

# **Cost efficiency of commercial banks in South-East Europe: a time-varying approach**

Francesco Guidi <sup>1</sup>

<sup>1</sup>University of Greenwich  
Faculty of Business

December 7, 2021

- Commercial banks in South-East Europe are the main channel through which financial resources are allocated to economic activities carried out in the region.
- One of the central issues SEE banks have to deal with is whether they are cost-efficient in providing services to their customers.
- In order to address this issue, the present study investigates the cost efficiency of commercial banks operating in seven SEE countries (Albania, Bosnia-Herzegovina, Bulgaria, Croatia, FYROM, Serbia, and Romania) by using bank-level data.

This study contributes to the current empirical literature on the cost efficiency of banks operating in the SEE region in several ways:

- Firstly, using a stochastic frontier approach (SFA hereafter), cost-efficiency scores were estimated for SEE commercial banks over the period 2003-2012.
- Secondly, these scores are then used to evaluate whether cost efficiency at bank level differs in relation to bank size (larger versus small banks) as well as bank ownership (domestic versus foreign ownership).

The following questions were addressed in this study

- Are some SEE commercial banks more cost-efficient than others?
- Do cost efficiency scores of SEE commercial banks change over time?
- Do these changes differ in relation to either the size or ownership status of the banks?

Recent empirical studies on cost efficiency in Eastern Europe banking industries include:

- **Bonin et al. (2005)** Cost and profit efficiencies, ten countries (Bulgaria, Czech Rep., Estonia, Croatia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, Slovakia), 1996 2000, 225 banks, Stochastic Frontier Analysis, Foreign owned banks are more cost and profit efficient than domestic owned banks;
- **Fries and Taci (2005)** Cost efficiencies, ten countries (Albania, Bulgaria, Croatia, Macedonia, Romania, Serbia)), 1999 2008, 171 banks, Stochastic Frontier Analysis, Foreign owned banks are less cost efficient than domestic owned banks.

Recent empirical studies on cost efficiency in Eastern Europe banking industries include (continued):

- **Kasman and Yildirim (2006)**, Cost and profit efficiency, 8 countries (Czech Rep., Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia), 1995-2002, Stochastic Frontier Analysis, Foreign-owned banks are more cost efficient than domestic banks;
- **Mamatzakis et al (2008)**, Cost and profit efficiencies, 10 countries (Cyprus, Czech Rep, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia), 1998-2003, Stochastic Frontier Analysis, Foreign-owned banks are the most profit-efficient, whereas state-owned banks are the most cost-efficient
- **Staikouras et al. (2008)** Cost efficiency, six countries (Bosnia-Herzegovina, Bulgaria, Croatia, FYROM, Romania, Montenegro), 1998-2003, Stochastic Frontier Analysis, Medium-sized banks are more cost-efficient than small- and large-sized banks

A total cost function for the  $i$ -th banking firm at time  $t$  is represented as follows:

$$TC_{i,t} = f(P_{i,t}, Y_{i,t}, Z_{i,t}) + v_{i,t} + u_{i,t} \quad (1)$$

where

$TC_{i,t}$  stands for total costs for firm  $i$  at time  $t$

$P_{i,t}$  is a vector of input prices

$Q_{i,t}$  is a vector of outputs

$Z_{i,t}$  is a vector of control variables

$v_{i,t}$  is the error term that corresponds to random fluctuations and follows a symmetric normal distribution

$u_{i,t}$  is the second error term that accounts for the firm's inefficiency and is assumed to follow an asymmetric, usually a truncated normal or half normal, distribution

In accordance with the empirical banking literature (see, for instance, Fries and Taci, 2005; Mamatzakis et al., 2008), the cost function is specified as a standard translog form, that is:

$$\begin{aligned} \ln TC_{it} = & \sum_m^n \alpha_m \ln P_{m,it} + \sum_s^t \beta_s \ln Q_{s,it} + \\ & \frac{1}{2} \sum_m^n \sum_n^m \alpha_{m,n} \ln P_{m,it} \ln P_{n,it} + \frac{1}{2} \sum_m^n \sum_n^m \beta_{s,t} \ln Q_{s,it} \ln Q_{t,it} + \\ & \sum_m^n \sum_s^t \phi_{m,s} \ln P_{m,it} \ln Q_{s,it} + Z_{j,t} + D_{j,t} + v_{ij,y} + u_{ij,t} \end{aligned} \quad (2)$$

where  $P_m$  and  $P_n$  are input prices,  $Q_s$  and  $Q_t$  are output quantities,  $Z_{j,t}$  is a vector of macroeconomic variables, and  $D_{j,t}$  is a vector of dummy variables. The composite error term in Eq. (2) is formed by two components: the random component  $v_{ij,y}$  and the bank inefficiency component  $u_{ij,t}$ . The random component  $v_{ij,y}$  captures inefficiencies beyond the control of banks managers, whilst the bank inefficiency component  $u_{ij,t}$  captures inefficiencies due to factors that could be controlled by management. On an operational matter, cost efficiency of the  $i$ -th firm at the  $t$ -th time period is calculated as follows:  $CE_{it} = \exp(-u_{ij,t})$

The intermediation approach proposed by Sealey and Lindley (1977) was used in order to define inputs and outputs in the stochastic frontier model, therefore:

- Total costs,  $TC_{i,t}$ , are calculated as the sum of interest and non-interest expenses (Bonin et al., 2005);
- Output prices,  $Q_{i,t}$ , are represented by total deposits and total loans (Bonin et al. 2005; Taci, 2005);
- Input prices  $P_{i,t}$  are represented by the price of labour, measured as personnel expenses divided by total assets (Mamatzakis et al., 2008), and the price of funds, measured by the ratio of interest expenses to total deposits (Mamatzakis et al., 2008).



- The geographical coverage of this study is as follow: Albania, Bosnia-Herzegovina, Bulgaria, Croatia, FYROM, Romania and Serbia;
- The time span considered is from the year 2003 to 2012, and a sample of commercial banks was taken from BankScope database;
- Bank balance sheet data for banking firms located in the above mentioned countries were collected from unconsolidated balance sheet and income statement reports as provided by Bankscope. In the construction of the data set I considered only commercial banks with at least three years of continuous data. In accordance with this criterion, I ended up with a data set of 172 commercial banks;

- The data collected from BankScope are, in most cases, in domestic currency. This was then converted into U.S. dollars by using a spot exchange rate for each domestic currency and U.S. dollar;
- after converting the data into this common currency, the effects of inflation were then removed by using the US GDP deflator from the U.S. National Bureau of Economic Analysis with all values expressed at 2009 prices;
- the bank-level data from Bankscope database were complemented with information about domestic and foreign ownership of banking firms by using the Claessens and Van Horen database;
- Furthermore, macroeconomic data at country level were taken from the World Bank - World Development Indicator database.

Variable	Symbol
Total Assets	TA
Customer deposits	TD
Total loans	TL
Total interest expenses	TIE
Total non-interest expenses	TNIE
Personnel Expenses	PE
Total costs	TC
Price of Labor	PL
Price of Funds	PF
Bank ownership	OWNS
Inflation	INF
Economic growth	GDPGR

**Table 1:** Variables description

	Mean	St	Median	Minimum	Maximum
TA	1475.694	3151.166	379.007	0.783	28334.97
TD	865.302	1815.997	245.993	0.528	13492.33
TL	905.475	1988.175	214.867	0.006	18671.88
TIE	45.031	116.451	10.184	0	1764.907
TN	57.072	124.532	16.669	0.702	1584.794
PE	21.833	49.171	7.220	0.390	821.044
TC	102.417	218.333	28.406	0.897	2457.939
PL	0.0253	0.142	0.016	0.001	4.712
PF	0.0415	0.046	0.00	2.188	0.719

**Table 2:** Descriptive statistics

# Empirical results (I)

	Coefficient	Standard Error
Dep. Var. TC		
$\ln(P1)$	1.256***	0.229
$\ln(P2)$	0.636***	0.152
$\ln(Q1)$	0.655***	0.122
$\ln(Q2)$	0.223***	0.103
$\ln(P1)^2$	0.066***	0.028)
$\ln(P2)^2$	0.012**	0.006
$\ln(P1)\ln(P2)$	0.112**	0.039
$\ln(Q1)^2$	0.069***	0.008
$\ln(Q2)^2$	0.048***	0.006
$\ln(Q1)\ln(Q2)$	-0.1***	0.012
$\ln(P1)\ln(Q1)$	0.038	0.026
$\ln(P2)\ln(Q1)$	0.005	0.018
$\ln(P1)\ln(Q2)$	-0.023	0.0222
$\ln(P2)\ln(Q2)$	0.008	0.012
GDPgrowth	-0.002	0.002
DCPPSB	-0.001	0.001
Lending rate	0.011***	0.004
EU dummy	-0.029	0.033

SEE region	Average	Maximum	Minimum
2003	0.923	0.975	0.788
2004	0.869	0.978	0.375
2005	0.853	0.975	0.335
2006	0.837	0.973	0.296
2007	0.821	0.970	0.258
2008	0.809	0.975	0.221
2009	0.785	0.972	0.181
2010	0.763	0.969	0.149
2011	0.752	0.965	0.119
2012	0.729	0.962	0.097
Average	0.826	0.913	0.613

**Table 4:** SFA results: evolution of average cost inefficiency scores over the period 2003-2012.

Albania	Average	Maximum	Minimum
2003	—	—	—
2004	0.888	0.888	0.888
2005	0.917	0.958	0.876
2006	0.863	0.954	0.774
2007	0.855	0.948	0.752
2008	0.855	0.943	0.728
2009	0.839	0.936	0.702
2010	0.814	0.930	0.674
2011	0.795	0.922	0.644
2012	0.775	0.913	0.613

**Table 5:** Commercial banks in Albania: evolution of average cost efficiency scores over the period 2003-2012.

Bosnia-Herzegovina	Average	Maximum	Minimum
2003	—	—	—
2004	0.881	0.961	0.819
2005	0.886	0.967	0.801
2006	0.876	0.964	0.781
2007	0.870	0.960	0.759
2008	0.867	0.955	0.736
2009	0.847	0.95	0.711
2010	0.843	0.959	0.684
2011	0.838	0.955	0.655
2012	0.829	0.95	0.624

**Table 6:** Commercial banks in Bosnia-Herzegovina: evolution of average cost efficiency scores over the period 2003-2012.



Bulgaria	Average	Maximum	Minimum
2003	0.847	0.906	0.788
2004	0.871	0.972	0.767
2005	0.866	0.968	0.744
2006	0.875	0.965	0.719
2007	0.848	0.961	0.693
2008	0.823	0.957	0.665
2009	0.823	0.952	0.634
2010	0.815	0.947	0.651
2011	0.804	0.941	0.569
2012	0.755	0.934	0.533

**Table 7:** Commercial banks in Romania: evolution of average cost efficiency scores over the period 2003-2012.

Croatia	Average	Maximum	Minimum
2003	0.938	0.975	0.813
2004	0.928	0.973	0.794
2005	0.920	0.970	0.774
2006	0.916	0.967	0.751
2007	0.906	0.963	0.727
2008	0.892	0.959	0.701
2009	0.883	0.954	0.674
2010	0.869	0.949	0.644
2011	0.852	0.944	0.613
2012	0.846	0.938	0.663

**Table 8:** Commercial banks in Croatia: evolution of average cost efficiency scores over the period 2003-2012.

FYROM	Average	Maximum	Minimum
2003	—	—	—
2004	0.978	0.979	0.978
2005	0.910	0.975	0.844
2006	0.9	0.973	0.828
2007	0.823	0.97	0.528
2008	0.797	0.966	0.491
2009	0.762	0.948	0.452
2010	0.765	0.942	0.413
2011	0.788	0.936	0.673
2012	0.721	0.929	0.334

**Table 9:** Commercial banks in FYROM: evolution of average cost efficiency scores over the period 2003-2012.

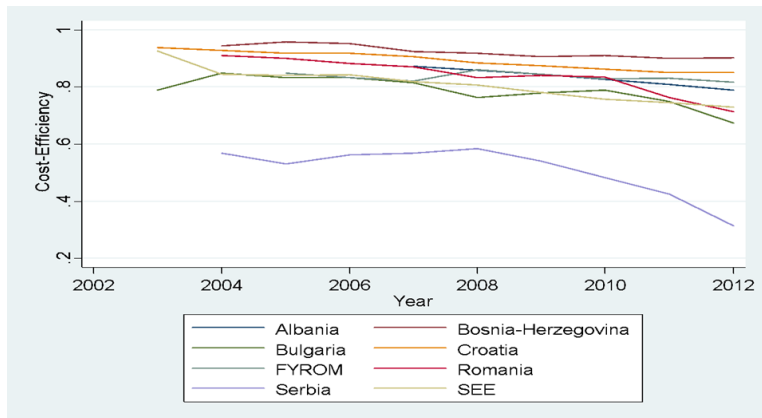
Romania	Average	Maximum	Minimum
2003	0.877	0.948	0.806
2004	0.912	0.967	0.802
2005	0.886	0.963	0.753
2006	0.874	0.959	0.729
2007	0.858	0.955	0.703
2008	0.850	0.975	0.675
2009	0.843	0.972	0.646
2010	0.835	0.969	0.615
2011	0.797	0.965	0.471
2012	0.785	0.962	0.432

**Table 10:** Commercial banks in Romania: evolution of average cost efficiency scores over the period 2003-2012.

Serbia	Average	Maximum	Minimum
2003	-	-	-
2004	0.566	0.664	0.375
2005	0.603	0.965	0.335
2006	0.548	0.961	0.296
2007	0.577	0.957	0.258
2008	0.593	0.952	0.221
2009	0.548	0.946	0.181
2010	0.475	0.834	0.149
2011	0.455	0.934	0.119
2012	0.412	0.927	0.097

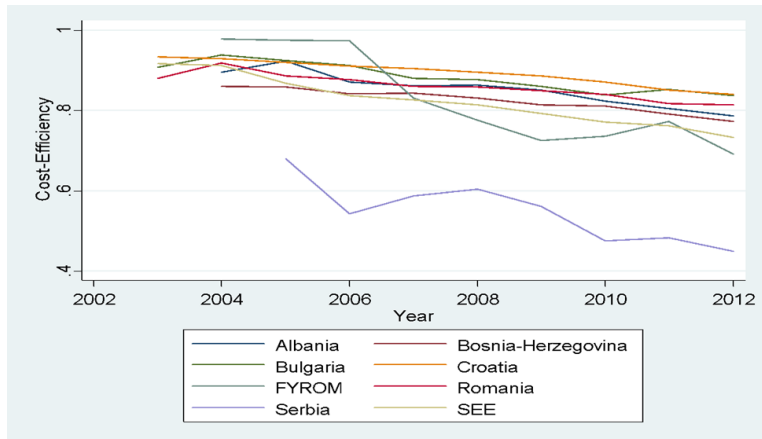
**Table 11:** Commercial banks in Serbia: evolution of average cost efficiency scores over the period 2003-2012.

## Empirical results (X)- Cost efficiency scores at bank ownership level (I)



**Figure 1:** Cost efficiency scores of domestic-owned banks at country and SEE level, 2003-2012

## Empirical results (XI) - Cost efficiency scores at bank ownership level (II)



**Figure 2:** Cost efficiency scores of foreign-owned banks at country and SEE level, 2003-2012

Does bank size account for cost efficiency?

it might be the case that larger banks could benefit from economies of scale that would allow them to reduce their costs, whilst smaller banks might not benefit from such economies

- I addressed that issue by dividing SEE banks in accordance with their asset size. I broke down the size class in assets by using quartiles and presented the relationship between bank size and cost efficiency levels in the following table;
- The findings reveal that, in general, cost efficiency scores tend to decrease as banks become larger;
- However, when banks become much larger (i.e. 4th quartile) their average cost efficiency tends to increase;
- As pointed out by Hasan and Marton (2003), the largest banks venture into different areas of banking business and might experience substantial economies of scale that substantially improve their efficiency, coupled with the ability of these banks to attract and retain better managers.



Does bank size account for cost efficiency?

it might be the case that larger banks could benefit from economies of scale that would allow them to reduce their costs, whereas smaller banks might not benefit from such economies

- I addressed this issue by partitioning SEE banks in accordance with their asset size. I broke down the size class into assets by using quartiles and presented the relationship between bank size and cost efficiency levels in the following table;
- The findings reveal that, in general, cost efficiency scores tend to decrease as banks become larger;
- However, when banks become much larger (i.e. 4th quartile) their average cost efficiency tends to increase;
- As pointed out by Hasan and Marton (2003), the largest banks venture into different areas of banking business and might experience substantial economies of scale that substantially improve their efficiency, coupled with the ability of these banks to attract and retain better managers.

Serbia	Total asset range	Average cost efficiency	Min	Max
First quartile	13.96 - 164.13	87.73	77.77	95.11
Second quartile	164.14 - 445.08	80.70	74.65	91.79
Third quartile	445.09 - 1209.58	75.92	66.71	85.65
Fourth quartile	1209.59 - 19125,65	80.68	73.12	93.96

**Table 12:** Cost efficiency and bank size over the period 2003-2012

## Conclusions and policy implications

- The findings show that on average, the level of cost efficiency for SEE commercial banks is 77.5%;
- The most cost-efficient commercial banks are those located in Albania and Bulgaria, whereas the least levels of cost efficiency were found for banks located in FYROM and Serbia;
- By taking into account domestic- or foreign-ownership, the findings of this study show that domestic banks are slightly more cost efficient than foreign-owned banks;
- On the other hand, looking at the size of banking firms, this study demonstrates that small banks are more cost-efficient than larger banks;
- Consolidation with major or other small banks would increase small banks size and benefit from economies of scale, as well as with the adoption of new technologies and management skills.

**Thank you for your attention**

◀ Return