

**Prüfung im SS 2024**

**Master-Spezialisierung:  
Controlling**

**Matrikelnummer:**



Please answer the following five questions:

- a) What is one of the drawbacks of the Farrell approach in evaluating DMU efficiency?

**Lösungsbereich:**

- b) What are non-discretionary inputs and outputs in DEA, and why are they significant in the analysis?

**Lösungsbereich:**

- c) What are four purposes of super-efficiency models in DEA?

**Lösungsbereich:**

- d) The duality theory provides envelopment and multiplier models for efficiency measurement and interpretation of results. When the number of DMUs is large, e.g., 1000, which method would be computationally more efficient? Explain your answer shortly.

**Lösungsbereich:**

- e) What are four different distance functions that can be used to measure efficiency in DEA?

**Lösungsbereich:**

The following data are used to measure the efficiency of five electricity supply companies:

	Company				
	A	B	C	D	E
Total Operating Expenses _ Input	5	2	3	5	4
Number of Customers _ Output	20	14	18	15	16
Revenue _ Output	15	4	9	12	20

- a) The following model was formulated to determine whether company D has slack. Note that in this model, the first output is non-discretionary.

$$\max([L1] S' [L2] S_1^0 [L3] S_2^0)$$

u.d.N.

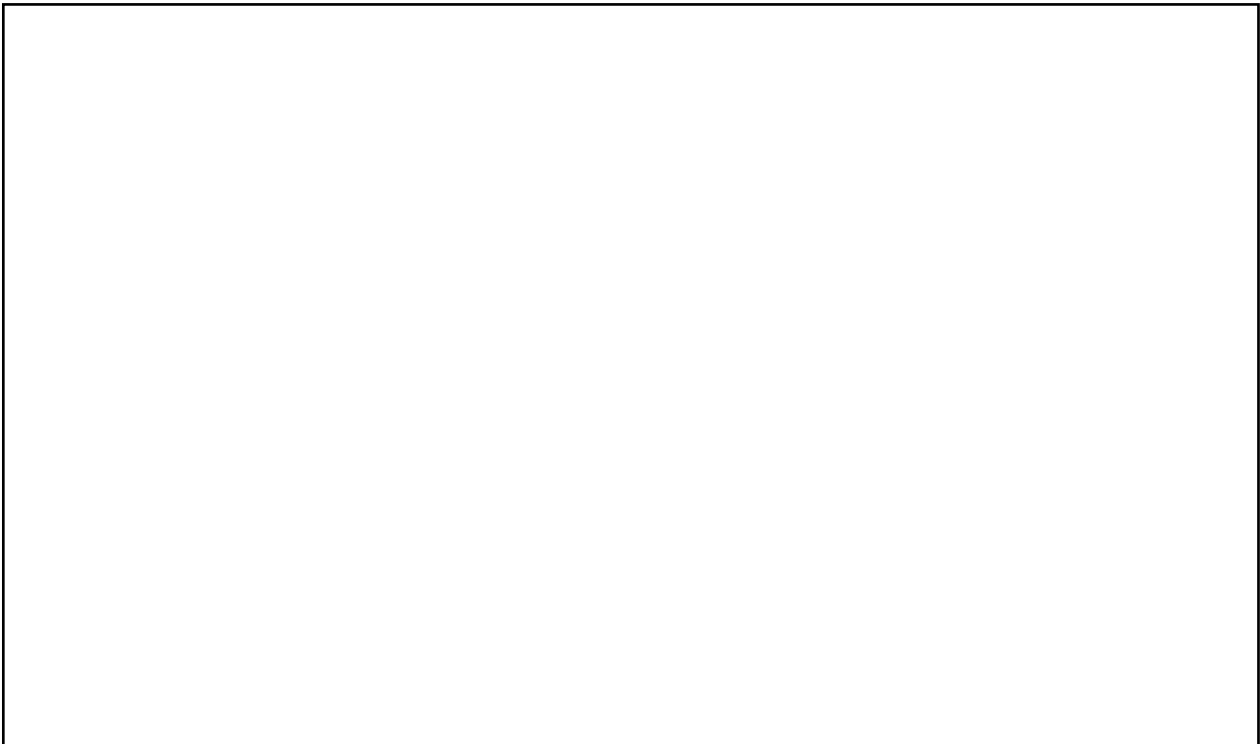
$$\begin{aligned}
 & 5 [L7] 5\lambda_A + 2\lambda_B + 3\lambda_C + 5\lambda_D + 4\lambda_E [L4] S' \quad (\text{Total Operating Expenses}) \\
 & 15 [L8] 20\lambda_A + 14\lambda_B + 18\lambda_C + 15\lambda_D + 16\lambda_E [L5] S_1^0 \quad (\text{Number of Customers}) \\
 & 12\varphi_D^* [L9] 15\lambda_A + 4\lambda_B + 9\lambda_C + 12\lambda_D + 20\lambda_E [L6] S_2^0 \quad (\text{Revenue})
 \end{aligned}$$

$$\lambda_j [L10] 0, \quad j = A, B, C, D, E$$

$$S' [L11] 0, \quad S_1^0 [L12] 0, \quad S_2^0 [L13] 0.$$


- Fill in the blanks (L1 to L6) with the appropriate sign, either "+" or "-".
- Fill in the remaining blanks (L7 to L13) with the appropriate sign, either "<", ">", "≤", "≥" or "=".
- Note: You can use the following notations to express these signs:
  - < : "less than",                      • ≤ : "less than or equal to",
  - > : "greater than",                  • ≥ : "greater than or equal to",
  - = : "equal to".
- Scoring: You must correctly fill in at least 12 out of the 13 blanks to get the full 6 points for this question.

**Lösungsbereich:**



- b) Formulate an output oriented envelopment model to measure the pure technical efficiency of DMU D. Note that in this model, the first output is non-discretionary.

**Lösungsbereich:**



Consider a benchmarking system over two periods. The results for a selected  $DMU_p$  are recorded in the table below:

Efficiency Measurements			
$Eff^1(X_p^1, Y_p^1)$	$Eff^1(X_p^2, Y_p^2)$	$Eff^2(X_p^1, Y_p^1)$	$Eff^2(X_p^2, Y_p^2)$
0,95	0,85	1,05	0,90

- a) What is the name of the component of the Malmquist Index that measures the "contribution of the change in the individual initiatives and activities"? Provide the formula for this component and calculate it for  $DMU_p$ .

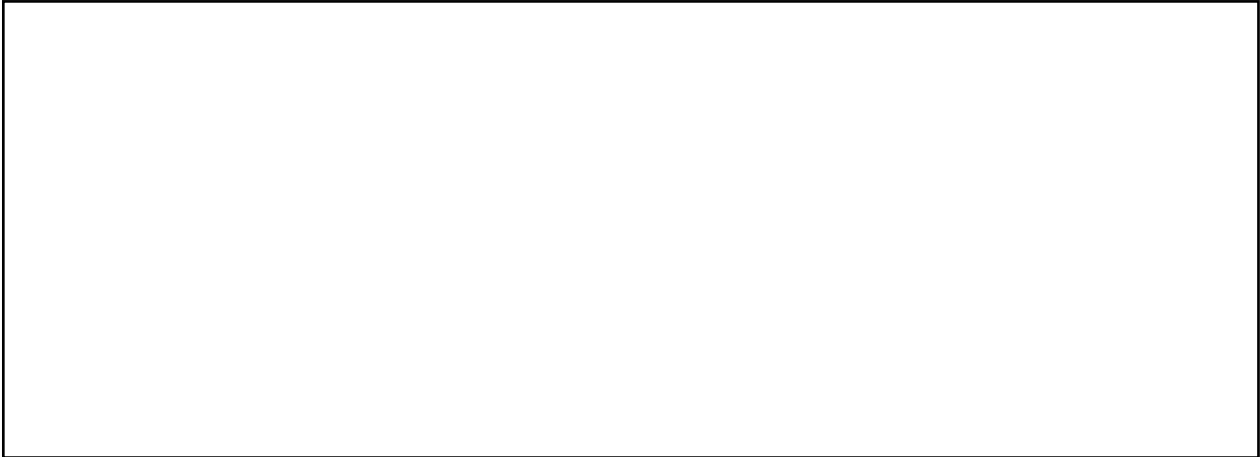
**Lösungsbereich:**

- b) What is the name of the component of the Malmquist Index that measures the "contribution of the frontier shift of the benchmark technology"? Provide the formula for this component and calculate it for  $DMU_p$ .

**Lösungsbereich:**

- c) Based on the results from (a) and (b), calculate the Malmquist Index (MI) for  $DMU_p$ . Interpret your result.

**Lösungsbereich:**

A large empty rectangular box with a black border, intended for the student to write their solution to the problem.



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**Korrekturbereich (bitte nicht ausfüllen)**

	APA
Max. Aufg. 1	10
Ergebnis	
Max. Aufg. 2	12
Ergebnis	
Max. Aufg. 3	8
Ergebnis	
Summe	