DOES DERIVATIVE INSTRUMENTS USE INCREASE ACCOUNTING PERFORMANCE OF BANKS IN EMERGING AND RECENTLY DEVELOPED COUNTRIES?

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Abstract

According to literature, principal findings reveal that by using derivatives banks in developed countries improve their performance. The purpose of this paper is to examine the impact of four derivative instruments (forwards, swaps, options and futures) used by banks in both emerging and recently developed countries on accounting performance. Overall sample is defined by 137 banks from both emerging and recently developed countries covering the period 2003-2010. Contrarily to expectations, overall findings indicate that derivative instruments decrease bank performance in the case of these countries.

Keywords: *Derivative instruments, bank performance, emerging countries, panel econometrics.*

JEL: *G21, O16, C23.*

1. INTRODUCTION

During the last decades the phenomena of globalization have paved the way to banks especially from emerging markets to enter to new profitable markets such as those of derivatives. Banks are motivated to use these innovations in order to protect against risk and uncertainty of the financial market, and also to generate revenue beyond that available from traditional bank operations. Indeed, such benefits of derivative instruments explain the widespread use and the rapid growth of derivative transactions in the recent decades.

It should be note also that during few years ago, countries such as Cyprus, Israel, and Taiwan were considered as emerging countries but nowadays they are labeled as developed countries by United Nations Office.

However, regarding their actual economic power and standard of living such countries cannot be defined as advanced countries like U.S.A., Western European counties or Japan but still close to emerging countries specifications. In the rest of this article these countries are labeled "recently developed countries" in order to distinguish between them and the advanced countries (North American countries; Eastern European countries; Japan). The main motivation for choosing banks from emerging countries is the fragility of the financial system of such countries and the higher likelihood of their banks to fail. Choosing to study on recently developed countries is motivated by the fact that such countries have recently been considered as emerging countries and have still had until now fragile financial systems compared to advanced countries. In the literature, the study conducted by Rivas et al. (2006) is limited only to banks from Latin America, and the rest of studies are focused on banks from developed or advanced countries especially from United States of America (Brewer et al. 2001; Cyree and Huang, 2006; Said, 2011). Therefore, this paper will be the first to focus on banks from both emerging recently developed countries studying the effect of derivatives usage on bank performance.

According to literature, principal findings reveal that by using derivatives banks improve their performance. Said (2011) find that derivatives usage affect positively performance of US banks. Rivas et al. (2006) deduce an increase of Latin American bank efficiency due to derivatives use.

The aim of this paper is then to explore the effect of the use of derivative instruments (forwards, swaps, options and futures) on accounting performance for banks in both emerging and recently developed countries. Moreover, this paper tends to compare results between banks in emerging countries and those in recently developed countries. The current study contributes to the literature in several ways. Firstly it allows checking the common thesis stipulating that derivative instruments are beneficial for bank performance in the case of emerging and recently developed countries. Moreover, this paper will be the first also to provide empirical evidence regarding the effect of each derivative instrument on accounting performance, since papers of the literature rather examine the share return performance. Lastly, this paper will be the first to combine and also compare banks in both emerging and recently developed countries concerning the relationship between bank performance and derivative instruments.

The main results expose that derivatives usage decreases bank performance in the case of these countries. Therefore, and contrarily to expectation, the main conclusion rejects literature thesis and prospects about positive effect of derivatives use on bank performance.

The remainder of the paper is planned as follows. Section 1 represents a background of the theoretical and empirical literature concerning the association between the use and performance of derivative instruments. In Section 2, the methodology used in this work is presented. In Section 3, the empirical results are analyzed and interpreted. Lastly, conclusion provides a summary of main findings with policy implications.

2. LITERATURE BACKGROUND

2.1. Theoretical literature review and results

Before presenting literature about derivatives use and performance, observation show that many papers have demonstrated the benefits of derivatives use: Brewer et al. (2000) examine the effects of the use of interest-rate derivative products on the commercial and industrial lending activity of US commercial banks. They find that interest-rate derivatives users have greater growth in their commercial and industrial loan portfolios than non-users. Furthermore, Gunther and Siems (1995) conclude that U.S. medium-sized commercial banks involved in derivatives are financially secure. Moreover, the findings of Minton et al. (2009) reveal that derivatives can increase the liquidity of the organizations due these tools used to hedges financial cost, agency cost, and improve the efficiency of these organizations.

Literature investigating the relationship between derivatives use and performance can be divided in two groups. The first group concern non-financial firms, i.e. corporate literature.

Allayannis and Weston (2001) have examined the use of foreign currency derivatives (FCDs) in a sample of 720 large U.S. nonfinancial firms between 1990 and 1995 and its potential impact on firm value. Using Tobin's Q[1] as a proxy for firm value, they find a positive relation between firm value and the use of FCDs. Moreover, the results of Bartram et al. (2011) show that the effects of derivative instruments use on firms' value are positive. In his paper, Ameer (2010) tests empirically the impact of Malaysian firm specific factors on the use of derivative instruments. He finds that there is a significant relationship between the use of derivatives and foreign sales, liquidity, firm growth, managerial ownership and size. Contrarily to previous studies the

[1] Tobin's q was developed by James Tobin (Tobin 1969) as the ratio between the market value (the going price in the market) and replacement value (the price in the market for newly produced commodities) of the same physical asset. Source: Wikipedia

findings of Fauver and Naranjo (2010) reveal a negative association between firm value defined by Tobin's Q and derivatives used in the U.S. context.

In the same way banking literature investigating the effect of derivative use on performance is limited to few papers. In his study Said (2011) explores how the use of derivatives by US banks have impacted their performance (measured by return on assets ratio, return on equity ratio, efficiency ratio, cost of funding earning assets, and net interest margin). He found a positive correlation between accounting performance measures and usage of derivatives. Furthermore, investigating whether the use of derivatives by banks in Latin America affect their efficiency (measured by Data Envelopment Analysis), Rivas et al. (2006) conclude that banks efficiency increases with the use of derivatives. Brewer et al. (2000) study the relationship between lending and derivatives use over the period from the fourth quarter of 1994. They explain how the association between BHC lending and their use of interest rate derivatives can be measured by examining the relationship between the growth in BHC business loans and their involvement in interest rate derivative markets. They find that banks using derivatives increase their business lending faster than banks that do not use derivatives. Moreover, they deduce that large banks are much more likely than small banks to use derivatives. They argue that there is an agreement with the idea that there is a fixed cost associated with initially learning how to use derivatives and large banks are more willing to incur this fixed cost because they will more likely to use a larger amount of derivatives. The findings of Brewer et al. (2001) show that U.S. interest-rate derivatives users do not increase significantly their accounting profits defined by return in asset and return on equity ratios in the 1986 to 1994 period. Finally, and in opposite to previous studies Sinkey and Carter (2000) deduce that U.S. bank users of derivatives have lower net interest margin than non-users.

In comparison to literature, this work is focusing on banks mainly from emerging countries and examining the effect of each derivative instrument on bank performance. This contribution is presented in the next section.

2.2. Empirical literature review

Investigating the impact of U.S. interest-rate derivatives usage on accounting profits Brewer et al. (2001) have used a widely two-index market model to characterize the return generating process for bank common stocks. This model is an extension of single index market model in which capital market risk sensitivity can be represented by the equity "beta" or the measured sensitivity of the firm's equity return with respect to the return on the

market-wide portfolio of risky assets. They examine other determinant of stock return which is unanticipated changes in interest rates during the entire period is from January 1986 to December 1994.

Brewer et al. (2000) study the relationship between lending and derivatives use over the period from the fourth quarter of 1994. To this end, they employ a basic model which relates C&I lending to previous quarter capital to total assets ratio and C&I charge offs to total assets. They add to the base model indicators for participation in any type of interest rate derivatives. The derivative-augmented regressions indicate that banks using any type of interest rate derivative, on average experience higher growth in their C&I loan growth. The net impact of derivative usage complements the C&I lending activities of banks.

Studying how the use of derivatives by banks in Latin America affect their efficiency Rivas et al. (2006) have used two-step OLS regressions to study the effect of derivatives use on bank efficiency. In the first stage, the efficiency scores are obtained on a variable representing derivatives usage and control variables that have been documented to affect efficiency scores. In this regression, efficiency measure represents the efficiency scores of Latin American banks obtained from the DEA model of the first stage. They have introduced dummy variable measuring derivatives usage, which take the value of 1 if a bank uses derivatives, 0 otherwise. If Latin American banks are using derivatives to hedge, a positive relation between *derivatives* usage and the efficiency score of Latin American banks is expected, and if the coefficient for derivatives measure is insignificant, it indicates that derivatives usage does not affect the efficiency of Latin American banks. The second stage regress efficiency within control variables. These variables are represented by the loans portfolio of the bank, which is a proxy for asset diversification, plays an important role in determining risk and hence, on average banks with small loan portfolios are required to maintain much higher capital levels. Therefore, they expect a positive relation between the size of the loans portfolio and the efficiency of Latin American banks. As control variable a measure of banks equity ratio adequacy is introduced in the model. They argue that lower equity ratio levels imply a higher risk-taking propensity and greater leverage, which could result in greater borrowing costs. Thus, they expected a positive relation between equity ratio and the efficiency of Latin American banks. They add to the model a proxy of the size. They are based in the theory that predicts that large well-diversified banks will be less likely to fail than small banks. Bank size serves as a proxy for a bank's ability to diversify since large banks have better diversified asset portfolios. Finally, they incorporate in the model as control variable the economic freedom index that the Heritage Foundation

calculates on a yearly basis. The index represents an average of 10 individual factors that allows us to classify countries as free, mostly free, mostly non-free, or repressed. 3 According to this index, Brazil and Mexico are classified as "mostly non-free" while Chile is classified as "mostly free". Thus, economic freedom index defined as a dummy variable takes a value of 1 if the country is "mostly non-free" (Brazil and Mexico) or 0 if it is mostly free (Chile).

In his study Said (2011) looks into the effect of the use of derivatives on U.S. banks performance during the sample period from 2002 to 2009. He has employed a two stages OLS regressions approach to determine the effect of the use of derivatives on US bank performance. They measure bank performance by the ratio of return on assets, the ratio of return on equity, the efficiency ratio, cost of funding earning assets, and net interest margin. While the objective of the second stage to examine the sensitivity of performances ratios within these five banks to the use of derivatives. After calculating the performances ratios for these banks the author uses the regression model to measure the sensitivity of the performances ratios to the usage of derivatives between independent.

According to the most previous papers (Rivas et al., 2006; Said, 2011) that have used ordinary least squares (OLS) regressions model with panel estimation techniques, in this study we use also panel regression model to estimate the effect of using derivatives in bank performance. Much details of the methodology adopted in this present study is developed in the next section.

3. METHODOLOGY

3.1. Data description

Annual accounting data are drawn from bank sample websites covering the period 2003-2010. Accounting data are defined by ratios drawn from annual reports.

3.2. Sample

Sample description

Since the majority of the previous paper was focused only on banks from developed countries, our contribution is to choose sample from emerging countries. We retain banks in which their websites provide data on notional amounts of derivative instruments in addition to accounting data during the period from 2003 to 2011.

However, the sample from emerging countries was relatively small (74

banks) to have relevant results so that we have added banks from developed countries that have characteristics similar to emerging countries (which we call recently developed countries) in order to enlarge the overall sample. This choice will provide us also opportunity to compare the two subsamples (panel from emerging countries vs panel from recently developed countries) and to check our hypothesis that the two subsamples have closed specificities which is another contribution compared to the literature.

If a bank data on notional amount of derivatives or/and accounting data are not available or/and missing, this bank is rejected from our sample. Thus, a bank is retained only if data on notional amount of derivative instruments and accounting data are available during the period 2003-2011.

Overall sample is defined by 137 banks from both emerging and recently developed countries. There are 74 banks from emerging countries where banks from recently developed countries are 63. The classification into emerging and recently developed countries is based on the list of countries by Human Development Index (HDI) used by the United Nations Office in year 2010. According to HDI, countries equal to 0.784 are classified as developed countries and countries that are below this index are considered as emerging countries. We call recently developed countries those that have been recently considered as emerging countries by United Nations Office.

Table 1 exposes the list of banks and their countries (as well as hyperlinks to bank web sites).

Table 1: ***Banks and their countries of overall sample***

Panel A. Banks of emerging countries

Countries and Bank Name	
Argentina	1.1 Bank Hipotecario
	1.2 BBVA Banco FRANCÉS S.A.
Brazil	2.1 Banco ITAÚ S.A.
	2.2 Santander Banespa
Bulgaria	3.1 Postbank Eurobank EFG
	3.2 Raiffiensen Bank Bulgaria
	3.3 Unit Credit Bulgaria
Chile	4.1 Banco de Chile
	4.2 Banco Santander
	4.3 BCI
China	5.1 Bank of China Limited

Croatia	6.1 Erste & Steiermärkische Bank D.D
	6.2 HPB
	6.3 Hypo Alpe Adria Bank D.D.
	6.4 Jadranska Banka Sibenik
	6.5 Privrednabanka banka Zagreb
	6.6 Zagrebacka Banka
India	7.1 HDFC Bank
	7.2 ICICI Bank
Indonesia	8.1 Bank Danamon
Jordan	9.1 Capital Bank
	9.2 Jordan Ahli Bank
	9.3 Jordan Kuwait Bank
Kazakhstan	10.1 Halyk Bank
Kuwait	11.1 Bank Bahrain Kuwait
	11.2 Burgan Bank
	11.3 Gulf Bank Kuwait
Latvia	12.1 Aizkraukles Banka Latvija
	12.2 AS SEB banka Latvijas Unibanka
	12.3 Baltic International Bank
	12.4 DNB Nord Banka
	12.5 Latvijas Kr jbanka
	12.6 Latvijas Biznesa Banka
	12.7 Norvik Banka
	12.8 Parex Banka
	12.9 Rietumu Banka
	12.10 Trasta Komercbanka
Lebanon	13.1 Banque Audi SAL Audi Saradar
	13.2 BLOM Bank SAL
	13.3 Libanese Canadian Bank
Lithuania	14.1 AB Citadele Bankas Parex Bankas
	14.2 DNB Nord Banka
	14.3 ŠIAULIU BANKAS
	14.4 Swedbank
	14.5 Ukio Bankas

Malaysia	15.1 CIMB Bank
	15.2 EON Bank
	15.3 OCBC Bank
Mauritius	16.1 MCB
Mexico	17.1 HSBC Mexico
Oman	18.1 Muskat Bank
Pakistan	19.1 United Bank Limited
Philippine	20.1 Philippine National Bank
Russia	21.1 Gazprombank
	21.2 TransCreditBank
Saudi Arabia	22.1 Arab National Bank
	22.2 Banque Saudi Fransi
	22.3 Saudi British Bank
South Africa	23.1 ABSA Bank
	23.2 Capitec Bank
	23.3 FirstRand Ltd.
	23.4 Imperial
	23.5 Sasfin Bank
Thailand	24.1 Bangkok bank
	24.2 Bank of Ayudhya
	24.3 Kasikorn Bank
	24.4 Krung Thai Bank
Turkey	25.1 Akbank
	25.2 Anadolubank Anonim Şirketi
	25.3 Garanti Bankasi
	25.4 Sekerbank
	25.5 Ziraat Bankasi
Vietnam	26.1 SacomBank Saigon Thuong Tin Bank
	26.2 ACB Vietnam

Panel B. Banks of recently developed countries

Countries and bank names	
Bahrain	1.1 Ahli United Bank B.S.C.
	1.2 Arab Banking Corporation
	1.3 Ithmaar Bank
	1.4 United Gulf Bank
Cyprus	2.1 Bank of Cyprus
	2.2 Hellenic Cyprus Bank
Czech Republic	3.1 Česká spořitelna
	3.2 CSOB
	3.3 Komer ní banka
	3.4 Raiffensenbank
	3.5 UniCredit Bank
Estonia	4.1 SEB Pank
	4.2 Swedbank
Hong Kong	5.1 Bank of East Asia
	5.2 Chong Hing Bank
	5.3 DAH SING Bank
	5.4 Fubon Bank
	5.5 Hang Seng Bank
	5.6 Shangai Commercial Bank
	5.7 Wing Hang Bank
Hungary	6.1 KERESKEDELMI ÉS HITELBANK ZRT.
	6.2 OTP Bank
	6.3 UniCredit Bank Hungary Zrt.
Israel	7.1 BANK LEUMI
	7.2 FIBI Bank
	7.3 Bank Hapoalim
Poland	10.1 Bank BPH S.A.
	10.2 Bank Pekao S.A.
	10.3 BRE Bank
	10.4 Bank Zachodni WBK

	10.5 Kredyt Bank S.A.
	10.6 Nordea Bank Polska S.A.
	10.7 PKO Bank Polski
Qatar	11.1 Ahli United Qatar
	11.2 Commercial Bank of Qatar
	11.3 Qatar National Bank
Singapore	12.1 DBS Bank
	12.2 OCBC Bank
	12.3 United Overseas Bank
Slovakia	13.1 Dexia banka Slovensko a.s Výročná správa
	13.2 Ludova Banka Volksbank
	13.4 VUB Banka
Slovenia	14.1 Abanka Vipa d.d. Slovenska
	14.2 Factor Banka d.d.
	14.3 NLB
	14.4 SKB banka, d. d.
	14.5 UniCredit Slovenija d.d.
South Korea	15.1 Industrial Bank of Korea
	15.2 Korea Exchange Bank
Taiwan	16.1 Bank Sinopac
	16.2 CHANG HWA COMMERCIAL BANK
	16.3 China Trust Commercial Bank
	16.4 E. Sun Bank
	16.5 Hua Nan Commercial Bank
	16.6 Landbank
	16.7 Mega International Commercial Bank
	16.8 Taishin International Bank
	16.9 Taiwan Business Bank
	16.10 Union Bank of Taiwan
United Arab of Emirates	17.1 First Gulf Bank
	17.2 Machreq Bank
	17.3 National Bank of Abu Dhabi

Sample statistics

The overall sample is composed of 137 banks. Banks in emerging countries represent 54% of the total banks, while banks in recently developed countries represent 45%. The overall sample is spread over six regions: Europe (54 banks), Asia (69 banks of which 17 are from the Gulf States and 9 from the Middle-East), Latin America (8 banks), Africa (6 banks of which 5 are from South Africa). Regarding dealer banks, the sample is defined by 12 dealer banks[2]. Table 2 presents the number and percentage of banks per derivative instruments used.

Table 2: ***Number and percentage of banks per derivative instruments used***

	Number of banks			Percentage		
Instruments	Total	Emerging	Recently developed	Total	Emerging	Recently developed
FWD+SWP+OPT+FUT	64	28	36	46.71%	37.84%	57.14%
FWD+SWP+OPT	101	44	57	73.72%	59.46%	90.48%
FWD+SWP+FUT	68	32	36	49.63%	43.24%	57.14%
FWD+OPT+FUT	64	28	36	46.71%	37.84%	57.14%
SWP+OPT+FUT	64	28	36	46.71%	37.84%	57.14%
FWD+SWP	123	61	62	89.78%	82.43%	98.41%
FWD+OPT	101	45	57	73.72%	60.81%	90.48%
FWD+FUT	70	34	36	51.09%	45.95%	57.14%
SWP+OPT	97	42	57	70.80%	56.76%	90.48%
SWP+FUT	69	33	36	50.36%	44.59%	57.14%
OPT+FUT	66	30	36	48.17%	40.54%	57.14%
FWD	133	70	63	97.08%	94.59%	100%
SWP	128	66	62	93.43%	89.19%	98.41%
OPT	101	45	57	73.72%	60.81%	90.48%
FUT	70	34	36	51.09%	45.95%	57.14%

3.3. Variables description

Five aspects and seven measures of bank performance are used in this work as follows:

[2] Hellenic Cyprus Bank; Hang Seng Bank; Hapoalim; EON Berhard; OCBC Malaysia; United Bank Limited; BRE Polish; PKO; OCBC Singapore; First Rand Bank; ABSA; Industrial Bank of Korea.

1. Profitability: measured by the return on assets (*ROA* equals to net income to total assets) ratio and the return on equity (*ROE* equals to net income to equity) ratio. These two measures are considered in the literature as standards of financial performance measures. *ROA* = net income / Total assets *ROE* = net income / Total equity.
2. Efficiency: defined by the cost to income ratio calculated by costs to operating income (or calculated also by expense income to operating income). *EFF* = Total operating expenses / total operating incomes.
3. Asset quality: defined by either the ratio of impaired loans to gross loans (that is non-performing loans ratio or NPL ratio), and the coverage ratio (that is equal to the ratio of loan loss reserve to non-performing loans). Both of these measures describe operating performance. *NPL* ratio = *NPL* / gross loan, coverage ratio = gross loan / total equity.
4. Capital adequacy: defined by the ratio of risky assets (loans) to equity. Adequacy ratio = gross loan / total equity.
5. Net interest margin: measured by the ratio of net interest income divided by total assets. Net interest income / total assets.

In the next Table 3 summarizes the expected effect sign of each variable on performance.

Table 3: ***Effect sign of variable on performance***

Ratios	**Expected effect on performance**
ROA	+
ROE	+
NPL ratio	–
Coverage ratio	+
Capital adequacy ratio	–
Efficiency ratio	+
NIM ratio	+

As follows, Table 4 presents the variables employed in the study along with their labels, definitions, expected signs and their use in previous studies. Regarding the heterogeneity of the sample, like in the study by Agusman et al. (2008) country dummy variables are included to control for the differences in the banking structure and regulatory environments, and the different economic and political characteristics that may affect the relation between derivative instruments and accounting measures of performance.

Table 4: ***Description of variables***

Labels	Description	Proxy for	References
Dependent variables			
EFF	Cost income defined by total operating expenses divided by total operating incomes	Efficiency	Lin and Zhang (2009)
NPL	Non-performing ratio is defined by non-performing loans divided by gross loan	NPL ratio	Berger et al. (2005); Lin and Zhang (2009)
COV	Coverage ratio is defined by loan loss reserves divided by non-performing loans	Coverage ratio	Liu (2010)
ROA	Return on assets is measured by net income divided by total assets	Profitability	Bonin et al. (2005); Frei et al. (1999); Said (2011)
ROE	Return on equity is measured by net income divided by total equity	Profitability	Bonin et al. (2005); Boubakri et al. (2005); Lin and Zhang (2009); Said (2011)
CAD	The ratio of risky assets (gross loan) divided by total equity	Capital adequacy	Boubakri et al. (2005)
NIM	Net interest income divided by total assets	Net interest margin	Said (2011)
Independent variables: derivative instruments			
FWD	Notional value of forwards divided by total assets	Forwards	Chaudhry et al. (2000)
SWP	Notional value of swaps divided ***by total assets***	Swaps	Chaudhry et al. (2000)
OPT	Notional value of options divided by total assets	Options	Chaudhry et al. (2000); Reichert and Shyu (2003)
FUT	Notional value of futures divided by total assets	Futures	Chaudhry et al. (2000)
Independent variables: control variables			
CAP	Book value of equity capital divided by total assets	Leverage	Chaudhry et al. (2000); Rivas et al. (2006); Yong et al. (2009)
LIQ	The ratio of liquid-assets-to-total-assets	Liquidity	Chaudhry et al. (2000); Reichert and Shyu (2003); Yong et al. (2009)
LOAN	The ratio of gross-loans-to-total-assets	Risky assets	Chaudhry et al. (2000); Rivas et al. (2006); Yong et al. (2009)

CR	The ratio of loan-loss-reserves-to-total loans	Credit risk	Chaudhry et al. (2000); Yong et al. (2009)
SIZE	Natural log of total assets	Bank size	Chaudhry et al. (2000); Reichert and Shyu (2003); Rivas et al. (2006); Yong et al. (2009)
DEAL	1 if bank is a member of the International Swaps and Derivative Association (ISDA), 0 otherwise	Dealer	Chaudhry et al. (2000); Yong et al. (2009)
COUNTRY	Dummy variable equals 1 when bank is issued from , 0 otherwise	Country variable	Agusman et al. (2008)

3.4. Testing hypotheses and expected results

Literature results (Rivas el al. 2006; Said, 2011) indicate a positive effect of derivative instruments use on bank performance. Hence, our hypothesis stipulates that the use of derivative instruments affects positively performance measure. Following the thesis stipulating that possessing considerable liquid assets in portfolios means generally that banks are healthy, so we anticipate a positive association between the variable proxy of liquidity and bank performance.

According to Rivas et al. (2006) the variable *LOAN* – which measures the loans portfolio of the bank – plays an important role in determining risk and hence, on average banks with small loan portfolios are required to maintain much higher capital levels than banks with large portfolios, and this reduces the banks' ability to perform efficiently. Thus, we expect a positive relation between the size of the loans portfolio (*LOAN*) and bank performance.

Since it is considered as the proxy of credit risk (*CR*), we expect a negative effect of credit risk on bank performance.

Theory states that high levels of equity ratio lead to higher efficiency. Casu and Molineux (2003) argue that lower equity ratio levels imply a higher risk-taking propensity and greater leverage, which could result in greater borrowing costs. Thus, a positive relation between the variable measuring equity ratio (CAP) and bank performance is expected (Rivas et al., 2006).

Theory also predicts that large well-diversified banks will be less likely to fail than small banks (Rivas et al., 2006). Bank size serves as a proxy for a bank's ability to diversify since large banks have better diversified asset portfolios (Shyu and Reichert, 2002; Mester, 1993). Thus, a positive relation between bank stock return and bank size (*SIZE*) is expected.

Net interest margin (*NIM*) is used in the study of Said (2011) as a performance measure, so we forecast a positive correlation between net interest margin and performance.

According to Fraser et al. (2002) the proxy of interest rate risk (*NONIM*) has a positive effect on bank risk, so we by analogy we presume a negative effect of non-interest income on performance.

Ultimately, the sign of the dummies on bank performance is not expected.

3.5. Empirical model

Panel regression models were conducted for each performance measure as follows in the equation below:

$$\begin{aligned}\text{Performance measure}_{i,t} &= \gamma_0 + \gamma_1 \text{FWD}_{i,t} + \gamma_2 \text{SWP}_{i,t} + \gamma_3 \text{OPT}_{i,t} + \gamma_4 \text{FUT}_{i,t} \\ &+ \gamma_5 \text{CAP}_{i,t} + \gamma_6 \text{LIQ}_{i,t} + \gamma_7 \text{LOAN}_{i,t} + \gamma_8 \text{CR}_{i,t} \\ &+ \gamma_9 \text{SIZE}_{i,t} + \gamma_{10} \text{DEAL}_{i,t} \\ &+ \sum_{k=1}^{K} \gamma_{11,k} \text{COUNTRY}_{i,t} + u_i + e_{i,t}, \end{aligned} \quad [1]$$

with *Performance measure* is one of the following seven ratios: *ROA*, *ROE*, *NPL*, coverage, efficiency or net interest margin; $(u_i + e_{i,t})$ 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. The computer software STATA 10 ® is used to estimate all regressions.

3.6. Specification tests

Firstly, the stationarity of all the variables is checked using the Augmented Dickey Fuller Tests with four lags, then with trend, and finally without constant. Then, the stationarity is also checked using Unit Root tests-Phillips-Perron test and *DF-GLS* test. Correlations between variables and collinearity are checked by correlation matrix and multicollinearity test. Moreover, the linearity of the model is tested for with Ramsey-Reset Test. In addition, a normal hazard of residuals is finally examined with Jacques-Bera Test. The Hausman test is applied to examine the absence of correlation between the independent variables and the error terms which confirms the choice of random effect model. Lastly, robustness of models used is verified by Modified Wald test for group-wise heteroskedasticity test and Breusch and Pagan Lagrangian multiplier test.

4. EMPIRICAL RESULTS

4.1. Regression analysis

In Table 5 the parameter estimates from Equation (1) for each of the seven performance measures are described.

Table 5: ***Estimated coefficients***

Years 2003-2010.

*, ** and *** respectively indicate statistical significance at the 10%, 5% and 1% levels.

The variable that are insignificant at 10% level were removed and the model was re-estimated to get more precise results. Consequently, no parameter values are provided for these variables: NS indicate insignificance of the coefficients.

( ) indicate standard deviation of the estimators.

Panel A. For overall sample

	ROA	***ROE***	***NPL***	***COV***	***CAD***	***EFF***	***NIM***
Constant	0.0239*** (0.0068)	0.3384*** (0.037)	0.1478*** (0.0221)	-1.236*** (0.3056)	4.8877*** (0.6128)	-1.3967*** (0.1211)	0.0221** (0.0107)
FWD	NS	NS	0.0054*** (0.0018)	-0.0601*** (0.0196)	NS	NS	-0.0023** (0.0009)
SWP	-0.0010*** (0.0003)	NS	NS	NS	-0.0935** (0.0377)	-0.0174** (0.0080)	NS
OPT	NS	NS	-0.0308*** (0.0080)	NS	0.2078* (0.1148)	-0.0408*** (0.0116)	-0.0077* (0.0022)
FUT	NS	0.0039* (0.0020)	0.0049*** (0.0015)	NS	NS	-0.0116** (0.0047)	NS
LOAN	-0.0238*** (0.0047)	-0.2423*** (0.0618)	-0.1164*** (0.0194)	1.4132*** (0.3935)	11.0992*** (0.5828)	NS	NS
CAP	0.0663*** (0.0167)	NS	NS	NS	-26.1029*** (4.7154)	0.5288*** (0.1278)	0.4611*** (0.1132)
LIQ	NS	NS	NS	2.6226*** (0.5736)	-1.4206* (0.8379)	NS	0.0904* (0.0478)
CR	NS	-7.166*** (2.155)	0.1526* (0.0867)	0.9124* (0.5521)	NS	NS	NS
SIZE	0.0011** (0.0004)	NS	-0.0055*** (0.0013)	0.0745*** (0.0216)	-0.2502*** (0.0512)	0.0907728*** (0.0128)	NS
DEAL	0.0057*** (0.0015)	NS	NS	0.2728** (0.1215)	0.8979*** (0.2738)	NS	NS

COUNTRIES	Details of the country dummies are available under request to the authors.						
R-squared	0.3110	0.1042	0.5534	0.4880	0.5151	0.3197	0.5703
F statistic	20.65***	15.29***	20.33***	17.37***	195.36***	66.61***	17.69***
Number of obs	1096	1096	544	544	1096	1096	1096

Panel B. Banks from emerging countries

	ROA	***ROE***	***NPL***	***COV***	***CAD***	***EFF***	***NIM***
Constant	0.0455*** (0.0080)	0.8180*** (0.2242)	0.0453*** (0.0103)	-1.8157*** (0.4464)	2.7202*** (0.5631)	-1.3055*** (0.1411)	0.0005 (0.0089)
FWD	NS	NS	NS	-0.0525** (0.0230)	-0.2454** (0.1220)	NS	NS
SWP	NS	NS	NS	NS	NS	NS	NS
OPT	-0.0051** (0.0022)	-0.0348** (0.0167)	0.0111*** (0.0033°	-0.2717** (0.1261)	NS	-0.0407*** (0.0110)	-0.0098*** (0.0027)
FUT	0.0010** (0.0004)	0.0107*** (0.0037)	NS	NS	NS	-0.0120** (0.0048)	NS
LOAN	-0.0343*** (0.0085)	-0.4548*** (0.1545)	-0.073*** (0.01598)	2.7197*** (0.4351)	10.8888*** (1.0154)	-0.2648*** (0.1003)	-0.0193** (0.0081)
CAP	0.0742*** (0.0164)	NS	-0.0921*** (0.0352)	NS	-27.0169*** (5.9292)	0.5539*** (0.1757)	0.6341*** (0.0901)
LIQ	0.0362** (0.0148)	NS	NS	2.4637*** (0.6654)	NS	NS	NS
CR	-0.2057*** (0.0570)	-2.9623** (1.2352)	0.9354*** (0.1242)	5.2735*** (1.4445)	14.7472* (7.8998)	-1.5926*** (0.4169)	0.2029*** (0.0563)
SIZE	NS	-0.0230** (0.0097)	NS	0.0985*** (0.0331)	NS	0.1003*** (0.0190)	NS
DEAL	0.0089*** (0.0032)	0.0549*** (0.0193)	-0.0169** (0.0069)	0.3094* (0.1826)	NS	-0.1317** (0.0533)	NS
COUNTRIES	Details of the country dummies are available under request to the authors.						
R-squared	0.3625	0.3542	0.7241	0.5202	0.4019	0.2265	0.7042
F statistic	10.60***	5.64***	27.52***	18.34***	147.45***	25.37***	8.27***
Number of obs	592	592	320	320	592	592	592

Panel C. Banks from recently developed countries

	ROA	***ROE***	***NPL***	***COV***	***CAD***	***EFF***	***NIM***
Constant	-0.0089 (0.0076)	-0.1438 (0.1251)	0.2071*** (0.0447)	0.6833* (0.3979)	11.5962*** (1.6368)	-1.2417*** (0.1177)	-0.0067 (0.0059)
FWD	NS	NS	-0.0533*** (0.0106)	-0.2411* (0.1228)	NS	NS	-0.0030*** (0.0007)
SWP	-0.0013*** (0.0005)	NS	0.0085** (0.0038)	0.5949** (0.2890)	-0.2059** (0.0854)	-0.0326*** (0.0123)	0.0011*** (0.0004)
OPT	NS	NS	-0.1078*** (0.0182)	NS	1.6579** (0.6717)	-0.1214* (0.0682)	NS
FUT	NS	-0.0583* (0.0320)	NS	NS	NS	NS	0.0061** (0.0030)
LOAN	-0.0196*** (0.0058)	-0.0962*** (0.0345)	-0.1100*** (0.0296)	NS	10.589*** (0.8073)	NS	0.0070* (0.0036)
CAP	0.0778*** (0.0279)	0.5353** (0.2310)	0.2776*** (0.0604)	NS	-29.8604*** (5.0553)	0.7894*** (0.2432)	NS
LIQ	-0.0240** (0.0120)	-0.1282* (0.0734)	-0.1159* (0.0670)	NS	-5.8019*** (1.2386)	NS	0.0156** (0.0078)
CR	NS	NS	0.0633*** (0.0151)	NS	NS	NS	NS
SIZE	NS	0.0231*** (0.0087)	-0.0143*** (0.0033)	0.0878** (0.0368)	-0.7837*** (0.1373)	0.0704*** (0.0115)	0.0011*** (0.0003)
DEAL	0.0053*** (0.0014)	0.0623*** (0.0170)	-0.0138* (0.0072)	NS	1.03232*** (0.2422)	0.0857** (0.0341)	NS
COUNTRIES	Details of the country dummies are available under request to the authors.						
R-squared	0.4920	0.1229	0.7534	0.3845	0.7228	0.5477	0.4207
F statistic	30.28***	8.51***	24.66***	30.75***	102.30***	83.46***	20.13***
Number of obs	504	504	224	224	504	504	504

4.2. Specification tests results

The P values of the Augmented Dickey Fuller Tests for all the specifications are closed to 0. We have similar results for the Phillips-Perron test. The *DF-GLS* test rejects the null hypothesis of unit root at 1% significance level for all the specifications. Stationarity of variables is then detected in all the cases[3]. The major results of the Ramsey-Reset Test are presented in the Table 6 as follows:

[3] The results of specification tests are available under request to the corresponding author.

Table 6: *Ramsey-Reset Test*

Dependent variable	Test statistic (~$\chi^2(3)$)	P value
Efficiency ratio (*EFF*)	21.27	0.0001 ***
Non-performing loan ratio (*NPL*)	279.15	0.0000 ***
Coverage ratio (*COV*)	12.18	0.0068 ***
Return on assets ratio (*ROA*)	211.24	0.0001 ***
Return on equity ratio (*ROE*)	370.39	0.0001 ***
Capital adequacy ratio (*CAD*)	380.26	0.0001 ***
Net interest margin ratio (*NIM*)	812.52	0.0001 ***

*, ** and *** respectively indicate statistical significance at the 10%, 5% and 1% levels.

For the seven performance measure the Ramsey-Reset test rejects the null hypothesis of linearity. In this case, there is problem of linearity that we have to check more. In the next, log regressions are used in order to improve linearity. The results of Ramsey-Reset test are summarized in Table 7.

Table 7: *Ramsey-Reset Test of Log regressions*

Dependent variable	Test statistic (~$\chi^2(3)$)	P value
Efficiency ratio (*EFF*)	21.27	0.0383 **
Non-performing loan ratio (*NPL*)	12.59	0.0056 ***
Coverage ratio (*COV*)	21.09	0.0001 ***
Return on assets ratio (*ROA*)	211.24	0.0000 ***
Return on equity ratio (*ROE*)	370.39	0.1878
Capital adequacy ratio (*CAD*)	380.26	0.8507
Net interest margin ratio (*NIM*)	812.52	0.0010 ***

*, ** and *** respectively indicate statistical significance at the 10%, 5% and 1% levels.

According to Table 7 of log regressions we deduce that linearity of the most regressions is enhanced. In fact, for efficiency, return on equity and capital adequacy the Ramsey-Reset test show linearity of regressions. However, for non performing loan ratio, coverage ratio, return on assets and net interest margin ratio the Ramsey-Reset test rejects the null hypothesis of linearity despite the use of log regressions. For this reason, the relation between these dependent variables and its predicted values are checked in Figure 1.

Figure 1: ***Performance measures in Log against their predicted variables***

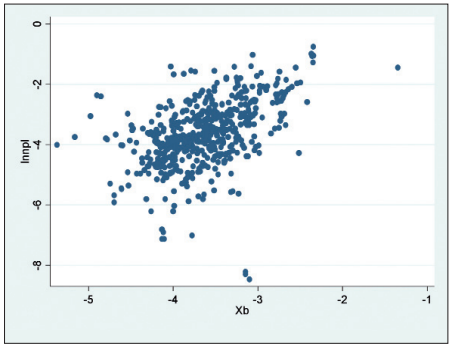

Figure 1.1. Log NPL

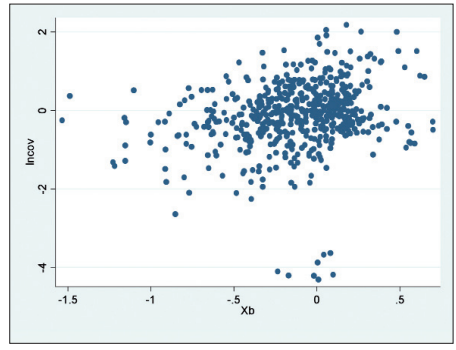

Figure 1.2. Log COV

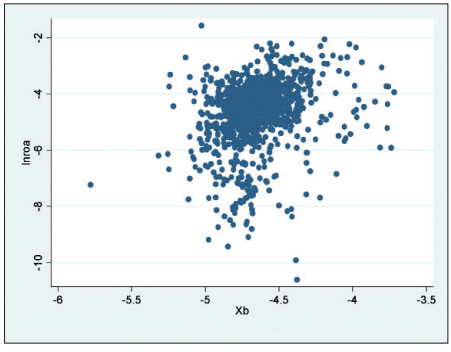

Figure 1.3. Log ROA

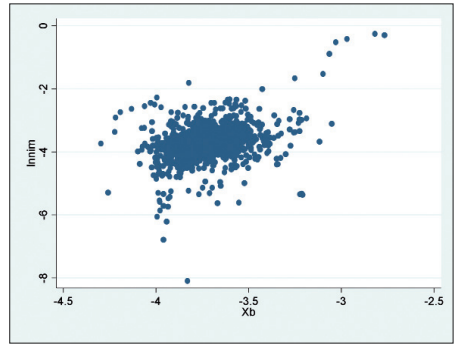

Figure 1.4. Log NIM

From Figure 1, we can see that there is weak nonlinear relation between the independent variables and the dependent variable for the first four pictures. There is weakness of nonlinearity when dependent variables are measured by logarithm of non-performing loan ration (*Lnloan*), logarithm of coverage ratio (*Lncov*), logarithm of return on assets (*Lnroa*) and logarithm of net interest margin (*Lnnim*). Indeed, in the whole we can say that linearity of the model is verified and therefore nonlinear models are not required.

Furthermore, a test for multicollinearity is made. A detection-tolerance or the variance inflation factor (VIF) for multicollinearity can be defined as follows:

$$\text{Tolerance}_j = 1 - R_j^2, \text{VIF}_j = 1 \,/\, \text{Tolerance}_j$$

where R_j^2 is the coefficient of determination of a regression of explanatory variable *j* on all the other explanatory variables. A tolerance of less than 0.20 or 0.10 and/or a VIF of 5 or 10 and above indicates a multicollinearity problem (see O'Brien 2007). Results are presented in Table 8.

Table 8: ***Multicollinearity test***

Table 8.1. for NPL and coverage ratios		
	VIF	**1/VIF**
Size	16.52	0.060532
Loan	13.67	0.073146
Cap	4.75	0.210584
Liq	3.33	0.300340
Swp	2.42	0.413403
Cr	1.90	0.526420
Fwd	1.60	0.626273
Opt	1.36	0.737182
Fut	1.28	0.781538
Mean VIF	5.20	

Table 8.2. for the other dependent variables		
	VIF	**1/VIF**
Size	12.74	0.078519
Loan	10.54	0.094916
Cap	3.39	0.295330
Liq	2.06	0.486105
Swp	1.42	0.705047
Cr	1.37	0.730518
Fwd	1.33	0.749972
Opt	1.30	0.768396
Fut	1.20	0.829965
Mean VIF	3.93	

The results in Table 8 show that there is no problem of multicollinearity. As follows the Table 9 resumes Hausman test results.

Table 9: ***Hausman Test***

Dependent variable	**Test statistic (~$\chi^2(9)$)**	**P value**
EFF	12.28	0.1981
NPL	9.94	0.3553
COV	12.25	0.1996
ROA	20.77	0.0137 **
ROE	61.03	0.0000 ***
CAD	10.09	0.3429
NIM	34.87	0.0001 ***

*, ** and *** respectively indicate statistical significance at the 10%, 5% and 1% levels.

For the results in which Hausman test show an absence of correlation between the independent variables and the error terms random effect model is retained. When performance is measured by ROE and NIM, the estimate of

the random effect model is inconsistent. To avoid this problem, fixed effect model is used instead.

Moreover, tests for robustness are used for all regressions (fixed and random effect models). For random effect models Breusch and Pagan Lagrangian multiplier test is performed. The null hypothesis stipulates that the random effect model is the appropriate model, otherwise, simple OLS regression should be conducted. The null hypothesis is H_0: "$Var(u_i)=0$" against H_1: "$Var(u_i)>0$". The results are as follows:

Table 10: ***Breusch and Pagan Lagrangian multiplier test***

Dep. variable	sd(Dep. Variable)	$sd(e_{i,t})$	$sd(u_i)$	Test statistic ($\sim\chi^2(1)$)	P value
Npl	0.0549582	0.0289006	0.0375704	665.74	0.0000 ***
Cov	1.072926	0.723215	0.7521066	425.29	0.0000 ***
Roa	0.0183679	0.0129591	0.0103871	508.74	0.0000 ***
Eff	0.4335106	0.2975887	0.3090517	946.86	0.0000 ***
Cad	4.482522	2.868206	1.79603	265.90	0.0000 ***

From these results on Breusch and Pagan Lagrangian multiplier test the null hypothesis is verified in the all models so that random effect models are justified.

On the other hand, for fixed effect models a Modified Wald test for groupwise heteroskedasticity is utilised.

Table 11: ***Modified Wald test for group-wise heteroskedasticity***

Dependent variable	Test statistic ($\sim\chi^2(137)$)	P value
ROE	6.7e+05	0.0000 ***
NIM	8.2e+05	0.0000 ***

The results above show that the null hypothesis of the presence of homoskedasticity (or constant variance) is verified. For this reason, the option 'robust' in STATA is used to control for heteroskedasticity and to improve the robustness of models.

5. DISCUSSION

Results found allow making notable conclusions.

For emerging countries, the impact of forwards use on bank performance is ambiguous because of its negative impact on coverage ratio and capital adequacy measure. Regarding results, it appears that swaps have no significant impact on bank performance. The use of options affects negatively financial performance measures, efficiency, net interest margin and coverage ratio and also it has a positive impact on *NPL* ratio that is why it seems that options decrease bank performance. These results suggest that banks from emerging speculate badly with options so that they make losses. This can be explained by the fact that banks in emerging countries have used derivatives recently and that their derivative markets are small so banks do not have many opportunities to diversify their portfolio of speculation. Concerning futures use, the effect of futures on bank performance is confusing due its positive impact on financial performance measures on one hand and its negative impact on efficiency measure on the other hand. These findings can be described by the fact that too little number of banks in the sample composed only of emerging countries has used futures in the sample period. Therefore, results about the impact of futures use on bank performance are not enough noteworthy.

For recently developed countries, it appears that forwards use decreases bank performance because of its negative effect on coverage ratio and net interest margin regardless of its negative impact on NPL ratio. The impact of swaps use on bank performance is understandable because, on one hand, it has negative impact on profitability and efficiency and, on other hand, it affects positively coverage ratio and net interest margin. In spite of its negative impact on *NPL* ratio, it seems that options use reduces bank performance since its negative effect on efficiency measure on one hand, and its positive effect on capital adequacy measure, on the other hand. Whereas, the impact of futures use on bank performance is not obvious because of its negative correlation with return on equity on one hand and its positive association with net interest margin on the other hand.

From these results, we deduce that thesis about positive impact of derivatives on performance is eliminated. Also from these findings we can realize that derivative instruments used for speculative fashion have negative effect on performance which indicates that banks in recently developed countries lose in your performance when they speculate by using forwards and options. In sum, comparing results expose that banks in recently developed countries deal with options better than those in emerging countries, and that

futures are used more properly by banks in emerging countries than those in recently developed countries.

Moreover, from comparing results, we deduce that the effect of derivatives use on bank performance is almost the same in the two subsamples. Findings can be explained either that banks in recently developed countries have nearly the same specificities as well as banks in emerging countries or by the small subsamples size.

6. CONCLUSIONS

The major conclusion is that banks in the whole seem to decrease their performance by using derivative instruments. Hence, the literature argument stipulating that derivatives use increases bank performance is indeed rejected. Therefore, the common opinion of many authors supporting that derivative instruments are beneficial for banks should be revised in the case of emerging and recently developed countries.

Thus and as proposals for forthcoming studies, we suggest that they enlarge more the two subsamples in order to detect more differences; otherwise they should combine the two subsamples. Ultimately, as suggestion for further papers the effect on bank performance of other financial innovations such as securitizations can be investigated.

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Résumé

Selon la littérature, les principaux résultats révèlent qu'en utilisant des produits dérivés les banques des pays développés améliorent leurs performances. Le but de cet article est d'examiner l'impact de quatre instruments dérivés (forwards, swaps, options et futures) utilisés par les banques dans les pays émergents et récemment développés sur les performances comptables. L'ensemble de notre échantillon est constitué par 137 banques provenant de ces pays émergents et récemment développés couvrant la période 2003-2010. Contrairement aux attentes, les résultats globaux indiquent que les instruments dérivés diminuent les performances des banques dans le cas de ces pays.