

## A Comparative Study of the Influence of Derivatives on Bank Stability in Emerging and Recently Developed Countries: Evidence from the Last Financial Crisis

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### Abstract

The major objective of this study is to inspect the differences in the effect of derivatives on the stability between banks from emerging countries and those from recently developed countries. According to the repercussions of the recent financial crisis, we divide the whole period on normal period "the pre-crisis period", 2003-2006 and turbulent period "the crisis and post crisis period", 2007-2011. We use the Generalized Methods of Moments (GMM) estimator technique developed by Blundell and Bond to estimate our regressions. Our main conclusions show that, in general, using derivatives by banks from emerging countries deteriorates their stability especially during the turbulent period, whereas, using derivatives do not weaken the stability of banks from recently developed countries. We deduce that banks from emerging countries are more destabilized by using derivatives than banks from recently developed countries.

**Keywords:** Banks; Derivatives; Stability; Emerging countries; Recently developed countries; Crisis; GMM

**JEL classification:** G01; G21

### Introduction

The last financial crisis started in United States of America in the end of 2007 had many repercussions on financial institutions around the world and in particular emerging countries [1]. Indeed, banks from emerging countries have suffered from the consequences of this crisis due to the fragility of their financial systems. Therefore, the causes of financial systems fragility in emerging countries are investigated by many studies [2-7]. For this reason, we decide to focus on banks from emerging countries in order to investigate whether using derivatives affects their stability.

On other hand, we remark that countries like Poland and Singapore which were defined as emerging countries are considered recently as developed countries. Therefore, we are motivated in this study to examine the issue in banks from these countries and to compare them with banks from emerging countries.

According to our reference paper [8], we separate two periods: the ordinary period which defines "the pre-crisis period (from 2003 to 2007)", and the troubled period which represents "the crisis and the post-crisis period (from 2008 to 2011)".

We choose Generalized Method of Moments (GMM) estimator, as proposed by Blundell and Bond, to conduct our empirical analysis because of its relevance. The dependent variable is defined by the z-score which is common accounting measure of bank stability used in many papers [8]. The independent variables are divided in two categories: the variables of interest defined by derivative instruments (forwards, futures, options and swaps), and the control variables represented by both bank-specific factors and country-specific variables.

The main purpose of this study is to compare the influence of derivatives on bank stability between emerging countries and recently developed countries.

In that case, we address the following research question: what are the differences in the effects of derivatives use on the stability of banks from emerging countries and those from recently developed countries?

This research question is investigated both in the pre-crisis period and in the crisis and post-crisis period in order to analyze whether the influence of derivatives on bank stability changes from stable to unstable period.

The contributions of this study to the literature are numerous. Firstly, this paper fulfills the lack of papers in inspecting the impact of derivatives on bank stability. Secondly, it is the first to compare banks from emerging countries to those from recently developed countries when examining this topic. Thirdly, this piece is the pioneer to estimate this issue with Generalized Methods of Moments estimator technique. Finally, this study provides empirical results related to the role played by derivatives during the recent financial crisis in emerging countries and recently developed countries.

The outcomes of the paper can be summarized as follows. In comparison to banks from recently developed countries, banks from emerging countries are more destabilized by using derivatives.

This piece is structured as follows: in Section 2, statistics about the evolution of derivatives as well in emerging countries and in recently developed countries are presented. In Section 3, we summarize the related literature. In Section 4, we present the methodology used. In Section 5, we analyze and discuss the results obtained; and in Section 5, we summarize and conclude.

### Statistics about Derivatives

During the last decade, we remark notably the evolution of derivatives usage either in emerging countries or in recently developed

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countries. Indeed, in this section, we present some statistics which confirm this growth.

The volume of options and futures traded in National Stock Exchange of India is augmented from 39,110,566 in 2005 to 525,299,023 in 2013. Equally, in JSE South Africa and in the same period, this volume is increased notably moving from 14,947,523 to 254,514,098. In Shanghai Futures Exchange this volume is increased from 40,079,750 to 365,329,379 in 2012. In Korea Futures Exchange the volume of options and futures traded is jumped from 678,045,824 in 2003 to 1,835,617,727 in 2012. In the same period, this volume is augmented from 1,854,413 to 156,731,912 in Taiwan Futures Exchange. As following the Figure 1 below show the evolution of options and futures volume in Taiwan Futures Exchange and in Shanghai Futures Exchange.

From these statistics, we deduce evidently the development of derivatives markets in emerging and recently developed countries. For this reason, we are motivated to inspect the impact of these instruments on the stability of banks from countries above-mentioned.

## Literature Review

Many papers have discussed about the fragility and the instability of banks in emerging countries. In fact, as it is said by Nilsen and Rovelli [4] emerging market economies have been affected by a long series of financial crises, starting with Chile in 1982, than Mexico in 1994–95, followed by Southeast Asia in 1997 (Indonesia, Korea, Malaysia, Philippines and Thailand) in 1997, Russia in 1998 and Brazil in 1999.

Each crisis had its own particular characteristics and determinants. However, they also shared common factors: each demonstrated the potential for sharp changes in investor sentiment, often triggered by a combination of unsustainable external imbalance, overvalued exchange rate, unsustainable fiscal policy, poorly monitored bank loans, unwise investments, and especially financial fragility.

Farhi and Borghi [1] show that companies from key emerging markets such as Brazil, China, South Korea, India and Mexico posted heavy losses as a result of the financial crisis of 2008.

Fu et al. [5] use information on 14 Asia Pacific economies from 2003 to 2010 to investigate the influence of bank competition, concentration, regulation and national institutions on individual bank fragility as measured by the probability of bankruptcy and the bank's Z-score. They argue that a larger value the bank-level Z-score means less overall bank risk and higher bank stability.

Chiaramonte et al. [8] address the issue of financial instability in

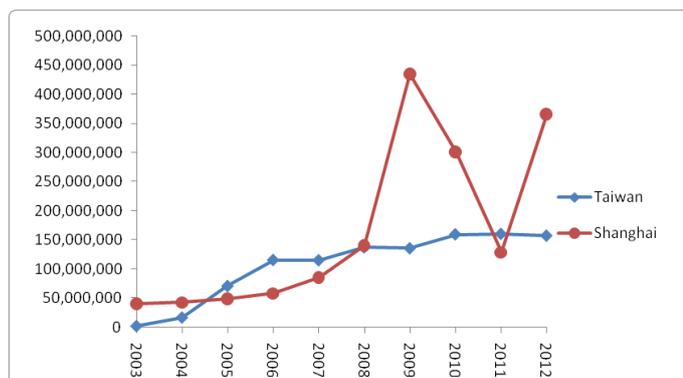


Figure 1: Shows the evolution of options and futures volume in Taiwan Futures Exchange and in Shanghai Futures Exchange.

Argentina which plunged into a severe recession that led to a financial crisis and the abandonment of the currency-board arrangement.

Akyuz and Boratav [3] tell that financial fragility in Turkey is resulting from irresponsible policies and lack of fiscal discipline. They argue that the Turkish banking system was extremely fragile, as it had been deregulated and granted deposit insurance without effective supervision.

On the other hand, other authors argue in their studies that financial innovations as derivatives can affect negatively firm stability. Indeed, Nilsen [4] explains that the causes of a financial crisis are many and varied such as shadow banking system, overconfidence, underestimating of risks, and financial innovations use. He concludes that financial innovation is good; however, since the recent financial crisis, there has been some doubt regarding whether all financial innovations are good for the system. Additionally, Warren Buffett [9] has called derivatives “financial weapons of mass destruction”. Moreover, Gatopoulos and Loubergé [10] investigate the determinants of firms’ use of foreign currency derivatives in Latin American countries exposed to currency crises. They claim that derivative markets have been effective tools for firms in these countries, at least in the post-crisis era. In the study of Coutinho et al. [11] a sample with 47 nonfinancial Bovespa Listed Brazilian companies from 2004 and 2010 was used to test the hypothesis that use of derivatives as a risk management policy tool reduces companies’ cost of capital. In contrast to other countries, the results of this study rejected this hypothesis, showing that in Brazil there is a positive relationship between using these tools and cost of capital. Furthermore, according to Rossi [12], companies based in emerging markets suffer more from derivatives market volatility than companies from more developed economies.

For these reasons, emerging country companies have started to increasingly invest in their earnings releases to the market. For example, Komulainen [2] investigated determinants and the hedging instruments used by Korean firms after 1997 Asian Crisis.

Sensoy [7] found evidences that Brazilian firms use derivatives for hedging purpose.

The results of the paper of Ghysels and Deon [13] indicate that futures markets and trading by foreign investors played a key role during the Korean stock market turbulence in 1997.

Compared to these studies, there are few empirical papers that have investigated the issue on banks. In the rest of this section, we present these studies.

As studies on developed countries, studies on emerging countries have investigated the impact of derivatives on bank stability.

As example of studies on developed countries we can find the study of Buffet [9], who finds a positive relationship between derivatives and the opacity of US large banks.

However, papers on emerging countries studying this issue are not so frequent.

The empirical literature on the role played derivatives within the banking stability puzzle is still limited, mostly because of the marginal importance of such banks in many emerging countries in comparison with developed countries.

As written by Capelle-Blancard [14] the recent literature on the dangers of derivatives is more concerned by systemic risks. Several studies suggest that the sophistication of the products and the

concentration of risks are potential sources of instability because of the increasing uncertainty, the repeated occurrence of extreme losses, and finally the greater possibility of global crisis.

Li and Marinc [15] find that the use of financial derivatives is positively and significantly related to BHCs' systematic risk exposures. Higher use of interest rate derivatives, exchange rate derivatives, and credit derivatives corresponds to greater systematic interest rate risk, exchange rate risk, and credit risk. The positive relationship between derivatives and risks persists for derivatives for trading as well as for derivatives for hedging.

Gatopoulos and Loubergé [10] argue that derivative markets have been effective tools for firms in emerging countries, at least in the post-crisis era.

Mayordomo et al. [16] find that banks' aggregate holdings of five classes of derivatives do not exhibit a significant effect on the bank's contribution to systemic risk. On the contrary, the banks' holdings of certain specific types of derivatives such as foreign exchange and credit derivatives increase the banks contributions to systemic risk whereas holdings of interest rate derivatives decrease it. Nevertheless, the proportion of non-performing loans over total loans and the leverage ratio have much stronger impact on systemic risk than derivatives holdings. Therefore, the derivatives' impact plays a second fiddle in comparison with traditional banking activities related to the former two items.

According to Farhi and Borghi [1], the negative effects of derivatives use on bank stability may be intensified in countries with more volatile currency markets, such as Brazil, Mexico, China, India and South Korea-emerging markets.

The main purpose of their research was to study the influence of the use of currency derivatives on bank' stability, based on data collected from financial publicly traded companies issued from emerging countries. After this deep review of literature, we remark that there are few empirical papers that have examined the effect of derivatives use on bank stability. Thus, the main contribution of this paper is to fulfill this gap in the literature. As regards the results of the literature we stipulate as main hypothesis that using derivatives depreciates bank stability.

## Methodology

### Data

We use accounting data which are available in the websites of retained banks during the period 2003-2011. We employ, additionally, economic data in order to define country variables which are collected from World Bank database.

### Period

According to our reference paper Chiaramonte et al. [8], we identify two periods: the pre-crisis period which is from 2003 to 2006, and the crisis and post-crisis which is from 2007 to 2011.

Moreover, this choice is also motivated by the aim to show the differences in the issue in the normal period and in the turbulent period.

### Sample

The sample is composed of banks from both emerging countries and also recently developed countries.

There are 66 banks from emerging countries and 63 banks from recently developed countries.

Emerging countries are defined according to the list of countries announced by the United Nations Office in 2010. Countries having Human Development Index less than 0.784 are classified as emerging countries and more than this index countries are considered as developed countries. On the other hand, during the last decade countries like Czech Republic and Singapore were considered as emerging countries but nowadays they are called developed countries according to the United Nations Office. For this reason, we are motivated in this work to include banks from these countries in order to compare them with banks from emerging countries. In our current work we call these countries "recently developed countries". Table 1 show classification of banks by countries.

Banks	Emerging Countries	Banks	Recently developed Countries
Banco de Chile	Chile	Ahli United Bank B.S.C. United Gulf Bank	Bahrain
Raiffeisen Bank	Bulgaria	Bank of Cyprus Hellenic Cyprus Bank	Cyprus
Zagrebacka Banka Privrednabanka zagreb Erste and Steiermarkische	Croatia	Komerčni banka Raiffeisenban	Czech Republic
Halyk Bank	Kazakhstan	Swedbank	Estonia
Trasta Komerbanka Bank Norvik Banka Baltic International Bank DNB Nord Banka AS SEB banka Latvijas Parex Banka Bank Aizkraukles Banka Rietumu Banka	Latvia	Bank of East Asia Chong Hing Bank DAH SING Bank Fubon Bank Hang Seng Bank Wing Hang Bank	Hong kong
Šialiu Bankas DNB Nord Banka Swedbank	Lithuania	FIBI Bank Bank Hapoalim	Israel
TransCreditBank GazpromBank	Russia	Bank BPH S.A. Bank Pekao S.A. PKO Bank Polski Bank Zachodni WBK BRE Bank Kredyt Bank S.A. Nordea Bank Polska S.A.	Poland
AK Bank Seker Anadolubank Anonim Sirketi Garanti Bank	Turkey	Commercial Bank of Qatar Qatar National Bank	Qatar
Gulf Bank Burgan Bank	Kuwait	DBS Bank United Overseas Bank	Singapore
Arab national bank	Bahrain	Dexia banka Slovensko a.s Výročná správa Tatra banka	Slovakia
OCBC Bank	Malaysia	Abanka Vipa d.d. Slovenska	Slovenia
Philippine National Bank	Philippine	Industrial Bank of Korea Korea Exchange Bank	Korea
United Bank Limited	Pakistan	Hua Nan Commercial Bank Mega International Commercial Bank Taiwan Business Bank	Taiwan
KTB Bank Bank of Ayudhya Bangkok Thailand Kasikorn Thailand	Thailand	National Bank of Abu Dhabi	United Arab Emirates
Capital Bank Jordan Ahli Bank Jordan Kuwait Bank	Jordan		
Muskat Bank	Oman		
BLOM Bank	Lebanon		
Sasfin ABSA Capitec bank	South Africa		

Table 1: Classification of banks by countries.

## Generalized methods of moments

Referred to the study of Chiaramonte et al. [8], we utilize the Generalized Methods of Moments (GMM) estimator technique. This choice is motivated by the fact that GMM are known as robust tests since their relevance in estimating regressions. In addition, GMM is proposed by Blundell and Bond and built on the works of Arellano and Bover [17], Farhi and Borghi [1] and Li and Marinc [15]. The consistency of the system GMM estimator depends both on the assumptions that the error term is not auto-correlated as well as on the validity of the instruments used. Two specification tests are reported. The first is the Hansen test of over-identifying restrictions, which examines the validity of the instruments by analyzing the sample analogue of the moment conditions used in the estimation procedure. The second test examines the hypothesis of no autocorrelation in the error term. The presence of first-order autocorrelation in the differenced residuals does not imply that the estimates are inconsistent. However, the presence of second-order autocorrelation implies that the estimates are inconsistent. Specifically, we use the two-step system GMM estimator (or linear dynamic panel-data) with Windmeijer corrected standard errors, including lagged differences. In fact, all explanatory variables are lagged with one year period to solve the potential endogeneity problem.

## Variables description

The current work uses as dependent variable a popular accounting measure of bank stability: the z-score [5,8,18-22].

In fact, in their study Fu et al. [5] define bank fragility by the probability of bankruptcy and the bank's Z-score. They argue that a larger value of bank-level Z-score means less overall bank risk and so higher bank stability. The z-score reflects the number of standard deviations by which returns would have to fall from the mean in order to wipe out bank equity. Higher values of z-score are indicative of lower probability of insolvency risk and greater bank stability. Since the z-score is highly skewed, we use the natural logarithm of the z-score, so-called  $\ln_z$ , which is normally distributed [19].

The formula of z-score is as follows:

$$z\text{-score} = [\text{ROA} + \text{EQTA}]/\text{std ROA}$$

From the first panel regression it emerges that average bank stability, measured by natural logarithm of z-score. This dependent variable is explained by variables of interests and control variables which are all one-period lagged.

Variables of interests are defined by the derivative instruments (forwards, futures, options and swaps). The control variables are both bank specific factors and country specific variables. Variables attached to banks are: bank size, the credit risk, the efficiency measure, the income diversification, bank lending behavior, capital adequacy and on-balance sheet interest risk.

The macroeconomic variables are: the annual percent change of Gross Domestic Product, the inflation, the degree of concentration (CR3 and CR5), and the bank market concentration determined by the normalized Herfindahl–Hirschman Index.

The independent variables used in our present piece are engaged in previous studies such as Komulainen and Lukkarila [2] who utilize inflation and GDP as control variables.

Finally, we think that is not necessary to include country dummies since all banks are from emerging countries so they seem to have

almost the same specificities.

## The model

The model seeks to empirically test the relationship between, on one hand, stability measure, and on other hand, derivative instruments and control variables.

The research model is as follows:

$$\text{Stability measure}_{i,t} = \gamma_0 + \gamma_1 \text{FWD}_{i,t} + \gamma_2 \text{SWP}_{i,t} + \gamma_3 \text{OPT}_{i,t} + \gamma_4 \text{FUT}_{i,t} + \gamma_5 \text{LOAN}_{i,t} + \gamma_6 \text{CAD}_{i,t} + \gamma_7 \text{LIQ}_{i,t} + \gamma_8 \text{CRISK}_{i,t} + \gamma_9 \text{SIZE}_{i,t} + \gamma_{10} \text{NONIM}_{i,t} + \gamma_{11} \text{EFF}_{i,t} + \gamma_{12} \text{GDP}_{i,t} + \gamma_{13} \text{INFLATION}_{i,t} + u_i + e_{i,t}$$

As in many papers above-mentioned, the stability is measured by Log z-score.

$(u_i + e_{i,t})$  is the composite error term.

$u_i$  is the random error in which heterogeneity is specifically to a cross-sectional unit-in this case, bank; and

$e_{i,t}$  is the random error in which heterogeneity is specifically to a particular observation. Independent variables are described in the Table 2 below:

CR3 is a country-level structural indicator of bank concentration, measured by the concentration of assets held by the three largest banks in each country, with higher value indicating greater market concentration.

CR5 is a country-level structural indicator of bank concentration, measured by the concentration of assets held by the five largest banks in each country, with higher value indicating greater market concentration.

In order to measure each country's degree of banking system concentration, we determined the normalized Herfindahl–Hirschman Index (norm\_HHI) where HHI is the sum of squared market shares (in term of total assets) of all banks in the country.

As a general rule, a normalized HHI Index below 0.10 signals low concentration, while above 0.18 signals high concentration, whereas an index between 0.10 and 0.18 shows that the industry is moderately concentrated.

## Results Analysis

### Presentation of results

The results are presented in the following Tables 3 and 4.

The dependent variable is  $\ln_z$  which measure the bank stability. The explanatory variables are bank-specific characteristics referring to bank size (SIZE), bank lending behavior (LOAN), credit risk (CRISK), efficiency (EFF), net interest margin (NIM), on balance-sheet interest rate risk (NONIM), and capital adequacy (CAD); macroeconomic factor referring to inflation (INFLATION), GDP growth (GDPC); industry-specific characteristics referring to bank market concentration (norm\_HHI) and bank sector concentration (CR3, CR5).

The dependent variable and the independent variables are defined respectively in Section 4.

All variables are lagged with one year period in order to solve the problem of colinearity.

“Pre-crisis period” denotes the period from 2003 to 2006.

“The crisis and “post” crisis period” denotes the period from 2007 to 2011.

	Variable	Measure	Notation	Expected sign
<b>Variables of interest</b>	Forwards	The notional amount of forwards divided by the total assets	FWD	-
	Swaps	The notional amount of swaps divided by the total assets	SWP	-
	Options	The notional amount of options divided by the total assets	OPT	-
	Futures	The notional amount of futures divided by the total assets	FUT	-
<b>Bank specific</b>	Size	Natural log of total assets	SIZE	+/-
	Bank lending behavior	The ratio of gross loan divided by total assets	LOAN	-
	Capital adequacy	defined by the ratio of risky assets (loans) to equity	CAD	+/-
	Liquidity	defined by the ratio of liquid assets to total assets	LIQ	+
	Credit risk	The ratio of Loan loss reserve divided by gross loan	CRISK	-
	Income diversification	Net interest income	NIM	+/-
	On-balance sheet interest rate risk	Non- interest income	NONIM	-
	Efficiency	The ratio of Total operating expenses divided by total operating incomes	EFF	+/-
<b>Country-specific variables</b>	Gross domestic product	Annual percent change of GDP	PCGDP	+/-
	Inflation	Inflation rate	INF	+/-

**Table 2:** Explanatory variables definitions.

	Pre-crisis period	Crisis & post crisis period	Whole period
<b>FWD (-1)</b>	<b>-0.5850062***</b> (0.2042648)	<b>0.285652**</b> (0.1232232)	0.0017102 (0.0964101)
<b>SWP (-1)</b>	<b>0.4400622*</b> (0.2285965)	<b>-0.3559456*</b> (0.2115074)	<b>0.0381461*</b> (0.0226887)
<b>OPT (-1)</b>	-1.035055 (2.87223)	<b>-0.076447**</b> (0.0320715)	-0.0059155 (0.0428379)
<b>FUT (-1)</b>	-0.0093527 (0.890406)	-1.110565 (0.7840606)	<b>-0.0730782***</b> (0.0270619)
<b>SIZE (-1)</b>	<b>5.011874***</b> (0.6182663)	0.4221781 (0.4058543)	-0.0422067 (0.0811979)
<b>LOAN (-1)</b>	<b>13.26754***</b> (2.520358)	<b>0.9358887***</b> (0.2968691)	0.3505004 (0.3429746)
<b>CAD (-1)</b>	<b>-0.5000665***</b> (0.1779837)	<b>-0.0854053***</b> (0.0150018)	<b>-0.06957***</b> (0.0089933)
<b>LIQ (-1)</b>	-0.8544894 (0.6957863)	-0.5360488 (0.6766704)	<b>-0.9304475**</b> (0.3658422)
<b>CRISK (-1)</b>	6.23054 (3.832758)	1.002004 (3.200659)	-2.386512 (2.232526)
<b>NIM (-1)</b>	4.719944 (8.71274)	n/a	<b>4.582903**</b> (2.199609)
<b>NONIM (-1)</b>	4.295793 (11.28709)	-2.227381 (5.150628)	-0.8027046 (3.519121)
<b>EFF (-1)</b>	-0.2682075 (0.2353647)	-0.0656392 (0.0544524)	-0.0506061 (0.0679234)
<b>GDP (-1)</b>	-0.0514015 (0.0772295)	<b>0.0330651**</b> (0.0138819)	<b>0.0286401***</b> (0.0089507)
<b>INFLATION (-1)</b>	<b>0.0789082**</b> (0.0337042)	0.0229803 (0.0223943)	0.0111777 (0.0153052)
<b>Number of observations</b>	132	198	330
<b>Sargan test</b>	0.0127	0.0520	0.4189
<b>AR(2)</b>	0.0000	0.0000	0.0000

Bold values denote the significant coefficients.

Values between parentheses denote standard deviations.

n/a denotes that the result is not available

\*\*\* denotes coefficient statistically different from zero (1% level, two-tail test), \*\* 5% level, \* 10% level.

\*\*\* denotes coefficient statistically different from zero (1% level, two-tail test), \*\* 5% level, \* 10% level.

**Table 3:** Two-step system GMM estimator: The case of banks from emerging countries.

	Pre-crisis period	Crisis and post crisis period	Whole period
<b>FWD (-1)</b>	0.1111618 (0.3964681)	0.1895767 (0.6601706)	0.1611246 (0.1224054)
<b>SWP (-1)</b>	-0.0375258 (0.1880472)	-0.1472884 (0.3626569)	-0.0423539 (0.0653179)
<b>OPT (-1)</b>	0.8424367 (0.9973037)	-0.3134258 (0.5401875)	<b>0.3880154**</b> (0.1867252)
<b>FUT (-1)</b>	-2.249099 (2.783288)	-0.0160163 (0.983819)	0.1775711 (0.2531672)
<b>SIZE (-1)</b>	-0.5151918 (0.4183631)	-0.0660622 (0.4455808)	<b>-0.4580942***</b> (0.0832505)
<b>LOAN (-1)</b>	2.214473 (1.365024)	0.6123035 (1.272298)	0.4667483 (0.558398)
<b>CAD (-1)</b>	-0.054044 (0.1227649)	<b>-0.1444569***</b> (0.0537997)	<b>-0.0560241**</b> (0.0236482)
<b>LIQ (-1)</b>	0.0737041 (1.856096)	5.453953 (3.615888)	0.2891943 (0.7309862)
<b>CRISK (-1)</b>	-10.24245 (10.81673)	<b>-2.020651**</b> (1.01312)	<b>-1.626356**</b> (0.7713039)
<b>NIM (-1)</b>	-65.44778 (61.43407)	15.11 (21.38387)	12.10292 (8.994912)
<b>NONIM (-1)</b>	-5.632391 (5.803888)	1.724435 (2.43056)	-0.6734852 (1.126224)
<b>EFF (-1)</b>	<b>1.972163*</b> (1.102308)	<b>0.9086902**</b> (0.4594416)	<b>0.5921288***</b> (0.1808785)
<b>GDP (-1)</b>	0.0772622 (0.0808249)	-0.0068757 (0.0157758)	<b>0.0165765***</b> (0.0063953)
<b>INFLATION (-1)</b>	-0.0230512 (0.1166989)	0.0152008 (0.0174825)	-0.006928 (0.0101484)
<b>Number of observations</b>	126	189	441
<b>Sargan test</b>	0.000	0.5326	0.5238
<b>AR(2)</b>	0.000	0.0011	0.0000

Bold values denote the significant coefficients.

Values between parentheses denote standard deviations.

\*\*\* denotes coefficient statistically different from zero (1% level, two-tail test), \*\* 5% level, \* 10% level.

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**Table 4:** Two-step system GMM estimator: The case of banks from recently developed countries.

Standard Errors of estimated coefficients are reported in parentheses.

We used the two-step system GMM estimator (or linear dynamic panel-data) with Windmeijer corrected standard errors. Sargan test is employed as postestimation test in order to show the robustness of our regressions while AR(2) is the p-value of the second order autocorrelation test statistic.

The regression findings on banks from emerging countries show differences between derivative instruments during each period test. Indeed, the relationship between forwards and stability measure is negative in the pre-crisis period and becomes positive during the crisis & the post-crisis period. In the opposite, the influence of swaps on stability measure is positive in the pre-crisis episode and turns into negative during the crisis and the post crisis epoch, but this effect remains positive in the whole period.

However, the impact of options on stability measure is negative only in pre-crisis episode. Equally, the effect of futures on stability measure is negative but only in the whole period.

As regards control variables, the ratio of risky assets (LOAN) has positive influence on stability measure during the pre-cris and also the crisis & post-crisis periods. In contrast, the relationship between capital adequacy and bank stability is negative during all periods. Finally, gross domestic product affects positively the stability measure during the crisis & post-crisis and also in the whole periods.

On the other hand, banks from recently developed countries, the regressions results show the significance only for the relationship between options and stability measure. In fact, the effect of options on bank stability is significantly positive only during the whole period.

Regarding the control variables, capital adequacy ratio has negative influence in stability measure during the crisis and post-crisis period and also in the whole period. Similarly, and during these two periods, the effect of credit risk on bank stability is negative. In opposition, the relationship between efficiency measure and bank stability is positive during all periods. Finally, the gross domestic product affects positively the stability of banks but only in the whole period.

### Comments on results

From the regression findings, we can say that using options by banks from emerging countries, during the crisis and the post crisis period, affects negatively the stability of banks. Indeed, we deduce that using options during the turbulent period aggravates the instability of banks. Thus, options can be considered as disruptive derivatives.

In contrast, in the case of banks from recently developed countries, the relationship between options use and stability is significantly positive in the whole period. Therefore, using options do not destabilizes banks. Hence, contrarily to banks from emerging countries, banks from recently developed countries should continue to use options commonly.

For this reason, we recommend banks from emerging countries to regulate more their use of options by providing more regulations and control.

As regards futures, using this instrument by banks from emerging countries affects their stability negatively in the whole period. However, this relationship is not significant in the case of banks from recently developed countries. Consequently, we advise banks from emerging countries more control when they use futures.

As for futures, the impact of swaps and forwards on stability in the case of banks from recently developed countries is not significant.

Nevertheless, noteworthy results are obtained in the case of banks from emerging countries. In fact, using swaps in the précises period and in the whole period affects positively the stability; however, this effect becomes negative during the crisis and the post crisis era. Thus, using swaps in the unstable episode is not recommended for banks from emerging countries. In the opposite, using forwards affects negatively the stability in the precrisis epoch but this impact becomes positive during the turbulent time. Therefore, using forwards by banks from emerging countries is recommended especially during the chaotic period.

As regards control variables, we remark that capital adequacy affects negatively the stability of both banks from emerging countries and banks from recently developed countries. Hence, there is evidence as the negative impact of capital adequacy on bank stability. Therefore, we suggest for banks either from emerging countries or from recently developed countries to manage well their capital adequacy ratio in order to avoid its negative effect on stability.

Nevertheless, efficiency has positive effect on stability of banks from recently developed countries; however, it does not have significant effect in the case of banks from emerging countries. Thus, efficiency of banks from recently developed countries play a favorable rule in strengthening their stability.

On the other hand, credit risk has a negative impact on stability of banks from recently developed countries; however, it does not have a significant effect in the case of banks from emerging countries. For this reason, we deduce that banks from recently developed countries manage worse their risky assets than banks in emerging countries. As a consequence, we recommend for banks from recently developed countries to enhance their management of loans by making more control.

In sum, banks from emerging countries have suffered during the last crisis by using derivatives especially options, futures and swaps. In contrast, the use of derivatives by banks from recently developed do not deteriorate their stability.

### Conclusion

The major purpose of this work is to compare the effect of derivatives use on bank stability in emerging countries to this in recently developed countries.

A widespread accounting measure of bank stability, the z-score is employed as proxy of bank stability and so defines the explanatory variable. The four derivative instruments (forwards, futures, options and swaps) represent the variables of interest while control variables are splitted into bank-specific factors and country-specific factors.

To estimate regressions, i.e. to test empirically the relationship between bank stability measure and the explanatory variables, we use Generalized Methods of Moments model as proposed by Blundell and Bond because of its convenient results. All the variables are one period lagged to solve the endogeneity problem.

Based on the paper of Chiaramonte et al. [8] and referring to the consequences of the last financial crisis we choose as period sample the period between 2003 and 2011 because we are motivated to separate between the pre-crisis period and the crisis and the post-crisis to investigate our issue.

Our present paper contributes mostly to the literature essentially in three ways, firstly, it is the first paper to investigate the effect of derivatives on bank stability either in emerging countries and in recently

developed countries, secondly, the paper is pioneer to explore whether derivatives affect bank stability during the normal and the turbulent periods, fourthly, this work is the first to compare this issue between banks from emerging countries and those from recently developed countries, finally, the paper is pioneer to be based on Generalized Methods of Moments to estimate the current issue.

Our major conclusions prove that using derivatives destabilizes banks from emerging countries while banks from recently developed countries do not weaken their stability by using derivatives.

Noteworthy recommendations are revealed from this study: for banks from emerging countries we advise them for more regulation when they use options and futures, however for banks from recently developed countries should continue to use options ordinary.

Finally, further studies should compare banks from emerging countries to those from developed countries when investigating this issue.

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