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Comparison and evaluation of bank efficiency in selected countries in EU

Zuzana Svitalkova*

Mendel University Brno, Zemědělská 1, Brno 613 00, Czech Republic

Abstract

The aim of this paper is to measure and compare the efficiency of bank system in selected countries in the EU (Czech Republic, Slovakia, Austria, Poland, Hungary, Slovenia). It is important to know the real state of the bank system and whether there is a place for improvement, or whether banks are already on the production possibility frontier. Detailed knowledge about financial conditions and the economic situation of banks helps to strengthen the financial system and enables better decision making for responsible persons. In this article are used DEA models with undesirable outputs and the result is expressed as a percentage of inefficiency in one indicator (compared in a group of estimated banks).

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Keywords: Bank efficiency; inefficiency indicator; DEA with undesirable output

1. Introduction

Each country should try to build the most advanced banking system, because the better bank system the state has, the more competitive the state is. In current strong competitive financial environment is necessary to work as efficient as possible and do not have unnecessary extra costs. Unfortunately, it can also happen that (in an effort to increase profits) managers can use strategies where the risk is high. Market regulators should therefore try to define rules to control or even decrease the risk.

* Corresponding author.
E-mail address: xsvitalk@node.mendelu.cz
Measuring the level of efficiency of the banking system can help to identify the performance of measured units and if there is some way for the eventual improvement. These measurements may provide valuable information to market regulators and also bank managers for their decision making. Inefficient banks have, in accordance to the article from Fioderlisi, Marques-Ibanez and Molyneux (2010), the tendency to make risky steps, which are dangerous for the entire financial system. Furthermore, the authors found, that banks, reaching the high productivity, operate with lower costs and do not tend to do operations that include moral hazard. Banks with balanced capital structure can afford to make business with higher risk.

There exist standard performance indicators, for example ROA (Return of asset), ROE (Return of equity), ROI (Return of investment) and other finance analysis indicators. All these indicators have a big disadvantage. To evaluate the bank efficiency it is necessary to compare a lot of results. Recently there are two basic methods of efficiency estimation – parametric (econometric) and nonparametric (mathematical programming). In both cases is the measured efficiency compared with the ‘best practice frontier’ in the group of investigated DMUs (Decision making units, in this study is one DMU/one bank).

The most frequently used parametric method is SFA (Stochastic Frontier Analysis). This method has a big disadvantage, that the model must be exactly defined. The DEA (Data Envelopment Analysis) model is a nonparametric method which allows quantification of the efficiency in one number and is formed as a piecewise linear combination of best-practice observations. Nonparametric approach is more suitable for bank efficiency ranking (Kamecka 2010, Apergis 2011, Holod a Lewis 2011, Ševčovič, Halická, Brunovský 2001). Advantage of the DEA model is the identification of sources and level of inefficiency for inefficient DMUs (Stavárek, Řepková 2011). One more advantage is that the technique works without the need for standardization.

Classical DEA models, described in Charms, Cooper, Rhodes (1978) rely on assumption that inputs have to be minimized and outputs maximized (or conversely minimization of outputs and maximization of inputs in the models oriented of inputs). A lot of authors applied this methodology in their articles. Casu, Molyneux (2000) envistigated the bank efficiency in the EU after joining in the EU. Fioderlisy Marques (2010) examined the bank risk and efficiency. Ševčovič, Halická, Brunovský (2001) investigated the level of performance of bank branches in Slovakia, Stavárek, Řepková (2011) estimated the efficiency of Czech banking industry. All these papers used the simply DEA CCR (constant returns to scale) and BCR (variable returns to scale, in other literature also VRS) model. As an undesirable output is in bank accounting considered ‘loan loss provision’. It is the money a bank sets aside to cover potential losses on loans. Because the changes in bank risk may temporary precede a decline in cost efficiency related to higher costs of dealing with non-performing loans, Fioderlisi (2010)
The term input- and output-oriented models relates to the way in which inefficient DMUs are projected onto the efficient frontier. There are three possibilities: input-oriented models try to reduce the input amounts by as much as possible without reducing present output levels. Output-oriented models maximize output levels without increasing inputs. The choice of an input-oriented model implies that banks cannot set their outputs independently and rather respecting the given level of demand for their products. They cannot set the price of their outputs freely: many legislators in the region set strict upper/lower bounds for pricing bank products, particularly those offered to consumers. In the model banks cannot also completely decide the price of inputs independently, Kamecka (2010).

In the article are explored 6 states of European Union: Czech Republic, Slovak Republic, Hungary, Poland, Slovenia and Austria. These states are historically and economical close connected and cooperate together in a lot of fields (culture, trade, internal security, defence, science and education, strengthening the region).

These chosen CEE counties had similar problems due to communist past: inherited ban loans from this time, lack of experience in commercial banking, rapidly growing number of banks, privatization of state-owned banks, entry of foreign banks, freeing of interest rates, changes in legislation, establishing of prudential legislation and supervision, Pančurová, Lyocsa (2013). Despite of these difficulties have in this time rather developed universal banking system. In Austria exist a lot of small banks and Austria has one of the densest bank networks in the world. This fact lead Austrian banks in the last years to the establishment the bank branches and subsidiaries in other states, especially in CEE countries so the bank systems in CEE countries and Austria are very close connected. The main joining is made by Erste Group, Raiffeisen Bank and Bank Austria. Austrian banks business strategies concentrate on a sustainable business model in Central and Eastern Europe with the overall goal to create value for shareholders, Winkler, Haiss (2011).
1.1. Short description of bank systems in selected states

1.1.1. Czech Republic

The Czech economy is for various reasons (tradition, under-development of the capital market, political hesitation with pension reform, etc.) dependent on bank financing much more than in Western Europe. The banking sector in the Czech Republic is largely foreign-owned (more than 95% of all assets are controlled by parent banks in developed countries, in particular in the EU). The bank system is created of 44 commercial banks, 5 building saving bank (with a specialised banking licence) and 21 branches of foreign banks. In general, the structure of the banking sector is relatively stable from a long-term perspective. Four ‘large banks’ manage approximately 57.5% of all assets. Their market share, however, is slowly declining due to relatively strong competition from small and medium-sized banks. The number of employees in Czech banks is over 40 000.

1.1.2. Slovak Republic

The beginning of economic transformation in Slovakia relates to the former Czech-Slovak federation. Today, on the market are 13 bank (joint stock companies) and 14 branches of foreign credit institutions. The most of them have the universal banking licence. The size of Slovak banking system is rather small and influenced by largest banks. Because of privatization in 1990’s are most of the banks a member of an international banking group (Erste, Intesa, Sanpaolo, KBC, RZB UniCredit, etc.). Foreign capital owns more than 90% of Slovak banking assets.

1.1.3. Hungary

Hungary has one of the smallest bank systems in the EU with a big bank concentration. Legislation in Hungary allows that universal entitling and licensed banks can provide a full range of securities transactions, including trade in stocks and publicly placed corporate bonds. As the Hungarian banking system continues to develop (especially after the joining to the EU in 2004), new types of credit and financial institutions are entering to the market, including mortgage banks and home-savings institutions.

1.1.4. Poland

Poland has the largest banking industry out of the V4 countries. Growing economy with rising credit demand makes Poland a favourable destination for investment in the banking sector. The banking system is focused on domestic business and plays an important role in financing private households, SMEs, big infrastructure projects and project financing. Polish banking sector is owned by foreign-owned institutions (70%). Low penetration of banking services makes Poland an attractive destination for capturing the market. The Polish banking system is showing resilience and has avoided serious problems during financial crisis.

1.1.5. Slovenia

The banking sector in Slovenia remains not so good develop. Slovenian banks have rather strong capital bases and robust loan portfolios. In many cases, however, banks are limited to a narrow range of traditional activities and have yet to engage in new consumer services, investment banking, and management of more complex financial instruments. Nevertheless, the financial statements of Slovenian banks are in compliance with international standards and audited by international auditors. Because of the relative immaturity of the banking sector, identifying financing for domestic projects can be problematic. Slovenia has taken some important steps to liberalize its financial markets.

1.1.6. Austria

Austria has a highly developed banking sector. The banking sector can be divided into 7 subsectors (joint stock banks and private banks, savings banks, state mortgage banks, Raiffeisen credit cooperatives, Volksbanken credit cooperatives, building and loan associations and special purpose banks). The biggest sectors are the joint stock banks and private banks, the Raiffeisen credit cooperatives and the savings banks. The Austrian banks have a lot of branches and subsidiaries in Central and Eastern Europe (CEE), because Austrian banks are facing there only relatively small risks and earn high profits. The Austrian Banking Sector generally displays solid numbers regarding
regulatory capital, the cost-to-income ratio, the return on equity, as well as profits before taxes. The costs to pay for the effects of the crisis are € 500 million.†

In the Table 1 below are mentioned some bank system characteristics and macroeconomic and bank sector indicators of estimated states. On the first view is visible that the structure of bank sector is not the same. In Poland and Austria are a lot of credit institutions and number of branches and in other states exist not so many credit institutions. These lands had the similar history and starting position after the communist times. They made till now a lot of steps and improvements for betterment the bank system. This article estimates, how efficient are the states in 2004–2011 and where are efficiency gaps.

Table 1. Key banking sector indicators [European Banking Federation]

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>Poland</th>
<th>Czech Republic</th>
<th>Austria</th>
<th>Slovakia</th>
<th>Slovenia</th>
<th>Hungary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of credit institutions</td>
<td></td>
<td>700</td>
<td>58</td>
<td>766</td>
<td>31</td>
<td>25</td>
<td>189</td>
</tr>
<tr>
<td>Number of branches</td>
<td></td>
<td>14 611</td>
<td>2 070</td>
<td>4 461</td>
<td>1 051</td>
<td>690</td>
<td>3 460</td>
</tr>
<tr>
<td>Number of bank staff</td>
<td></td>
<td>186 331</td>
<td>39 461</td>
<td>78 085</td>
<td>18 452</td>
<td>11 813</td>
<td>41 305</td>
</tr>
<tr>
<td>Total Assets (mil. €)</td>
<td></td>
<td>309 803</td>
<td>180 395</td>
<td>1 010 385</td>
<td>58 025</td>
<td>52 350</td>
<td>114 924</td>
</tr>
<tr>
<td>Total loans (mil. €)</td>
<td></td>
<td>217 025</td>
<td>106 739</td>
<td>609 754</td>
<td>38 388</td>
<td>38 361</td>
<td>74 143</td>
</tr>
<tr>
<td>Total deposits (mil. €)</td>
<td></td>
<td>190 180</td>
<td>122 308</td>
<td>545 905</td>
<td>42 161</td>
<td>37 938</td>
<td>56 762</td>
</tr>
<tr>
<td>Capital and reserves (mil. €)</td>
<td></td>
<td>40 686</td>
<td>19 711</td>
<td>89 051</td>
<td>7 863</td>
<td>4 111</td>
<td>8 859</td>
</tr>
<tr>
<td>Loan to deposit ratio (%)</td>
<td></td>
<td>121.90</td>
<td>92.40</td>
<td>118.60</td>
<td>93.10</td>
<td>154.67</td>
<td>161.77</td>
</tr>
<tr>
<td>ROE (%)</td>
<td></td>
<td>12.32</td>
<td>13.67</td>
<td>1.47</td>
<td>11.08</td>
<td>−11.10</td>
<td>−7.89</td>
</tr>
<tr>
<td>Population</td>
<td></td>
<td>38 200 037</td>
<td>10 532 770</td>
<td>8 404 252</td>
<td>5 435 273</td>
<td>2 050 189</td>
<td>9 985 722</td>
</tr>
</tbody>
</table>

2. Methods and resources

The dataset was obtained from Bankscope – Bureau van Dijk database. From both states were selected 8–12 biggest banks according to total assets. Estimated dataset comprises approximately 75–80 % of the whole market.

In traditional DEA models (CCR, BCR) the main objective is to maximize outputs or inputs (depends on the type of the model). The simple models ignore the undesirable outputs. But it is necessary to decrease these ‘bad outputs’ and increase the desirable outputs to improve the performance of DMU.

There are different methods, how to incorporate undesirable outputs into the DEA model. Indirect approaches transform the values of the undesirable output variables by a monotone decreasing function so that they can be included in the model along with the desirable outputs in the technology set T and are maximized. In this way, by maximizing the transformed values, the original undesirable output values are minimized. Direct approaches on the other hand include the undesirable output data directly into the DEA model but instead modify the assumptions of the model in order to consider the undesirable outputs appropriately, Triantis, Hoopes, Koelling, (2002)

In model are n DMUs (banks) which are evaluated, indexed by j = 1,...,n

The input and output vectors of DMUj is Xj = (xij, ..., xij) and Yj = (yij, ..., yij)

In this article is used the indirect approach, it means the transformation of undesirable outputs (we set as variable d, the constant for recalculating the undesirable outputs to plus sign values: di = maxj(yij) + 1).

ψg = ψg + d, i ∈ UO

ψg...transformed undesirable outputs; UO... undesirable outputs, DO...desirable outputs, I...inputs

The undesirable outputs are positive now, we can consider them as normal outputs and it is possible to maximize them.

† Source: European Banking Federation, Knowyourcountry
\[ T = \{ (X, Y) \mid X \geq \sum_{j=1}^{n} \lambda_j X_j, Y \leq \sum_{j=1}^{n} \lambda_j Y_j, \lambda_j \geq 0, j = 1, \ldots, n \} \]  

(2)

\[
\text{Max} \quad g = \theta_q - \varepsilon \left( \sum_{i=1}^{m} s_i^- + \sum_{i=1}^{mDO} s_i^+ + \sum_{i=1}^{mUO} s_i^+ \right)
\]

(3)

\[ \lambda = \text{intensity variables that form linear combinations of observed inputs and outputs with variable return to scale imposed by the constant:} \sum_{j=1}^{n} \lambda_j = 1; \]

\[ \theta_q \quad \text{… degree of efficiency of virtual unit (the system looks for the combination of virtual inputs and outputs which are better or worse than the inputs and outputs of estimated Unit);} \]

\[ s_i^+, s_i^- \quad \text{… slacks (distance from production possibility frontier);} \]

\[ \varepsilon \quad \text{… infinitesimal constant which ensures inclusion of all inputs and outputs to the model at least in this value, it is usually} 10^{-8} \]

The DMU is efficient if \((x, y) \in T\). In this situation no less or any more input can produce the same output or if the same input can produce no more any single outputs. (Fukuyama, Weber 2009)

Constrain:

\[
\sum_{j=1}^{n} \lambda_j x_i + s_i^- = x_i, i \in I
\]  

(4)

\[
\sum_{j=1}^{n} \lambda_j y_i - s_i^+ = \theta_q y_i, i \in DO
\]  

(5)

\[
\sum_{j=1}^{n} \lambda_j y_i - s_i^+ = \phi_q y_i, i \in UO
\]  

(6)

\[ \lambda_j \geq 0, s_i^+ \geq 0, s_i^- \geq 0 \]  

(7)

\[ \text{VRS}: \sum_{j=1}^{n} \lambda_j = 1 \]  

(8)

\[ \text{CRS}: \sum_{j=1}^{n} \lambda_j - \text{free} \]  

(9)

Efficient units have the efficiency = 1. The units with higher level of measured efficiency are not effective and have to improve the inputs, desirable outputs and undesirable outputs in this way:

\[ x_i = x_i - s_i^+, i \in I; \]  

(10)

\[ y_i = \Phi_q y_i + s_i^+, i \in DO \]  

(11)

\[ y_i = d_i - (\Phi_q y_i + s_i^+), i \in UO \]  

(12)

All symbols with * are the vectors of optimal values of the models.

The paper focuses only on commercial banks. Other specialized banks (central banks, investment banks, securities houses, multilateral government banks, non-banking credit institutions, specialized financial institutions…) were not included in this study. As inputs were selected: personnel costs, deposits, fixed assets and as outputs net interest revenue, loans and as an undesirable output loan loss provision. All data were used from unconsolidated financial statements, annual periodicity.

All data were adjusted for inflation (2005 = 100 %). For conversion of results in national currencies were used the exchange rates from 31.12.20XX. Selected period was 2004–2011. In the year 2004 the Bank for International Settlements introduced the regulation Basel II. All financial institution had to gradually adjust its financial statements, information and accounting systems and methodology according this rule. Basel II went into effect in 2008.

3. Results and discussion

Comparison of efficiency between the bank system of V4 countries, Slovenia and Austria is displayed in Figure 1. The efficient units have the score 100 % and the inefficient units have the score 0 %.
In the year 2004, the starting efficiency rate position of the banking systems in all estimated countries differ a lot. According to the CCR model the most efficient system is in Hungary with the level of 60 %. Also in the CCR model with undesirable output achieved Hungary the best efficiency rate which increased in 2007 and went down in the next estimated years. The second best rates achieved the Austrian bank system which also slightly rose in 2007 and after that deteriorated according to the CCR model and according to the CCR model with undesirable outputs expanded again in 2010. The worse situation is in Poland and Slovakia. According to the CCR model is the efficiency in Slovakia only 36 % and in Poland only 28 %. In Slovakia is interesting, how big impact has the undesirable output on bank sector efficiency. In Czech Republic and Slovenia is the efficiency rate nearly the same in 2004. If we compare the performance in CCR model and the CCR model with undesirable output, there is a visible efficiency contraction in all states but in the model with undesirable output is in both states a significant growth and Czech Republic has the best efficiency in the years 2009–2011. The undesirable output loan loss provision has an important impact on achieved efficiency in all years and all estimated states.

In Hungary, there was a decline of bank system performance mostly in all years. Despite of a good level of GDP (4 %) and growing exports in 2004 and 2005, the efficiency declined. Bank profits were influenced because of the restrictive fiscal politics and the impacts of domestic household consumption. Manufacturing industry cancelled a lot of employee. Because of easing lending standards and because of that new loans improved the bank profits. Nevertheless these income wasn’t enough for improving the efficiency compared to other states. All banks faced a big credit and market risk. The loans rose in a huge tempo and most of them were in other than domestic currency. In the model with undesirable output, we can see a big improvement of efficiency in 2007. Hungary had a lot of new loans and because of good collaterals (new houses) didn’t have problems with non-performing loans and loan loss provisions. Increasing energy-, oil- and food prices and the apparent financial crisis deteriorated the efficiency of Hungarian system in the next years. Hungary had to face a big problem with foreign currency loans, decreasing housing prices, lack of liquidity and in 2008, the IMF and World Bank provided a liquidity injection of 20bil. €. Despite this fact deteriorated the efficiency seriously according to the both CRS models in the last estimated years.

Because of historical reasons, Austria has one of the most developed bank system in the EU. The accelerating economic situation in Austria in the first half of 2004 was driven primarily by exports, while investment activity and consumer spending rose at a subdued pace. The decision to invest to CEE countries was really a very good step for Austrian banks. Banking markets in CEE benefit from strong demand for banking products. The subsidiaries in CEE generated 40 % of operating incomes parent companies in 2004. The increasing energy and oil prices and not sufficient domestic demand decreased the efficiency of Austrian bank system in the next year. Favourable economic environment in 2006 and 2007 caused a reduction of non-performing loans in Austria and had a very positive effect, according to the CRS model with undesirable output. In the course of the year 2008, sustained financial turmoil worldwide led to a downward revision of the economic outlook for both industrialized and CEE countries. These imbalances and, in some countries, also the relatively large share of domestic foreign currency loans have
contributed to a further increase in both interest rate and exchange rate risks, which have already partly materialized. Financing via quoted shares almost dried up, and growth in bond-based financing slowed from a high level.

When Slovenia joined the EU on 1 May 2004 became also a member of the economic and monetary union. The sustained disinflation trends allowed the Bank of Slovenia to cut nominal interest rates while leaving real interest rates positive in the first half of the year. The priority number one was to entry to ERM II. The banking system efficiency was about 38% and increased slightly in the next year because of the big effort of Slovenia to have good results before entry to ERM II and because of export growth. In 2005 increased the salaries of employee and the interest rates (that’s why were the most of new loans in foreign currency), which negatively influenced the efficiency. In we compare the CCR model and the CCR model with undesirable outputs, the efficiency increased in the next years according to the model with undesirable output. The reason is the drop in loan loss provisions. The differences between the two models are in some years also 20%. In 2009, Slovenia received the liquidity injection from ECB. The profits also deteriorated in the last estimated years and the non-performing loans increased.

The starting position of Czech banking sector was in the average scale of efficiency. Czech banks were in the process of privatising large banks and clearing their balance sheets of bad debts by transfer and sale to transformation institutions, which took several years. Mergers occurred liquidations of businesses. The Czech Republic’s ratio of total banking sector assets to GDP is at 99.8%, very high by comparison with other new CEE member states of the EU. This is a sign of a relatively developed banking sector, although this ratio for the Czech Republic is also decreasing. Development of ever more sophisticated products, services, sales channels and internal banking processes increased the efficiency in the next years. Deterioration came in 2010. During the financial crisis was the situation in the Czech financial market has generally stabilised, although low liquidity, weak activity and higher volatility persist in the money market. The deterioration of Czech banking system performance in 2010 and 2011 was caused of recession associated with the collapse of some large debtors, losses from securities holdings in the event of renewed financial market turmoil (e.g. due to restructuring of the sovereign debt of some over-indebted euro area countries), potential liquidity problems in the building society sector and the impact of new regulatory initiatives, mainly indirectly via links to parent companies abroad. If we concentrate on the CCR model with undesirable outputs, we can see a huge efficiency improvement of efficiency compared to other estimated states. Czech banking sector had also during the crisis sufficient capital and remains highly profitable banks. It was the main source of Austrian bank profits on consolidated bases till today.

The favourable economic environment influenced the Slovak banking sector in 2004. This applies both to external factors, such as growth in the global economy and continuing positive development in banking groups across the EU, and to domestic factors, in particular the Slovak Republic’s macro-economic development. The effect of Slovakia’s accession to the EU was not greatly apparent in Slovak banks’ business. The fears of some banks as regards greater competitive pressure were not confirmed. From the aspect of regulation banks are at various stages of preparation for implementing the New Basel Capital Accord. Nevertheless according to the CCR model the efficiency deteriorated the next years. On the other hand the efficiency rapidly increased according to the CCR model with undesirable output. The loan loss provision compared to other estimated states was on a very low level and the banking sector wasn’t affected. The financial sector reported in the next years further growth, and increase in profitability. The direct impact on financial markets sector stability was moderate. The reason is the relatively strong link to domestic economy and the fact that the share of bank’s activities related to foreign countries was negligible.

Poland had the lowest bank efficiency in all estimated years and in both used models, only about 22–28% in CCR model and 15–40% in CCR model with undesirable output. The main reason is the loan quality and not a well-developed payment system in beginning of measured years and the lack of fiscal and systemic reform policies. The high level of current earnings means that companies had no need to take out new loans, being able to fund investment and ongoing operations internally. One of the reasons of bank inefficiency are nominal wages, their growth was limited due to the maintenance of high unemployment. In Poland, there is a high demand for bank loans. The bulk of credit was granted to households. The big risk for the future is that 57% of total new loans were in foreign currency. Capital adequacy ratio was quite stable, at around 13–14%. The Polish banking sector may still be considered as a promising growth market. Most Polish banks entered the financial crisis with relatively healthy fundamentals.
According to the VRS models which describe more real the economic environment had the Hungarian bank system the best efficiency score, about 90% in the VRS model and 86% in VRS model with undesirable output. Nevertheless the performance declines seriously all the time and in 2011 has Hungary the second (in the VRS model third) worse efficiency. The second best result had Austria. Austrian efficiency rate is in all models (CCR and VRS with and without undesirable output) similar. Good starting position and that a peak in 2007 and decline of efficiency all the next years. Austria has these good results because of profits of branches in CEE countries and in 2011 has together with Czech Republic the same efficiency level, 78% or 82% – according to the used VRS model. The starting position of Czech banking sector was pretty low, only 62% in the VRS model and nearly 60% in the model with undesirable output. Because of successful bank privatization and positive banking sector results is Czech Republic the most efficient state. Surprisingly, the Poland doesn’t have the worse results in these VRS models. The performance of Poland banking sector is improving and in 2011 in the VRS model with undesirable output achieved nearly the same rate as the two best states. The results according to CCR models underestimate performance for not constant returns to scale. That’s why we used both models to avoid an error in performance evaluation. Slovak banking sector performance started at 56% (VRS model) and 52% (VRS model with undesirable output) level. It is one of the two worst results of estimated countries. According to models with undesirable output improves the efficiency of Slovak bank sector since 2005 and according to the models without undesirable output the efficiency declines and in 2009 starts raise. Slovenia’s efficiency begins in 2004 together with Czech Republic, Slovakia and Poland on the nearly same efficiency level in VRS model, nevertheless in deteriorated at about 15% and in the model with undesirable output and fluctuated the efficiency about 55–66%.

The Table 2 shows the units which have the efficiency score 100% so they are effective according to the VRS model with used inputs and outputs. As we could see in the Figure 2 the most efficient bank system had Austria. It confirms also the number of efficient units in the Table 2. In Austria were every year 4–7 units with the efficiency 100%. But we can’t forget that Austria has a good efficiency because of profits from CEE countries. The second
and third most effective states were according to the VRS model with undesirable output Hungary and Czech Republic. Hungary had in the years 2004–2009 more efficient units as in the last measured years. It is visible also in Figure 2, where the efficiency rate decreases. In the case of Czech Republic is the situation exactly opposite, the first years 2004–2007 doesn’t have Czech Republic so many effective units and in the years 2008–2011 has the banking system more units with the rate 100 %, so the efficiency improved during the time. Although the efficiency rate of Slovakia looks not very successful in the Figure 2 the banking system had more efficient units than Poland, which has the efficiency rate much higher. The reason is that Slovakia has more efficient units but the other estimated banks are not so effective. In the average is the efficiency rate not so performing. Poland in the other way has not so many effective units but the other estimated units have the efficiency higher, nearly 100 % that’s why has in the Figure 2 better performance. The worse of all estimated states has Slovenia and it shows the Figure 2 and also the Table 2 with efficient units.

If we concentrate on 100 % efficient unit we can mention that the these units are usually the specialized bank on some business – mortgage banks or small bank which choose only the business which fits them from the whole segment and from which they have the most profit. The universal banks which offer a huge variety of services and products to clients have usually also higher costs connected with better IT systems, training of staff for all the products, higher number of staff and buildings.

Table 3. The reasons of the inefficiency of all countries in all periods

<table>
<thead>
<tr>
<th></th>
<th>All periods</th>
<th>Inputs</th>
<th>Outputs</th>
<th>net interest revenue</th>
<th>LLP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>personnel costs</td>
<td>fixed assets</td>
<td>deposits</td>
<td>loans</td>
</tr>
<tr>
<td>CZ</td>
<td></td>
<td>-3.82 %</td>
<td>-9.13 %</td>
<td>-3.86 %</td>
<td>11.09 %</td>
</tr>
<tr>
<td>SK</td>
<td></td>
<td>-6.67 %</td>
<td>-35.52 %</td>
<td>-8.08 %</td>
<td>75.64 %</td>
</tr>
<tr>
<td>HU</td>
<td></td>
<td>-4.58 %</td>
<td>-17.11 %</td>
<td>-2.05 %</td>
<td>27.81 %</td>
</tr>
<tr>
<td>PL</td>
<td></td>
<td>-17.53 %</td>
<td>-8.94 %</td>
<td>-4.39 %</td>
<td>17.63 %</td>
</tr>
<tr>
<td>SI</td>
<td></td>
<td>-7.12 %</td>
<td>-33.95 %</td>
<td>4.26 %</td>
<td>64.58 %</td>
</tr>
<tr>
<td>AT</td>
<td></td>
<td>-0.11 %</td>
<td>-2.43 %</td>
<td>-2.44 %</td>
<td>0.89 %</td>
</tr>
</tbody>
</table>

In the Table 3 we can see the reasons of inefficiency. The numbers are counted for all periods and for all states. These are the distances between efficiency frontier and the measured unit. The farther the distance between efficiency frontier and measured unit, the more inefficient the measured unit is. Czech Republic has the most source of inefficiency in loan loss provisions, but compared to other states is the score in the correct range. Slovakia has problems with more inefficiency factors. The biggest problem are loans which should be 75.64 % higher, the big problem are also loan loss provisions which should be 73.34 % smaller. Banks in Slovakia own also much more fixed assets than necessary. The big banks are typical for a huge range of branch offices. Hungarian and Polish bank systems have also very high number of loan loss provisions. In Slovenia is the main source of bad performance the number of loans, the banks should increase loans and net interest revenue and decrease loan loss provisions. Austria surprisingly has the most efficient banks as we saw in the Figures 1 and 2 above and also the Table 3 proves this fact.

Generally the banks in all states should concentrate on the growth of loans, but they have to create well the conditions for lending not to increase the loan loss provisions. They should also estimate their fixed assets if is really necessary to own all the buildings and other tangible assets and consider if is there other possibility for using these assets, leasing etc. The personnel costs are not so big problem only Poland has quite higher score. The main challenge for decreasing these costs is to decrease the salaries of managers but it is the very complicated topic. Surprisingly also owing a lot of deposits is not very good because of often not used free liquidity buffer.

4. Conclusion

The aim of this paper was to estimate the level of bank efficiency in the V4 countries, Slovenia and Austria in the period 2004–2011 and to compare them and find the most important sources of inefficiency. For the survey were
used two models: CCR and VRS without and with undesirable output. As an undesirable output was chosen ‘loan loss provision’. As inputs were selected personnel costs, deposits and fixed assets, as outputs loans, net interest revenue. In the survey were covered every year 8–12 biggest banks in every country (chosen according to the total assets), which account for about 80% of the whole market in estimated states. According to both models the best performance had Austrian and Czech banking sector. It proves also the number of efficient units and the slacks between the efficiency frontier and measured unit. The systems in Slovenia and Slovakia had the worst performance of measured counties. Poland was according to the CCR models also one of the most inefficient countries but according to the VRS model reached the average values of efficiency. The main source of inefficiency was in all states not enough supplied loans and a large number of loan loss provisions. That is also the reason why were the result in the model with and without undesirable output so considerable. Thus proves how important in the undesirable output in the model, especially because of a lot of problems with liquidity and non-performing loans in the last economic crisis.

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