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Bank capital and risk in the South Eastern European region

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BANK CAPITAL AND RISK IN THE SOUTH EASTERN EUROPEAN REGION

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Abstract

This paper examines the simultaneous relationship between bank capital and risk. A model is set up which assumes that banks' decisions regarding capital and risk are made endogenously in a dynamic pattern. A simultaneous equation system was estimated using an unbalanced panel of SEE banks from 2001 to 2009. A key result for the whole sample of banks is the relationship between regulatory (equity) capital and risk which is positive (negative). However, a positive two-way relationship between regulatory capital and risk was found only in less than-adequately capitalized banks, which also increased substantially their risk in 2009. Thus, banks' decisions differentiate between equity capital and risk and regulatory capital and risk. A positive, significant and robust effect of liquidity on capital was identified. Both regulatory and equity capital exhibit procyclical behavior, whilst the relationship between risk and rate of growth of GDP is ambitious.

Keywords: Banking, capital, risk, liquidity, regulation, dynamic panel estimation

JEL Classification: C33, G21, G32

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1. Introduction

Over the past three years banks in many advanced and emerging economies have responded to the challenges posed by the crisis mainly by increasing their capital and lowering their risk exposures in order to pave the way for a sustained upturn in which credit supply would not be limited by poor capitalization. In theory, banks can be thought of as profit maximizers which jointly determine capital and risk. Since raising capital comes at some cost, the concern is whether capital provides compensating benefits to the bank mainly when it is in excess of the capital requirements. Empirical research provides evidence that banks in the US and Europe makes simultaneous choices about capital and risk (Rime, 2001 and Jokipii and Milne, 2010). However, both theoretical analysis and empirical research provide conflicting predictions for the relationship of capital and risk. This relationship has several important policy implications for the banking sector and the economy as a whole, since credit crunch the observed in the last two years is more pervasive in countries with a bank-based credit system, as is the case with countries in the South-Eastern European (SEE) region.

In the present study we investigate the relationship between bank capital (regulatory and equity) and risk in SEE countries. We want to examine the behavior of SEE banks in terms of choices about capital and risk over the last decade and mainly after the financial crisis of 2008. Due to this crisis almost all the banks in the SEE countries suffered heavy losses on their loan portfolios or their trading activities, in particular the non-traditional ones. Therefore it might be expected that they would be attempting either to lower their exposures to relatively high-risk assets or to increase their capital in order to ensure compliance with requirements.

More precisely, this paper uses a modified version of the simultaneous equations model developed by Shrieves and Dahl (1992) to analyze banks' choice of capital (both regulatory and equity) and risk in seven SEE countries (Albania, Bulgaria, Bosnia-Herzegovina, FYROM, Serbia, Croatia and Romania) spanning the period 2001-2009.

The paper focuses on the following issues: Firstly, while a number of studies have examined the above relationship in the US and other European countries besides SE ones, this is, to the best of our knowledge, the first attempt to estimate the relationship between bank capital and risk in the SEE region. Secondly, we investigate the relationship between both equity and regulatory capital with risk, assuming that banks differentiate in their decisions between equity capital and risk and between regulatory capital and risk. Thirdly, we estimate our model for the full sample of banks and for sub-samples according to the size of the equity capital-to-assets and regulatory capital-to-risk-weighted-assets ratios respectively. Fourthly, we consider as a control variable the index of bank liquidity, which is rarely used in empirical research. We also account for the effect of the banking reform process in the SEE countries on bank capital and risk.

The empirical results suggest that the relationship between regulatory capital and risk is positive. Moreover, the significance and causation of this relation depends on the degree of capitalization. In less-than-adequately capitalized banks there is a two-way relationship between bank regulatory capital and risk, while in well-capitalized banks this relation is not significant. The evidence confirms the assumption that banks differentiate in their decisions between equity capital and risk and regulatory capital and risk, since the former relation is negative.

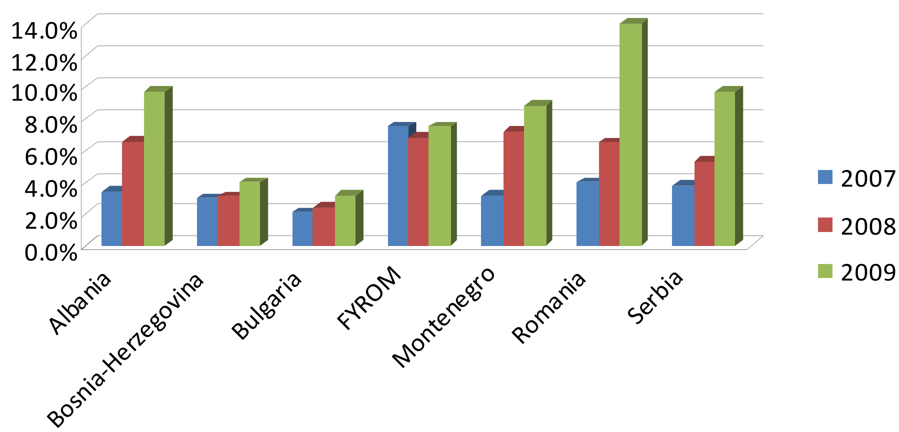
The rest of the paper is organized as follows: Section 2 reviews and evaluates recent developments in the economies and the banking industries of SEE countries. Section 3 outlines the theoretical and empirical literature. Section 4 presents the specification of the model. Section 5 describes the data and the determinants of capital and risk, while Section 6 describes the econometric methodology. Section 7 reports and analyses the empirical results. Conclusions and some policy suggestions are offered in the final section.

2. Economic development in the SEE countries and the banking industry

During the last decade, SEE countries have made significant steps towards their main target to become full EU members. Their banking sectors have undergone profound changes during the past twenty years. Countries in the region each progressed at a difference pace each and with considerable difficulties and setbacks, to the liberalization of their banking systems. The process included the privatization of state-owned banks, most of which were acquired by foreign banks, and the *de novo* entry of foreign banks (foreign ownership is high and ranges from 75% in Serbia to 93% in Albania). The credit system in these countries is still in the intermediate stages of development with respect to the depth and scope consistent with their respective stage of economic development. However, financial intermediation in those countries is converging fast. Over the last five years significant efforts have been made to bring the SEE countries' regulatory framework in line with EU directives and the Basel Core Principles. Before the crisis, the SEE banking sector was characterized by sufficient capitalization and benign levels of credit risk.

The recent mainly international financial crisis has hit these countries hard since the heightened risk aversion of investors towards the SEE region and 'flight to quality' frenzy led to a significant increase in risk premiums. The crisis affected the SEE countries' banking system in a rather severe way for the following reasons:

Figure 1
NPLs to Total Loans (%) in SEE

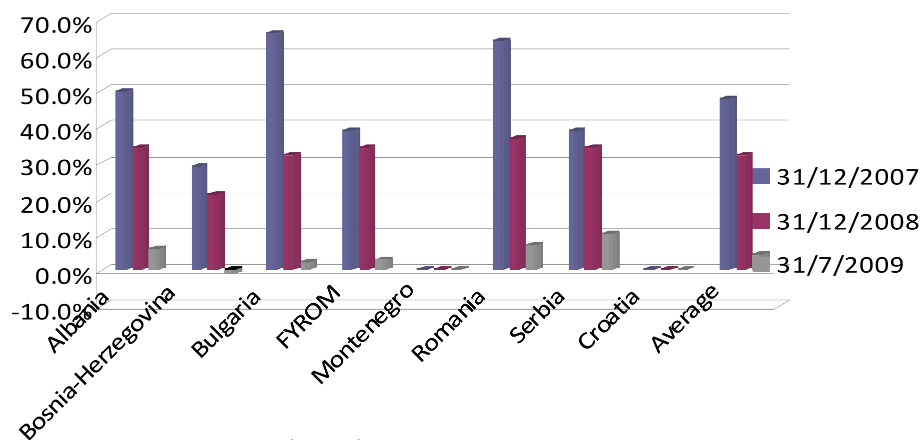


Source: EBRD (2010): "Transition Report 2009"

- The fall in GDP growth (Figure 1 in Appendix) has led to an increase in the ratio of non-performing loans to total loans (NPLs, Figure 1). In fact, of the SEE regions that before the crisis had relied heavily on foreign capital to finance credit bonus the probability that a loan becomes non-performing is higher in those countries[1].

- NPLs also increased due to the fact that many loans were denominated in foreign currencies and local currencies have depreciated.
- High lending rates on the back of increasing risks[2].
- Property prices plummeted, reducing banks' collateral value.

Figure 2
Total Credit Growth



Source: EBRD (2010).

Due to the relative soundness of their banking sectors (Figure 3 and Appendix Figure 2), the relatively low reversals in net capital flows and the support[3] from international organizations/initiatives (the World Bank, the EU, the IMF and the Vienna Initiative[4]), the SEE countries were able to avoid the worst-case outcome of a systemic crisis, although, significant risk still lie ahead[5].

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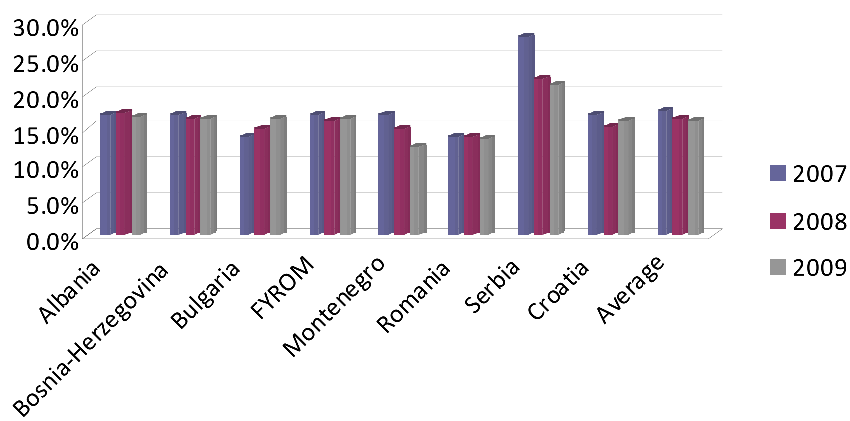
[1] See EBRD (2010) and European Central Bank(ECB 2010),
[2] See EBRD (2010).
[3] The IMF and EU support in Romania reached 5.5 per cent of GDP.
[4] The "Vienna Initiative" helped international bank groups to bolster their subsidiaries in Bosnia and Herzegovina, Romania and Serbia.
[5] In 2009, capital ratios decreased in three (Bosnia, FYROM and Romania) out of seven SEE countries.

Table 1. Minimum capital requirements (end of 2009)

Countries	Capital Adequacy Ratio (%)
Albania	12.0
Bosnia-Herzegovina	12.0
Bulgaria	12.0
Croatia	10.0
FYROM	8.0
Romania	10.0
Serbia	8.0
Average	10.3
Source: EBRD (2010).	

It is worth noting that, minimum capital requirements increased in the SEE countries and at the end of 2009 the relevant ratio on average was 10.3% (Table 1).

Figure 3
Bank Regulatory Capital to RWA in SEE



Source: EBRD (2010).

However, banks held capital ratios at almost 15% (Figure 3), that is significantly higher than set by capital requirements. This comfortable level of capitalization provided adequate protection against shocks originating in the domestic economy and the banking system.

3. Literature review

3.1 Theoretical literature

The relationship between capital and risk has important implications for the implementation of the Basel II capital adequacy requirement. Theoretically, the relationship between capital and risk in the banking sector is ambiguous.

A bank may choose to increase its risk alongside its capital levels, since increased risk leads to higher insolvency probability. The theory of the bank as a mean-variance portfolio manager generates a positive relationship between capital requirements and risk (Koehn and Santomero, 1980, Kim and Santomero, 1988)[6]. However, increased capital regulation can reduce portfolio risk if risk weights are chosen to be proportional to, for example, the systemic risks of the assets (market-based risk weights).

The theory of the deposit insurance has shown that when deposit insurance underprices risk, banks seeking to increase capital will increase risk as well (Merton, 1977, Sharpe, 1978, and Dothan and Williams, 1980). However, if the marginal value of deposit insurance option with respect to risk is increasing, then more regulatory capital will reduce risk (Furlong and Keeley, 1989), thus generating a negative relationship.

The capital buffer theory suggests that the relationship between capital and risk varies with how close banks are to the minimum capital requirements. This theory demonstrates that a bank will choose to hold capital above the minimum capital requirements since there are (implicit and explicit) costs of falling below them. Therefore banks with capital levels close to (or below) the minimum capital requirements will choose to increase their capital and lower their risk levels, while banks with sizeable capital buffers will increase their levels of risk along with their capital buffer level (Milne and Whaley, 2001, and VanHoose, 2007).

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[6] However, Keeley and Frulong (1991) show that the mean-variance portfolio model is inappropriate to analyze the effect of capital regulation on the risk of bank failure, because of the model's assumption of constant borrowing rates and costs are independent of portfolio risk. They suggest that increased capital will not cause banks to increase risk.

Finally, the industrial organization approach argues that holding capital is more costly than the risk-free interest rate, thus increasing capital (by capital regulation) induces a bank to become more risk-averse and vice versa (Saunders et al., 1990).

3.2 Empirical literature

The capital-risk relationship in the banking industry has been examined for various countries in several empirical papers. For US banks, Jokipii and Milne (2010) find a negative capital-buffer-risk relationship for banks with marginal capital adequacy and a positive one for highly capitalized banks. Similarly, a negative relationship was found by Aggarwal and Jacques (2001). However, Berger et al. (2008) and Shrieves and Dahl (1992) find a positive one, indicating that banks that increased their target capital have also increase their risk exposure. However, this relationship is not strictly the result of regulatory influence since it holds even in banks with capital in excess of the minimum regulatory capital requirement. For six G10 countries (Canada, France, Italy, Japan, UK and the USA), Van Roy (2008) finds that weakly capitalized banks did not modify the ratio of risk-weighted assets to total assets differently from well-capitalized banks. Lindguist (2004) argues for a negative capital buffer-risk relationship for Norwegian banks. Finally, for Swiss banks, Rime (2001) shows that regulatory pressure affects the level of capital, but not the level of risk, and finds a positive relationship between capital ratio and risk.

4. Model specification and data

4.1 The model

In this analysis, we assume that bank capital and risk decisions are taken simultaneously. The observed levels of capital and risk in any bank consist of two components: one is managed internally by the bank and a second is an exogenous random shock. Hence, the present study deviates from previous literature (e.g. Shrieves and Dahl, 1992, Jacques and Nigro, 1997) which assume that banks decide on *changes* in capital and risk. However, we preserve the core of this literature and we assume that actual bank capital and risk adjust to their long-run target levels. In turn, due to exogenous shocks, this adjustment is costly (or sometimes infeasible), preventing banks from a fully contemporaneous adjustment of capital and risk. Thus, our model assumes that actual capital and risk follow a partial adjustment process, defined by:

$$\Delta CAP_{i,t} = \lambda_1 (CAP^*_{i,t} - CAP_{i,t-1}) + \varepsilon_{i,t}, \quad (1)$$

$$\Delta RISK_{i,t} = \lambda_2 (RISK^*_{i,t} - RISK_{i,t-1}) + e_{i,t}, \quad (2)$$

Where Δ represents first differences, $CAP_{i,t}$ and $Risk_{i,t}$ are observed capital and risk levels respectively for bank i in period t, with i=1,…,N, t=1,…,T, $CAP^*_{i,t}$ and $RISK^*_{i,t}$ are the target levels of capital and risk respectively, $\varepsilon_{i,t}$ and $e_{i,t}$ are random shocks and $0\leq \lambda_1 \leq 1$ and $0\leq \lambda_2 \leq 1$ are the speeds of adjustment of actual levels of capital and risk to their targets, respectively.

The model further assumes that the long-term target level of capital and risk is determined by a set of explanatory control variables, Z and H respectively, which include bank specific determinants (including $CAP_{i,t}$ in the risk equation and $RISK_{i,t}$ in the capital equation) as well as industry specific and macroeconomic determinants:

$$CAP^*_{i,t} = \lambda_j Z^j_{i,t} + \varepsilon'_{i,t}, \quad (3)$$

$$RISK^*_{i,t} = \lambda_k H^k_{i,t} + e'_{i,t}, \quad (4)$$

where λ_j and λ_k are the vectors of coefficients of the $Z^j_{i,t}$ and $H^k_{i,t}$ vectors of variables respectively, with j=2,…,J and k=2,…,K

Therefore, the final dynamic system of equations with endogenous variables to be estimated takes the form:

$$CAP_{i,t} = \alpha_o + \delta_1 CAP_{i,t-1} + \alpha_1 RISK_{i,t} + \sum_{j=2}^{J} \alpha_j Z^j_{i,t} + \eta_{i,t}, \quad (5)$$

$$RISK_{i,t} = \beta_o + \delta_2 RISK_{i,t-1} + \beta_1 CAP_{i,t} + \sum_{k=2}^{K} \beta_\kappa H^k_{i,t} + w_{i,t}, \quad (6)$$

where $\delta_1 = 1 - \lambda_1$, $\alpha_j = \lambda_1 \lambda_j$, $\delta_2 = 1 - \lambda_2$ and $\beta_k = \lambda_2 \lambda_\kappa$.

4.2 Determinants of bank capital and risk

Table 2 lists the variables used to proxy capital and risk and their determinants as well as notation and the expected effect of the determinants according to the literature.

4.2.1 Bank-specific determinants

Capital: Two alternative measures are used to proxy this variable (CAP). First, the total capital adequacy ratio(CAR) and second, the equity to assets (EA) ratio[7]. CAR has been used by Shrieve and Dahl (1992), Jacques and Nigro (1997) and Aggarwal and Jacques (1998). Equity is measured in an accounting context.

Risk: There is no consensus in the literature about the appropriate measure of bank risk[8]. In the present study, in order to capture the asset risk of banks, we use the ratio of non-performing loans to gross loans (NPL)[9]. This measure captures those bank loans that are actually in default. In addition, it is not much influenced by changes in accounting standards. However, it should be noted that this proxy is an *ex post* measure of risk. Also, this proxy is used in theoretical models that consider loan defaults as the main source of bank instability (Martines-Miera and Repullo, 2010).

Size: One of the most important questions underlying bank policy is which size optimizes bank capital and risk. Larger banks can diversify their asset portfolios, However, for larger banks, the effect of size could be negative for bureaucratic and other reasons (diseconomies of scale). Hence, the size-capital and risk relationship may be expected to be non-linear (Athanasoglou et al., 2008). The logarithm of real bank's assets and their square is used in order to capture potential nonlinearities. Overall, the SEE banking sector includes small financial institutions with limited country coverage.

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[7] While CAR is the definition of capital used by regulators, the one used by banks might be different, such as the market value of capital, the book equity or the economic capital.

[8] See Beck, 2008, for a survey of alternative measures of bank risk.

[9] See also Shrieves and Dahl, 1992 and Aggrarwal and Jaques, 1998, among others, who proxy risk by this variable.

Table 2. Definitions, notation and expected effects of the explanatory variables of bank capital and risk

	Variable	Measure	Notation	Expected effect	
				Capital	Risk
Dependent variables	Capital (CAP)	Equity/Assets	EA		
		Total Regulatory Capital Ratio	CAR		
	Risk	Impaired Loans /Gross Loans	NPL		
Determinants	Liquidity	Liquid Assets/deposits and s-t funding	LIQ	Negative/ Positive	Positive/ Negative
	Profitability	Net Profits (before taxes) /Average Assets	ROA	(EA)Positive/ (CAR) ?	-
	Size	Ln(real assets) Ln(real assets)^2	S S^2	Negative	Positive
	Loan Losses	Loan Loss Provisions /Gross Loans	LLP	Positive	Negative
	Banking reform	EBRD index	EBRDI	?	?
	Economic activity	Rate of growth of GDP	GDPR	Negative	Negative

Profitability: Profitability may have a positive effect on bank target capital if banks increase capital through retained earnings rather than through equity issues. The former increases the banks' value in the market, while the latter, if interpreted as "a signal of weakness", may reduce it.

The relation between equity capital and profitability is considered systemic and positive, since higher profits can lead to an increase in capital (Athanasoglou, et al., 2006, Berger, 1995). However, the relation between profitability and regulated capital may not be significant or positive if capital requirements are binding, since in this case banks will hold more economic capital and will be less profitable. Thus, the expected sign on the coefficient of this variable can be either positive or negative. The bank's returns on assets (ROA)[10] are included in the equity capital equation with an expected positive coefficient and in the regulatory capital equation with an ambiguous one.

Liquidity: An important role of a bank in the economy is to create liquidity (Berger and Bowman, 2009). Indeed, as the last crisis shows, illiquidity and poor asset quality were the main causes of bank failures. Despite the importance of bank liquidity there is disagreement in the literature about its measurement. An often used measure of liquidity is the ratio of loans to deposits. In the present study, we measure liquidity as the ratio of liquid assets to customer deposits and short-term funding. Liquid assets include: 1) trading securities and at fair value through income, 2) loans and advances to banks, and 3) cash and due from banks. In the denominator the following items are included: 1) customer deposits (sight and term): 2) deposits from banks, and 3) other deposits and short-term borrowing. There are surprisingly few empirical studies that focus on the effect of liquidity on capital and risk. Jokipii and Milne (2010) argue that banks with higher liquidity can decrease their capital and increase their levels of risk. However, banks may hold liquidity as self-insurance against liquidity shocks. In turn, high levels of liquidity expose banks, mainly small ones, to risk-taking (Allen and Gale, 2003) leading to increasing levels of capital in order to control risk-taking. In some cases liquidity requirements can be as effective as capital requirements. Therefore, in this case, the effect of liquidity on capital will be positive while on risk will be ambiguous.

Loan losses: Loan losses affect capital positively, since banks with increased loses will raise their capital (regulatory and equity) in order to reduce risk. The effect of loan losses on risk is expected to be negative, since increased loan losses will induce banks to lower their risk exposure. These losses are approximated by the loans-loss provisions to gross loans (LLP) ratio.

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[10] For the calculation of this ratio, we use the average values of assets of two consecutive years and not the end-year values, since profits are a flow variable generated during the year.

4.2.2 Industry-specific determinants

The EBRD index of banking reform (EBRDI): This index represents banking system reform in the SEE countries and identifies progress in areas such as: 1) the adoption of regulation according to international standards and practices. 2) the implementation of tighter and more efficient supervision. 3) the privatization of state-owned banks and 4) the write-off of non-performing loans and the closure of insolvent banks. The index provides a ranking of progress for institutional reform of the banking sector, on a scale of 1 to 4+. A score of 4+ represents a banking system that approximates the institutional standards and norms of an industrialized market economy. In 2009, SEE countries get an average score of this index at 3.3 as against 2.8 in 2002. This development implies that the banking system of the SEE countries has shown small improvement during the period under examination. The impact of this index on both capital and risk is an ambiguous one, although one may expect that banks with high levels of institutional standards become riskier.

4.2.3 Macroeconomic determinants

GDPR: The annual growth rate of gross domestic product of each SEE country is included in both capital and risk equations to capture the effect of the macroeconomic environment. Capital requirements under the Basel I and II frameworks are procyclical, in the sense that they rise during downturns and decline during upturns[11]. Also, credit risk is procyclical since credit and bank credit standards and firms probability of default are strongly procyclical. Therefore, the effect of output on capital and risk is expected to be negative.

4.3 The Data

We use annual bank-level and macroeconomic data for seven SEE countries (Albania, Bosnia-Herzegovina, Bulgaria, Croatia, FYROM, Romania and Serbia) over the period 2001-2009. The dataset is unbalanced and covers approximately 85% of the

[11] See Athanasoglou and Daniilidis (2011) for an extended discussion on bank procyclicality.

industry's total assets in the SEE countries[12]. The total number of banks in the sample for the region ranges between 70 banks in 2001 up to 115 banks in 2009, representing a total of 895 observations.

The bank variables are obtained from the BankScope database. We focus on banks with unconsolidated accounts using the International Financial Reporting Standards (IFRS) for the whole period.

The macroeconomic variables are obtained from the IMF's International Financial Statistics (IFS) and the banking reform index from the European Bank for Reconstruction and Development (EBRD).

Table 3 Descriptive Statistics

		ALBANIA	BULGARIA	BOSNIA-HER/VINA	CROATIA	FYROM	ROMANIA	SERBIA
EA*	MEAN	9,37	12,96	11,85	11,84	21,51	13,05	18,94
	S.D.	1,14	1,67	2,27	1,93	9,63	3,21	4,50
CAR*	MEAN	17,34	23,25	24,36	22,49	24,38	31,64	25,88
	S.D.	4,43	7,95	4,11	2,33	12,46	16,43	8,54
ROA*	MEAN	0,85	1,14	1,27	1,10	1,07	1,22	1,20
	S.D.	0,50	0,09	0,39	0,07	0,35	0,27	0,18
LLPs*	MEAN	0,97	0,80	2,04	0,59	2,40	1,06	6,04
	S.D.	0,48	0,66	1,17	0,16	3,84	1,20	4,04
NPL*	MEAN	4,26	8,50	5,00	6,37	1,59	2,60	2,89
	S.D.	4,29	7,64	3,22	3,04	1,67	3,22	4,62
LIQ*	MEAN	50,66	62,98	59,81	50,34	57,91	58,09	56,23
	S.D.	19,72	21,57	19,94	13,46	16,10	18,50	13,26
S	MEAN	9,77	7,04	6,10	9,00	8,23	8,34	10,06
	S.D.	0,52	0,85	0,76	0,25	0,73	0,55	0,82
S^2	MEAN	95,47	49,55	37,20	80,94	67,76	69,61	101,14
	S.D.	0,27	0,72	0,57	0,06	0,54	0,30	0,68
GDPR	MEAN	5,62	4,28	4,44	4,36	2,40	4,42	4,51
	S.D.	1,45	3,57	3,14	0,93	3,30	4,48	3,23
EBRDI	MEAN	2,70	3,70	5,30	4,35	4,00	3,00	5,40
	S.D.	0,28	0,26	3,14	0,93	3,30	0,26	3,23

For the notation of the variables see Table 2. Variables with an asterisk are percentages
EA=Equity/Assets ratio , CAR=Total Regulatory Capital ratio , ROA= Return over Assets,
LLP=Loan Loss Provisions over Gross Loans, NPL=Impaired Loans to Gross Loans ratio,
LIQ=Liquid assets/deposits and s-t funding, S=ln(real assets), GDPR=Rate of growth of GDP,
EBRDI=Banking reform index.

[12] Data for the coverage ratio and the number of banks for each country and for all the years are available upon request.

Table 3 presents country averages for the variables used during the period 2001-2009. For the whole region, the period-average capital ratio is 18.6 and 25.6 for EA and CAR respectively, while the average LLP and NPL are 2.89 and 4.72 respectively.

The average equity to assets ratio for the whole region, is about 17 per cent, much higher than the European average. The reasons behind this low financial leverage in the region are the ongoing restructuring process of financial institutions and the low access to other sources of funds. Similarly, liquidity stands at an average of 57 per cent over the examined period, which is higher than the European average (ECB, 2010).

5. Econometric methodology

Equations (5) and (6) form the basis for the estimations of the dynamic panel model with an endogenous variable. Since the model is dynamic the use of least squares of fixed effects (FE) or random effects (RE) models produce biased and inconsistent estimates in equations (5) and (6) respectively.

The econometric analysis and estimation of our system of equations involves four steps. Firstly, we specify the error structure of the model. Secondly, we check for the presence of unobservable cross-country and time effects. Thirdly, we test of stationarity of the panel, using a unit root test for unbalanced panels. Finally, we specify the methods of estimation.

We assume a one-way error component model. Thus, in (5) and (6) the error terms $\eta_{i,t}$ and $w_{i,t}$, include the unobserved bank-specific effect and the idiosyncratic error respectively. Moreover, due to the differences that exist between the banking system of different SEE countries and also the effects of the last crisis, we should test for potential cross-country and time effects. We test for these effects by including in equations (5) and (6) country- and time-specific dummies, respectively. Thus, the econometric system is expanded as follows:

$$CAP_{is,t} = \alpha_o+\gamma_1 CAP_{is,t-1}+\alpha_1 RISK_{is,t} + \sum_{j=2}^{J} \alpha_j Z^j_{is,t} + \sum_{s=1}^{S-1} \delta_{1s} D_{s-1}+\eta_{is,t}, \quad (7)$$

$$RISK_{is,t} = \beta_o + \gamma_2 RISK_{is,t-1} + \beta_1 CAP_{is,t} + \sum_{k=2}^{K} \beta_k H^k_{is,t} + \sum_{s=1}^{S-1} \delta_{2s} D_{s-1} + w_{is,t}, \qquad (8)$$

$\eta_{is,t} = \mu_{is} + v_{is,t} + \lambda_t$,

$w_{is,t} = u_{is} + \varphi_{is,t} + \lambda_t$,

Where D_{s-1} stands for the country-specific dummy variables, s stands for countries with s=1,…,S, μ_{is} stands for the bank-specific effects, $v_{is,t}$ stands for the idiosyncratic error and λ_t accounts for the unobservable time effect.

The significance of the time effects is tested with the relevant LM test which implies that we should include a year-specific dummy variable to account for λ_t. It turns out that the dummy variables for the year 2009 (D_9) in some cases is significant. This outcome is consistent with the adverse conditions that banks in the SEE countries faced in 2009 due to the global financial turmoil. Therefore, equations (7) and (8) are expanded as follows:

$$CAP_{is,t} = \alpha_o + \gamma_1 CAP_{is,t-1} + \alpha_1 RISK_{is,t} + \sum_{j=2}^{J} \alpha_j Z^j_{is,t} + \sum_{s=1}^{S-1} \delta_{1s} D_{s-1} + \delta_1 D_9 + \eta_{is,t}, \qquad (9)$$

$$RISK_{is,t} = \beta_o + \gamma_2 RISK_{is,t-1} + \beta_1 CAP_{is,t} + \sum_{k=2}^{K} \beta_k H^k_{is,t} + \sum_{s=1}^{S-1} \delta_{2s} D_{s-1} + \delta_2 D_{9} + w_{is,t}, \qquad (10)$$

The non-stationarity of the panel was tested using the Fisher test (Maddala and Wu, 1999). The null of non-stationarity is rejected at the 5% levels for all variables.

The dynamic system of equations (9) and (10) will be estimated by the one-step and the two-step system GMM estimator[13] (Blundell and Bond, 1998). We use the two-step robust estimates unless the Sargan test rejects the null hypothesis that the moment conditions are valid[14]. Since in this case standard errors are downward biased, the robust estimator suggested by Windmeijier (2005) is used.

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[13] This method assumes: first, that there is no serial correlation in the idiosyncratic errors, and second, the initial condition that these errors are uncorrelated with the first difference of the first observation of the dependent variable.

[14] The method uses lagged first differences of the dependent variable in the level equation as instruments in addition to those of lagged values of the depend, predetermined and endogenous variables and first differences of the strictly exogenous variables.

It should be denoted, in case that the coefficient of the lagged dependent variable estimated by the GMM estimator above will be shown to be insignificant, then the model is static and the two stages least squares instrumental variables with random effects (2SLS-RE) method[15] will be used with the Baltagi-Chang (1994) estimators of the variance components. In this case, we test for the endogeneity of risk in the capital equation and capital in the risk equation using the Wu-Hausman test statistic.

The system of equations (5) and (6) will be estimated for the full sample and for sub-samples according to the following two criteria: Firstly, using the average equity-to-assets ratio (EA), we obtain high and low equity capital banks respectively. Secondly, using the average regulatory capital ratio (CAR), we obtain sub-samples of the high and low regulatory capital banks, respectively. Therefore, the system of equations (5) and (6) will be estimated for the full sample and for the above four (4) sub-samples. Thus, we do not follow the literature by including shift parameters for the four sub-samples and using a fixed effects method, but rather we allow the slope coefficients to vary across the four sub-samples.

6. Results

6.1 Full sample results

The variables are defined in Table 2. Table 4 presents correlations of the main variables in levels. The correlation between regulatory capital and risk appears to be positive but small in size, while the relationship between equity capital and risk is negative.

Table 5 reports the results obtained from the estimation of the simultaneous equations model (9) and (10) for the full sample. The first two columns present the estimated capital equation (equation (9)) when the dependent variable (CAP) is either the total regulatory capital ratio (CAR) or the equity to assets ratio (EA). The next two columns of Table 5 present the estimated risk equation (equation (10)) either when capital is measured by CAR or by EA.

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[15] The Hausman test, for the whole sample, provides evidence in favour of a RE model ($x^2(11)=15.68$, with p-value=0.49)

Table 4. Correlation matrix of the variables

	EA	CAR	ROA	NPL	LLP	LIQ	GDPR	EBRDI	S	S^2	D_9
EA	1.00										
CAR	0.58	1.00									
ROA	0.08	-0.06	1.00								
NPL	-0.09	0.04	-0.09	1.00							
LLP	0.14	0.09	-0.64	0.00	1.00						
LIQ	0.30	0.53	0.12	-0.03	0.01	1.00					
GDPR	0.50	0.02	0.11	-0.21	0.15	0.04	1.00				
EBRDI	-0.06	-0.08	0.01	0.02	0.03	-0.05	-0.001	1.00			
S	-0.24	-0.17	0.06	-0.02	0.04	-0.19	-0.08	0.06	1.00		
S^2	-0.21	-0.15	0.06	-0.01	0.05	-0.17	-0.08	0.05	0.99	1.00	
D_9	-0.55	0.02	-0.10	0.22	-0.11	-0.03	-0.93	0.008	0.11	0.11	1.00

In the CAR equation (first column) our findings indicate a static regulatory capital equation and a positive but statistically insignificant relation between risk and capital. The Wu-Hausman test confirms that the two variables are endogenous. However, in the EA equation (second column) the short-run impact of capital on bank risk is negative and statistically significant (-0.46), while the long-run impact appears to be close to -1. Even during the last crisis, banks in the SEE countries managed to absorb the increased risk by reducing their equity capital but with an (insignificant) increase in the regulatory capital[16]. The above result is in accordance with previous findings by Aggarwal and Jacques (2000), Rime (2000), Van Roy (2004) and Jokipii and Milne (2010).

The empirical results show that liquidity causes banks to hold more regulatory capital (CAR equation). Although not being significant the negative coefficient of the growth rate of GDP is a robust result in all the estimated samples. Berger et al. (1995) explain this relationship with the argument that banks hold high levels of capital to be able to exploit unexpected investment opportunities.

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[16] Note that CAR is a truncated variable not a continuous one, since it cannot be reduced below its minimum.

Table 5. Estimation results for the simultaneous equation model

(Full sample)

	Dependent variables							
	Capital				Risk			
	CAP(=CAR)		CAP(=EA)		NPL(CAP=CAR)		NPL(CAP=EA)	
Methods	2SLS-RE		System GMM		2SLS-RE		System GMM	
Explanatory variables	coefficient	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.
CAP_t					0.08**	1.91	-0.01	-0.11
CAP_{t-1}			0.75***	5.02				
NPL_t	0.28	0.53	-0.46***	-2.27				
NPL_{t-1}							0.23**	2.04
ROA	0.85	1.40	0.80*	1.79				
LIQ	0.12***	3.59	-0.01	-0.29	-0.03*	-1.68	0.01	0.39
LLP	0.45	1.41	0.46	1.21	-0.01	-0.16	0.12	0.33
S	4.52	0.99	5.02	0.69	-4.18***	-2.66	-7.03	-1.28
S^2	-0.35	-1.24	-0.38	-0.76	0.25***	2.58	0.48	1.33
GDPR	-0.23	-0.70	-0.05	-0.24	0.39**	1.91	0.07	0.35
EBRDI	-0.02	-0.19	0.17	1.42	0.03	0.31	0.10*	1.81
D_9	-0.50	-0.13	1.85	0.80	5.29***	2.47	3.19*	1.66
Wu-Hausman-test[1]	3.09 (0.08)		0.92 (0.24)		2.21 (0.12)		2.31 (0.11)	
Wald-test	73		166		53		275	
Sargan-test[2]			44.74 (0.36)				35.77 (0.73)	
AR(1)[3]			-3.01 (0.00)				-1.20 (0.22)	
AR(2)[3]			-0.19 (0.84)				0.60 (0.54)	
R^2(overall)	0.19				0.27			
No of obs.	268		358		268		268	

Note: For the notation of the variables see Table 2.

, **, ** Significance at the 10, 5 and 1% levels of significance respectively.

The country dummies (D_{s-1}) and the constant are not reported.

1. Test for the endogeneity of risk in the capital equation and vice versa, with p-values in parentheses.
2. Test for over-identifying restrictions, with p-values in parentheses.
3. First and second order autocovariance in residuals, with p-values in parentheses.

The estimated coefficients of the remaining variables have the correct signs but are all insignificant. In the equity capital (EA) equation, the coefficient of the lagged dependent variable $CAP_{i,t-1}$ is highly significant and denotes a fast speed of capital adjustment of 75% per year[17]. The impact of risk on equity capital appears to be negative and significant.

It is worth noting that the coefficients of the NPL variable in this equation is opposite in sign to that in the CAR equation, indicating that banks' capital and risk decisions differentiate between regulatory and equity capital. In contrast to the previous case, the coefficient of liquidity is negative and not significant. The relationship between profitability and capital is positive, as in the case of regulatory capital, but here is significant. This finding is not surprising in light of previous research regarding the SEE countries (Athanasoglou et al., 2006) and implies that the benefits associated with increasing profits are offset by costs of increasing regulatory capital, while in the equity capital case, retained profits add to capital. The coefficients of the remaining variables are insignificant.

The risk equation with regulatory capital is static with the impact of regulatory capital on risk being positive and significant, indicating that banks with higher levels of capital will engage in higher risk-taking. The negative and significant coefficient of liquidity appears to suggest that this variable is associated with lower risk. The effect of size on risk is significant, suggesting that to a certain extent increasing size reduces risk although for extremely large banks it is associated with increasing risk. The estimated coefficient of the growth rate of GDP reflects, contrary to expectations, a counter-cyclical behaviour of risk. The adverse conditions that banks faced in 2009 increased risk significantly as indicated by the positive and highly significant coefficient on D_9. Finally, the impact of both the loan losses and the EBRDI is not significant.

In contrast to the previous case, the risk equation with equity capital is dynamic. The estimated coefficient of the lagged dependent variable indicates a rather slow speed of risk adjustment, in facts

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[17] This is higher than reported for large USA banks by Berger et al. (2008).

Table 6. **Estimation results for the simultaneous equation model**

(High equity capital banks)

	Dependent variables							
	Capital				Risk			
	CAP(=CAR)		CAP(=EA)		NLP(CAP=CAR)		NLP(CAP=EA)	
Methods	System GMM		System GMM		2SLS-RE		2SLS-RE	
Explanatory variables	Coefficients	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.
CAP_t					-0.02	-0.38	-0.12*	-1.72
CAP_{t-1}	0.57***	3.09	0.45*	1.71				
NPL_t	0.92	1.64	-0.21	-0.06				
NPL_{t-1}								
ROA	-0.87	-0.49	1.21	0.53				
LIQ	0.07*	1.74	0.01	0.16	-0.02	-1.06	-0.01	-0.57
LLP	0.58	0.37	0.66	1.00	-0.01	-0.17	0.01	0.13
S	17.9	0.68	30.75	0.44	-5.01***	-2.25	-4.4**	-1.99
S^2	-0.85	-0.43	-2.19	-0.45	0.33***	2.23	0.28**	1.90
GDPR	-2.7*	-1.77	-0.71	-0.30	0.19	0.60	0.02	0.08
EBRDI	-0.21	-1.15	0.35***	2.40	-0.11	-0.87	-0.07	-0.56
D_9	-26.2	-1.48	-4.05	-0.16	4.37	1.37	2.98	0.91
Wu-Hausman-test[1]	0.88 (0.35)		0.76 (0.31)		0.15 (0.70)		0.11 (0.73)	
Wald-test	168		107		16		19	
Sargan-test[2]	42.7 (0.40)		9.98 (1.00)					
AR(1)[3]	-1.96 (0.04)		-1.03 (0.30)					
AR(2)[3]	0.20 (0.25)		-0.29 (0.77)					
R^2(overall)					0.17		0.14	
No of obs.	157		157		157		157	

Note: For the notation of the variables see Table 2.

, **, ** Significance at the 10, 5 and 1% levels of significance respectively.

The country dummies (D_{s-1}) and the constant are not reported.

1. Test for the endogeneity of risk in the capital equation and vice versa, with p-values in parentheses.
2. Test for over-identifying restrictions, with p-values in parentheses.
3. First and second order autocovariance in residuals, with p-values in parentheses.

substantially slower than in the equity capital equation[18]. The estimated coefficient on capital is negative but highly insignificant.

The EBRDI variable has a positive and marginally significant impact on risk, suggesting that reforms induce banks to take higher risks.

6.2 Results for high equity capital banks

Results for estimating equations (11) and (12) for the sub-sample of high equity banks are presented in Table 6. The estimated equations of (both regulatory (CAR) and equity (EA)) capital appear to be dynamic, while those of risk appear to be static. Thus, as opposed to the whole sample case actual regulatory capital of high equity banks adjust partially to their target (long-run) levels, while the adjustment of risk is instantaneous. In the CAR equation the impact of risk on capital is positive but not significant. The coefficient of the lagged dependent variable is significant, indicating a fast speed of adjustment. Liquidity has a positive and significant impact on capital. The negative and significant coefficient of the rate of growth of GDP appears to reflect the procyclical nature of bank regulatory capital in this sub-sample.

In the equity capital equation, the impact of risk is negative but statistically insignificant. The speed of capital adjustment is lower than in the regulatory capital case. Among the remaining variables, only the banking reform index (EBRDI) takes a significant and contrary to expectations-positive coefficient.

In the risk equation, the coefficient on regulatory capital is negative but insignificant. In fact, size is the only significant determinant of risk among all the explanatory variables in this equation. This result suggests that larger banks maintain a lower level of risk up to a point. In the second risk equation, equity capital has a negative and marginally significant impact on risk, in line with the negative relation in the equity capital equation. From the remaining control variables, only size has a negative and non-linear impact on risk, indicating that higher equity banks take on lower levels of risk.

[18] See also Jokipii and Milner (2010), for similar results.

Table 7. Estimation results for the simultaneous equation model
(Low equity capital banks)

	Dependent variables							
	Capital				Risk			
	CAP(=CAR)		CAP(=EA)		NPL(CAP=CAR)		NPL(CAP=EA)	
Methods	2SLS-RE		System GMM		2SLS-RE		2SLS-RE	
Explanatory variables	coefficients	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.
CAP_t					0.38*	1.73	-0.01	-0.04
CAP_{t-1}			0.44**	1.91				
NPL_t	0.35**	1.96	-0.01	-0.12				
NPL_{t-1}								
ROA	-0.03	-0.08	0.52***	2.22				
LIQ	0.04**	1.81	-0.00	-0.01	-0.03	-1.28	0.02	1.18
LLP	-0.10	-0.46	0.00	0.02	0.14	0.58	0.78***	3.55
S	-6.40***	-2.38	1.39	0.53	-1.95	-0.63	3.49	1.11
S^2	0.41***	2.49	-0.08	-0.45	0.12	0.62	-0.22	-1.14
GDPR	-0.19	-0.78	-0.05	-0.31	0.32	1.18	0.64***	2.99
EBRDI	-0.07	-0.97	-0.04***	-2.49	0.05	0.58	0.03	0.51
D_9	-1.83	-0.65	0.58	0.33	4.44	1.49	8.43***	3.62
Wu-Hausman-test[1]	3.35 (0.07)		2.14 (0.11)		6.08 (0.02)		0.04 (0.83)	
Wald-test	31		162		29		40	
Sargan-test[2]			26.5 (0.97)					
AR(1)[3]			-2.05 (0.03)					
AR(2)[3]			1.00 (0.31)					
R^2(overall)	0.36				0.36		0.21	
No of obs.	121		199		121		199	

Note: For the notation of the variables see Table 2.
, **, ** Significance at the 10, 5 and 1% levels of significance respectively.
The country dummies (D_{s-1}) and the constant are not reported.
1. Test for the endogeneity of risk in the capital equation and vice versa, with p-values in parentheses.
2. Test for over-identifying restrictions, with p-values in parentheses.
3. First and second order autocovariance in residuals, with p-values in parentheses.

6.3 Results for low equity capital banks

Our estimates for the sub-sample of low equity banks (Table 7) show that, with the exception of the equity capital equation, the estimated models are static. The relationship between risk and regulatory capital (first column) is positive and significant but lower than it was with that of high equity banks. This finding is expected since in this sub-sample banks would have to increase capital in compliance with existing compulsory capital requirements or even above them. Jokipii and Milne (2010) argue that higher risk-taking can increase the probability of default and encourage banks to increase regulatory capital. The estimated coefficient on liquidity, as in the last two cases, is positive and significant. Both coefficients on the size variables are significant, suggesting that low equity banks, probably due to high cost, choose to reduce regulatory capital, if it is well above the minimum in the initial stages of their development, and increase it when they reach a certain size.

The relationship between equity capital and risk (second column) is negative but insignificant. In this equation, profitability and reforms are associated with higher and lower equity capital respectively, with significant coefficients as opposed to the regulatory capital case.

In the risk equation, the impact of regulatory capital appears to be positive and significant. Thus, up to now this is the only case where the estimations indicate a two-way positive relation between capital and risk. However, the estimated coefficients of the remaining variables are insignificant. The relationship between risk and equity capital in this sub-sample appears to be negative and insignificant.

The estimated coefficient on loan losses is positive and highly significant, suggesting that banks with higher loan losses increase risk-taking. The rate of growth of GDP, contrary to expectations, has a positive and significant coefficient. An interesting finding is the coefficient of the time dummy variable, which suggests that in 2009 low capital banks' risk-taking, was affected more than in high equity banks.

Table 8. **Estimation results for the simultaneous equation model**

(Banks with high and low regulatory capital)

	Dependent variables							
	Banks with high CAR				Banks with low CAR			
	Capital(CAR)		Risk(CAR)		Capital(CAR)		Risk(CAR)	
Methods	2SLS-RE		2SLS-RE		2SLS-RE		2SLS-RE	
Explanatory variables	coefficients	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.
CAP_t			0.09**	1.81			0.00	-0.01
NPL_t	0.10	0.10			0.44**	1.92		
ROA	0.54	0.50			0.13	0.32		
LIQ	0.33***	2.98	-0.09	-1.55	0.03	1.30	0.01	0.47
LLP	0.41	0.85	-0.32***	-2.18	-0.83**	-1.95	0.88***	3.38
S	-3.52	-0.41	-7.52*	4.56	-2.70	-1.11	-2.03	-0.91
S^2	0.13	0.25	0.41	1.27	0.14	0.96	0.10	0.78
GDPR	-0.55	-0.33	0.99*	1.75	-0.06	-0.26	0.20	1.28
EBRDI	1.94	0.18	-5.80	-1.06	0.00	0.04	0.05	0.87
D_9	-1.46	-0.89	7.44	1.22	-0.11	-0.04	4.02***	2.33
Wu-Hausman-test[1]	2.98 (0.09)		2.78 (0.10)		3.35 (0.07)		8.62 (0.00)	
Wald-test	28		46		18		50	
R^2(overall)	0.35		0.30		0.17		0.36	
No of obs.	83		83		180		180	

Note: For the notation of the variables see Table 2.

, **, ** Significance at the 1, 5 and 10% levels of significance respectively.

The country-dummies (D_{s-1}) and the constant are not reported.

Test for the endogeneity of risk in the capital equation and vice versa, with p-values in parentheses.

6.4 Results for high and low regulatory capital banks

As shown in Table 8, the estimated equations in both sub-samples represent long-run (static) relations[19] between capital and risk, which according to the capital buffer theory can be either positive or negative. It is clear that in the sub-sample of banks with relatively high CAR (first column) the coefficient on risk, although positive, is not significant.

In addition, increased profitability and loan losses increase capital but are also insignificant. In fact, the positive coefficient of liquidity is the only significant one in this equation. However, risk (second column) is affected positively and significantly by capital but the size of the effect is small, while it is determined negatively and significantly by liquidity and size.

In the sub-sample of banks with low CAR, the empirical estimations indicate that there is a positive and significant one-way relationship between regulatory capital and risk.[20] One possible explanation of these findings is that, while well capitalized banks have completed their adjustments to the target levels of capital, by contrast, those banks with relatively lower capitalization continue to adjust their target levels of capital either to satisfy minimum capital requirements or to create an adequate buffer above them. However, the opposite holds for risk. High CAR banks can increase their risk-taking after increasing their regulatory capital but not the low CAR ones. We further find that, in the low CAR sub-sample, an increase in loan loss provisions decreases regulatory capital and increases risk. This is the first case where a significant relationship between this variable and regulatory capital and risk is observed.

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[19] This finding differs from that of Jacques and Nigro (1997), Rime (2001) and Roy (2008), which find that weakly capitalized banks increase their capital faster than well-capitalized banks.

[20] This result is consistent with that of Rime (2001) for Swiss banks.

7. Conclusions

This paper has analyzed the relationship between bank capital and risk in the SEE region. To examine the impact of both micro-and macroeconomic environment and, specifically, the last crisis on banks' choice of capital and risk, we estimated a dynamic equations system assuming that choices of capital and risk are made simultaneously within each bank.

The last financial crisis has proved that the SEE countries need a stable, healthy and efficient banking system in order to finance private and public investment and consumption. As shown in the analysis, continued financial reform and improvement in the structure of banks in the SEE countries over the last decade have contributed to high levels of equity capital in the high equity capital banks without altering systematically their behavior towards risk. In contrast, in the low equity capital banks reforms contributed negatively to equity capital. Overall, reforms seem to have increased risk-taking by banks.

The results for the whole sample of banks show that there is a one-way relatively weak but significant relationship between the capital adequacy ratio and risk-taking but not vice versa. This finding can be explained by the fact that on average banks in the SEE region keep their target level of capital above the regulation requirements and is in line with the charter value theory. In the equity capital equation, the coefficient on the lagged dependent variable implies a relatively quick adjustment to target, while risk has a negative and significant impact on equity capital.

In contrast, the estimation results for banks with low equity capital and a low CAR identify a positive and significant two-way relationship between **regulatory capital** and **risk** for equity capital and one-way relationship for regulatory capital. In the remaining two sub-samples this relation is positive but insignificant. Additionally, in the four sub-samples, the empirical results suggest that there is a negative relationship between equity capital and risk, which is marginally significant in the risk equation for high equity capital banks case only. These results show first that: First, less-than adequately capitalized banks raise their target regulatory capital after an increase in risk in order to cover potential losses while in turn engage in riskier activities. And, second, banks differentiate in their choices between equity capital, regulatory capital and risk.

We find a significant and positive (negative) influence of liquidity (liquidity risk) on regulatory capital in the whole sample of banks and in the four sub-samples with the exception of banks with a low CAR, indicating that high levels of liquidity lead to increasing CAR in order to control for risk. This is confirmed by the negative impact of this variable on risk which is marginally significant in the whole sample case only. Hence, in cases where regulatory capital and risk are not related (high CAR banks), liquidity has a strong positive impact on capital. This seems to suggest that in the case of high capitalized banks with target capital higher than the regulatory one, an increase in the liquidity risk will increase capital, but this does not translate into a significant reduction of risk. Also, liquidity has a negative (positive), albeit insignificant, effect on equity capital and risk.

Profitability seems to have a significant positive influence on equity capital only in the case of banks with low equity capital, but does not have any significant effect on regulatory capital in all the cases considered.

Banks with higher loan losses appear to raise CAR and reduce risk in the whole sample and in the high equity capital and high CAR (significantly) sub-sample cases, but decrease regulatory capital and raise risk in the low equity and CAR (significantly) sub-samples. The estimated coefficient of this variable on equity capital and risk equations is positive but insignificant, with the exception of its impact on risk in the low equity sub-sample. It seems that banks with both larger equity and CAR have the capacity to raise capital and reduce risk whenever loan losses occur. With regard to size, larger banks will hold less regulatory capital in the low equity sub-sample banks and reduce risk taking in the whole sample and in the high equity banks sub-sample. On the other hand, size has not a significant influence on equity capital. The influence of GDP growth on capital (both regulatory and equity) appears to be negative in all cases but significant only in the CAR equation in the high equity sub-sample of banks. This finding indicates the procyclical nature of economic activity, although it is important in high equity banks only. On the contrary, the impact of this variable on risk is positive. Finally, reforms in the banking sector seem to affect significantly equity capital only. This influence is positive (negative) in the high (low) equity sub-sample of banks.

APPENDIX

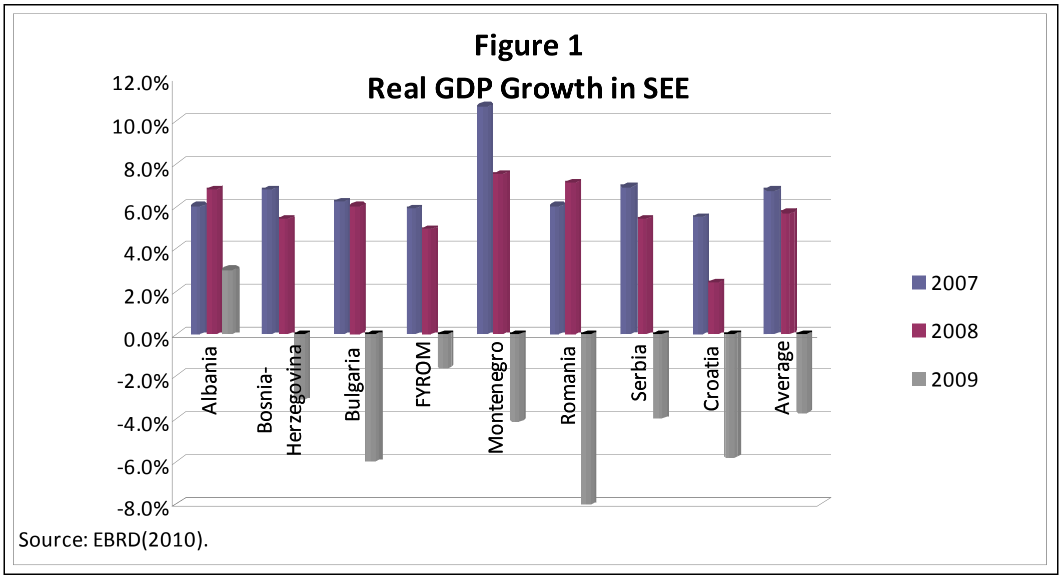
Figure 1
Real GDP Growth in SEE
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
-2.0%
-4.0%
-6.0%
-8.0%
Albania
Bosnia-Herzegovina
Bulgaria
FYROM
Montenegro
Romania
Serbia
Croatia
Average
2007
2008
2009
Source: EBRD(2010).

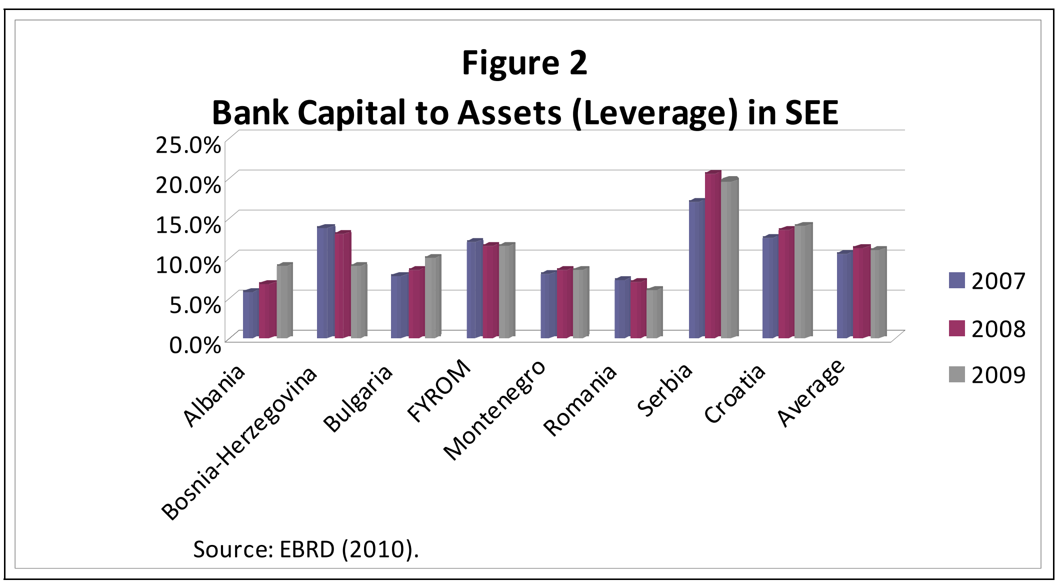
Figure 2
Bank Capital to Assets (Leverage) in SEE
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Albania
Bosnia-Herzegovina
Bulgaria
FYROM
Montenegro
Romania
Serbia
Croatia
Average
2007
2008
2009
Source: EBRD (2010).

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