

FINANCIAL BASED COMPANY VALUATION USING INTEGRATED ANALYTICAL HIERARCHY PROCESS AND DATA ENVELOPEMENT ANALYSIS



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ABSTRACT

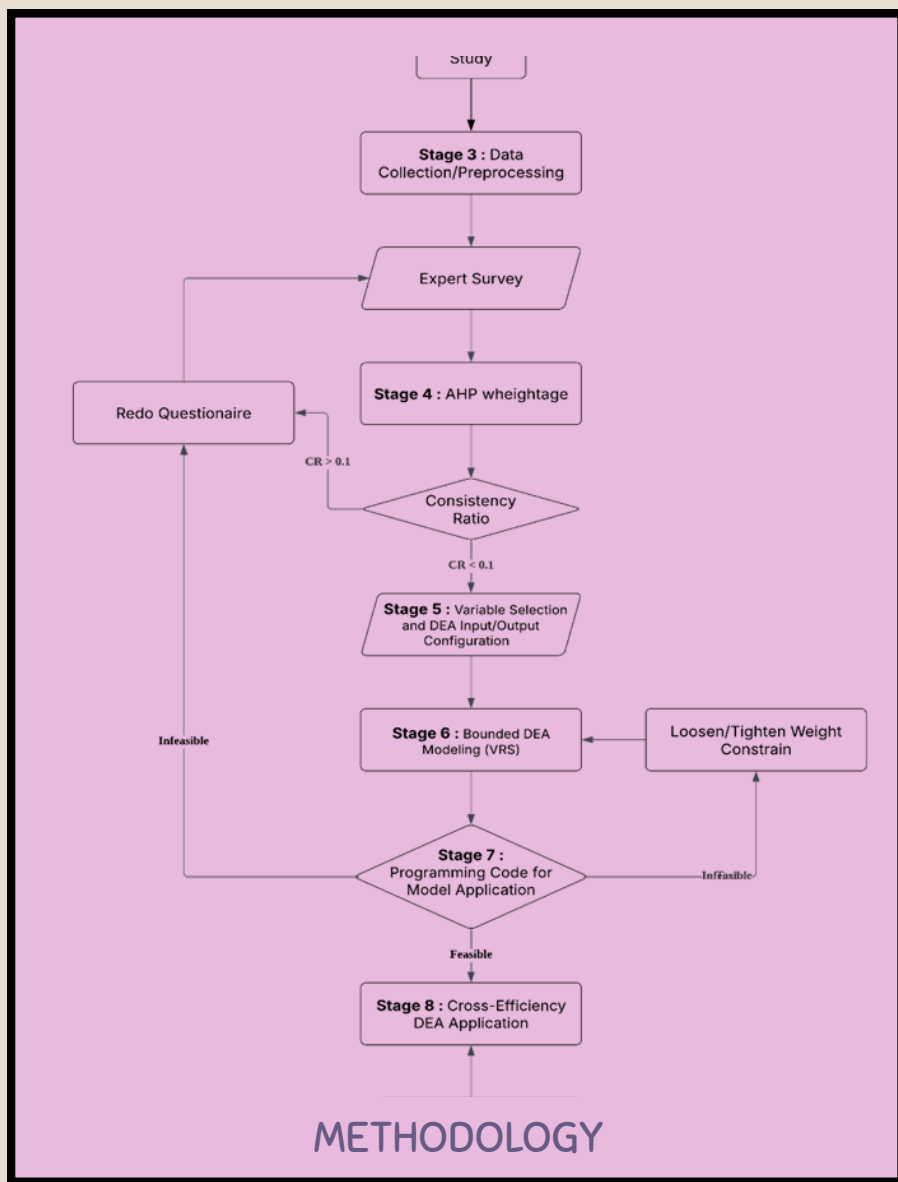
This study proposes a hybrid company valuation framework by integrating the Analytic Hierarchy Process (AHP) and Data Envelopment Analysis (DEA) to evaluate and rank financial efficiency in Malaysian banking firms. Traditional financial analysis methods often fail to capture the multidimensional nature of company performance and lack a systematic integration of expert judgment. To address these limitations, this research applies AHP to derive expert-informed weights for key financial ratios, including profitability, valuation, liquidity, and operational efficiency. These weights are then embedded into a Variable Returns to Scale (VRS) DEA model as upper bounds, ensuring that efficiency scores reflect both empirical data and stakeholder priorities. Furthermore, a cross-efficiency DEA approach is used to enhance the discriminatory power and generate a complete firm ranking. The model is tested using financial data from Bursa Malaysia-listed banks between 2019 and 2024, and its outputs are validated against actual stock price performance using Spearman's rank correlation. The results confirm a weak alignment between DEA-derived financial efficiency and market behavior, demonstrating that market prices are also influenced by external and behavioral factors beyond financial data.



OBJECTIVES

Main Objectives:

- Integrate expert weight (AHP) into DEA financial analysis
- Rank firms by financial efficiency
- Compare model results with actual market trends



IMPLEMENTATION & RESULT

VARIABLE WEIGHT ASSIGNMENT

1 C1 Valuation Ratios: *

Mark only one oval.

1 2 3 4 5 6 7 8 9

P/E ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ P/B Ratio

EXPERT SURVEY SNIPPET

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	C1	C2	C3	C4	C5	C6	C7	C8	weight
C1	0.0845	0.0857	0.1304	0.0909	0.0337	0.1071	0.0769	0.1379	0.09341
C2	0.1690	0.1714	0.1739	0.1364	0.2697	0.2143	0.1538	0.2069	0.18693
C3	0.0282	0.0429	0.0435	0.0682	0.0225	0.0357	0.0513	0.0345	0.04083
C4	0.2535	0.3429	0.1739	0.2727	0.2697	0.2143	0.3077	0.2069	0.23519
C5	0.1690	0.0429	0.1304	0.0682	0.0674	0.1071	0.0513	0.0690	0.08816
C6	0.0845	0.0857	0.1304	0.1364	0.0674	0.1071	0.1538	0.0690	0.10430
C7	0.1690	0.1714	0.1304	0.1364	0.2022	0.1071	0.1538	0.2069	0.15967
C8	0.0423	0.0571	0.0870	0.0909	0.0674	0.1071	0.0513	0.0690	0.07151
SUM	1	1	1	1	1	1	1	1	1

NORMALIZED AHP PAIRWISE COMPARISON MATRIX WITH CRITERIA WEIGHT



CRITERIA WEIGHT RANKING

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LEFT CRITERION (LHS)	MEAN SCORE (LHS COMPARED TO RHS)	MEAN SCORE (RHS COMPARED TO LHS)	RIGHT CRITERION (RHS)
C1	5.4	4.6	C2
C1	3.8	6.2	C3
C1	6.1	3.9	C4
C1	5.4	4.6	C5
C1	4.8	5.2	C6
C1	5.6	4.4	C7
C1	4.5	5.5	C8
C2	4.1	5.9	C8
C3	5.6	4.4	C8
C4	3.8	6.2	C8
C5	4.9	5.1	C8
C6	4.8	5.2	C8
C7	4.2	5.8	C8
C7	4.9	5.1	C2
C7	3.9	6.1	C3
C7	5.6	4.4	C4
C7	3.9	6.1	C5
C7	4.9	5.1	C6
C6	5.5	4.5	C2
C6	4	6	C3
C6	5.6	4.4	C4
C6	4.8	5.2	C5
C2	3.7	6.3	C5
C3	5.8	4.2	C5
C4	3.6	6.4	C5
C4	4.7	5.3	C2
C4	3.6	6.4	C3
C2	3.7	6.3	C3

SURVEY RESULT

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CRITERIA	SUBCRITERIA	WEIGHT
C1	P/E Ratio	0.112505
C2	Return on Equity (ROE)	0.213245
C4	Free Cash Flow (FCF)	0.347125
C6	Debt-to-Equity (D/E) Ratio	0.142451
C7	Revenue Growth Rate	0.184674

FINALIZED AHP CRITERIA WEIGHT

RANKING RESULT

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ROLE	VARIABLE	LABEL	AHP WEIGHT
Input	PE	x_1	0.112505
Output	ROE	y_1	0.213245
Output	FCF	y_2	0.347125
Input	DE	x_2	0.142451
Output	RG	y_3	0.184674

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VARIABLE CONFIGURATION						
DMU	PE	ROE	FCF	DE	RG	
HONG LEONG BANK BHD	DMU1	0.146417934	0.193889099	0.194210819	0.244080146	0.196673869
HONG LEONG BANK BHD	DMU2	0.229189528	0.159751037	0.192305077	0.091074681	0.196619708
CMB GROUP HOLDINGS BERHAD	DMU3	0.171813764	0.159751037	0.202529507	0.276867031	0.201844729
PUBLIC BANK BHD	DMU4	0.26822386	0.245756118	0.202950177	0.118397086	0.194361619
MALAYAN BANKING BHD	DMU5	0.184354915	0.197095438	0.208024419	0.269581056	0.210100075

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2019 BANK DATA		
VARIABLE	VARIABLE WEIGHT LOWER BOUND	VARIABLE WEIGHT UPPER BOUND
P/E Ratio	0.05625244	0.29251269
Debt-to-Equity (D/E) Ratio	0.071225702	0.370373652
Return on Equity (ROE)	0.106622528	0.554437145
Free Cash Flow (FCF)	0.173562516	0.902525083
Revenue Growth Rate	0.092336814	0.48015143
Multiplier	0.5	2.6

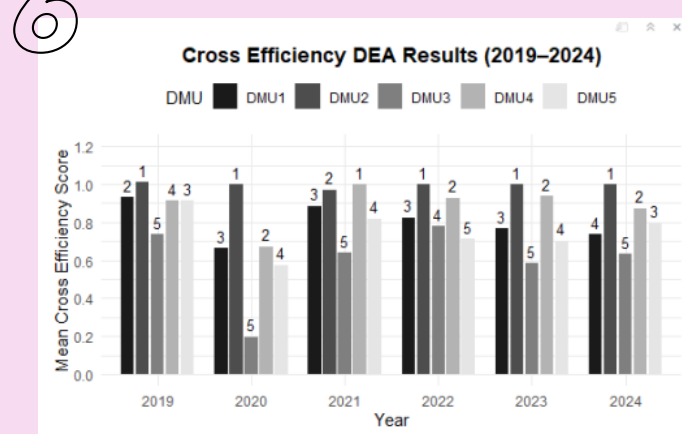
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2019 UPPER AND LOWER BOUND TIGHTENING							
DMU	Efficiency	μ	v_1	v_2	u_1	u_2	u_3
1	0.8783	0	0.2925	0.2342	0.1066	0.2523	0.0923
2	1.0000	0	0.2891	0.3704	0.2382	0.1736	0.0923
3	0.8154	0	0.2925	0.1797	0.1066	0.2265	0.0923
4	0.9191	0	0.2925	0.1819	0.1576	0.1736	0.0923
5	0.8670	0	0.2925	0.1709	0.1066	0.2223	0.0923

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2019 RMARKDOWN DEA RESULT					
	DMU1	DMU2	DMU3	DMU4	DMU5
EVALUATED BY DMU1	0.878290321	0.999919735	0.753775791	0.897841635	0.79381798
EVALUATED BY DMU2	0.738698278	1.000150388	0.603339468	0.920176584	0.669216084
EVALUATED BY DMU3	0.95526369	0.999940126	0.815257071	0.903435171	0.855320655
EVALUATED BY DMU4	0.944964373	1.000007381	0.784814226	0.919068884	0.841141477
EVALUATED BY DMU5	0.969885438	0.999864195	0.826896594	0.904336758	0.866875068
MEAN CE_k	0.930213	1.010391	0.735643	0.912352	0.912777

2019 CROSS EFFICIENCY RESULT



CROSS EFFICIENCY RESULT RANKED ACROSS 2019-2025

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YEAR	DMU	COMPANY FINANCIAL EFFICIENCY	STOCK PRICE INCREASE (END OF YEAR)	SPEARMAN' S RANK CORRELATION, ρ
2019	DMU1	3	1	-0.50 Moderate inverse correlation
	DMU2	1	4	
	DMU3	5	3	
	DMU4	2	5	
	DMU5	4	2	
2020	DMU1	3	4	0.90 Strong positive correlation
	DMU2	1	1	
	DMU3	5	5	
	DMU4	2	2	
	DMU5	4	3	
2021	DMU1	3	4	-0.10 Very weak inverse correlation
	DMU2	2	2	
	DMU3	5	1	
	DMU4	1	3	
	DMU5	4	5	
2022	DMU1	3	2	0.40 Weak positive correlation
	DMU2	1	1	
	DMU3	4	3	
	DMU4	2	5	
	DMU5	5	4	
2023	DMU1	3	4	-0.80 Strong inverse correlation
	DMU2	1	5	
	DMU3	5	2	
	DMU4	2	3	
	DMU5	4	1	
2024	DMU1	4	2	-0.90 Very strong inverse correlation
	DMU2	1	4	
	DMU3	5	1	
	DMU4	2	5	
	DMU5	3	3	

COMPARISON OF FINANCIAL EFFICIENCY AND STOCK PRICE INCREASE RANK

Conclusion:

The AHP-DEA model combines expert judgment with quantitative scoring. It offers valid financial insights and benchmarking potential.

Recommendation:

- Use AHP-DEA in long-term investment strategy
- Expand to ESG, governance, or qualitative indicators
- Useful for analysts, investors, and corporate managers