



Hilary Cheng, Ph.D.

College of Management
Yuan Ze University

Research Interest

- Service Management, e-Business
- Operations Management, Managerial Decision Modeling
- Enterprise Resource Planning
- Business Venturing
- Business Analytics and Data Visualization



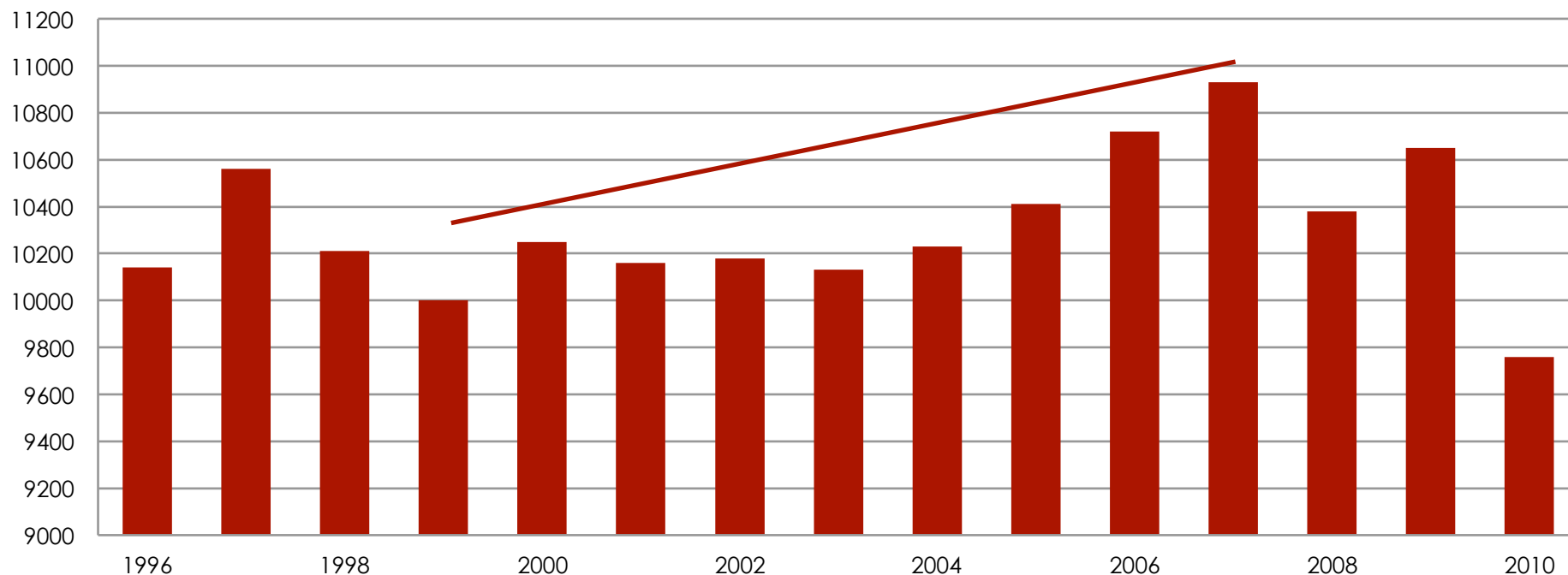
The Performance Evaluation of Japanese Hotels: An Application of Data Envelopment Analysis Model

Yuan Ze University
Hilary Cheng, Yi Chuan Lu, Hitoshi Katsukura

Research Background

The Performance
Evaluation of
Japanese Hotels:
DEA Model

Scale of Hotel industry in Japan 1996-2010



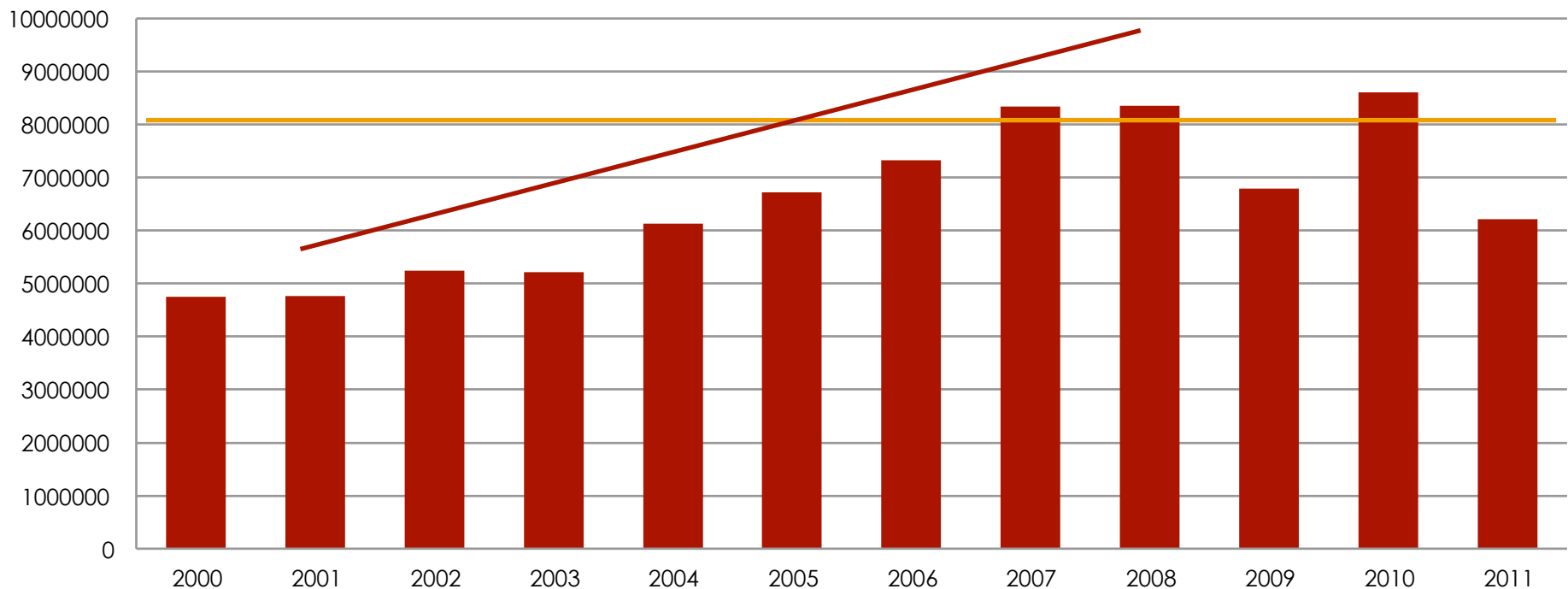
Unit: a hundred million yen

Research Background



The Performance
Evaluation of
Japanese Hotels:
DEA Model

The number of foreign visitors after 2000



Unit: person

Research Motivation

The Performance
Evaluation of
Japanese Hotels:
DEA Model

It is not yet starting to collect data in hotel industry by Japanese government.

We can see the Sales Ranking of Hotel or Ryokan (Japanese-style hotel), but not support for hotel industrial management.

Koike (2012) research about accommodation environment in Japan. But not yet started to disclose about efficiency of **International Tourism Hotel**.

Target:

International Tourism Hotel in Japan

The Performance
Evaluation of
Japanese Hotels:
DEA Model



Definition of International Tourism Hotel in Japanese

- Minimum number of rooms: more than 15 rooms
 - It is essential to have a certain level of number of customer
 - Western style of restaurant and kitchen
 - It is essential to have a certain level of area as party venue and restaurant
 - Sign for foreign tourists (English sign, room, evacuation route等)
- We do not focus on Ryokan (Japanese-style hotel)

The Characteristic of International Tourism Hotel in Japan

「 Room section 」 「 Food and Drink section 」 「 Party section 」

Research Object Collecting Data

The Performance
Evaluation of
Japanese Hotels:
DEA Model



- OHTA PUBLISHING COMPANY

JAPAN HOTEL ALMANAC 2003-2010

Sales Ranking 300(2001-2008)

Number of registrations : 5714

- International Tourism Hotel (in Japan)

Number of registrations : 1108 (2008)

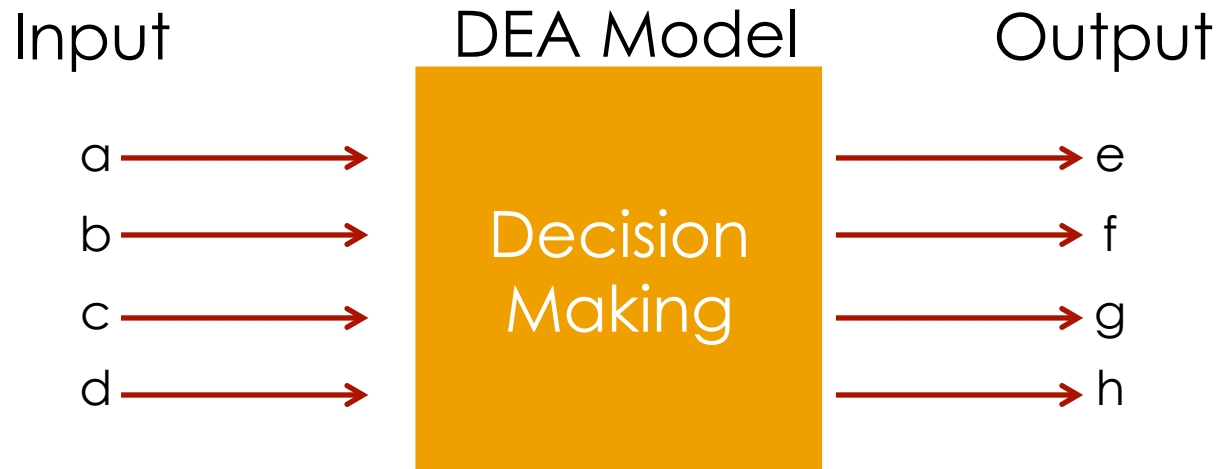
Data 2001-2008

What is DEA?

The Performance
Evaluation of
Japanese Hotels:
DEA Model

Evaluation

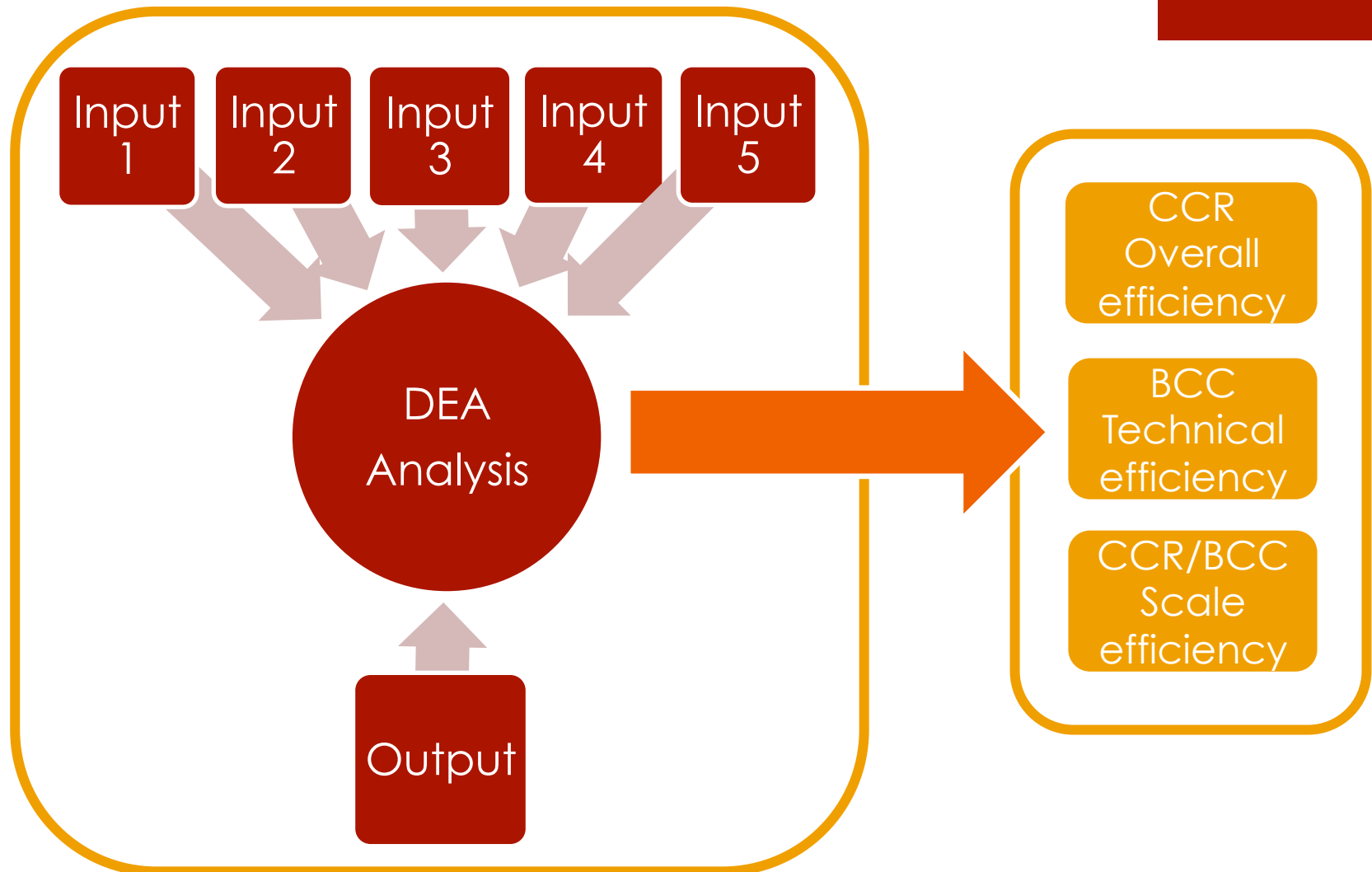
Efficiency
Performance
Productivity

$$= \frac{\text{Output}}{\text{Input}}$$


Research Method

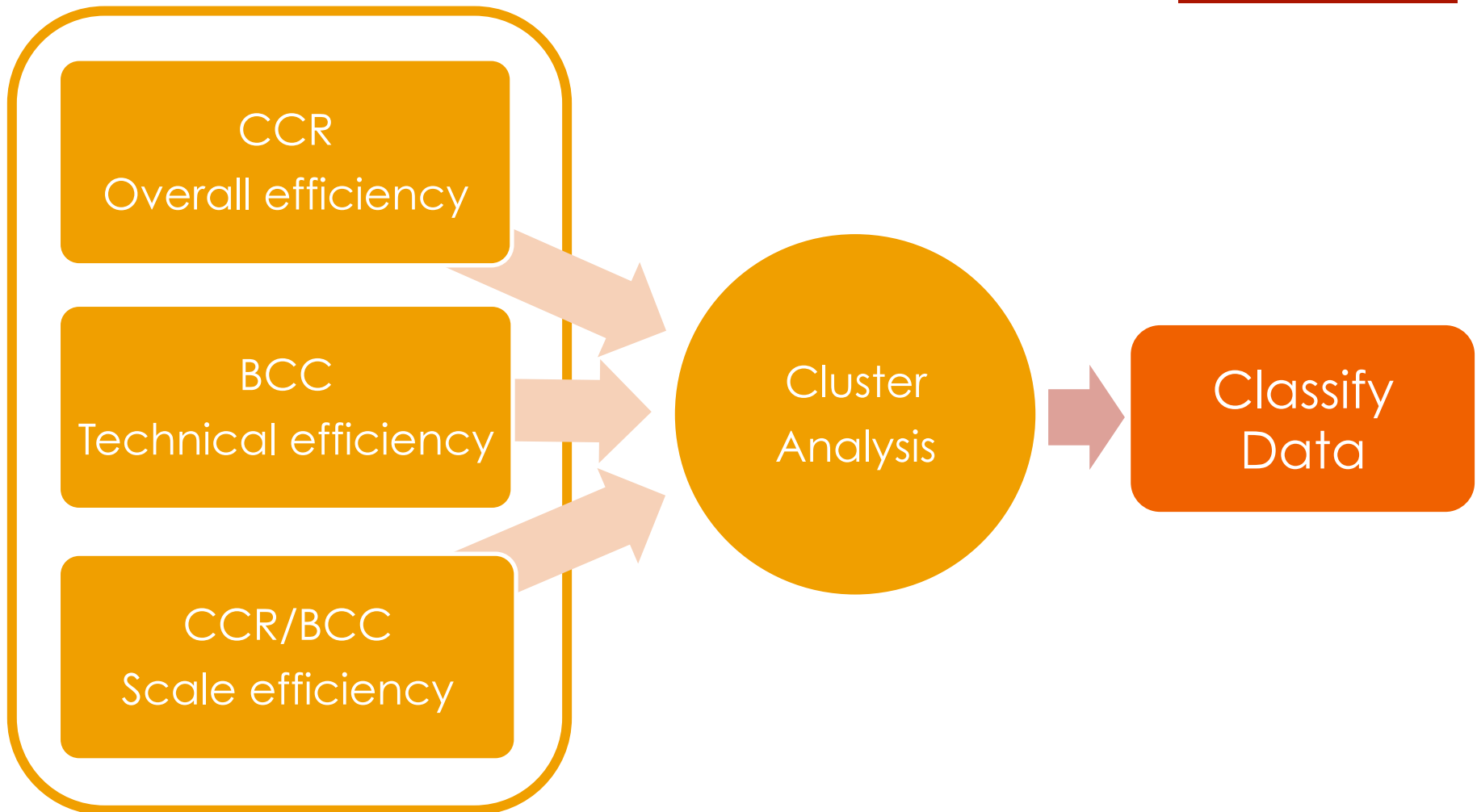
Data Envelopment Analysis Model

The Performance
Evaluation of
Japanese Hotels:
DEA Model



Cluster Analysis

The Performance
Evaluation of
Japanese Hotels:
DEA Model



Input Variable

The Performance
Evaluation of
Japanese Hotels:
DEA Model



Variable	contents
Input1	「 Number of Room 」
Input2	「 Number of Employee 」
Input3	「 Number of Restaurant Seat 」
Input4	「 Number of Bar Seat 」
Input5	「 Number of Party seat 」
Output1	「 Total Revenue 」

Correlation analysis 01-04

The Performance
Evaluation of
Japanese Hotels:
DEA Model

2001 Correlations

			Input1	Input2	Input3	Input4	Input5	Output1
Spearman's rho	Input1	Correlation Coefficient	1.000					
	Input2	Correlation Coefficient	.699	1.000				
	Input3	Correlation Coefficient	.828	.641	1.000			
	Input4	Correlation Coefficient	.595	.597	.638	1.000		
	Input5	Correlation Coefficient	.489	.793	.512	.628	1.000	
	Output1	Correlation Coefficient	.830	.811	.756	.644	.611	1.000

2002 Correlations

			Input1	Input2	Input3	Input4	Input5	Output1
Spearman's rho	Input1	Correlation Coefficient	1.000					
	Input2	Correlation Coefficient	.617	1.000				
	Input3	Correlation Coefficient	.813	.604	1.000			
	Input4	Correlation Coefficient	.588	.532	.625	1.000		
	Input5	Correlation Coefficient	.491	.758	.509	.588	1.000	
	Output1	Correlation Coefficient	.839	.730	.733	.662	.596	1.000

2003 Correlations

			Input1	Input2	Input3	Input4	Input5	Output1
Spearman's rho	Input1	Correlation Coefficient	1.000					
	Input2	Correlation Coefficient	.697	1.000				
	Input3	Correlation Coefficient	.798	.649	1.000			
	Input4	Correlation Coefficient	.571	.611	.584	1.000		
	Input5	Correlation Coefficient	.479	.695	.490	.593	1.000	
	Output1	Correlation Coefficient	.850	.788	.741	.668	.596	1.000

2004 Correlations

			Input1	Input2	Input3	Input4	Input5	Output1
Spearman's rho	Input1	Correlation Coefficient	1.000					
	Input2	Correlation Coefficient	.671	1.000				
	Input3	Correlation Coefficient	.804	.646	1.000			
	Input4	Correlation Coefficient	.577	.656	.638	1.000		
	Input5	Correlation Coefficient	.478	.571	.489	.616	1.000	
	Output1	Correlation Coefficient	.858	.834	.761	.725	.609	1.000

Correlation analysis 05-08

The Performance
Evaluation of
Japanese Hotels:
DEA Model

2005 Correlations								
			Input1	Input2	Input3	Input4	Input5	Output1
Spearman's rho	Input1	Correlation Coefficient	1.000					
	Input2	Correlation Coefficient	.684	1.000				
	Input3	Correlation Coefficient	.807	.670	1.000			
	Input4	Correlation Coefficient	.571	.649	.647	1.000		
	Input5	Correlation Coefficient	.495	.603	.504	.624	1.000	
	Output1	Correlation Coefficient	.838	.833	.769	.737	.607	1.000

2006 Correlations								
			Input1	Input2	Input3	Input4	Input5	Output1
Spearman's rho	Input1	Correlation Coefficient	1.000					
	Input2	Correlation Coefficient	.666	1.000				
	Input3	Correlation Coefficient	.790	.636	1.000			
	Input4	Correlation Coefficient	.563	.660	.615	1.000		
	Input5	Correlation Coefficient	.474	.588	.465	.629	1.000	
	Output1	Correlation Coefficient	.825	.831	.721	.741	.597	1.000

2007 Correlations								
			Input1	Input2	Input3	Input4	Input5	Output1
Spearman's rho	Input1	Correlation Coefficient	1.000					
	Input2	Correlation Coefficient	.631	1.000				
	Input3	Correlation Coefficient	.781	.542	1.000			
	Input4	Correlation Coefficient	.564	.555	.624	1.000		
	Input5	Correlation Coefficient	.473	.453	.453	.601	1.000	
	Output1	Correlation Coefficient	.824	.768	.693	.726	.578	1.000

2008 Correlations								
			Input1	Input2	Input3	Input4	Input5	Output1
Spearman's rho	Input1	Correlation Coefficient	1.000					
	Input2	Correlation Coefficient	.669	1.000				
	Input3	Correlation Coefficient	.779	.610	1.000			
	Input4	Correlation Coefficient	.517	.529	.603	1.000		
	Input5	Correlation Coefficient	.458	.522	.438	.516	1.000	
	Output1	Correlation Coefficient	.830	.793	.706	.666	.521	1.000

Result of CCR

CCR	Score									
nit nam	2001	2002	2003	2004	2005	2006	2007	2008	Average	
H01	0.922	0.943	0.908	1.000	1.000	1.000	1.000	1.000	0.972	
H02	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
H03	0.949	0.963	0.989	0.880	0.904	0.822	0.923	0.852	0.910	
H04	1.000	0.914	1.000	1.000	1.000	1.000	1.000	1.000	0.989	
H05	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
H06	1.000	0.897	0.914	0.958	0.993	0.960	0.930	0.842	0.937	
H07	0.906	0.884	0.870	0.855	0.921	0.990	1.000	0.947	0.921	
H08	0.996	1.000	1.000	1.000	1.000	1.000	1.000	0.937	0.992	
H09	0.608	0.721	0.644	0.647	0.745	0.941	0.910	0.877	0.762	
H10	0.871	0.884	0.851	0.898	0.810	0.813	0.829	0.830	0.848	
H11	0.887	0.857	0.890	0.918	0.934	0.930	0.954	0.943	0.914	
H12	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
H13	0.840	0.787	0.742	0.788	0.826	0.846	0.920	0.962	0.839	
H14	0.862	0.802	0.769	0.807	0.807	0.795	0.745	0.679	0.783	
H15	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
H16	0.878	0.726	0.794	0.856	0.794	0.750	0.753	0.677	0.778	
H17	1.000	0.998	0.968	1.000	1.000	1.000	1.000	1.000	0.996	
H18	0.919	1.000	1.000	1.000	1.000	1.000	0.973	0.917	0.976	
H19	0.970	0.990	0.871	0.872	1.000	0.992	1.000	1.000	0.962	
H20	0.687	0.719	0.871	0.923	0.993	1.000	0.902	0.881	0.872	
H21	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
H22	0.460	0.444	0.507	0.708	0.651	0.661	0.597	0.663	0.586	
H23	0.694	0.748	0.735	0.819	0.784	0.767	0.873	0.781	0.775	
H24	0.863	0.732	0.825	0.859	0.843	0.773	0.777	0.768	0.805	
H25	0.550	0.534	0.689	0.690	0.670	0.623	0.607	0.601	0.621	
H26	0.935	0.918	1.000	0.986	1.000	1.000	1.000	1.000	0.980	
H27	1.000	1.000	1.000	1.000	1.000	0.999	0.913	0.912	0.978	
H28	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
H29	0.643	0.612	0.561	0.612	0.674	0.614	0.552	0.563	0.604	
H30	0.768	0.726	0.765	0.870	0.904	0.853	0.768	0.772	0.803	
H31	0.899	0.841	0.895	0.825	0.910	0.938	0.871	0.929	0.888	
H32	0.769	0.812	0.770	0.823	0.760	0.753	0.657	0.701	0.756	
H33	0.830	0.644	0.901	0.863	0.927	0.975	0.739	0.804	0.835	
H34	0.929	0.837	0.876	0.952	0.943	1.000	1.000	0.886	0.928	
H35	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
H36	0.637	0.695	0.707	0.689	0.641	0.623	0.607	0.574	0.646	
H37	0.474	0.476	0.585	0.643	0.628	0.624	0.549	0.491	0.559	
H38	0.896	0.841	0.856	0.836	0.790	0.737	0.833	0.806	0.824	

The Performance
Evaluation of
Japanese Hotels:
DEA Model

■ Best DMU

「H02」 「H05」 「H12」
「H15」 「H21」 「H28」
「H35」

■ Improvement is required DMU

「H37」

Result of BCC

BCC										
Jnit name	2001	2002	2003	2004	2005	2006	2007	2008	Average	
H01	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H02	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H03	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.981	0.998
H04	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H05	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H06	1.000	0.911	0.961	0.972	1.000	0.968	0.932	0.844	0.949	
H07	0.948	0.901	0.913	0.862	0.924	0.994	1.000	0.952	0.937	
H08	0.996	1.000	1.000	1.000	1.000	1.000	1.000	0.956	0.994	
H09	0.649	0.815	0.725	0.681	0.815	0.972	0.927	0.963	0.818	
H10	0.889	0.888	0.860	0.918	0.817	0.823	0.833	0.853	0.860	
H11	0.902	0.932	0.983	0.938	0.947	0.931	0.963	0.974	0.946	
H12	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H13	0.849	0.790	0.755	0.796	0.842	0.853	0.923	0.963	0.846	
H14	0.944	0.885	0.837	0.861	0.844	0.820	0.760	0.708	0.832	
H15	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H16	0.896	0.730	0.802	0.876	0.819	0.760	0.755	0.680	0.790	
H17	1.000	1.000	0.982	1.000	1.000	1.000	1.000	1.000	0.998	
H18	0.967	1.000	1.000	1.000	1.000	1.000	0.973	0.925	0.983	
H19	1.000	1.000	0.921	0.946	1.000	1.000	1.000	1.000	0.983	
H20	0.708	0.739	0.880	0.924	0.994	1.000	0.951	0.898	0.887	
H21	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H22	0.492	0.493	0.535	0.747	0.700	0.709	0.672	0.727	0.634	
H23	0.816	0.781	0.766	0.836	0.797	0.775	0.946	0.870	0.823	
H24	1.000	0.784	0.881	0.909	0.870	0.787	0.849	0.845	0.866	
H25	0.711	0.585	0.751	0.766	0.747	0.691	0.739	0.714	0.713	
H26	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H27	1.000	1.000	1.000	1.000	1.000	1.000	0.970	0.969	0.992	
H28	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H29	0.739	0.648	0.679	0.705	0.699	0.641	0.699	0.709	0.690	
H30	0.916	0.893	0.993	1.000	0.996	0.940	1.000	1.000	0.967	
H31	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H32	0.871	0.921	0.942	0.966	0.870	0.870	0.911	0.972	0.915	
H33	1.000	0.901	1.000	1.000	1.000	1.000	1.000	1.000	0.988	
H34	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H35	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H36	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H37	0.854	0.794	0.995	0.964	0.821	0.821	0.852	0.872	0.871	
H38	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

The Performance Evaluation of Japanese Hotels:
DEA Model

■ Best DMU

「 H01 」 「 H04 」 「 H05 」
「 H026 」 「 H31 」 「 H34 」
「 H36 」 「 H38 」

■ Improvement is required DMU

「 H22 」

Result of CCR/BCC

CCR/B	2001	2002	2003	2004	2005	2006	2007	2008	Average
H01	0.922	0.943	0.908	1.000	1.000	1.000	1.000	1.000	0.972
H02	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H03	0.949	0.963	0.989	0.880	0.904	0.822	0.923	0.868	0.912
H04	1.000	0.914	1.000	1.000	1.000	1.000	1.000	1.000	0.989
H05	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H06	1.000	0.984	0.951	0.986	0.993	0.991	0.998	0.998	0.987
H07	0.956	0.980	0.953	0.992	0.997	0.995	1.000	0.996	0.984
H08	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.979	0.998
H09	0.938	0.885	0.888	0.951	0.914	0.969	0.982	0.911	0.931
H10	0.980	0.996	0.990	0.977	0.991	0.987	0.995	0.973	0.986
H11	0.983	0.920	0.905	0.978	0.986	0.999	0.991	0.967	0.966
H12	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H13	0.990	0.996	0.983	0.991	0.981	0.992	0.997	0.999	0.991
H14	0.913	0.906	0.919	0.937	0.956	0.969	0.980	0.958	0.941
H15	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H16	0.979	0.994	0.990	0.977	0.969	0.988	0.997	0.995	0.985
H17	1.000	0.998	0.986	1.000	1.000	1.000	1.000	1.000	0.998
H18	0.950	1.000	1.000	1.000	1.000	1.000	1.000	0.992	0.993
H19	0.970	0.990	0.946	0.922	1.000	0.992	1.000	1.000	0.978
H20	0.970	0.973	0.990	0.999	0.999	1.000	0.948	0.981	0.983
H21	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H22	0.936	0.900	0.948	0.947	0.931	0.932	0.887	0.912	0.924
H23	0.851	0.958	0.959	0.980	0.984	0.990	0.922	0.898	0.941
H24	0.863	0.934	0.936	0.944	0.970	0.983	0.916	0.909	0.930
H25	0.774	0.912	0.917	0.901	0.898	0.902	0.821	0.842	0.870
H26	0.935	0.918	1.000	0.986	1.000	1.000	1.000	1.000	0.980
H27	1.000	1.000	1.000	1.000	1.000	0.999	0.941	0.941	0.986
H28	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H29	0.869	0.944	0.826	0.868	0.964	0.957	0.790	0.794	0.875
H30	0.838	0.813	0.771	0.870	0.908	0.907	0.768	0.772	0.830
H31	0.899	0.841	0.895	0.825	0.910	0.938	0.871	0.929	0.888
H32	0.883	0.882	0.818	0.852	0.874	0.865	0.721	0.722	0.826
H33	0.830	0.715	0.901	0.863	0.927	0.975	0.739	0.804	0.846
H34	0.929	0.837	0.876	0.952	0.943	1.000	1.000	0.886	0.928
H35	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H36	0.637	0.695	0.707	0.689	0.641	0.623	0.607	0.574	0.646
H37	0.555	0.600	0.588	0.666	0.765	0.760	0.645	0.562	0.641
H38	0.896	0.841	0.856	0.836	0.790	0.737	0.833	0.806	0.824

The Performance Evaluation of Japanese Hotels:
DEA Model

■ BestDMU

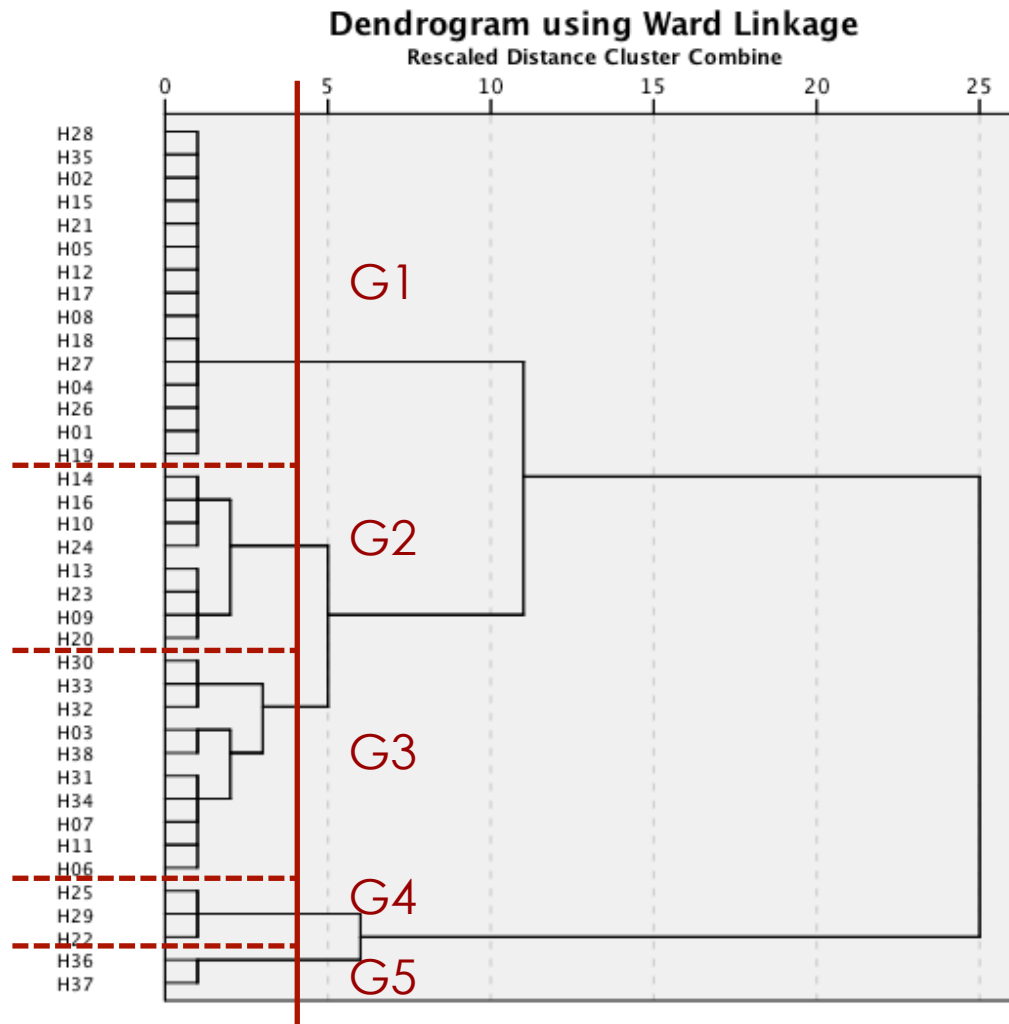
「H02」 「H05」 「H12」
「H15」 「H21」 「H28」
「H35」

■ Improvement is required DMU

「H37」

Cluster Analysis

The Performance
Evaluation of
Japanese Hotels:
DEA Model



Using Data

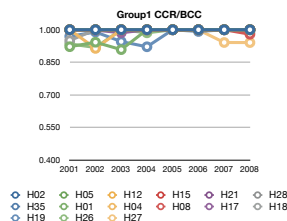
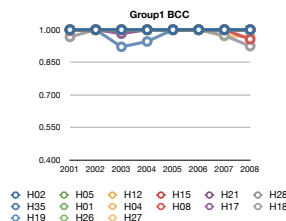
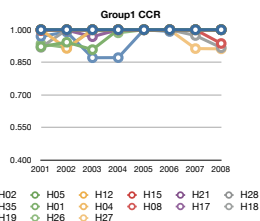
DMU Data
Result of CCR,
Result of BCC,
Result of CCR/BCC

Cluster Analysis
✘ Ward method,
Quadrance

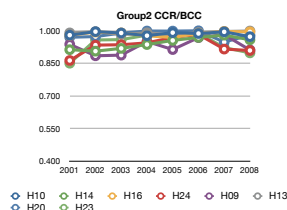
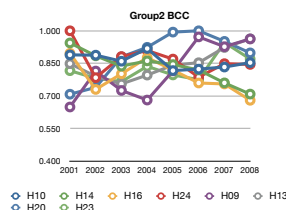
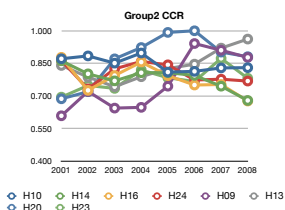
Result of Cluster Analysis

The Performance Evaluation of Japanese Hotels:
DEA Model

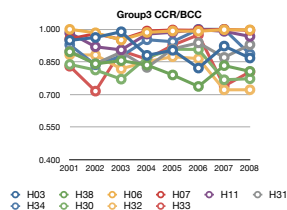
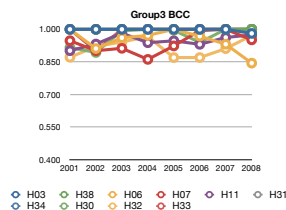
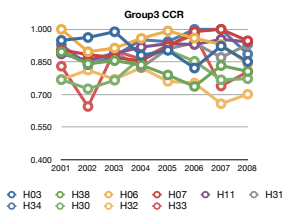
G1



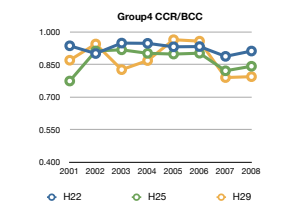
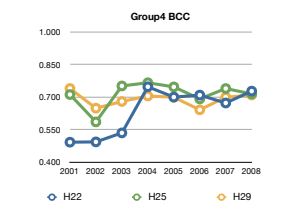
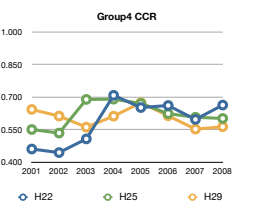
G2



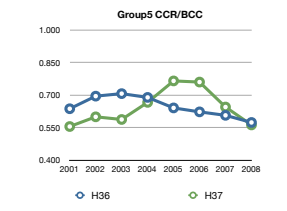
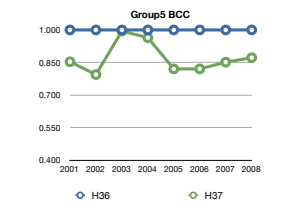
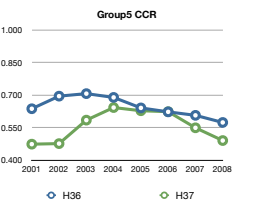
G3



G4



G5



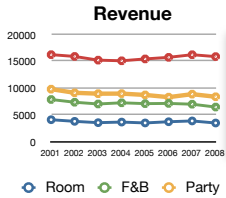
Result of DEA Data

The Performance Evaluation of Japanese Hotels:
DEA Model



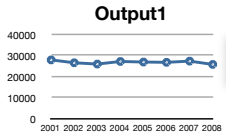
RANKING	2001	2002	2003	2004	2005	2006	2007	2008
REVENUE	2	2	2	2	2	2	2	2
CCR	I	I	I	I	I	I	I	I
BCC	I	I	I	I	I	I	I	I
CCR/BCC	I	I	I	I	I	I	I	I
RTS	C	C	C	C	C	C	C	C

RTS = Returns to Scale,
I = Increasing, C = constance, D = Decreasing



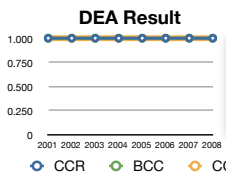
REVENUE	2001	2002	2003	2004	2005	2006	2007	2008
Room	4122	3819	3573	3684	3523	3746	3894	3512
F&B	7877	7367	7045	7264	7108	7148	7003	6474
Party	9795	9118	8957	8969	8721	8313	8868	8384
Other	16203	15872	15184	15063	15408	15704	16191	15841

Unit: 万円



TOTAL	2001	2002	2003	2004	2005	2006	2007	2008
REVENUE	27882	26523	25912	27139	26876	26728	27302	25736

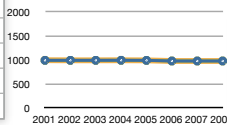
Unit: 万円



DEA RESULT	2001	2002	2003	2004	2005	2006	2007	2008
CCR	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
BCC	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
CCR/BCC	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

$0 \leq CCR, BCC, CCR/BCC \leq 1.000$

Input 1

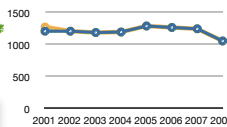


Number of Rooms

	2001	2002	2003	2004	2005	2006	2007	2008
AI	987	987	987	988	986	973	973	973
CCR TI	987	987	987	988	986	973	973	973
BCC TI	989	987	987	988	986	973	973	973

Unit: 室

Input 2

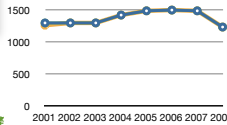


Number of Employees

	2001	2002	2003	2004	2005	2006	2007	2008
AI	1203	1203	1182	1190	1284	1261	1240	1050
CCR TI	1203	1203	1182	1190	1284	1261	1240	1050
BCC TI	1269	1203	1182	1190	1284	1261	1240	1050

Unit: 人

Input 3

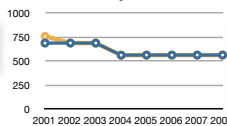


Number of Restaurant sheets

	2001	2002	2003	2004	2005	2006	2007	2008
AI	1297	1297	1297	1420	1486	1498	1486	1233
CCR TI	1297	1297	1297	1420	1486	1498	1486	1233
BCC TI	1261	1297	1297	1420	1486	1498	1486	1233

Unit: 席

Input 4

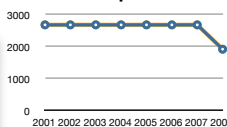


Number of Bar sheets

	2001	2002	2003	2004	2005	2006	2007	2008
AI	686	686	686	560	561	561	561	561
CCR TI	686	686	686	560	561	561	561	561
BCC TI	756	686	686	560	561	561	561	561

Unit: 席

Input 5



Number of Party sheets

	2001	2002	2003	2004	2005	2006	2007	2008
AI	2670	2670	2670	2670	2670	2670	2670	1910
CCR TI	2670	2670	2670	2670	2670	2670	2670	1910
BCC TI	2670	2670	2670	2670	2670	2670	2670	1910

Unit: 席

AI Actual Input, TI=Target Input

Result of DEA Data H02

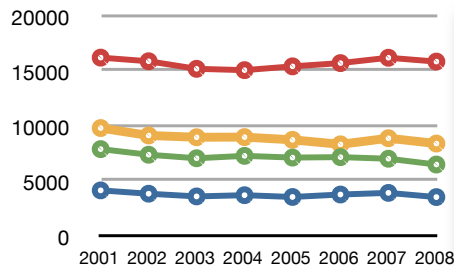
The Performance
Evaluation of
Japanese Hotels:
DEA Model



RANKING	2001	2002	2003	2004	2005	2006	2007	2008
REVENUE	2	2	2	2	2	2	2	2
CCR	I	I	I	I	I	I	I	I
BCC	I	I	I	I	I	I	I	I
CCR/BCC	I	I	I	I	I	I	I	I
RTS	C	C	C	C	C	C	C	C

RTS = Returns to Scale,
I = Increasing, C = constance, D = Decreasing

Revenue



REVENUE	2001	2002	2003	2004	2005	2006	2007	2008
Room	4122	3819	3573	3684	3523	3746	3894	3512
F&B	7877	7367	7045	7264	7108	7148	7003	6474
Party	9795	9118	8957	8969	8721	8313	8868	8384
Other	16203	15872	15184	15063	15408	15704	16191	15841

Unit: 万円

○ Room ○ F&B ○ Party ○ Other

Result of DEA Data H37

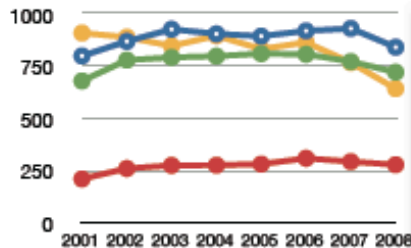
The Performance
Evaluation of
Japanese Hotels:
DEA Model



RANKING	2001	2002	2003	2004	2005	2006	2007	2008
REVENUE	38	37	37	36	36	35	36	37
CCR	37	37	36	37	38	35	38	38
BCC	31	30	20	24	31	31	31	29
CCR/BCC	37	37	36	37	38	35	38	38
RTS	C	C	C	C	C	C	C	C

RTS = Returns to Scale,
I = Increasing, C = constance, D = Decreasing

Revenue



REVENUE	2001	2002	2003	2004	2005	2006	2007	2008
Room	800	870	928	906	895	920	932	842
F&B	680	780	793	799	811	808	773	722
Party	910	890	848	897	833	865	768	643
Other	210	260	275	276	281	309	293	278

Unit: 万円

Room F&B Party Other

Conclusion

The Performance
Evaluation of
Japanese Hotels:
DEA Model

DEA Model Method

We set:

Input

- 「Number of Room」
- 「Number of Employee」
- 「Number of Restaurant Seat」
- 「Number of Bar Seat」

Output

- 「Number of Party seat」

Total 38 International Tourism
Hotels

We found:

Best DMU

- 「H02」 「H05」 「H12」 「H15」
- 「H21」 「H28」 「H35」

Improvement is required DMU
「H37」

5 types of efficiency groups

Q&A