Research on the influencing factors of financing efficiency of big data industry based on panel data model--Empirical evidence from Guizhou province

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Abstract. This paper mainly studies the influence factors of financing efficiency of Guizhou big data industry, and selects the financial and macro data of 20 Guizhou big data enterprises from 2010 to 2016. Using the DEA model to obtain the financing efficiency of Guizhou big data enterprises. A panel data model is constructed to select the six macro and micro influencing factors for panel data analysis. The results show that the external economic environment, the turnover rate of the total assets of the enterprises, the increase of operating income, the increase of the revenue per share of each share of the business income have positive impact on the financing efficiency of the big data industry in Guizhou. The key to improve the financing efficiency of Guizhou big data enterprises is to improve.

1. Introduction
In 2014, Guizhou's big data industry was still in its growth stage, and Guizhou province has built a big data industry. Now the big data industry in Guizhou is in the leading position in the country. The development of big data industry in Guizhou has been greatly promoted as the national big data comprehensive test area has been officially settled in Guizhou. With the growth of big data industry in Guizhou, the problem of financing efficiency of enterprises shows up. Financing efficiency directly affects the application efficiency of a large amount of funds. This paper analyzes the influencing factors of financing efficiency and analyzes the influence and extent of these factors. Based on this, it is helpful to raise the financial efficiency of Guizhou big data industry, which has positive influence on the development of big data industry in Guizhou province.

2. Literature review
Since the big data industry has just emerged, domestic and foreign researches have focused on the connotation of financing efficiency. Research on the financing efficiency and influencing factors of traditional manufacturing industry. Richardson (2006)¹ analyzed the investment efficiency through the investment expectation model, and used the residuals in the investment expectation model to represent the underinvestment and overinvestment. Bai et al. (2006)² used capital marginal return to measure investment efficiency. Dabla-norris et al. (2012)³ constructed a public investment efficiency index to study the investment efficiency of public investment. Cui et al. (2014)⁴ adopt the dynamic factor panel data model, and empirical research has studied the influence factors of financing efficiency of non-listed smes. The empirical results show that the enterprise own quality and the main
business of the financing efficiency is larger, the influence of foreign debt capital profitability, liquidity and size, the influence of solvent on the financing efficiency.

Zhang, Zhao (2015) \[^5\] using the cross-tiered model and 559 scientific and technological innovative listed companies. The results show that there is a significant negative correlation between government support and the financing efficiency of technological innovation enterprises. There is a significant positive correlation between financial development and corporate social capital and the financing efficiency of technological innovation enterprises. Pan et al. (2016) \[^6\] used Malmquist index to evaluate the financing efficiency of environmental protection industry in China. Based on the empirical results of the Tobit model, it is found that the financing efficiency of the environmental protection industry is decreasing, and the scale and quality of the enterprises can improve the financing efficiency.

However, the research on the financing efficiency of the big data industry is scarce. This paper studies the influence factors of financing efficiency of Guizhou big data industry, and selects the influence factors of financing efficiency of big data industry in Guizhou province from both macro and micro perspectives. The macro influence factors mainly include external factors such as the status of economic development. The microscopic-influencing factors include total asset turnover, revenue growth rate, operating income per share, financial expense ratio, operating margin, economic development level and other internal factors. Then, the panel data model is constructed to analyze the influence of these factors on the financing efficiency of the big data industry in Guizhou province.

3. Analysis of financing efficiency of big data industry

3.1. DEA method
In this paper, the data of DEA financing efficiency is adopted. Not to need the presupposes a specific functional form, weight in the model was produced by the mathematical programming, eliminates artificial subjective factors, to be able to objectively evaluate the big data in Guizhou industry financing efficiency.

The CCR model adopted in this paper is the first DEA model and one of the most basic DEA models, established by Chames, Cooper and Rhodes in 1978. The model is to evaluate the efficiency of the decision unit based on the premise of the scale benefit.

\[
\begin{align}
\min & \quad \theta - \varepsilon \left( \sum_{i=1}^{m} s_{-}^{i} + \sum_{i=1}^{m} s_{+}^{i} \right) \\
\sum_{j=1}^{n} y_{oj} - s_{-}^{r} = y_{or}, & \text{ } r \in \{1, 2, 3 \ldots s\} \\
\theta, \lambda, s_{-}^{r}, s_{+}^{r} & \geq 0, \text{ } j = 1, 2, 3 \ldots n
\end{align}
\]

In the formula: \(\theta\) shows the efficiency value of the corresponding DMU; \(N\) represents the number of similar DMU; \(M\) and \(s\) respectively represent the number of input and output; And the relaxation variable that is input to the I and the output of the r item, respectively; And the ith input and r output of the first DMU; Lambda is the linear combination coefficient; Epsilon is an infinitesimal number of non-archimedes, which is infinitesimal in the calculation. This paper uses DEA technology to calculate the financing efficiency of 20 big data enterprises in guizhou. The input indexes selected in this paper are operating income, return on equity, total asset turnover, and output index is the operating cost, total assets and total assets.

3.2. Variable selection
The financing efficiency (FE). Through DEA data envelopment analysis method, the input index and output index are selected, and the multi-input multi-output model is used to analyze the financing efficiency of the 20 big data enterprises selected in the past seven years. Total asset turnover (TAT).
The total asset turnover rate is an indicator of asset utilization. This paper analyzes the operating efficiency of the enterprise by using total assets turnover ratio. Revenue growth rate (RGR). The growth rate of operating income is the ratio of the annual revenue growth to the total revenue of the previous year, reflecting the increase and decrease of business revenue. It is an important index to evaluate the growth status and development ability of enterprises. Operating income per share (OIP). The operating income per share is the ratio of the total business income of the company to the total equity capital. What it reflects is the income Shared by the company to each share, and also an important index reflecting the income of the shareholders. Financial cost ratio (FAR). Financial expenses are part of the financing cost of the enterprise. Financial expense ratio is the percentage of financial expenses and main business income. Operating profit margin (OPM). Operating profit margins reflect the ability of business managers to make profits without considering non-operating costs. The higher the operating profit margin the higher the profitability of the enterprise; Economic development level (GDP). As the external financing environment of enterprises, economic development can affect financial institutions and investors. In turn, it affects the risk appetite of financial institutions and investors, thus changing the financing efficiency of the market.

3.3. The data source
The company's basic financial data from 2010 to 2016 is from the RESSET financial database. The data on macroeconomic growth came from the NBS website (http://www.stats.gov.cn).

4. Analysis of the empirical results of the influence factors of financing efficiency
Panel data also calls the time series of cross section data or pool data, refers to the time sequence on multiple section, on the cross section samples taken at the same time observation of sample data, that is the cross section data and data fusion together of the time series data. The panel data has the following advantages: first, the panel data makes use of more information of the data to improve the degree of freedom and effectiveness. A more efficient and reliable parameter estimation can be obtained to estimate more precise and complex behavioral equations. Second, the panel data can better detect and measure the impact of simple use of cross-section data or time series data. Finally, panel data can better study the complex problems of dynamic behavior.

4.1. Panel unit root test
The panel data model needs to check the stability of data before regression. Some non-stationary economic time series tend to show a common trend of change, and these sequences themselves do not necessarily have a direct correlation. At this point, the data is returned, although there is a higher R squared, the result is of no practical significance. This situation is called false regression or false regression. In order to avoid false regression and ensure the validity of the estimated results, we must test the stability of each panel sequence. The most commonly used method to test the stability of data is the unit root test. The root test of the original sequence is stable with four factors, and the two factors are not stable. It can be judged that TAT, RGR, OIP, FAR, OPM, GDP is a sequence of orders.

4.2. Empirical model construction
There are three types of panel data model: pool model, fixed effect model, and random effect model. Based on the constant and coefficient vectors, it can be divided into mixed regression model, variable intercept model and variable coefficient model. In this paper, the model selection is carried out through F test, and then the Hausman test is used to select the model, and finally the empirical model is obtained.

F test is as the following:

$$ F = \frac{SSR_1 - SSR_2 / (N - 1)}{SSR_2 / (NT - N - K)} \sim F[(N - 1), (NT - N - K)] $$

(4)
\[ \text{SSR}_i \] is the sum of squared residuals of the pool model, \( \text{SSR}_j \) is the sum of squared residuals of the transversal model. The number of N sample companies, K is the number of factors, and T is the length of time. And \( \text{SSR}_i \) is greater than \( \text{SSR}_j \), so the cross-sectional model is better fitting. According to the Hausman test, P value was greater than 0.05. So to accept the original test, establish the random variable intercept model. This is shown in model (5):

\[
FE_{i,t} = \alpha_i + \beta_1 TAT_{i,t} + \beta_2 RGR_{i,t} + \beta_3 OIP_{i,t} + \beta_4 FAR_{i,t} + \beta_5 OPM_{i,t} + \beta_6 GDP_{i,t} + v_{i,t} + u_{i,t} \tag{5}
\]

4.3. Empirical analysis

This paper, by using random effects variable intercept panel data estimation model (5), the estimated results as shown in Table 1. The R-squared equals 0.6888, and the Adjusted R-squared equals 0.6206, which suggests that the fit of the model to estimate is good. From the results of Table 1, total asset turnover and GDP growth rate have the greatest impact on the financing efficiency of enterprises. Overall this article selects six influence factors of the total assets turnover, operating income growth, revenue per share, operating profit margin, and growth in the level of economic development will be the big data of Guizhou industry financing efficiency to have the positive effect. The increase of financial expense ratio will make the financing efficiency lower, but the impact coefficient is small, and every increase of one percent of the financial expense ratio will lead to the reduction of the financing efficiency of 0.015%. For companies to reduce financial asset ratio can not only improve enterprise benefits, and can promote the ascension of the financing efficiency, so to reduce financial asset ratio to promote the efficiency of corporate finance has a good benefit.

In terms of revenue per share, each percentage point raised by each percentage of operating income will increase the enterprise financing efficiency by 0.012%. Per share of the revenue increase that business is good, good cost control, profit distribution to shareholders ability will improve, strengthen external investor confidence, for the use of financing funds will also be more efficient. In the good stage of national economy development, the enterprise financing is easy, the market atmosphere is active, the enterprise operation is improved and the financing efficiency can be improved significantly. Every one percent increase in national economic growth will increase the financing efficiency of enterprises by 0.0711%. The improvement of total asset turnover is the most important for the improvement of the financing efficiency. The largest enterprises should try to improve their total assets turnover. From the growth rate of operating revenue and operating profit margin, the growth of these financial indicators can also lead to the improvement of financing efficiency. The improvement effect was not as obvious as the first two indexes, with each percentage point increased by 0.0046% and 0.0011% respectively. Thus improve the efficiency of corporate finance big data, can through the growth rate of total assets, business income growth, revenue per share, financial asset ratio to improve the effect of the micro factors, at the same time learn where rapid economic growth is more advantageous to promote the efficiency of financing.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|-------|
| TAT      | 0.2689      | 0.0645     | 4.1633      | 0.0001|
| RGR      | 0.0046      | 0.0004     | 1.1572      | 0.2492|
| OIP      | 0.0125      | 0.0036     | 3.4488      | 0.0008|
| FAR      | -0.0150     | 0.0020     | -4.4795     | 0.0000|
| OPM      | 0.0011      | 0.0012     | 0.9395      | 0.3491|
| GDP      | 0.0711      | 0.0055     | 12.822      | 0.0000|
| R-squared| 0.6888      |            |             |       |
| Adjusted R-squared| 0.6206      |            |             |       |
5. Conclusions and policy recommendations

The research on the influencing factors of financing efficiency of big data enterprises in Guizhou is related to whether the big data industry in Guizhou can improve the financing efficiency. It plays an important role in the rapid development of big data industry. This paper calculates the financing efficiency of big data enterprises through DEA model. Based on the research results and selection of domestic and foreign scholars, six influencing factors were selected to construct the panel data model. The influence of these factors on the financing efficiency of big data enterprises in Guizhou province is analyzed empirically. The empirical results show that the total asset turnover, the operating income per share, and the economic development level have a significant positive correlation to the improvement of financing efficiency. The financial cost ratio has a significant negative correlation to the financing efficiency of big data enterprises in Guizhou. Therefore, increasing the turnover rate of total assets, lowering the financial cost and increasing the operating income per share are beneficial to the improvement of the financing efficiency of the big data enterprises in Guizhou.

According to the conclusions obtained from the above research, the following policy Suggestions are proposed:

Firstly, we should energetically develop the economic construction of Guizhou. Build Guizhou big data industry in all directions. The industrial development of big data in the state has strengthened the economic vitality and power of the whole region. The rapid economic development can promote the financing efficiency and development trend of Guizhou big data. The survival and development of enterprises depends on the external environment. A good economic development environment will not only stimulate the healthy development of the industry, but also promote the improvement of regional financing efficiency. The government plays a very important role in this, and the government can encourage the development of big data industries through subsidies, tax breaks, etc. Guiding people's investment in strengthening the big data industry.

Secondly, regulate market mechanism and guide market normalization competition. For quality enterprises to increase subsidies. We will encourage enterprises to increase their investment in assets and encourage them to expand production and maintain their revenue. The accumulation of enterprise assets is a reflection of a quantity, also a qualitative leap, the increase of the total assets of the enterprise is beneficial to the improvement page of the financing efficiency. The survival and development of enterprises depends on the investment of the assets and the upgrading of the original equipment. Ensuring the profitability of enterprises is the basis to ensure the smooth financing of enterprises. Therefore, by increasing the investment of enterprise assets, a strong operating income capacity will have a positive effect on the enterprise's own development.

Thirdly, encourage financial institutions to provide preferential financing services to the big data industry, and provide a shortcut for enterprise financing. The following measures can be taken: first, to encourage equity financing in big data industries. To encourage the ability of big data enterprises to be listed on the new three board, to encourage the ability of big data enterprises to raise public financing. The second is to open up the loan business shortcut for the big data industry. Third, promote the development of non-bank financial institutions, encourage more private capital to participate in the construction of big data industries, and provide more rapid micro-credit services.

Acknowledgments

This paper is supported by Guizhou Soft Science Research Project “Study on the financing efficiency of big data industry and its influencing factors in Guizhou province” (Granted No.: Guizhou Science Cooperation Base[2017]1501).

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