Face value big data multiple linear regression model analysis

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Abstract. In order to explore the impact of the live video host’s face value on the consumption of viewers watching the live video, the author formed a 28-person research team from 20:00 pm to 22:00 pm every evening to conduct a 336-hour follow-up survey. A total of 488 valid online questionnaires and 56 personal in-depth interview records were collected. The author classifies the big data obtained in the survey, and then establishes a multiple linear regression analysis model, using a stepwise regression analysis method. At the same time, the Eviews10.0 is used to objectively analyze and accurately verify the classified big data. The conclusion is that the beautification degree of the live video host’s face, eyes and ears is positively correlated with the live video sales revenue, while the live video host’s mouth shape is negatively correlated with the live video sales revenue.

1. Introduction

1.1. Research background
On the TikTok live video platform, the face value of the person in charge of the live video has a great influence on the consumption behavior of the live video viewers. In order to explore the different components of the live video host’s appearance and the influence on the consumption of the live audience, we conducted in-depth research.

1.2. Literature review
American scholar Hanernesh proposed the definition of Beaty pays from the perspective of beauty and economics (Daniel S. Hamermesh, 2011). Face value is usually related to trust. Wilson and Eckel pointed out that the higher the face value, the better the trust and the greater the number of trusted audiences. Fukuyama believes that trust can reduce transaction costs, which are usually lower than the average transaction cost in society. Therefore, people who look good are more likely to earn higher incomes. In addition, research by foreign scholars such as Brooks, Karina, Tobias, and Patrick pointed out that the higher the value of the face, the faster an individual can earn income (Brooks AW, Huang L, Kearney SW, 2014). Obvious promotion effect (Karina D, Eva S, 2015) (Tobias W, Patrick R, 2016) [4]. Based on the research on personal appearance, Markus and Tanya confirmed that appearance has a positive effect on the increase of personal income. At the same time, it is pointed out that discrimination based on face value is widespread, and this phenomenon has been universally recognized by Alfred, Columnman and Heckman scholars. Chinese scholars Zhang Weiying and Ke Rongzhu pointed out that good looks can better improve economic performance and increase personal
income. Jiang Qiuchuan and others analyzed graphs and height data from the perspective of graphs, and pointed out the impact of appearance on income. Based on the study of CFPS cross-sectional data, Liu Yipeng and others believe that the premium of face value is not significant. After research, Yang Guozheng, Wang Shanggao, Pu Yajun and others pointed out that there is a positive correlation between appearance value and personal income, and appearance value premiums and ugliness are widespread. Cui Faqiang's conclusion based on the research on the influence of personal image in live video sales is that the optimization of personal image can increase personal income. Shan Depeng et al. It is pointed out that the value of appearance has a significant impact on personal income, and the impact on women’s income is even more important, but it has no significant impact on women with a high degree of education.

In summary, on the one hand, scholars have carefully analyzed the influence of appearance on personal income from the aspects of beauty, figure, height and image. It is generally believed that the combination of different external factors has a positive effect on increasing personal income. On the other hand, on the basis of comparing costs and benefits, the relationship between appearance, trust, costs and benefits is proposed. The higher the appearance, the better the personal trust, the lower the transaction cost, and the faster the personal economic income. In summary. Finally, from the perspective of gender and education, it is certain that there is a significant positive correlation between appearance value and income. The appearance of women is more important than the appearance of men, but higher education will weaken the significant impact of women’s appearance on increasing personal income.

2. Research design

2.1. Data sources
The research data is mainly derived from the 14-day field survey conducted by the research team. We tended to focus the survey on the live audience participating in the survey. At the same time, we also counted the income of the live video broadcaster from the sales of goods. According to the requirements, the live viewers participating in the survey must have a 120-minute live shopping event every night from 8 pm to 10 pm. The viewers can only choose one broadcaster per day, and the live video broadcaster of each day cannot be the same. After the event, the audience should fill in the online evaluation questionnaire from the questionnaire star website. Each option is filled out in accordance with the principle of percentile. The larger the value, the greater the impact on the audience’s consumption, the smaller the value, the more it represents the consumption of the audience. The smaller the impact. Due to the large number of audiences, we cannot arrange for someone to count the specific time each audience participates in the event. Therefore, the data we use is more derived from the honest reports of the audience. After collecting the data, we organized and counted the data according to the two team leaders. A total of 488 valid questionnaires were collected in this survey. The data is shown in Table 1.

| day | Sales revenue | complexity | Face shape | hairstyle | eyebrow | eye | nose | mouth | ear |
|-----|--------------|------------|------------|-----------|----------|-----|------|-------|-----|
| 1   | 29.8         | 76         | 78         | 65        | 55       | 78  | 79   | 70    | 50  |
| 2   | 33.7         | 70         | 77         | 70        | 55       | 85  | 77   | 72    | 50  |
| 3   | 56.9         | 92         | 90         | 92        | 65       | 95  | 95   | 90    | 53  |
| 4   | 55.4         | 91         | 89         | 90        | 60       | 93  | 96   | 87    | 55  |
| 5   | 34.8         | 81         | 79         | 72        | 57       | 84  | 83   | 77    | 51  |
| 6   | 43.3         | 88         | 84         | 82        | 58       | 88  | 82   | 74    | 50  |
| 7   | 52.1         | 89         | 84         | 88        | 61       | 90  | 90   | 76    | 52  |
| 8   | 46.5         | 85         | 85         | 84        | 60       | 89  | 89   | 74    | 49  |
2.2. Variable selection
The research selected 14 live video broadcasters’ revenue from live video sales as the main explained variable. At the same time, the skin color, face shape, hairstyle, eyebrows, eyes, nose, mouth and ears of the live video broadcaster are selected as explanatory variables to construct a multiple regression evaluation model for the influence of the main face value of the live video broadcaster on the sales effect of the live video broadcast for better evaluation. The value of the above explanatory variables is derived from the data collation of the questionnaire for the effect of live video broadcasts on live video sales.

2.3. Model design
Let \( Y_i \) be the total revenue from live video sales of the live video broadcaster, \( X_{1i} \) the skin color index of the live video broadcaster, \( X_{2i} \) the face shape index of the live video broadcaster, \( X_{3i} \) the hairstyle index of the live video broadcaster, and \( X_{4i} \) the eyebrow index of the live video broadcaster. \( X_{5i} \) is the main eye indicator of the live video broadcaster, \( X_{6i} \) is the main nose indicator of the live video broadcaster, \( X_{7i} \) is the main mouth indicator of the live video broadcaster, \( X_{8i} \) is the main ear indicator of the live video broadcaster, \( \beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7 \) and \( \beta_8 \) are parameters, and \( \mu_i \) is a random disturbance term. Establish the multiple regression model (1). Since the parameter estimation and model testing of the model (1) have not been carried out, there is the possibility of explanatory variable adjustment. Therefore, we named the model (1) the initial model.

\[
Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \mu_i \tag{1}
\]

3. Measurement inspection and result analysis

3.1. Model estimation results and analysis

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|-------|
| C        | -134.7003   | 19.01821   | -7.082698   | 0.0009|
| X1i      | 0.027424    | 0.180613   | 0.151839    | 0.8853|
| X2i      | 0.722654    | 0.333060   | 2.169742    | 0.0822|
| X3i      | 0.252384    | 0.157575   | 1.601678    | 0.1701|
| X4i      | 0.071000    | 0.173251   | -1.972532   | 0.1056|
| X5i      | 0.650946    | 0.325640   | 1.998975    | 0.1021|
| X6i      | 0.267654    | 0.162719   | 1.644889    | 0.1069|
| X7i      | -0.341743   | 0.173251   | -1.972532   | 0.1056|
| X8i      | 0.745979    | 0.379085   | 1.967842    | 0.1062|

The estimation results in Table 2 show that the face shape of the live video broadcaster has a significant impact on the delivery effect of the live video broadcaster, while the anchor skin color, the anchor hairstyle, the anchor eyebrows, the anchor eyes, the anchor nose, the anchor mouth and the anchor ears have an effect on the live broadcast sales. The impact is not significant. As a result, there
may be multicollinearity between variables. Therefore, continue to use the stepwise regression analysis method to further examine the possible multicollinearity problems among explanatory variables, and perform operations such as eliminating related variables based on the economic significance of each explanatory variable.

### 3.2. Stepwise regression analysis

The test result of model (1) shows that the face shape of the live video broadcaster has a significant influence on the sales effect of the live video broadcaster. Considering comprehensively, other explanatory variables are the elements that constitute the appearance value. Although the functional performance of each variable is different, they are often combined and evaluated when constituting the appearance value. Therefore, there may be multiple collinearity among the explanatory variables. For this reason, we adopt the method of elimination. First, after eliminating the host’s skin color explanatory variables, we establish model (2) and perform the second regression analysis.

\[ Y_i = \beta_0 + \beta_2X_{2i} + \beta_3X_{3i} + \beta_4X_{4i} + \beta_5X_{5i} + \beta_6X_{6i} + \beta_7X_{7i} + \beta_8X_{8i} + \mu_i \]  

(2)

Using the same method as the initial model (1) for analysis, the results of the quadratic regression analysis can be obtained, as shown in Table 3.

**Table 3.** (2) The estimated output results of the initial model.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|-------|
| C        | -135.6122   | 16.51064   | -8.213624   | 0.0002|
| X2i      | 0.750956    | 0.252547   | 2.973526    | 0.0248|
| X3i      | 0.262460    | 0.130766   | 2.007095    | 0.0915|
| X4i      | 0.077010    | 0.317346   | 0.242669    | 0.8163|
| X5i      | 0.640840    | 0.291661   | 2.197204    | 0.0704|
| X6i      | 0.266749    | 0.148783   | 1.792869    | 0.1232|
| X7i      | -0.348490   | 0.153218   | -2.274475   | 0.0633|
| X8i      | 0.769341    | 0.317001   | 2.426938    | 0.0514|

The results in Table 3 show that after excluding the explanatory variables of the host’s skin color, the host’s face shape still has a significant impact on the host’s sales effect. At the same time, the host’s hairstyle, host’s eyes, host’s mouth and host’s ears affect the host’s sales. The sales effect is significant. The influence of the eyebrows and nose of the live video broadcaster on the sales effect of the live video broadcaster is still not significant. Therefore, we further removed the anchor’s eyebrows and adopted further corrections to the model.

### 3.3. Revised model

Considering the results of the secondary regression analysis, there may be correlation between the skin color of the live video broadcaster and the eyebrows of the broadcaster, and there may also be multicollinearity. For this reason, after excluding the skin color and eyebrows of the broadcaster, the explanatory variables Correlation test between. See Table 4 for details.
Table 4. Correlation test statistics table between explanatory variables.

| Explanatory variables | R-squared | P value of T statistic | P value of F statistic | Is it significant |
|-----------------------|-----------|------------------------|------------------------|------------------|
| x2i                   | 0.890941  | 0.00                   | 0.00                   | Y                |
| x2i,x3i               | 0.942136  | 0.01,0.01              | 0.00                   | Y                |
| x2i,x3i,x5i           | 0.969389  | 0.02,0.11,0.01         | 0.00                   | N                |
| x2i,x3i,x5i,x6i       | 0.972470  | 0.11,0.150.01,0.34     | 0.00                   | N                |
| x2i,x3i,x5i,x6i,x7i   | 0.974058  | 0.11,0.170.02,0.33,0.50| 0.00                   | N                |
| x2i,x3i,x5i,x6i,x7i,x8i| 0.987453  | 0.01,0.07,0.03,0.07,0.04,0.03| 0.00                   | Y                |

In summary, establish model (3) and continue to carry out regression analysis.

\[ Y_i = \beta_0 + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \mu_i \]  

(3)

The same analysis method as the initial model (1) and (2) is adopted to obtain the third regression analysis result, as shown in Table 5.

Table 5. Results of the third regression analysis.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|-------|
| C        | -135.3965   | 15.33843   | -8.827269   | 0.0000|
| X2i      | 0.751887    | 0.234931   | 3.200459    | 0.0151|
| X3i      | 0.259120    | 0.120983   | 2.141792    | 0.0695|
| X5i      | 0.673492    | 0.240746   | 2.797517    | 0.0266|
| X6i      | 0.280140    | 0.128549   | 2.179253    | 0.0657|
| X7i      | -0.353838   | 0.141065   | -2.508338   | 0.0405|
| X8i      | 0.786330    | 0.287640   | 2.733733    | 0.0292|

Analyzing the results in Table 5, it is found that the anchor face, anchor hairstyle, anchor eyes, anchor nose, anchor mouth and anchor ears have a significant impact on the delivery effect of live video broadcasters. Therefore, the regression result of the model is obtained:

\[ Y_i = 135.3965 + 0.751887X_{2i} + 0.259120X_{3i} + 0.673492X_{5i} + 0.280140X_{6i} - 0.353838X_{7i} + 0.786330X_{8i} + \mu_i \]  

(4)

From the analysis of the results, it can be seen that the effect of the live video broadcast host’s delivery is positively correlated with the host’s face, host’s hairstyle, host’s eyes, host’s nose, and host’s ears, and negatively correlated with the host’s mouth, which is the same as the proportional relationship in the model, and has both economic meaning. It conforms to the theory, indicating that the modified model has good goodness of fit, and the t-test values of the constant term and each explanatory variable are all passed without multicollinearity.

3.4. Model checking

3.4.1. Goodness of fit test

\[ \overline{R^2} = 1 - \frac{RSS / (n - k - 1)}{TSS / (n - 1)} \]  

(5)
We use Eviews10.0 software to calculate and analyze the results. The coefficient of determination $R^2 = 0.987453$, and the adjusted coefficient of determination $R^2_{adj} = 0.976295$, indicating that the sample regression equation fits the sample's observations well, and the explanatory variables are important to the live video broadcaster. The explanatory ability of the evaluation of the carrying effect is 97.67%, and it can be judged that the revised model has a good fit well.

3.4.2. **Overall significance test.** Propose the original hypothesis and alternative hypothesis: $H_0: \beta_0 = \beta_1 = \ldots = \beta_k = 0$, $H_1: \beta_j$ is not all 0. It has been obtained that $F = 91.81930$, given $\alpha = 0.1$, the degrees of freedom $k-1 = 6$ and $n_k = 7$ obtained by looking up the table are $F_{\alpha}(6,7) = 2.827$, because $F > F_{\alpha}(6,7)$, fully explain, at a significance level of 0.1, the model rejects the null hypothesis that the overall is not significant. Therefore, the model is overall significant.

3.4.3. **Model fitting regression.** Comparing the Fitted curve and the Actual curve, it fully shows that the multivariate linear model of the factors affecting the sales effect of the live video broadcaster has a good effect. See picture 1.

![Figure 1. Curve of fitted values.](image)

4. **Conclusions and recommendations**

Based on the previous research results, this paper further uses the data from the field survey and uses the method of multiple regression analysis to successfully construct the host’s face value components (the host’s skin color, face shape, hairstyle, eyebrows, eyes, nose, mouth and Ears) The regression model for evaluating the impact of live video broadcasters on the delivery of goods. Based on the results and innovation of the model analysis, it puts forward the following research conclusions:

4.1. **The anchor’s face, eyes and ears are important factors affecting the anchor’s delivery effect**

In the age of looking at the face, the eyes are the window of the soul and a tool for direct emotional communication with the audience. Especially on the live broadcast platform, the live video broadcaster cannot directly communicate with the audience. Currently, the eyes not only undertake the
function of inner communication, but also need to undertake the function of language and information transmission. For this reason, the training and optimization of the eyes can improve communication with consumers to promote live broadcast sales revenue. Ears are often neglected by live video broadcasters. However, in this analysis, the small beautification of ears by broadcasters may greatly increase the revenue of live video sales. For this reason, we specially conduct interviews with consumers. It is further concluded that ears are not often paid attention to, once they are paid attention, especially the changes in earrings, while they can stimulate consumers' desire to consume.

4.2. Excessive grooming of the anchor’s mouth will reduce revenue from live video sales
The function of the mouth plays a very important role in traditional sales, but in the live broadcast process, part of the mouth function is replaced by the eyes. For this reason, consumers are more inclined to communicate emotionally through the eyes of the live video broadcaster and exchange information through words. The function of the mouth is weakened in the live broadcast platform. If live video broadcasters over-modify their mouths, consumers may shift their attention from their eyes to their mouths, which will affect the effect of live video sales. Therefore, we do not recommend that live video broadcasters over-dress their mouths.

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References
[1] Daniel S. Hamermesh. Beauty Pays [M] USA.Princeton University Press,2011.08
[2] Karina D, Eva S. Myth or fact ? The beauty premium across the wage distribution in Germany [J]. Economics Leters,2015,129(4):29-34.
[3] Brooks A W, Huang L, Kearney S W, et al. Investors prefer entrepreneurial ventures pitched by attractive men [J]. Proceedings of the National Academy of Sciences of the United States of America, 2014, 1 (12): 427-431.
[4] Fukuyama F. Social capital and the modern capitalist economy: creating a high trust workplace [M]. USA: Stem Busines Magazine, 1997.
[5] Tobais W, Patrick R. How beauty works. The oretical mechanisms and two empirical aplications on students' evaluation of teaching [J]. Social Science Research, 2016, 57(2): 253-272.
[6] Faqiang Cui, Cui Faqiang. Quantitative study on factors affecting the price of residential real estate multiple linear regression model [J]. Journal of physics. Conference series, 2020, 1629 (1).
[7] Markus M M, Tanya S R. Why beauty maters [J]. The American Economic Review, 2006, 96(1): 222-235.
[8] Averett S L, Korenman S. The economic reality of the beauty myth [J]. The Journal of Human Resources, 1996, 31(2): 304-330.
[9] Trust and its interpretation: a cross-provincial survey and analysis from China [J]. Zhang Weiying, Ke Rongzu. Economic Research. 2002(10)
[10] "Beauty Economics" in China's Labor Market: Does Body Matter? [J]. Jiang Qiuchuan, Zhang Kezhong. Economics (Quarterly). 2013(03)
[11] Good-looking and high-income? Research on the discrimination of appearance in China's labor market [J]. Liu Yipeng, Zheng Yuan, Zhang Chuanchuan. Economic Review. 2016(05)
[12] Research on the effect of academic correction of appearance discrimination in the labor market [J]. Yang Yuanzheng, Xiangxiang Ming, Zheng Xiaodong. Southern Economy. 2017(03)
[13] Does beauty affect income? [J]. Wang Shangao, Yan Binjian, Zhou Yingheng, Tian Xu. Northwestern Population. 2018(04)