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COST EFFICIENCY OF THE GERMAN BANKING SECTOR

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MAKALE BİLGİSİ

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ÖZET

Almanya'da bankacılık sektörünün 2015-2018 yılları arasındaki maliyet etkinliğini değerlendirmek için bu çalışmada stokastik sınır analizi (SFA) ve iki alternatif X-verimlilik modeli kullanılmıştır. Araştırmanın sonuçları, Alman bankalarının ortalama maliyet etkinliğini göstermektedir. Bankaların etkinliği %57 ile %96 arasında değişmektedir ve her büyüklükteki banka için araştırma periyodu süresince değişmektedir. Ülkenin en önde gelen finansal kurumlarının çoğunun etkinlik dereceleri ulusal ortalamanın üzerinde olmasına rağmen, bir bankanın büyüklüğü ile etkinlik düzeyi arasında doğrudan bir ilişki yoktur. Buna ek olarak, Almanya'daki bankacılık sektörü genellikle ölçek ekonomilerinden yararlanmaktadır. Analiz sonuçları, genel etkinlik açısından, ülkenin batısında yer alan Alman bankalarının ülkenin doğusunda yer alan bankalardan daha üstün olduğunu göstermektedir.

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ABSTRACT

The stochastic frontier analysis (SFA) and two alternative X-efficiency models are used in this paper in order to assess the cost efficiency of the banking sector in Germany between the years 2015 and 2018. The research's results indicate that German Banks' average cost efficiency may range from 57 to 96% and that it changes over time for banks of all sizes. There is no direct correlation between the size of a bank and its level of efficiency, even though the majority of the nation's most prominent financial institutions have efficiency ratings that are higher than the national average. In addition to this, the banking sector in Germany generally benefits from economies of scale. The results of the analysis show that in terms of overall efficiency, German Banks that are situated in the western part of the country are superior to those that are located in the eastern part of the country.

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1. INTRODUCTION

The German banking sector has consistently garnered significant attention. Comprising three fundamental components, namely private commercial banks, public sector banks, and cooperative banks, this system effectively integrates profit-oriented entities (private banks) with others (public and cooperative banks) that aim to promote regional economic growth. Germany has a substantial number of banks, amounting to 1,408 as reported in 2022, which is the most among nations in the euro area. This significant presence of banks in Germany is indicative of its bank-based economic system, as acknowledged by the International Monetary Fund in 2022.

2. BANKING SYSTEM IN GERMANY

The German Banking system is sustained by three primary institutions: public sector banks (25 per cent of banking assets), private commercial banks (12 per cent of banking assets), and cooperative banks (11 per cent of banking assets). At the end of 2020, the banking system assets were mostly held by privately-owned commercial banks, accounting for around 43 percent of the total assets (IMF, 2022).

The first pillar, which includes 164 domestic private commercial banks and 22 international bank branches, is the most significant portion of the banking sector. The Big Three Commercial Banks, which set themselves apart from other banks by providing a variety of services like retail, corporate, and investment banking, control one-third of the sector's activity (IMF, 2022).

The public saving banks resemble the autonomous regional Landesbanken and the 377 savings banks that comprise the banking system's second pillar (IMF, 2022). The savings banks' business goals are continuously enhancing their region's social and economic conditions. They operate according to local legislation and provide services to homes and SMEs.

With over 1,000 branches nationwide, cooperative banks are part of the third pillar. They operate according to local regulations, much like savings banks. Despite having boards of executives and regulatory bodies, cooperative banks must maximise profits in order to continue doing business and sustain long-term activity (Faltermeier, 2012:15).

1.1. Capital Requirements for German Banking

In 2010, due to the financial crisis, Europe had a national debt crisis, and the German Banking industry had serious capital problems. Due to the dependency of European countries' financial sectors and their link to high national debt and complex assets, Germany's Banks, especially the state-owned Landesbanks, which are small and not very profitable, need the support of the government (Deutsche Bundesbank, 2018).

As a result, German Banks increased their capital ratios and began to maintain capital of higher quality in accordance with Basel III's new regulatory framework and the ECB's intensive evaluation program. German Banks' core tier 1 ratio of capital increased from 7.58 per cent in 2009 to 10.02 per cent in 2014, much above the country's legislated required capital rate requirement of 8 per cent.

German Banks, particularly the big ones, increased their Tier 1 capital ratio in 2018. They issued fresh shares to increase their common equity (Deutsche Bundesbank, 2018). After the tier 1 ratio was raised, banks had enough capital and could adapt to the new regulatory capital rules. Due to their excessive capital levels, however, banks in Germany had to cut back on loans and other assets in order to meet legal standards.

1.2. Standards for liquidity in German Banking

In order to ensure that banks always have enough liquidity to support them in a financial crisis, the Basel Committee established the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). I examine the German Banking sector's liquidity capabilities in this section.

1.2.1. Liquidity Coverage Ratio (LCR)

The LCR's goal is to ensure banks have enough liquid assets to survive a month of liquidity crisis. The goal is to decrease liquidity risk by boosting the assets that banks can turn into cash at a trying time (King, 2013:4149). Weak assumptions might be made since it is not feasible to determine the aggregate LCR ratio of German Banks due to data restrictions. One hypothesis is that German Banks have become less reliant on liquid assets due to Europe's low-rate environment and domestic banking stability. They may also profit from the cheap borrowing costs in the wholesale markets.

1.2.2. Net Stable Funding Ratio (NSFR)

In order to lower maturity transition risk, the NSFR encourages banks to maintain more reliable and long-term financing resources against their liquid assets (Chiaramonte and Casu, 2017:147). The trade-off between profitability and liquidity may be the primary justification for the low amount of NSFR in the German Banking industry. King (2013) examined how various NSFR-increasing tactics might affect net interest margins. In particular, he found out that the NSFR ratio of German Banks was 78 per cent at the end of 2009, which is a significant decrease in NIMs.

The main issue is with the Available Stable Funding (ASF) component since German Banks depend primarily on wholesale debt, which is low weighted according to the NSFR definition. In light of King's (2013) reasoning, I thus credit Germany's universal banking architecture with widely diversified financing and robust allocation to trading assets for the country's low NSFR ratio.

1.3. Deposit Insurance Scheme (DIS)

The DIS's primary goal is to stop systemic bank runs by depositors by safeguarding their funds and guaranteeing financial stability. However, market discipline and moral hazard concerns may be related to DIS. According to Demirguc-Kunt and Huizinga (1999), establishing an explicit deposit insurance plan undermines the market restraint that depositors and creditors apply to financial institutions (Beck, 2002:709). DIS became an important topic during the 2008 financial crisis when many countries raised their bank insurance to improve trust in their economies.

In 1975, Germany's first explicit DIS was launched; it was privately run and sponsored. The EU mandated a mandatory DIS in all member nations in 1994, setting a minimum 20,000 Euro coverage limit. In 1998, Germany adopted the European standards but only provided the bare minimum in deposit protection. The EU Deposit Insurance Scheme (DIS) was founded on minimal harmonisation, which allows member states to cover depositors over the coverage level but never less than 20,000 Euros.

Due to depositors' growing mistrust of banks after the 2008 financial crisis, several domestic governments in EU member states increased their domestic DIS coverage by taking advantage of the DIS's minimal harmonisation to stop massive bank runs and deposit withdrawals. Ireland became the first nation in the EU to expand its domestic DIS to an unrestricted sum on September 30, 2008. Germany made the decision to expand its DIS to an unrestricted sum a few days later. However, the EU increased the minimum protection level of the Deposit Guarantee Scheme in order to boost depositors' trust and stop activities like the ones described above.

The EU adopted a new DIS in 2014 that, in contrast to the old one, adheres to the maximisation of harmonisation concept. The financial means must be increased by required ex-ante payments by credit institutions, and the coverage ceiling will stay steady at a maximum of 100,000 Euros (Bundesbank, 2018).

2. RESEARCH REVIEW

An overview of the literature on cost efficiency in the German Banking industry is provided in this part. Although there are several studies on bank efficiency, there are few studies on the German Banking system. According to the scant available research, Sheldon (2001) notes that between 1994 and 1999, German Banks were less efficient than other European Banks owing to public policy, stringent regulation and financial conservatism. According to the research of Altunbas et al. (2001), three organisational models in German Banking each have their own unique cost and profit boundaries.

Furthermore, certain studies by the Bundesbank regarding bank efficiency in German Banking provide essential details. Between 1993 and 2004, the risk for the more effective universal German Banks was lower than for the less effective banks (Porath and Koetter, 2007:32). Bos et al. (2009) also investigate how heterogeneity affected the efficiency ratings of German Banks.

This research makes two literary contributions. First, it shows how the German Banking system's cost efficiency is represented regionally. Second, to the best of my knowledge, this is one of the first studies to assess the analysis of the state distribution of banking cost efficiency in Germany.

3. METHODOLOGY

Efficiency can be measured using parametric (stochastic) approaches and non-parametric (deterministic) approaches, which are the two primary techniques. I use parametric techniques in my work for the cost frontier estimates. Contrary to deterministic techniques, I favour parametric models because they enable to define a stochastic factor, which makes the estimates less susceptible to the effects of chance occurrences and measurement mistakes (Reinhard et al., 2000:293). I employ Stochastic Frontier Analysis (SFA) that was created by Aigner et al. (1977) and Meeusen and Van den Broeck (1977).

Two alternative models are used in this research to reflect the cost efficiencies in the German Banking sector. Battese and Coelli (1995) is the first model, while Battese and Coelli (1992) is the second. The two models' specs and methods are shown below.

I include country-specific environmental factors in model I to investigate their potential effects on the distribution of efficiency scores. Since various factors directly impact firm impacts, I employ the Battese and Coelli (1995) model, which yields efficiency estimates (Lozano-Vivas and Pasiouras, 2010:1442). The cost frontier is defined as follows:

$$lnTC_{i,t} = \alpha_0 + \sum_{i=1}^{n} a_i \ln y_{it} + \sum_{j=1}^{n} \beta_j \ln p_{jt} + \frac{1}{2}\sum_{i}^{n}\sum_{i}^{k} \sigma_{ik} \ln y_{it} \ln y_{kt} + \frac{1}{2}\sum_{j}^{m}\sum_{h}^{m} \gamma_{jh} \ln p_{jt} \ln p_{ht} + \sum_{i}^{n}\sum_{j}^{m} \delta_{ij} \ln y_{it} \ln p_{jt} + v_{it} + u_{it} \quad (1)$$

Where TC is the bank *i*'s total cost at time *t*, $q_{i,it}$is a vector of outputs, $p_{i,it}$ is a set of input prices and *β* is a vector of parameters that that require estimation but are unknown. I introduce the monotonicity requirements; this means that the marginal cost of inputs and outputs must be suitable for ascertaining if the cost function is well-structured.

Following Semih Yildirim and Phillipatos (2007), I additionally apply the standard constraints of symmetry and linear homogeneity for input prices and the definition of the mean $\mu_{i,t}$ is:

$$\gamma_{jh} = \gamma_{hj}$$

$$\sum_{j}^{m} \beta_j = 1 \sum_{j}^{m} \gamma_{jh} = 0 \sum_{j}^{m} \delta_{ij} = 0$$

$$\mu_{i,t} = z_{i,t}\delta \qquad (2)$$

Where $v_{i,t}$ is the independently distributed random error, which is assumed to follow a normal distribution, δ is a p $\times$ 1 vector of parameters that must be calculated, and $z_{i,t}$ is a $p \times 1$ vector of observable factors that affect the efficiency scores of the bank *i* at time *t*.

$\sigma^2 = \sigma_v^2\sigma_u^2$ is the entire variance of the total error term $(\varepsilon_{i,t})$. According to Goddard et al. (2014), the random component's contribution to the overall variance is given by the formulas $\sigma_v^2 = \sigma^2/(1+\lambda^2)$ and $\sigma_u^2 = \sigma^2\lambda^2/(1+\lambda^2)$, where $\lambda=\sigma_u/\sigma_v$ denotes the respective contributions of *u* and *v* to $\varepsilon_{i,t}$. Regarding the cost frontier's specification, it is based on the reasonable assumption that all banks would use the same manufacturing technology in this sample. The total cost, which is the sum of interest, payroll, and other operational costs, is the cost function's dependent variable.

I use the "intermediation" methodology in this research, which treats deposits as inputs and refers to investments and loans as outputs (Semih Yildirim and Phillipatos, 2007:132).

$$\begin{aligned}\ln TC = {} & \beta_0 + \beta_1 \ln Q1 + \beta_2 \ln Q2 + \beta_3 \ln Q3 + \beta_4 \ln P1 + \beta_5 \ln P2 + \beta_6 \ln P3 + \beta_7 \ln Q1 \ln Q2 + \\ & \beta_8 \ln Q1 \ln Q3 + \beta_9 \ln Q2 \ln Q3 + \beta_{10} \ln P1 \ln P2 + \beta_{11} \ln P1 \ln P3 + \beta_{12} \ln P2 \ln P3 + \\ & \beta_{13}\frac{1}{2}\ln(Q1)^2 + \beta_{14}\frac{1}{2}\ln(Q2)^2 + \beta_{15}\frac{1}{2}\ln(Q3)^2 + \beta_{16}\frac{1}{2}\ln(P1)^2 + \beta_{17}\frac{1}{2}\ln(P2)^2 + \\ & \beta_{18}\frac{1}{2}\ln(P3)^2 + \beta_{19} \ln Q1 \ln P1 + \beta_{20} \ln Q1 \ln P2 + \beta_{21} \ln Q1 \ln P3 + \beta_{22} \ln Q2 \ln P1 + \\ & \beta_{23} \ln Q2 \ln P2 + \beta_{24} \ln Q2 \ln P3 + \beta_{25} \ln Q3 \ln P1 + \beta_{26} \ln Q3 \ln P2 + \beta_{27} \ln Q3 \ln P3 + \\ & u_{i,t} + v_{i,t}\end{aligned} \qquad (3)$$

I examine how domestic macroeconomic factors affect German Banking efficiency. The form of $\mu_{i,t}$ for investigating these variables is as follows:

$$\mu_{i,t} = \delta_0 + \delta_1 GDPGR + \delta_2 UN + \delta_3 INF \qquad (4)$$

In this equation, UN stands for the unemployment rate, GDPGR for GDP growth, and INF for inflation in the German economy, which are all constants.

Both the cost frontier's parameters, Equation (3) and Equation (4) for the inefficiency specification are evaluated concurrently and in a single step using maximum likelihood. The Likelihood-Ratio (LR) test will determine the relevance of the cost frontier and inefficiency specification's parameters.

$$LR = -2[L(H_0) - L(H_1)]$$

On the other hand, I use model II to carry out the method specification that Battese and Coelli (1992) proposed. With just one parameter to be evaluated, the time-varying efficiency in this model is predicted using an exponential time function. and may be written as follows in its general form:

$$y_{it} = a + x_{it} + (v_{it} + u_{it}) \quad \textit{and} \quad u_{it} = (e^{-\eta(\tau - T)})u_i$$

Depending on the η which is the sign of the inefficiency impact, u_{it} is either non-increasing or non-decreasing. This specification's primary flaw is that it forbids changes to the rank ordering of businesses over time (Coelli et al., 2005:252).

4. DATA

I use data from commercial German Banks' unconsolidated statements acquired from the Orbis bank database between 2016 and 2018, resulting in an imbalanced panel with 315 observations. A short descriptive statistic for the variables is included in the table 1.

Table 1. Descriptive statistics

Variable	Name	Mean	Standard Deviation	Min	Max
Y1 (Output 1)	Deflated Gross Loans	9059.442	31509.78	0.843000	258451
Y2 (Output 2)	Deflated Loans to other Banks	4534.658	21509.70	0.026000	209226.4
Y3 (Output 3)	Deflated Other Earning Assets	18019.39	113523.40	0.113797	1175922
P1 (Input 1 price)	Borrowed funds	0.3905	2.2456	0.000107	24.869
P2 (Input 2 price)	Labour	0.0207	0.0496	0.000861	0.499
P3 (Input 3 price)	Physical capital	0.0064	0.0177	0.000045	0.224
TC	Total Cost	497.607	2134.57	0.433031	21056.67

Note: Values in millions of Euros

5. EMPIRICAL FINDINGS

In this section, the analysis results are presented. According to the result of the Likelihood-Ratio (LR) test, shown below, I can apply the model formulation.

Table 2. Likelihood ratio test

Null hypothesis	Likelihood Ratio Test	Decision
Model I		
Test: Null hypothesis: There is no one-sided error term present, σ_u^2.	31.14	Reject Null
Model II		
Test: Null hypothesis: There is no one-sided error term present, σ_u^2.	204.17	Reject Null

Notes: The key parameters at the 5% level of significance were taken from Kodde and Palme (1986) and 10.371 is a critical value for both models.

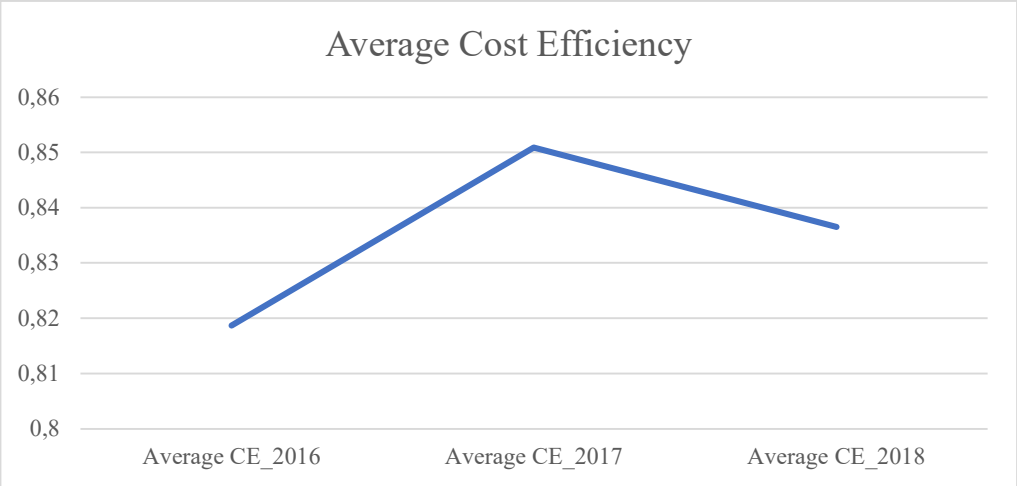
5.1. Cost Efficiency Analysis

For the period under consideration, I find that the German Banking sector has an average cost efficiency of 0.84 by concentrating just on model I's efficiency results, which provides my study with the required flexibility. These results concur with past studies on the cost efficiency of German Banking.

According to the research findings, the typical German Bank could achieve the same level of efficiency as the most effective bank by cutting expenses by around 13 per cent. The graph below shows the mean cost efficiency from 2016 to 2018.

Cost efficiency showed an upward trend in 2016–2017, rising to 0.85 from approximately 0.82; however, by the end of 2018, the number had fallen below 0.84.

Figure 1. Average cost efficiency



I summarise the characteristics of the German Banking system to study the factors that influenced cost efficiency across the investigated period. German Banks' improved cost efficiency between 2016 and 2017 may be ascribed mainly to better refinancing terms and higher lending levels, leading to a notable rise in net interest income. More precisely, a favourable climate for banks was created by the decline in financing costs and the increase in lending. Additionally, the total banking efficiency for 2017 was favourably impacted by the reduction in employee costs and other operational expenses. According to Bundesbank (2018), major banks, in particular, increased their efficiency by boosting their net commission revenue by 0.6 billion and decreasing employee expenses.

In contrast, even though German Banks' financing position remained advantageous and interest rates in the interbank market fell to new all-time lows, the decline in the average cost efficiency figure in 2018 may be mainly attributed to rising employment and operational expenditures. According to Bundesbank (2019), administrative costs increased by 5%, hitting a new all-time high of $90 billion in staff costs. In addition, Jovanović et al. (2017) examined how new Basel III rules affected the income, expenses, and operations of cooperative banks in Germany. They discovered a markedly adverse link with the banks' credit business division. The loss in cost efficiency for that time period is strongly connected to new regulatory standards, extending these results to this sample, and considering the implementation of capital buffer requirements in 2018. Banks are eliminating branches due to cost pressure brought on by regulations, which has undoubtedly influenced how well they lend and how many loans they originate.

5.1.1. Efficiency Comparison of Models

The two models' cost efficiency ratings are quite different from one another. The outcome makes sense when it is taken into account by the various model assumptions. However, the inclusion of macroeconomic variables in the model definition is a significant distinction between the two models. This element is likely primarily responsible for the observed divergence in the cost efficiency ratings. In other words, the cost efficiency ratings in German Banks are roughly 30% lower than they should be because environmental macroeconomic elements are ignored.

Table 3. Descriptive statistics of model's comparison

Cost Efficiency	Mean	Standard Deviation	Min	Max
Model I	0.840	0.081	0.415	0.970
Model II	0.512	0.203	0.368	0.914

5.1.2. The benefits of scale

By recording each bank's unique economies of scale every year, the research also seeks to determine the extent of economies of scale. From the estimate that model I produce, scale economies can be acquired.

Table 4. Descriptive statistics of model's comparison

Variable	Observations	Mean	Standard Deviation	Min	Max
Economies of Scales	315	0.97375	0.05316	0.831046	1.01254

After determining the overall economies of scale, I divided the sample into three groups based on the size of the banks. This division is crucial since the German Banking industry is seen as being "over-banked". Thus, I examine the evolution of scale economies by asset class and year.

Table 5. Economies of scale analysis results

Size	2016	2017	2018	Average Per Group
Large Banks	1.006222567	1.007545994	1.014987799	1.009585453
Medium Banks	1.010067875	0.998175065	1.010725004	1.006322648
Small Banks	0.963120937	0.962780941	0.974394987	0.966765622
Average Per Year	0.993137126	0.989500667	1.00003593	

This table shows economies of scale (ES) for 2016–2018 and size classes. ES < 1 suggests economies of scale, ES = 1 constant returns to scale, and ES > 1 diseconomies.

In summary, only small banks exhibit economies of scale, whereas the other two groups of banks exhibit marginal diseconomies of scale. This conclusion is significant because it suggests that the small German Banks are responsible for the overall economies of scale in the domestic banking industry. In terms of economies of scale each year, the values fluctuate in the neighbourhood of one, indicating scale economies from 2016 to 2017. However, in 2018, I observed practically continuous returns to scale in the banking industry in Germany.

5.1.3. Individual bank efficiency

The table below lists the most and least effective German Banks in terms of cost efficiency, along with the rankings of the two biggest and most significant banks, Deutsche Bank and Commerzbank.

Table 6. Individual bank efficiency scores from 2016 to 2018

Bank Name	2016	2017	2018	Average Cost Efficiency
Deutsche Bank AG	0.8632	0.8908	0.8865	0.8874
Commerzbank AG	0.8542	0.8845	0.8758	0.8715
Mizuho Bank Ltd	0.9163	0.9216	0.9308	0.9277
ProCredit Bank AG	0.9405	0.9035	0.8963	0.9181
Shinhan Bank Europe GmbH	0.9147	0.9154	0.9028	0.9180
Norderstedter Bank Eg	0.9124	0.9124	0.9068	0.9087
Europaisch-Iranische Handelsbank AG	0.6192	0.5203	0.4785	0.5342
Morgan Stanley Bank AG	0.7706	0.5314	0.5143	0.6027
FFS Bank GmbH	0.2912	0.7407	0.8021	0.6283
Akbank AG	0.5514	0.7420	0.7103	0.6656

ProCredit Bank is an excellent example of one of Germany's top performers in terms of cost efficiency while seeing a decline in performance during the study period. ProCredit's specialised knowledge in small company financing gives them a competitive advantage over its SME target market in general, which results in significant efficiency. However, the decrease in its primary product, loans, might be blamed for the deterioration in cost efficiency levels. In response, bank management reduced the number of branches and increased the proportion of client deposits in overall financing, keeping ProCredit Bank among the best-practice banks.

As opposed to that, the loans, deposits, and total assets of Europaisch-Iranische Handelsbank significantly declined between 2016 and 2018. This German Bank, owned by the Iranian government, specialises in international trade and transactions with Iran. The global embargo on Iran, which had a significant impact on the bank's operations and, therefore, its cost efficiency, is to blame for its decline.

The cost efficiency ratings of the two biggest banks are much higher than the average efficiency scores, following a general pattern that saw considerable increases in 2017 and minor declines in 2018. In order to increase efficiency in a margin-constrained environment, Commerzbank unveiled its strategic strategy in 2019, which included workforce reduction, business structure digitisation and decrease in investment banking and trade. Aiming to become a more effective, less complicated, and better-capitalised bank, Deutsche Bank has announced plans to cut employees, decrease domestic offices and product offerings, abandon several Global Market business lines, and digitalise procedures.

5.2. Efficiency of German States

In this section, I examine how the German Banking system's cost efficiency is represented regionally. The differences in CE derived by model I per state are shown in the table and the map. The study's results indicate that banks in Germany's western region are the most effective. With efficiency ratings of 0.895 and 0.889, respectively, Lower Saxony and Rhineland-Palatinate banks are the most effective. These results align with Koetter (2006:210), who discovered that small banks perform German Banking in big western states. The domestic banking sector is also heavily concentrated in the country's western region.

Table 7. German state efficiency scores by bank prevalence

State	Average Cost Efficiency
Bavaria	0.8506
Berlin	0.8123
North Rhine-Westphalia	0.8485
Rhineland-Palatinate	0.8886
Brandenburg	0.8280
Hesse	0.8571
Schleswig-Holstein	0.8705
Baden-Württemberg	0.8324
Hamburg	0.7612
Lower Saxony	0.8951
Bremen	0.8413

6. CONCLUSION

In this research, I look at the levels of cost efficiency in German Banking from 2016 to 2018. To do this, by using a sample of German commercial banks, I estimate a cost function with three input prices and three outputs by employing the stochastic frontier based on two models (Battese and Coelli, 1992; Battese and Coelli, 1995), which enables to account for environmental factors.

The German Banking industry's average cost efficiency, which I found to be 0.86, and a minor upward trend between 2016 and 2018 suggest that domestic banks have been putting much effort into cost-cutting measures. One of the most apparent ways banks increase cost efficiencies is through staff reduction, branch closures, and decreased bank activity. The results also show some small economies of scale, mainly due to the participation of the small banks. According to my analysis of the state distribution of banking cost efficiency, banks in Western Germany have greater cost efficiency.

I conducted a cost-benefit analysis to see how the new criteria will affect the efficiency and performance of banks in Germany, regardless of the regulatory method used. The new capital structure has undoubtedly stifled banks' performance, so the banking industry has been improving its performance via cost management control. Furthermore, German Banks may need help to comply with liquidity regulations, including LCR and NSFR. According to the IMF (2022), banks should put plans in place to alter the compositions of their balance sheets and their investments since short-term borrowing used to finance trading positions or investments with longer maturities would be penalised in NSFR calculations. Consequently, these changes will directly impact the German Banking industry's profitability and cost efficiency.

This empirical study might be developed in future studies by measuring efficiency scores over a longer period of time to get a better understanding of the broader picture. Inputs and outputs may also give various insights. A non-parametric method such as Data Envelopment Analysis (DEA) might be used to assess the cost efficiency of both bank types and compare the results of the DEA and SFA techniques.

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