

國立清華大學 105 學年度碩士班考試入學試題

系所班組別：服務科學研究所 甲組

考試科目（代碼）：統計學（4502）

共 5 頁，第 1 頁 *請在【答案卷、卡】作答

Below are data for 16 hotels in Hsinchu in on Chinese New Year day of 2015. For each hotel we have the number of rooms occupied (**Occupancy**), the daily rate of a room in NT\$ (**RoomRate**), and what kind of room it is (**RoomType**): a single room (**RoomType**=0) or double room (**RoomType**=1).

Occupancy	RoomRate	RoomType
70	1575	0
66	1863	0
64	1881	0
55	2394	0
65	2556	0
52	2640	0
60	4170	0
50	3492	0
53	3657	1
48	3771	1
60	4455	1
52	4854	1
45	5550	1
72	5598	1
75	7686	1
66	6023	1

Suppose this sample is representative of all hotels in Hsinchu on Chinese New Year day of 2015.

We wish to test whether, on average, the occupancy of double rooms is higher than single rooms.

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共 5 頁，第 2 頁 *請在【答案卷、卡】作答

1. **[10%]** Which of the following set of hypotheses is the appropriate for answering this question? We use μ to denote the average occupancy of the hotels.
 - a. $H_0: \mu_{\text{double}} = \mu_{\text{single}}$ and $H_1: \mu_{\text{double}} \neq \mu_{\text{single}}$
 - b. $H_0: \mu_{\text{double}} \leq \mu_{\text{single}}$ and $H_1: \mu_{\text{double}} > \mu_{\text{single}}$
 - c. $H_0: \mu_{\text{double}} > \mu_{\text{single}}$ and $H_1: \mu_{\text{double}} \leq \mu_{\text{single}}$
 - d. $H_0: \mu_{\text{double}} \geq \mu_{\text{single}}$ and $H_1: \mu_{\text{double}} < \mu_{\text{single}}$
2. **[10%]** Which of the following sample statistics are **necessary** for computing the test statistic? (choose all that apply)
 - a. average occupancy of all hotel rooms
 - b. average occupancy of double rooms in hotels
 - c. occupancy for each of the 16 hotels
 - d. standard deviation of double-room occupancy
 - e. average room rate of double rooms
3. **[10%]** Compute the test statistic (assume equal variances of prices in double and non-double restaurants in Taipei). Choose the value of the test statistic:
 - a. < -2
 - b. in the interval $[-2, 0)$
 - c. in the interval $[0, 2)$
 - d. in the interval $[2, 3]$
 - e. > 3
4. **[10%]** If you know that the average meal price at this Taipei restaurant is less than NT\$400, what is the probability that it is located double?
 $P(\text{RoomType}=1 \mid \text{RoomRate} < 4000) =$
 - a. in the interval $[0, 0.2)$
 - b. in the interval $[0.2, 0.4)$
 - c. in the interval $[0.4, 0.6)$
 - d. in the interval $[0.6, 0.8)$
 - e. in the interval $[0.8, 1]$

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共 5 頁，第 3 頁 *請在【答案卷、卡】作答

Below is a linear regression model for occupancy, with the independent variables RoomRate, RoomType, and their interaction. Use the output to answer the following questions.

Regression Statistics	
Multiple R	0.670
R Square	0.449
Adjusted R Square	0.311
Standard Error	7.578
Observations	16

ANOVA					
	df	SS	MS	F	Significance F
Regression	3	560.886	186.962	3.256	0.060
Residual	12	689.052	57.421		
Total	15	1249.938			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	72.568	8.795	8.251	0.000	53.406	91.730
RoomRate	-0.005	0.003	-1.471	0.167	-0.012	0.002
RoomType	-44.484	14.539	-3.060	0.010	-76.162	-12.807
RoomPrice*RoomType	0.011	0.004	2.738	0.018	0.002	0.019

5. [10%] Using the regression model, predict the average double-room occupancy at a new hotel with RoomRate=5000 NTD.

Choose the most appropriate predicted range of occupancy:

- a. < 46 rooms
- b. 46-55 rooms
- c. 56-65 rooms
- d. 66-75 rooms
- e. > 75 rooms

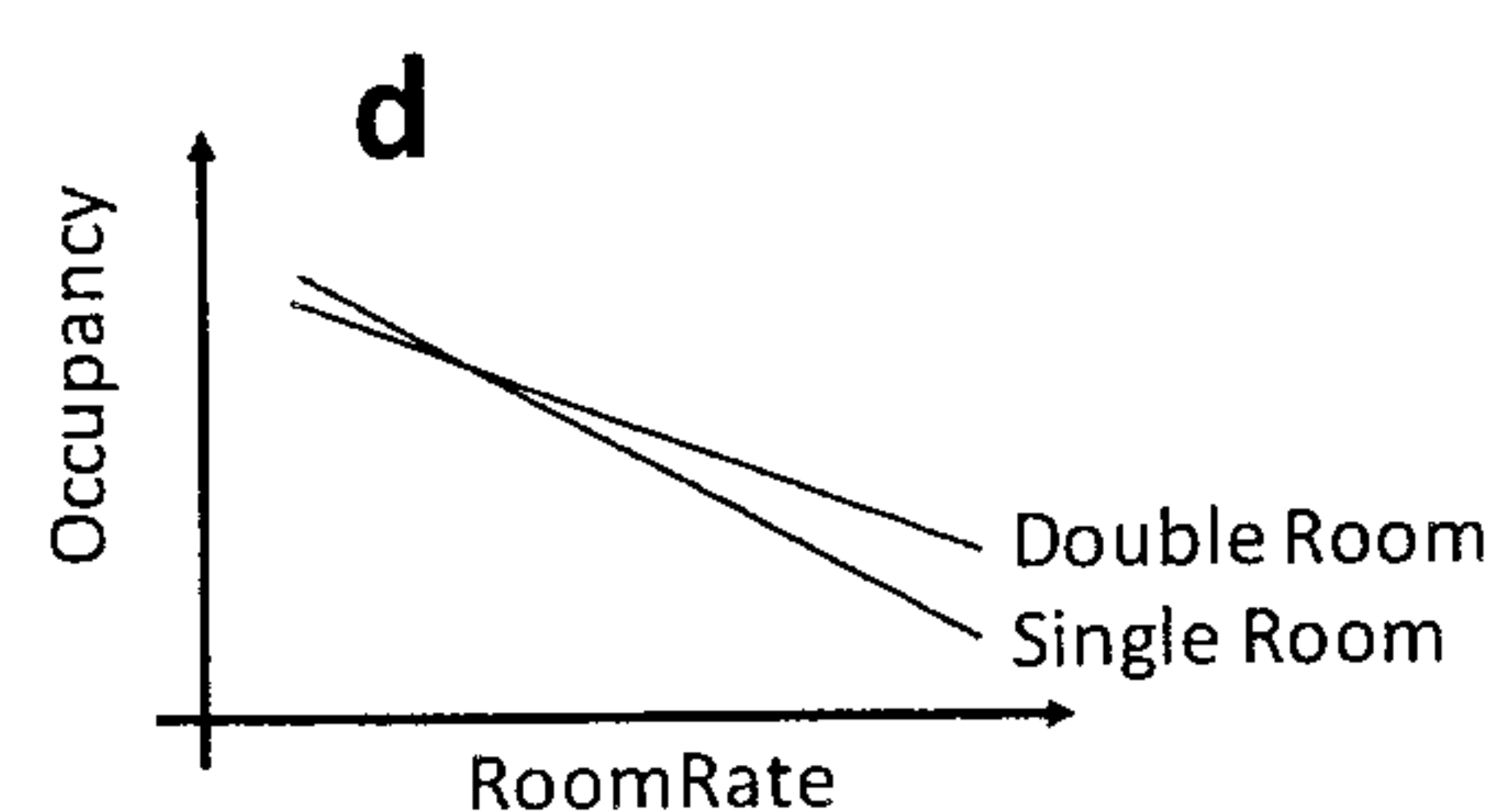
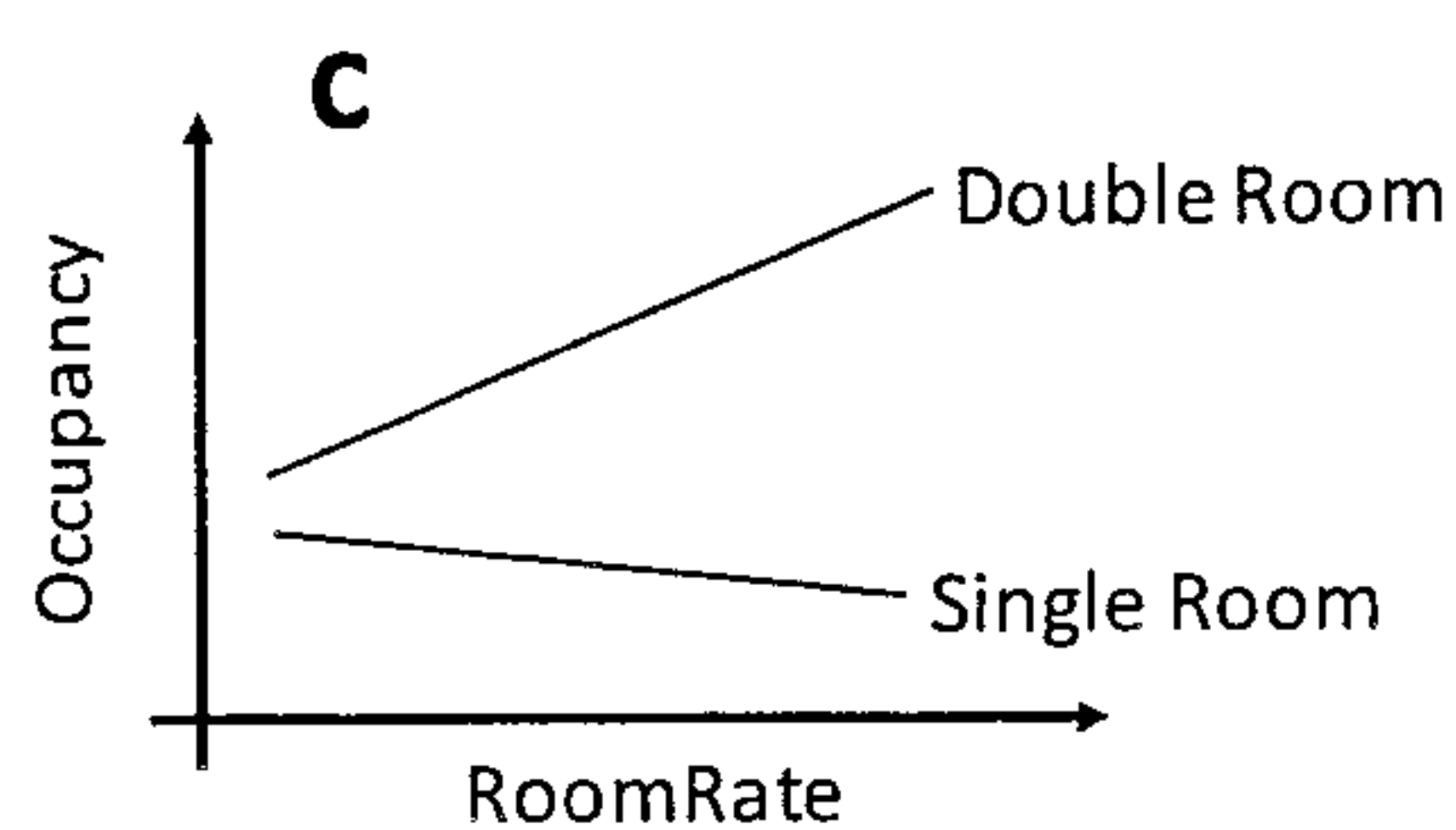
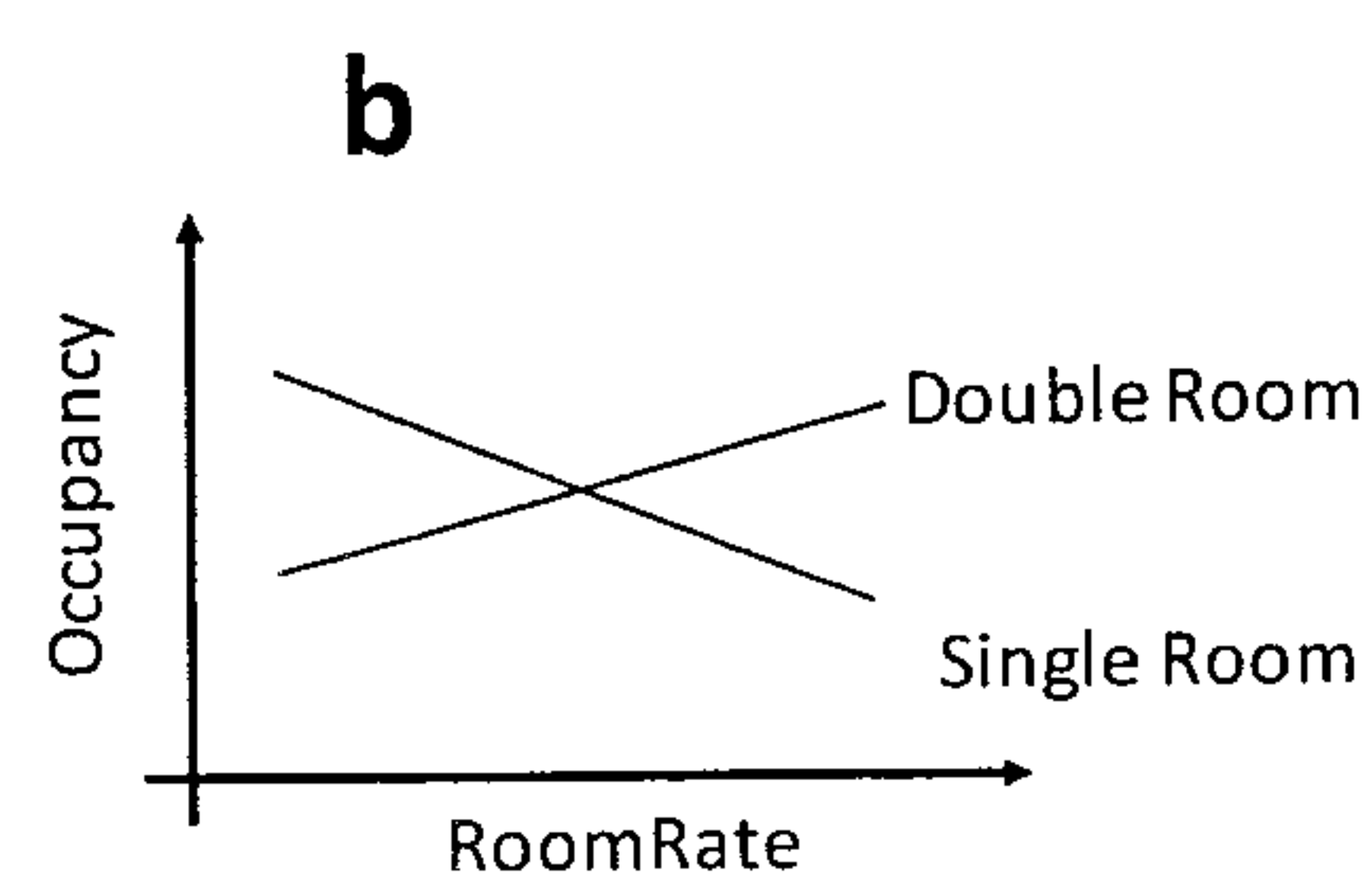
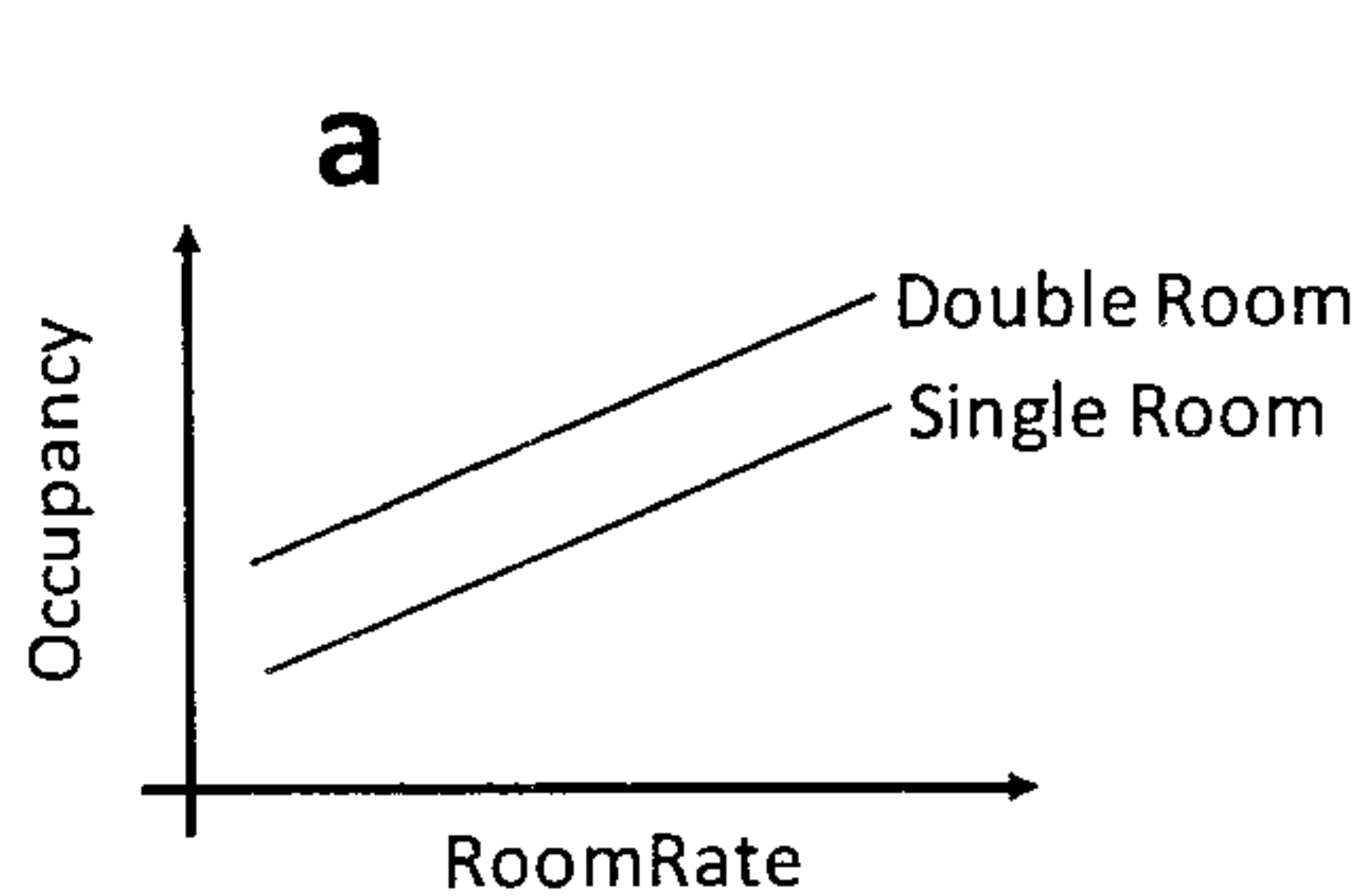
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6. [10%] The 99% confidence interval for the parameter for RoomType
- a. includes the value 0
 - b. includes only positive values
 - c. includes only negative values
7. [10%] For a double room, decreasing the room rate by 1000 NTD is associated with an average occupancy that is...
- a. higher by 6 rooms
 - b. lower by 6 rooms
 - c. higher by 5 rooms
 - d. lower by 5 rooms
 - e. higher by 11 rooms
8. [10%] Which of the following four charts best describes the estimated regression model shown in the output?

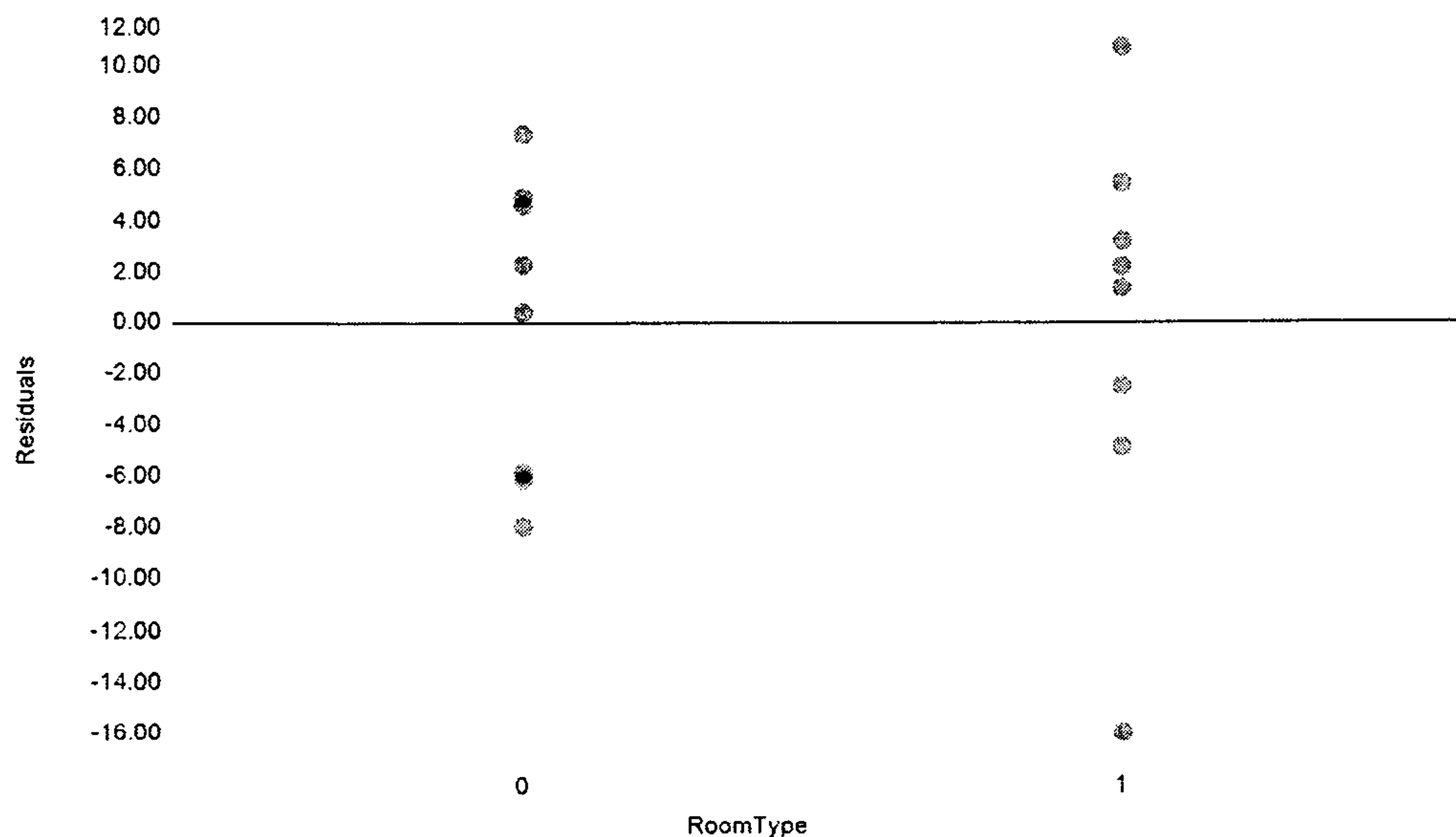


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9. [10%] Based on the regression output, what can we say about the relationship between occupancy and room rate among hotels in Hsinchu on Chinese New Years Day in 2015? Use a 5% significance level. (Choose all that apply)
- Occupancy is negatively associated with room rate
 - Occupancy is negatively associated with room rate for single rooms
 - Occupancy is negatively associated with room rate for double rooms
 - Occupancy is positively associated with room rate for single rooms
 - Occupancy is positively associated with room rate for double rooms
10. [10%] The chart below shows the residuals from the regression model, separately for single room and double room observations. Which of the following statements are correct? (choose all that apply)



- Most double room observations are over-predicted by the model
- Most double room observations are under-predicted by the model
- The difference between model predictions and actual occupancy is at most 10 rooms for all eight single-room observations
- The difference between model predictions and actual occupancy is at most 10 rooms for all eight double-room observations