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Efficiency and stock performance of EU banks: Is there a relationship?

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ABSTRACT

The purpose of this paper is to examine whether the stock performance of EU listed banks is related to their efficiency. Our sample consists of 171 banks operating in 15 EU markets over the period 2002–2006. First, we use stochastic frontier analysis to estimate the cost and profit efficiency of banks, while controlling for environmental factors. Then, we investigate if changes in profit and cost efficiency are reflected in changes in stock prices. Our results indicate that the change in profit efficiency has a positive and significant impact on stocks prices; however, there is no relationship between changes in cost efficiency and stock returns.

1. Introduction

Over the last decades, a number of studies have examined the efficiency of banks using parametric and non-parametric techniques. A major part of this literature is dedicated in analyzing the banking performance in domestic markets (e.g. Berger and Humphrey [1], Drake [2], Lozano-Vivas [3]), while some recent studies provide cross country evidence (e.g. Maudos et al. [4], Delis and Papanikolaou [5]). Furthermore, irrespective of the geographical coverage, these studies examine various issues such as the impact of environmental conditions (e.g. Lozano-Vivas et al. [6], Avkiran [7]), the impact of risk (e.g. Altunbas et al. [8]), off-balance sheet activities (e.g. Pasiouras [9]), different techniques for the construction of the frontiers (e.g. Weill, [10]), and efficiency at a branch level (e.g. Camanho and Dyson, [11]; Das et al., [12]).

However, as Beccalli et al. [13] point out, despite the rich literature on bank efficiency, there have been only a few studies that attempt to link the efficiency of banks to their stock performance. This is surprising, since the studies on stock market behavior indicate that there is a link between stock prices and earnings (see Kothari [14] for a review of the literature). Considering the argument that efficiency estimates derived from frontier techniques are superior to traditional accounting ratios in assessing the performance of banks [15–17] it would be interesting to examine whether such information is incorporated in stock returns.

Stock returns denote the measure if banks are creating value for shareholders or not. It may be expected that lower cost or higher profit result to higher return for stock performance, even though the extent of stock performance change may not incorporate the extent of earning changes. An increase of the profitability and/or a decrease of the cost generate expectations to the investors for better future financial results and respectively, for higher stock prices and earnings. In our assignment, the main objective is to study whether cost and profit efficiency reflect the price formation process.

So far our knowledge is limited to evidence from a few studies that examine individual countries such as Spain [18], Singapore [19], US [20], Australia [21], and Greece [22], as well as the cross-country study of Beccalli et al. [13] that examines the five principal EU banking sectors (i.e. France, Germany, Italy, Spain and UK). These studies estimate mainly technical and/or cost efficiency measures and tend to document a positive relationship with stock returns.

In the present study, we aim to add to this body of the literature by providing evidence from 15 EU countries. The selection of the aforementioned countries was based on the homogeneity of their economic environmental while the stock markets in EU of 15 are more developed in relation to the other European countries, which are characterized as emerging markets. Obviously, from the above studies, we differentiate our paper in three important respects. First, we extend the analysis to cover other EU countries. It is likely that differences between the principal and smaller banking sectors will yield interesting results. Second, we consider a longer time period as we examine stock returns over four years. In relation to this, it is also important to highlight that Beccalli et al. [13] examine stock returns over 2000, a rather problematic period due to the bullish

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market in the first months and the sharp decrease in the following months. In contrast, the period that we examine (2003–2006) was more stable. The third and probably most important difference is that we examine both profit and cost efficiency[1]. It seems that profitability is the key underlying factor that drives stock performance. This is not surprising as shareholders are rather conscious for the profits of a firm rather than its costs, as the dividends that they receive depend on the firm's earnings. In a study that examines the relationship between various traditional performance measures and stock returns in the US, Chan et al. [23] argue that one drawback of sales per share is that it may have little relation to underlying profitability. Therefore, if investors focus on profitability, sales will not measure the variation in financial performance that they perceive to be a key driver of future dividends. Obviously, by interpolation we can make a similar argument about cost and profit efficiency. Our approach is consistent with studies that use traditional accounting measures of performance and focus on earnings driven measures such as operating or net income (e.g. Chan et al. [23], Chen and Zhang [24]) rather than expenses.

The rest of the paper is structured as follows. Section 2 presents our data and methodology. Section 3 discusses the empirical results. Section 4 concludes the study.

2. Description of methodology and data

2.1. Methodology

The efficiency estimates in this study have been obtained using the stochastic frontier approach (SFA). The main argument for the SFA over the non-parametric techniques, such as data envelopment analysis (DEA), lies to the fact that it allows for a random error, which accounts for measurement errors and other random factors in the estimation of efficiency [25]. The innovation concerning the introduction of the composed error was first proposed by Aigner, Lovell and Schmidt [26] and Meeusen and van den Broeck [27]. In our case SFA is preffered than DEA because the model of Battese and Coelli [28] allows for exogenous effects in a single frontier.

The model employed in this paper is the one of Battese and Coelli [28] which permits the estimation of efficiency in a single stage while accounting for the impact of environmental variables.[2] In its general form, the cost model can be expressed as follows:

$$C_{it} = C(q_{i,t}, p_{i,t}; \beta) + (V_{it} + U_{it}), \quad i = 1, 2, \ldots, N, \quad t = 1, 2, \ldots, T$$

where C_{it} is the total cost of the i-th firm in the t-th period, q_{it}, a vector of output quantities of the i-th firm in the t-th period, $p_{i,t}$ stands for a vector of input prices, β is a vector of unknown parameters, while V_i stands for the random variables which are assumed independent and identically distributed, with mean zero and constant variance and independent of the U_{it} which are non-negative random variables. The latter are independently distributed as truncations at zero of the $N(m_{it}, \sigma_U^2)$ distribution, where the mean, m_{it}, is assigned as $m_{it} = z_{it}\delta$, where z_{it} is a vector of variances that affect the efficiency of the i-th firm in the t-th period, and δ is the vector with the parameters to be estimated. This stochastic frontier model incorporates the calculation of measurement error and statistical noise using maximum likelihood methods.

Furthermore, we estimate an alternative profit efficiency model. The alternative profit function assumes closer presentation of reality (e.g. unmeasured quality differences in the banking service) while the standard profit function accepts perfect competition for the markets (see Berger and Mester [30]).

In the construction of the profit efficiency model we replace total cost by profit before taxes (PBT) and change the sign of the inefficient term (i.e. $-u_{it}$), while input prices and outputs remain the same. Thus, the equation in its general form will be the following:

$$P_{it} = P(q_{i,t}, p_{i,t}; \beta) + (V_{it} - U_{it}), \quad i = 1, 2, \ldots, N, \quad t = 1, 2, \ldots, T,$$

where P_{it} is the profit before tax of the i-th firm in the t-th period.

Stock performance is calculated on the basis of monthly returns[3] using the following equation, where CASR stands for cumulative annual stock returns:

$$\text{CASR in year } t = ((1 + \text{month 1 return}) * (1 + \text{month 2 return}) * \ldots * (1 + \text{month 12 return})) - 1$$

After estimating the efficiency scores,[4] the stock returns are regressed against the annual change in efficiency so that to examine whether stock prices reflect changes in profit and cost efficiency.

2.2. Parameter and model determination

For the assessment of banks' efficiency we estimate the cost frontier and the profit frontier model using a translog function. In both specifications, we use three outputs: total customer loans (Q_1), other earning assets (Q_2) and non-interest income[5] (Q_3). The input prices refer to the cost of deposits (P_1), which denotes the ratio of interest expenses to deposits and short term funding; the price of capital (P_2), which corresponds to the ratio of non-personnel expenses divided by the fixed assets and finally the price of labor (P_3) calculated by the ratio personnel expenses to total assets. Thus, we follow the intermediation approach, as in the studies of Bos and Kolari [31], Fries and Taci [32], Lozano-Vivas and Pasiouras [33] among several others.

The translog function in the case of the cost efficiency takes the following form:

$$\begin{aligned}
\ln\frac{TC}{P3} &= \beta_0 + \beta_1 \ln(Q1) + \beta_2 \ln(Q2) + \beta_3 \ln(Q3) + \beta_4 \ln\left(\frac{P1}{P3}\right) \\
&+ \beta_5 \ln\left(\frac{P2}{P3}\right) + \beta_6 \frac{1}{2}(\ln(Q1))^2 + \beta_7 \ln(Q1)\ln(Q2) \\
&+ \beta_8 \ln(Q1)\ln(Q3) + \beta_9 \frac{1}{2}(\ln(Q2))^2 + \beta_{10} \ln(Q2)\ln(Q3) \\
&+ \beta_{11} \frac{1}{2}(\ln(Q3))^2 + \beta_{12} \frac{1}{2}\left(\ln\left(\frac{P1}{P3}\right)\right)^2 + \beta_{13} \ln\left(\frac{P1}{P3}\right)\ln\left(\frac{P2}{P3}\right) \\
&+ \beta_{14} \frac{1}{2}\left(\ln\left(\frac{P2}{P3}\right)\right)^2 + \beta_{15} \ln(Q1)\ln\left(\frac{P1}{P3}\right) + \beta_{16} \ln(Q1)\ln\left(\frac{P2}{P3}\right) \\
&+ \beta_{17} \ln(Q2)\ln\left(\frac{P1}{P3}\right) + \beta_{18} \ln(Q2)\ln\left(\frac{P2}{P3}\right) + \beta_{19} \ln(Q3)\ln\left(\frac{P1}{P3}\right) \\
&+ \beta_{20} \ln(Q3)\ln\left(\frac{P2}{P3}\right) + \beta_{21} D1 + \beta_{22} D2 \\
&+ \beta_{23} D3 + \beta_{24} D4 + u_{i,t} + v_{i,t}
\end{aligned}$$

[1] Another study that examines profit efficiency is the one of Kirkwood and Nahm [21] in Australia. Chu and Lim [19] in Singapore and Pasiouras et al. [29] in Greece estimate profit-oriented measures of efficiency by defining expenses as inputs and profits as outcomes. However, in principle these two studies focus on technical efficiency rather than profit efficiency as they do not incorporate information on input and output prices.

[2] See Dietsch and Lozano-Vivas [29] for the importance of accounting for environmental factors during the estimation of efficiency in a cross-country setting.

[3] We use Bankscope Bureau Van Dijk database for stock price information, which publishes monthly stock prices.

[4] The efficiency change in each year is calculated as: Efficiency change in year t=(efficiency score$_t$–efficiency score$_{t-1}$)/efficiency score$_{t-1}$

[5] Non-interest income is comprised by commission, fee, trading and other operating income.