \leq \gamma\}$  (where  $\{\cdot\}$  is the indicator function) and setting  $x_i(\gamma) = x_i d_i(\gamma)$ , we can represent equations (3.1.1) and (3.1.2) by the single equation

$$y_i = \theta' x_i + \delta x_i(\gamma) + e_i \quad (3.A.3)$$



where  $\theta' = \theta_2'$ ,  $\delta$  and  $\gamma$  are the regression parameters. The threshold model is estimated using least squares (LS). To test for the null of no threshold against the alternative of threshold, we use the heteroskedasticity-consistent Wald test statistic<sup>6</sup> (Hansen, 1996, 2000). Since the threshold  $\gamma$  is not identified under the null hypothesis, the p-values are calculated by bootstrap methods. To derive the asymptotic distribution of the slope coefficients, we can proceed as if the threshold estimate were the true value. In this case, the slope parameters are shown to be asymptotically normal with a standard asymptotic covariance matrix (Hansen, 2000).

### 3.1.2 Data set for the first empirical analysis.

The data set consists of cross country observations for 122 countries over the 1980-2008 period.<sup>7</sup> The sources of data are World Development Indicators (2010) and Freedom House (2010). These sources were selected in order to prevent possible problems related to heterogeneity of the database.

GDP per-capita is expressed in terms of variation over the period, GDP80 represents the value of GDP per capita in the base year, inflation is expressed in terms of the average in the period (in log form), school enrolment (Sec80) is expressed in terms of gross rate, government consumption is expressed by the average (in log form), trade is expressed as the average (in log form), civil liberties (civil) are expressed as the average of the index, liquid liabilities (lly) are expressed in terms of the average (in log form).

Tables 1 and 2 show the sources of data and the summary statistics.

Table 1. Sources of Data.

Variables	Sources	Unit of Measurement
GDP per capita	World Development Indicators	Constant 2000 US\$
Inflation	World Development Indicators	GDP deflator (annual %)
School enrolment secondary	World Development Indicators	% gross
General government final consumption expenditure	World Development Indicators	% of GDP
Trade	World Development Indicators	% of GDP
Liquid liabilities (M3)	World Development Indicators	% of GDP
Civil	Freedom House	Index (0-10 scale)

<sup>6</sup> Some works that use LM test, by Hansen (2001) show that these two tests are equivalent for finite samples.

<sup>7</sup> Refer to Appendix 1 for a list of countries.

Table 2. Summary Statistics.

Variables	Mean	Std. Dev.	Min	Max
GDP	0.64	1.02	-0.80	8.72
GDP80	5512.35	7989.48	135.44	46605.66
inf	0.51	1.77	0.01	13.18
Sec80	0.48	0.30	0.02	1.09
civil	3.42	1.63	1	6.93
trad	0.79	0.43	0.20	2.71
lly	0.49	0.32	0.08	1.96

### 3.1.3. Empirical results of first analysis.

Table 3 shows the results of the first specification, the threshold value for GDP80 is \$1060 per capita and the Wald-test confirms the presence of non linearity in the model. The threshold level was calculated by the bootstrap method with 1000 replications and with a trimming percentage of 10%<sup>8</sup>.

The level of GDP threshold is similar to the Deidda-Fattouh (2002) (henceforth D&F) level of \$756, the increment possibly representing the variation of world income with respect to the earlier period<sup>9</sup>.

The differences in the other results are very interesting because for countries with low income economic growth are influenced by the indicator of education, but in all cases the amount of liquidity is not significant in explaining growth, unlike the D&F analysis.

Another important factor is the difference in the R-squared value, this being approximately one half of the D&F value.

Table 3. Model 1.

	Low-GDP80(GDP80≤1060.69)			High-GDP80(GDP80>1060.69)		
	Coeff.	s.e.	t-stat	Coeff.	s.e.	t-stat
GDP80	-0.00	0.00	-2.53	-0.00	0.00	-2.28
Sec80	3.62	1.57	2.30	0.56	0.58	0.97
lly	2.03	1.38	1.47	0.15	0.38	0.39
Threshold estimate	1060.69					

<sup>8</sup> Azman-Saini, W.N.W. et al. (2010) used the same methodologies to study the effects of foreign direct investment on growth.

<sup>9</sup> We recall that Deidda and Fattouh (2002) analyzed the period 1960-1989.

Wald-test for no threshold (p-value)	6.89 0.08	
Number of countries R <sup>2</sup>	35 0.24	44 0.12

The situation does not change for the other two specifications, shown in Table 4 and Table 5, only the value of education in the low-income group is significant (except the initial GDP value) and the level of R-squared is systematically lower than the D&F value. We suppose that this is due to the fact that the level of complexity of economic systems has changed over the two decades that divide the two analyses.

In particular there are several good explanations for this phenomenon.

First of all, the indicator of financial development appears to be inadequate, the simple amount of money (LLY) is largely employed in the literature, but it cannot represent the complexity of contemporary financial systems. For instance, the increase in the amount of money can be decided by government (in poor countries) and can be limited by financial central institutions to prevent inflation (for instance in the EU and the USA). In such cases the simple amount of money with respect to GDP could go in the opposite direction of growth (anti-cyclical policy).

Similar arguments can be used to analyze the role of trade. At the initial stage of the development, the countries that once were closed to international trade and now are open to it and obtain more benefits from it. In the modern relationship between countries the effect of trade is very complex, the role of the specialization of work and the role played by international companies tend to change the outcomes of trade that could increase or decrease GDP<sup>10</sup>.

Inflation is in general simple to interpret; it has the expected sign in all specifications but is not significant. The reason could be the positive relation between inflation and growth that is shown in the work of Khan and Senhandji<sup>11</sup> (2001), such a kind of relationship was experienced during the periods of increasing demand (during the second part of the '80s in Italy for example).

This result could be explained by two arguments. First, the impact of education on productivity could depend on the stage of development. In poor countries with limited access

<sup>10</sup> Winner and loser theory is explained by Williamson (2002).

<sup>11</sup> In this work the authors find a positive relationship between inflation and growth at low level of inflation, being a positive relationship at low rates of inflation and a negative one as inflation rose (which weakened as inflation increased).

to education the enrolment rate may correspond to the rate of new skilled workers in the job market. Even if the majority of people in developed countries have graduated it does not mean that all of them are skilled. Second, the factors that determine international competition are not always the same. Sometimes competition is based on innovative research but sometimes competition could be based on low-wage policy. We assume that key factors of international competition have changed over the last 20 years.

The role of Government consumption has also declined, we have to remember that the '80 and '90 were two decades after the Keynesian revolution and a good number of economies had changed the role of state in the economy (the UK for example).

Table 4. Model 2.

	Low-GDP80(GDP80≤1060.69)			High-GDP80(GDP80>1060.69)		
	Coeff.	s.e.	t-stat	Coeff.	s.e.	t-stat
GDP80	-0.00	0.00	-1.75	-0.00	0.00	-2.53
Sec80	4.67	1.73	2.70	0.48	0.58	0.82
lly	1.36	1.46	0.93	0.06	0.39	0.16
gov	0.84	0.93	0.90	0.01	0.36	0.02
trad	-1.11	0.75	-1.48	0.20	0.25	0.78
inf	-0.27	0.19	-1.43	-0.10	0.10	-1.06
Threshold estimate	1060.69					
Wald-test for no threshold (p-value)	11.69 0.07					
Number of countries	34			44		
R <sup>2</sup>	0.34			0.19		

Table 5. Model 3.

	Low-GDP80(GDP80≤1060.69)			High-GDP80(GDP80>1060.69)		
	Coeff.	s.e.	t-stat	Coeff.	s.e.	t-stat
GDP80	-0.00	0.00	-1.67	-0.00	0.00	-2.48
Sec80	4.79	2.14	2.24	0.30	0.63	0.49
lly	0.93	2.01	0.46	0.12	0.41	0.29
gov	0.79	1.02	0.78	-0.02	0.37	-0.04
trad	-0.99	0.87	-1.14	0.20	0.29	0.70
inf	-0.29	0.22	-1.33	-0.10	0.11	-0.93

civil	0.37	1.07	0.34	0.29	0.35	0.82
Threshold estimate	1060.69					
Wald-test for no threshold (p-value)	12.05					
	0.10					
Number of countries	31			42		
R <sup>2</sup>	0.33			0.22		

In the end, it is not so strange that the values and the explanatory capacity of the model have changed, because economic systems have changed and the relationship between variables and countries has become more complex.

For this reason in the second empirical analysis we focus on more complex specifications, in particular in relation to the financial aspects.

### 3.2.1. Methodology of the second empirical analysis.

In this part we use a model similar to Levine and Zervos (1998) (henceforth L&Z), and apply to this model the threshold methodology used in section 3.1.1.

In this type of model the growth rate of GDP per capita ( $\Delta y_i$ ) depends on a vector of real variables ( $\Delta \mathbf{x}_i$ ) and at the same time depends on a vector of financial variables ( $\Delta \mathbf{z}_i$ ).

The model is the following:

$$\begin{aligned} \Delta y_i &= \beta_0 + \Delta \mathbf{x}_i' \boldsymbol{\beta} + \Delta \mathbf{z}_i' \boldsymbol{\delta} + \varepsilon_i \\ \varepsilon_i &\approx N(0, \sigma^2) \\ i &= 1, \dots, n \end{aligned} \tag{3.2.1}$$

In the model  $\Delta y_i$  is the average growth in GDP per capita in the period 1992-2008, whilst  $\Delta \mathbf{x}_i$  and  $\Delta \mathbf{z}_i$  are the average growth of real and financial variables.

Including real factors in the model, L&Z try to isolate the effects on financial variables to verify the significance of these variables.

To estimate the parameters of the model L&Z use OLS. The estimate of variance is obtained by an estimator that is robust with respect to the homoscedasticity problem.

The econometric specification is:

$$\Delta y_i = \beta + \beta_1 \Delta K + \beta_2 \Delta L + \delta_1 \Delta capit + \delta_2 \Delta credbank + \delta_3 \Delta reser + \delta_4 \Delta spread + \delta_5 \Delta rint + \delta_6 \Delta gsav + u_i \quad (3.2.2)$$

Where K and L represent two gross measures of the production function, we suppose that gross fixed capital formation (K) and the gross amount of labour force (L) can capture a good part of the production function effect.

In particular some authors use other measure of labour supply, but in our opinion a more sophisticated measure can be wrong if we consider jointly countries with different types of education system or with heterogeneous job market rules.

The scope of this work is only to analyze the effects of financial indicators and for this reasons, a gross measure of labour supply can be used.

The first two measures of the financial system are related to the literature of “bank based” and “market oriented” form of intermediation. For a long period the economic debate was concentrated on explaining if the form of intermediation can have an effect on the quality of credit and, as a consequence, on the growth rate.

Some authors<sup>12</sup> argue that during a first stage of economic development the bank system is more useful in promoting growth in a financial market, and only when the country is developed and the operators have a credible set of informations, the financial market can substitute banking intermediation.

We use two standard measures to capture these effects: market capitalization<sup>13</sup> (*capit*) and bank credit to the private sector<sup>14</sup> (*credbank*), these variables are used in this context to see if these differences between two forms of intermediation is significant for modern economic systems.

Another two standard measure of financial development are real interest rate (*rint*) and gross domestic saving (*gsav*). In the growth model saving is the most important factor, but in the financial growth context the effects of variations in savings on growth depends on the efficiency of the financial sector. A high rate of saving does not always determine a high GDP growth rate, it depends on the quality of banking (or market) selection of investment.

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<sup>12</sup> For instance Rybezynsky (1988) and Mayer (1988).

<sup>13</sup> Rousseau and Watchel (2000) and Arestis et al. (2001).

<sup>14</sup> See for example King and Levine (1993), Levine and Zervos (1998) and Favara (2004).

The interpretation of the real interest rate parameter is more complex, because its interpretation is always ambiguous in empirical results<sup>15</sup>.

The reason is to do with the meaning of the interest rate. It represents a measure of profitability of investment but at the same time, it represents a measure of risk. An increase in the real interest rate can represent a larger amount of profit and we can observe a positive impact on growth, or it can represent an increase in risk.

For these reasons there could be both negative or positive impact on growth. Negative if the risk aversion effect is stronger than the profit effect. Also we can suppose that the meaning of the interest rate could be different at different stages of macroeconomic stability, because an increased level of instability certainly leads to an increase in the risk level. This effect will be positive if the level of expected profit goes up and the profit effect is greater than the risk effect.

To consider a degree of competition in the financial sector we use the difference between the rate applied to deposits and lending (spread<sup>16</sup>). We expect that an increase in competition, as a reduction in spread, is related to an increase in GDP growth, but some authors<sup>17</sup> argue that in the first stage of development (or for countries in economic transformation) strong market power for bank is important to guarantee stability. For this reason it is not really simple to interpret this parameter.

Inflation rate (*inflat*) is used to check for specific price effects on this sample.

We use the threshold methodology and use the initial GDP value as a threshold variable but the most important innovation pursued in this work is the utilization of an indicator for Macroeconomic Stability as a different threshold variable. The focus of these two types of splitting is to verify if the income effect is different from the stability effect. In other words we have to verify if the relationship, stable equals rich, is correct or to in explaining the role of the financial factor. The variable used in this work to represent the macroeconomic stability is the bank's liquidity reserve ratio.

In the next subsection we explain briefly the reasons for this choice.

### **3.2.2 Bank's Liquidity Reserve Ratio and Macroeconomic Stability.**

Various measures of Macroeconomic Stability proposed in the literature are all affected by some problems. In particular, the inflation rate used by Rousseau and Watchel (2002)

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<sup>15</sup> See Tsuru (2000).

<sup>16</sup> As in Mattesini (1996).

<sup>17</sup> Mayer (1988) for instance.

(henceforth R&W) can at the same time be the cause and effect of instability. For example, an external shock like reduction of oil supply has a strong effect on the inflation rate for countries that are net oil buyers. This is not a case of variation of internal stability if we consider the relationship between the internal financial system and internal savers, but inflation is affected. Secondly inflation tends to be stable for long periods, if we use an R&W classification, a country that has 15.1% inflation rate for one year is unstable but if this country has the same 15.1% inflation rate for the next 15 years it will be stable.

In this work we propose another indicator of instability, namely the bank's liquidity reserve ratio<sup>18</sup>. This value represents a practical measure of risk behaviour of internal banks. This indicator varies between two extreme cases. The first represents a system with perfect information and guarantees deposits (like public insurance), in this case the probability of default is zero and the amount of liquid reserve is also close to zero. The second extreme case is a system with political and social instability, uncertainty of returns and a high probability of default. In this case internal banks have to prevent their default risk and to avoid that they increase the liquid reserve ratio<sup>19</sup>. This indicator is useful to represent macroeconomic stability because it includes a good number of other effects that are very difficult to evaluate<sup>20</sup>, therefore this rate is determined by banks in competition in the market without constraints<sup>21</sup>.

### **3.2.3 Data set for the second empirical analysis.**

The data set consists of cross country observations for 82 countries over the 1992-2008 period.<sup>22</sup> The sources of data are the World Development Indicators (2010).

GDP per-capita is expressed in terms of variation over the period (in log form), GDP92 represent the value of GDP per capita in the base year, the real interest rate is expressed in terms of an average for the period (in log form), market capitalization is expressed in terms of an average for the period (in log form), gross domestic saving is expressed by an average (in log form), labour is expressed in average (in log form), the bank sector is expressed by an average (in log form), liquid reserves are expressed in terms of the gross rate, gross capital

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<sup>18</sup> This indicator was used by Roubini and Sala I Martin (1992) as an independent variable to explain GDP variations among countries.

<sup>19</sup> This argumentation is presented in Demirguc-Kunt and Detragiache (1998).

<sup>20</sup> Such as social and political instability that can determine bank runs, and also the default of the economic system not caused by financial factors.

<sup>21</sup> Some governments (or central banks) fix the minimum amount of reserve but in general this is lower than the real reserve rate. Furthermore the same legal amount of reserve also depends on the systemic risk present in the economic system.

<sup>22</sup> Refer to Appendix II and Appendix III for a list of countries.



formation is expressed as an average (in log form), the spread is expressed by an average (in log form).

Tables 6 and 7 show the source of the data and give summary statistics.

Table 6. Sources of Data

Variables	Sources	Unit of Measurement
GDP per capita	World Development Indicators	Constant 2000 US\$
Market capitalization of listed companies	World Development Indicators	% of GDP
Gross capital formation	World Development Indicators	% of GDP
Labor force, total	World Development Indicators	unit
Real interest rate	World Development Indicators	%
Gross domestic savings	World Development Indicators	% of GDP
Interest rate spread (lending rate minus deposit rate)	World Development Indicators	%
Bank liquid reserves to bank assets ratio	World Development Indicators	%
Domestic credit provided by banking sector	World Development Indicators	(% of GDP)

Table 7. Summary statistics.

Variables	Mean	Std. Dev.	Min	Max
<i>GDP</i>	8.46	1.31	5.57	10.52
<i>credbank</i>	-0.45	0.63	-1.69	1.08
<i>capit</i>	-1.20	0.99	-4.79	0.73
<i>spread</i>	-2.77	0.79	-4.42	0.01
<i>gsav</i>	-1.65	0.67	-5.42	-0.74
<i>rint</i>	-2.78	0.69	-5.15	-0.68
<i>k</i>	-1.50	0.20	-2.19	-0.90
<i>l</i>	15.66	1.69	11.94	20.40

### 3.2.4. Empirical results for the second analysis.

Table 8. Model 4.

	"Stable"(reser $\leq$ 0.09)			"Instable"(reser $>$ 0.09)		
	Coeff.	s.e.	t-stat	Coeff.	s.e.	t-stat
<b>credbank</b>	0.77	0.33	2.37	0.92	0.51	1.81
<b>capit</b>	0.38	0.22	1.73	0.20	0.22	0.93
<b>spread</b>	0.06	0.37	0.17	0.00	0.30	0.01
<b>gsav</b>	0.68	0.51	1.34	0.42	0.22	1.89
<b>rint</b>	-0.36	0.36	-1.01	0.28	0.28	1.00
<b>k</b>	-0.28	0.80	-0.35	-0.71	1.08	-0.66
<b>l</b>	-0.19	0.08	-2.32	-0.29	0.14	-2.10

Threshold estimate	0.09	
Wald-test for no threshold (p-value)	90.74 0.00	
Number of countries	47	21
R <sup>2</sup>	0.62	0.48

In table 8 we show the results of the threshold regression after splitting the sample because the Wald test highly rejects the null hypothesis of no threshold. In this model we used “reser” (at 9.45% per year) as a threshold variable and split these two subgroups into stable and unstable countries. It is interesting to observe that for stable countries all two form of intermediation, by the market and by banks, explained the growth of GDP. For unstable countries only the bank sector is significant. Also for unstable countries the role of savings is important in explaining growth according to a growth theory and suggests a possible path of transmission, savings going to firms via the bank sector. It is also interesting to show that in the work of L&Z the role of banking and the market is always significant for the whole sample of countries. These results according to the analysis of Rioja and Valev (2004) and Favara (2004) are because the effect of finance is diversified if we use subsamples. Also results of the Rousseau-Watchel (2002) support a part in which they propose that macroeconomic stability is a crucial factor in explaining the finance and growth nexus.

Table 9. Model 5.

	“Low Income”(GDP92≤6877.86)			“High Income”(GDP92>6877.86)		
	Coeff.	s.e.	t-stat	Coeff.	s.e.	t-stat
<b>credbank</b>	0.30	0.29	1.03	0.59	0.15	3.82
<b>capit</b>	0.12	0.13	0.93	0.27	0.11	2.44
<b>spread</b>	0.17	0.17	1.02	0.27	0.18	1.57
<b>gsav</b>	0.27	0.14	1.87	0.76	0.24	3.12
<b>rint</b>	0.11	0.16	0.69	0.13	0.21	0.64
<b>k</b>	1.04	0.59	1.76	-0.72	0.42	-1.73
<b>l</b>	-0.28	0.07	-3.78	0.03	0.04	0.75
Threshold estimate	6877.86					
Wald-test for no threshold (p-value)	90.74 0.00					
Number of countries	39			29		
R <sup>2</sup>	0.41			0.68		

In table 9 we show the results of the threshold regression after splitting the sample because the Wald test highly rejects the null hypothesis of no threshold . In this model we used “GDP92” (at 6,877 US dollars per year) as a threshold variable and split these two subgroups into High income and Low income countries.

This classic method of splitting the subsample offers another clear picture of the finance- growth nexus: for High income countries all forms of financial services promote growth and savings also play a role. On the other hand, in Low income countries there is no relationship between financial indicators and growth except for saving.

These results also suggest additional comments regarding the different ways of splitting the subsample of countries. The number of stable subsample countries is greater than the number in the high income subsample of countries. Therefore, this fact suggests that there is a small group of “rich and stable” countries where the link between finance and growth is strong and stable at the same time.

Besides, there is a group of "poor" but stable countries, where finance can promote development in subsequent periods. Furthermore, the split on stability grounds appears to be more logical if we compare “ low income” and “unstable” results: in the low income group it seems difficult to find the reason why saving is significant without a related channel of transmission. A bank is a channel between saving and investment in an unstable subgroup because the parameter related to the bank is as significant as savings<sup>23</sup>.

Another important consideration is related to a value of R-squared for the various groups, the same model explains about 60% of growth for rich and stable countries and about 40% for unstable and poor countries, this suggests a large challenge for future work in terms of a model designed to explain growth and instability.

## **4. Conclusion**

The background of information and knowledge available in the modern society about the relationship between finance and growth is in constant evolution.

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<sup>23</sup> According to a Asymmetric Information Theory.

At this stage of evolution of the literature, some important questions are related to the non linearity of financial growth. For instance, if the level of economic development affects this relationship and the role played by macroeconomic stability.

To answer to these questions we have applied threshold regression to a sample of countries.

The recent empirical literature has suggested that the relationship between finance and growth is not linear, the result of all the specifications of this work offer further support for these results.

Furthermore, some authors have suggested that the level of economic development can determine the results of finance on growth and also in this case the result of our empirical analysis supports these results.

A recent field of research analyses the role of macroeconomic stability on the finance-growth link and assumes that the general macroeconomic context determines the real effects of finance. In this work we propose a new indicator of stability: the bank's liquidity reserve ratio. The empirical results confirm the role of macroeconomic stability in understanding the finance- growth nexus and the mechanisms of transmission. In addition our analysis suggest that stability allows us to understand better the differences in the empirical literature, in particular this work show that a "rich" country is not necessarily "stable" and the real effect of finance can depend on stability more than wealth.

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## Appendix I.

Country with GDP80>1060,69				Country with GDP80<=1060,69	
Country	Code	Country	Code	Country	Code
Algeria	DZA	Mauritius	MUS	Albania	ALB
Argentina	ARG	Mexico	MEX	Bangladesh	BGD
Australia	AUS	Netherlands	NLD	Benin	BEN
Austria	AUT	New Zealand	NZL	Burkina Faso	BFA
Bahamas, The	BHS	Norway	NOR	Burundi	BDI
Bahrain	BHR	Oman	OMN	Cameroon	CMR
Barbados	BRB	Panama	PAN	Central African Republic	CAF
Belgium	BEL	Paraguay	PRY	Chad	TCD
Belize	BLZ	Peru	PER	China	CHN
Bolivia	BOL	Portugal	PRT	Comoros	COM
Botswana	BWA	Saudi Arabia	SAU	Congo, Dem. Rep.	ZAR
Brazil	BRA	Spain	ESP	Congo, Rep.	COG
Brunei Darussalam	BRN	St. Lucia	LCA	Cote d'Ivoire	CIV
Bulgaria	BGR	St. Vincent and the G.	VCT	Egypt, Arab Rep.	EGY
Canada	CAN	Suriname	SUR	Gambia, The	GMB
Chile	CHL	Sweden	SWE	Ghana	GHA
Colombia	COL	Switzerland	CHE	Guinea	GIN
Costa Rica	CRI	Trinidad and Tobago	TTO	Guinea-Bissau	GNB
Cyprus	CYP	Tunisia	TUN	Guyana	GUY
Denmark	DNK	Turkey	TUR	India	IND
Dominican Rep.	DOM	United Arab Emirates	ARE	Indonesia	IDN
Ecuador	ECU	United Kingdom	GBR	Kenya	KEN
El Salvador	SLV	United States	USA	Lesotho	LSO
Estonia	EST	Uruguay	URY	Liberia	LBR
Fiji	FJI			Madagascar	MDG
Finland	FIN			Malawi	MWI
France	FRA			Mali	MLI
Gabon	GAB			Mauritania	MRT
Georgia	GEO			Morocco	MAR
Germany	DEU			Mozambique	MOZ
Greece	GRC			Nepal	NPL
Grenada	GRD			Nicaragua	NIC
Guatemala	GTM			Niger	NER
Honduras	HND			Nigeria	NGA
Hong Kong SAR, China	HKG			Pakistan	PAK
Hungary	HUN			Papua New Guinea	PNG
Iceland	ISL			Philippines	PHL
Iran, Islamic Rep.	IRN			Rwanda	RWA
Ireland	IRL			Senegal	SEN
Israel	ISR			Sierra Leone	SLE
Italy	ITA			Sri Lanka	LKA
Jamaica	JAM			Sudan	SDN
Japan	JPN			Swaziland	SWZ
Jordan	JOR			Syrian Arab Republic	SYR
Korea, Rep.	KOR			Thailand	THA
Latvia	LVA			Togo	TGO
Luxembourg	LUX			Vanuatu	VUT
Malaysia	MYS			Zambia	ZMB
Malta	MLT			Zimbabwe	ZWE



## Appendix II.

<i>Country with reser&gt;0.09 ("Unstable")</i>		<i>Country with reser&lt;=0.09 ("Stable")</i>			
<i>Country</i>	<i>Code</i>	<i>Country</i>	<i>Code</i>	<i>Country</i>	<i>Code</i>
Argentina	ARG	Australia	AUS	Kuwait	KWT
Bulgaria	BGR	Austria	AUT	Latvia	LVA
China	CHN	Bangladesh	BGD	Macedonia, FYR	MKD
Costa Rica	CRI	Belgium	BEL	Malta	MLT
Croatia	HRV	Bolivia	BOL	Mexico	MEX
Egypt, Arab Rep.	EGY	Botswana	BWA	Morocco	MAR
El Salvador	SLV	Brazil	BRA	Namibia	NAM
Estonia	EST	Canada	CAN	Netherlands	NLD
Fiji	FJI	Chile	CHL	New Zealand	NZL
Ghana	GHA	Colombia	COL	Norway	NOR
Greece	GRC	Cote d'Ivoire	CIV	Oman	OMN
Iran, Islamic Rep.	IRN	Cyprus	CYP	Panama	PAN
Jamaica	JAM	Czech Republic	CZE	Philippines	PHL
Jordan	JOR	Ecuador	ECU	Poland	POL
Kenya	KEN	Finland	FIN	Portugal	PRT
Lithuania	LTU	France	FRA	Saudi Arabia	SAU
Nigeria	NGA	Germany	DEU	Singapore	SGP
Pakistan	PAK	Greenland	GRL	Slovak Republic	SVK
Paraguay	PRY	Hungary	HUN	South Africa	ZAF
Peru	PER	Iceland	ISL	Spain	ESP
Romania	ROM	India	IND	Sweden	SWE
Russian Federation	RUS	Indonesia	IDN	Switzerland	CHE
Slovenia	SVN	Ireland	IRL	Thailand	THA
Sri Lanka	LKA	Israel	ISR	Tunisia	TUN
Trinidad and Tobago	TTO	Italy	ITA	Turkey	TUR
Ukraine	UKR	Japan	JPN	United Kingdom	GBR
Uruguay	URY	Korea, Rep.	KOR	United States	USA
Venezuela, RB	VEN				

## Appendix III

<i>Country with GDP92&gt;6877.86 ("High Income")</i>		<i>Country with GDP92&lt;= 6877.86 ("Low Income")</i>			
<i>Country</i>	<i>Code</i>	<i>Country</i>	<i>Code</i>	<i>Country</i>	<i>Code</i>
Argentina	ARG	Bangladesh	BGD	Nigeria	NGA
Australia	AUS	Bolivia	BOL	Pakistan	PAK
Austria	AUT	Botswana	BWA	Panama	PAN
Belgium	BEL	Brazil	BRA	Paraguay	PRY
Canada	CAN	Bulgaria	BGR	Peru	PER
Cyprus	CYP	Chile	CHL	Philippines	PHL
Finland	FIN	China	CHN	Poland	POL
France	FRA	Colombia	COL	Romania	ROM
Germany	DEU	Costa Rica	CRI	Russian Federation	RUS
Greece	GRC	Cote d'Ivoire	CIV	Slovak Republic	SVK
Greenland	GRL	Croatia	HRV	South Africa	ZAF
Iceland	ISL	Czech Republic	CZE	Sri Lanka	LKA
Ireland	IRL	Ecuador	ECU	Thailand	THA
Israel	ISR	Egypt, Arab Rep.	EGY	Trinidad and Tobago	TTO
Italy	ITA	El Salvador	SLV	Tunisia	TUN
Japan	JPN	Estonia	EST	Turkey	TUR
Korea, Rep.	KOR	Fiji	FJI	Ukraine	UKR
Malta	MLT	Ghana	GHA	Uruguay	URY
Netherlands	NLD	Hungary	HUN	Venezuela, RB	VEN
New Zealand	NZL	India	IND		
Norway	NOR	Indonesia	IDN		
Oman	OMN	Iran, Islamic Rep.	IRN		
Portugal	PRT	Jamaica	JAM		
Saudi Arabia	SAU	Jordan	JOR		
Singapore	SGP	Kenya	KEN		
Slovenia	SVN	Kuwait	KWT		
Spain	ESP	Latvia	LVA		
Sweden	SWE	Lithuania	LTU		
Switzerland	CHE	Macedonia, FYR	MKD		
United Kingdom	GBR	Mexico	MEX		
United States	USA	Morocco	MAR		
		Namibia	NAM		