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# **Banking Operational Cost in the Balkan Region under a Quadratic Loss**

## **Function**

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## **Abstract**

This paper presents of theoretical specification of a quadratic loss function based on forward looking rational expectations to model the underlying dynamics of operational performance of the banking industry. As an empirical application we examine the determinants of total operating costs within a dynamic panel analysis in the Balkan region that is the South East Europe (SEE) over the period 1998-2005. Results show that operating performance is positively related to loan quality and the asset size or the bank's market share, whilst the speed of adjustment to the long run operational cost is substantial in magnitude.

*JEL Classification:* D24; G21; L25

*Keywords:* Forward looking rational expectations, banking operating costs.

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## 1. Introduction

This paper examines the dynamic operating performance across banks using a simple concept of operating performance as in Kwan (2003) for the South East Europe (SEE thereafter) banking system. Moreover, we use a multi period forward looking rational expectations specification to measure the speed of adjustment from the optimal level of operational performance. The theoretical specification is based on a quadratic loss function that in turn is used to derive a dynamic panel model.

To this end, it is the first time that operational performance is not seen as a static process, and thus time invariant, but as a dynamic process based on rational expectations. One of main finding of the paper is the estimated slow pace of banking adjustment, providing some insights over the consequences of the low degree of adequate competition in the banking industry in SEE.

The rest of the paper is organized as follows. Section 2 presents the theoretical specification, while Section 3 describes the data used in the analysis and the findings. Finally, some conclusions are offered in Section 4.

## 2. A theoretical specification

The starting point of our analysis is a simple model of operating performance as in Kwan (2003):

$$O_{ct} = \alpha_1 + \Sigma a_2 X_{ct} + \Sigma a_3 Z_{ct} + \varepsilon_t, \quad (1)$$

where  $O_{ct}$  refers to Bank's operational cost, defined as total operating expenses divided by total asset to account for operating cost per unit.  $X_{ct}$  represents balance sheet variables, while  $Z_{ct}$  are external variables common to all banks.

The above model is then augmented by a forward looking rational expectations specification similar to the one found in the optimal money demand literature (see Cuthbertson and Taylor, 1990, Huang and Shen, 2002). Thus, the typical bank is assumed to minimize the conditional expectation of a discounted quadratic loss function ( $L$ ). This objective function takes the form:

$$L = E_t \left\{ \sum_{i=1}^n D^i \left[ \gamma_1 (O_{ct+i} - O_{ct+i}^*)^2 + \gamma_2 (O_{ct+i} - O_{ct+i-1})^2 \right] \right\}, \quad (2)$$

where  $\delta_i$  ( $i=1, 2$ ) are the non-negative adjustment cost coefficients,  $D$  denotes the discount factor less than unity,  $\gamma_1$  represents the disequilibrium parameter, measuring the deviation of actual operating cost  $O_{ct+i}$  at time  $t+i$  from its optimal (long-run equilibrium) value  $O_{ct+i}^*$ , while  $\gamma_2$  counts for the short-run adjustment (transaction) between any two consecutive periods.

Taking a partial derivative of equation (2) with respect to  $O_{ct+i}$  and rearranging gives the following equation for operational costs:

$$O_{ct} = \lambda O_{ct-1} + (1 - \lambda)(1 - D\lambda) \sum_i^n (D\lambda)^j E_t(O_{ct+i}^*), \quad (3)$$

where  $\lambda$  is the stable root of the Euler equation and its value lies between zero and one.

We assume that the long run operating cost is  $C_{ct}^*$  approximates the functional form of the desired operating cost as defined by Kwan (2003). Here, we assume that this functional form follows a simple stochastic process:

$$O_{ct}^* = \zeta O_{ct-1}^* + \varepsilon_t, \quad (4)$$

where  $\varepsilon_t$  is white noise.

The reduced form cost equation on the basis of (3) and (4) can then be expressed as:

$$O_{ct} = OC_{ct}^* + \delta O_{ct-1} + \varepsilon_t, \quad (5)$$

where  $OC_{ct}^*$  is function of  $D$ ,  $\gamma$ , and the parameter of equation (4).

The above equation assists the identification of the underlying dynamic effect as measured by  $\delta$ . In detail,  $\delta$  captures the persistence of operating costs over time, whilst  $1-\delta$  reflects the adjustment speed.

### 3. Data and empirical analysis

The operating performance of the banking industry in the SEE region is of particular importance as financial markets primarily consist of banks that capture the dominant share in financial transactions and they are the principal financial intermediaries for a variety of services. Our sample is derived from Bankscope and consists of banks from the six SEE countries, namely Albania, Bosnia-Herzegovina, Bulgaria, FYR of Macedonia, Romania, and Serbia-Montenegro. The period of the study covers the 1998-2005. Our dataset includes 77 banks over the sample period, which comprises a large portion of banks both in terms of the number of financial institutions operating, but mainly in importance based on the balance sheet aggregates.

The dependent variable is measured as total operating expenses divided by total asset to account for operating cost per unit ( $O_{Ct}$ ). As explanatory variables we include: the loan loss reserves to gross loans ( $LRES$ ), the cash and due from banks to total assets ( $CA$ ), the equity to total assets ( $EQA$ ), the bank's deposits to customer and short-term funding ( $DEP$ ), the loans to total assets ( $LA$ ), and the ratio of domestic credit to the private sector as a percentage of GDP ( $DmCr$ ) (see Berger and DeYoung, 1997). We also include a variable that accounts for the age of the representing bank ( $AGE$ ). To capture any market power related correlation, we use the Herfindahl Index ( $HHI$ ) that in our case is a 5-firm concentration ratio. Apart from the aforementioned bank and market specific factors, we also include one general macroeconomic variable that is an index of productivity. We use country specific dummy variables ( $D$ ) to identify any heterogeneity in operating performance across markets. Lastly, a time trend captures systematic changes in the underlying operating cost structure over time.

Table 1 presents the regression results of Equation (5) with total operating expenses as the dependent variable. The estimation of the above equation follows the GMM method of Arellano and Bond (1993) so as to correct for the existence of endogeneity and possible heterogenous relationship between different Banks. The models fit the data reasonably well, with R-square is 58 per cent.

**Table 1: Regression Estimates of Operating Costs**

<i>LRES</i>	0.048	2.36
<i>CA</i>	0.168	6.1
<i>EQA</i>	0.121	2.68
<i>DEP</i>	-0.023	-1.6
<i>LA</i>	0.216	4.78
<i>AGE</i>	0.078	2.31
<i>DmCr</i>	0.278	5.36
<i>HHI</i>	0.01	0.006
<i>Pro</i>	0.094	1.58
<i>BH</i>	-0.563	-2.29
<i>BUL</i>	-0.090	-0.96
<i>FYROM</i>	-0.712	-2.73
<i>ROM</i>	1.604	3.4
<i>SB</i>	-0.101	-5.48
<i>t</i>	-0.031	-3.59
<i>Con</i>	2.64	1.27

R<sup>2</sup>: 0.58, 1<sup>st</sup> column parameter estimate, 2<sup>nd</sup> t-statistic. Country dummies are: Bosnia-Herzegovina (BH), Bulgaria (BUL), FYR of Macedonia (FYROM), Romania (ROM), and Serbia-Montenegro (SB).

The coefficient of the loan loss reserves ratio (LRES) is positive and statistically significant, consistent with the ‘*bad management*’ or the ‘*bad luck*’ hypothesis (Altunbas et al., 2000, and Akhigbe and McNulty, 2003). The liquidity ratio, that is the cash and due from banks to total assets (CA), is positive and statistically significant, insinuating that although liquid assets reduce bank’s liquidity risk, these assets involve additional operating costs (Altunbas et al., 2000 and Kwan, 2003).

The coefficient of the ratio of equity to assets (EQA), is positive and statistically significant, indicating, in conjunction with the sign of deposits (DEP), that the process of raising equity involves higher costs than raising deposits. The ratio of loans to total assets (LA) is positive and statistically significant, indicating that the costs associated with the credit origination and loan monitoring are quite substantial. On the other hand, the deposit mix variable presents the expected negative sign, though it is not statistically significant. An interesting finding is that the coefficient of the age variable is positive and statistically significant, in line with the *'learning by doing'* hypothesis as identified by Mester (1996) and Akhigbe and McNulty (2003). As found in previous studies (Altunbas et al., 2000, and Akhigbe and McNulty, 2003) the ratio of domestic credit to the private sector as a percentage of GDP (*DmCr*) raises operating costs. The Herfindahl index is statistically significant positive. Regarding the productivity variable (Pro), as expected a positive impact on operating cost is reported, though it is not statistically significant. Overall, the dummy variables indicate that there are substantial differences in the operating cost across SEE countries. The coefficient of the time trend is negative and statistically significant in most cases, indicating that, on average, operating costs among the seven SEE countries follow a downward path from 1998 to 2005; the latter verifies the efforts undertaken to direct the banking sector towards a more efficient structure.

Table 2 present the estimates for  $\delta$ , capturing the persistence of operating costs over time, whilst  $1-\delta$  reflects the adjustment speed. The results show the most of the parameter estimates are statistical significant.

**Table 2. Estimates of Persistence Parameter  $\delta$ .**

No	$\delta$	S.E.	No.	$\delta$	S.E.	No.	$\delta$	S.E.
1	0.200	0.055	27	0.487	0.054	53	0.059	0.041
2	0.438	0.074	28	0.195	0.161	54	0.236	0.219
3	0.384	0.083	29	0.331	0.051	55	0.216	0.027
4	0.457	0.009	30	0.412	0.043	56	0.310	0.024
5	0.516	0.007	31	0.444	0.048	57	0.352	0.092
6	0.453	0.017	32	0.730	0.028	58	0.289	0.064
7	0.381	0.013	33	0.640	0.044	59	0.226	0.065
8	0.580	0.080	34	0.491	0.034	60	0.452	0.045
9	0.454	0.153	35	0.213	0.067	61	0.459	0.159
10	0.224	0.147	36	0.177	0.034	62	0.425	0.049
11	0.343	0.034	37	0.478	0.002	63	0.131	0.127
12	0.662	0.010	38	0.847	0.052	64	0.104	0.023
13	0.655	0.024	39	0.294	0.030	65	0.143	0.023
14	0.504	0.021	40	0.199	0.013	66	0.296	0.026
15	0.120	0.031	41	0.224	0.045	67	0.454	0.056
16	0.153	0.016	42	0.683	0.037	68	0.457	0.037
17	0.179	0.023	43	0.486	0.005	69	0.523	0.007
18	0.076	0.052	44	0.209	0.029	70	0.313	0.065
19	0.175	0.020	45	0.223	0.051	71	0.631	0.031
20	0.184	0.015	46	0.216	0.023	72	0.502	0.013
21	0.204	0.128	47	0.386	0.007	73	0.195	0.056
22	0.240	0.045	48	0.350	0.032	74	0.197	0.057
23	0.263	0.077	49	0.300	0.088	75	0.071	0.073
24	0.140	0.052	50	0.205	0.020	76	0.174	0.007
25	0.191	0.017	51	0.412	0.134	77	0.257	0.020
26	0.318	0.190	52	0.714	0.073	All	0.342	0.051

No indicates the number of bank in the sample,  $\delta$  is the adjustment parameter, and S.E. reports the standard errors.

Note that the parameter estimates of  $\delta$  capture, in effect, the degree of persistence of bank's operating cost over time, and as a result the  $1-\delta$  reports the speed of adjustment to the desired optimal level of operating cost. The results show variability across different banks, though the average speed of adjustment is leaned towards high values. In detail, the range of values for  $\delta$  is from 0.059 to 0.73 with the average value 0.342, implying that the average adjustment speed is 0.66. This value is high and represents a longer persistence of non-optimal operating cost in the banking industry of SEE. In effect, the average bank in SEE is lacking performance as it fails to optimise operating costs quickly over time.

A possible explanation of this finding could be the high capital ratios observed in the SEE banking systems, largely the result of the restructuring plan implemented by the SEE governments to manage insolvency problems. This process of restructuring it appears that comes at a cost in terms of operating performance, a typical characteristic for emerging financial markets. Thus, the sluggish speed of adjustment could be seen as a signal of low degree of exploiting technological advances to curb operating costs. However, one would expect that over time the efficiency loss due to restructuring would fall as market matures, given also the negative value for the time trend.

#### **4. Conclusion**

The paper contributes to the analysis of operating performance of the banking industry. To this end, we present a theoretical specification based on forward looking rational expectations regarding operating performance. We find that the speed of adjustment to optimal operating costs is sluggish in SEE, an area rarely being investigated, over the period 1998-2005. This is a clear sign that banks, on average, could accelerate further the pace of improvement of their operating performance over time.

## References

- Arellano, M. and S. R. Bond. 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies*, 58, 277-297.
- Akhigbe, A. and J.E. McNulty. 2003. The Profit Efficiency of Small US Commercial Banks. *Journal of Banking and Finance*, 27: 307-325.
- Altunbas, Y., M. Liu, P. Molyneux and R. Seth. 2000. Efficiency and Risk in Japanese Banking. *Journal of Banking and Finance*. 24: 1605-1628.
- Berger, A. and R. DeYoung. 1997. Problem Loans and Cost Efficiency in Commercial Banking. *Journal of Banking and Finance*. 21: 849-870.
- Cuthbertson, K. and M.P. Taylor. 1990. Money demand, expectations and the forward-looking model. *Journal of Policy Modelling*. 12, 289-315.
- Huang, T.H. and C.H. Shen. 2002. Seasonal cointegration and cross-equation restrictions on a forward-looking buffer stock model of money demand. *Journal of Econometrics*. 111, 11-46.
- Kwan, S.. 2003. Operating Performance of Banks Among Asian Economies: An International and Time Series Comparison. *Journal of Banking and Finance*. 27: 471-489.
- Mester, L.. 1996. A Study of Bank Efficiency Taking into Account Risk-Preferences. *Journal of Banking and Finance*. 20: 1025-1045.