Environment uncertainty, accounting information quality and inefficient investment

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Abstract. The business environment of an enterprise is changing rapidly. Enterprises need to find suitable investment opportunities in the rapidly changing business environment to promote the long-term growth of enterprise value. Since the outbreak of 2019-nCoV, business environment has undergone major changes, which has a profound impact on the enterprise's investment behavior. This paper selects A-share listed companies from 2014 to 2018. Based on the study of the impact of environment uncertainty on investment efficiency, the paper analyzes the mechanism of the impact of accounting information quality on this correlation. It is found that when the enterprise is facing uncertain environment, improving accounting information quality can effectively alleviate the inefficient investment of the enterprise.

1. Introduction
Environment uncertainty means that the environment faced by enterprises is in a rapidly changing situation. The enterprise will also make corresponding economic decisions because of the uncertainty of the environment. It can be said that a major issue that companies must face is how to deal with environment uncertainty. Currently, China is in a critical period of economic transformation and development. In 2015, the central economic working conference proposed the structural reform of "three go, one drop, one supplement"[1-3]. In addition, the "Sino-US Trade Conflicts" has brought uncertainty to economic globalization, and the 2019-nCoV has had a profound impact on the global economy. Those show that the business environment is significant uncertainty [4].

Investment is one of the most important contents of corporate financial management, and efficient investment can increase corporate value. If an enterprise fails to judge the environment correctly and makes over-investment or under-investment decisions by mistake, it will damage the value of the enterprise and the interests of stakeholders. Since the resources of enterprises are limited, over-investment will lead to serious waste of enterprise resources and even threaten the survival and development of enterprises [5-6]. However, if the enterprise does not make the necessary investment, resulting in under-investment, the enterprise will lose the necessary development opportunities. Therefore, to improve the development quality of enterprises by avoiding inefficient investment is a key issue that must be solved.

The quality of accounting information is of vital importance to stakeholders. High-quality accounting information can help investors make correct investment decisions, so as to regulate the capital market. High quality accounting information can also help managers to make efficient business
decisions, so as to promote the healthy and long-term development of enterprises. But in recent years, there are many financial frauds in the capital market, which greatly reduce the quality of accounting information, not only damage the interests of investors, but also have a very adverse impact on the value of enterprises.

2. Literature review and research hypothesis

2.1. Environment uncertainty and inefficient investment
Modigliani and Miller (1959) find that in the perfect market, the only factor influencing investment decision is the profitability of investment. But in reality, because of the principal-agent problem and information asymmetry, the investment behavior of enterprises will be under-investment and over-investment. Environment uncertainty that enterprises are facing will have an important impact on their investment decisions.

Jensen (1986, 1993) believes that managers can obtain private interests by controlling more resources. In the case of information asymmetry, managers may invest the resources of enterprises in projects with negative net present value (NPV) to obtain private benefits, which leads to over investment of enterprises [7-8]. When enterprises faced a highly uncertain environment, even if enterprises invest in a project with a negative net present value, it can be attributed to the external environment.

Amihud and lev (1981) believe that owners and managers have different risk appetite for investment [9-11]. When the investment project is successful, the owner enjoys the income from the investment project, but the managers can only get a portion of the income. Therefore, in the face of environment uncertainty, managers tend to avoid risks, which will lead to insufficient investment.

Shen Huihui (2012) think that the environment uncertainty is positively related to the deviation degree of enterprise investment. Xu Qian (2014) shows that with the improvement of environment uncertainty, it will be more difficult for shareholders to supervise the managers [11-15].

Based on the above researches, this paper propose the following hypothesis:

Hypothesis 1: the stronger the environment uncertainty faced by enterprises, the more likely to lead to inefficient investment.

2.2. Accounting information quality and inefficient investment
Kanodia and Lee (1998) believe that in order to alleviate the information asymmetry and avoid inefficient investment of enterprises, it is necessary to improve the quality of accounting information.

Bushman and Smith (2001) show in their research that the owners require managers of enterprises to disclose the accounting information of enterprises with high quality. On the one hand, it can make the owners make more scientific decisions, on the other hand, it can restrain the managers of enterprises to avoid over investment.

Assawer Elaoud and Jarboui (2017) introduce a moderate variable of auditor professionalism. Their research shows that the quality of accounting information and the professionalism of auditors have a certain role in improving investment efficiency.

Ge Jiashu (2005) points out that the accounting information disclosed by an enterprise must meet the required quality standard. The key factor of accounting information is reliability.

Jiang Yufeng (2010) shows that the improvement of the quality of accounting information of enterprises can effectively alleviate over-investment of enterprises.

Based on the above researches, this paper propose the following hypothesis:

Hypothesis 2: In an uncertain environment, improving the quality of accounting information can effectively suppress inefficient investments.

3. Sample data, indicators measurement and model

3.1. Samples and data
This paper takes all A-share listed companies from 2014 to 2018 as research samples. In order to ensure the reliability and integrity of data. The data was screened as follows: excluding the financial industry, ST companies and companies with missing data, 7737 pieces of data were obtained. The data is from CSMAR database, and the statistical software is stata14.

3.2. Measurement of indicators

3.2.1. Measurement of investment efficiency (INV). The mainstream view of measuring investment efficiency is to use Richardson (2006) investment expectation model. The model divides the total investment of an enterprise into new investment and maintenance investment. By constructing a regression model of new investment, fitting the value of the company's optimal investment amount, then use the new investment minus the optimal investment to get the residual of the new investment regression model, the residual error is used to measure the inefficient investment of the enterprise.

The measurement equation is as follows:

\[ \text{invest}_{it} = \beta_0 + \beta_1 \text{growth}_{it-1} + \beta_2 \text{lev}_{it-1} + \beta_3 \text{cash}_{it-1} + \beta_4 \text{age}_{it-1} + \beta_5 \text{size}_{it-1} + \beta_6 \text{ret}_{it-1} + \beta_7 \text{inv}_{it-1} + \sum \text{nd} + \sum \text{year} + \epsilon_{it} \]  

(1)

In this model, invest represents the company's investment level. Growth is measured by the number of years the company has been listed. Size is the size of the company's assets. Ret is the stock's annual return. Year and ind are dummy variables for year and industry. In this model, the greater the absolute value of the residual, the higher the level of inefficient investment (INV).

3.2.2. Measurement of environment uncertainty (EU). This article draws on the views of Shen Huihui (2012), using the adjusted standard deviation of sales revenue for the past five years to measure environment uncertainty. In addition, the steady growth of income should be subtracted.

The measurement equation is as follows:

\[ \text{Sale} = \alpha_0 + \alpha_1 \text{year} + \epsilon \]  

(2)

In this model, sale means sales revenue, and year is the annual variable. The residuals of this model measure the abnormal income of enterprises. Calculating the standard deviation of abnormal income for the past 5 years. Divide by the average value of sales revenue over the past five years to get the environment uncertainty that has not been adjusted by the industry. Then, taking the median of the unadjusted environment uncertainty of the same industry in the same year as the industry uncertainty. Next, divide the unadjusted environment uncertainty by the industry uncertainty to obtain the final measured environment uncertainty (EU).

3.2.3. Measurement of accounting information quality (IQ). Drawing on previous research, this paper uses the modified Jones model to measure the quality of accounting information.

The measurement equation is as follows:

\[ \frac{\text{TA}_{lt}}{\text{Asset}_{lt-1}} = \gamma_1 \frac{1}{\text{Asset}_{lt-1}} + \gamma_2 \frac{\Delta \text{REV}_{lt-1} - \Delta \text{REC}_{lt}}{\text{Asset}_{lt-1}} + \gamma_3 \frac{\text{PPE}_{lt}}{\text{Asset}_{lt-1}} + \epsilon_{lt} \]  

(3)

In this model, TA is the total accrued items, using operating profit minus net cash flow from operating activities. Asset is the scale of the company's assets. \( \Delta \text{REV} \) is the company's annual revenue growth. \( \Delta \text{REC} \) is the increase of the company's accounts receivable. PPE is the net value of fixed assets. Regressing the model, its residual as a manipulable accrued profit DA. After taking the absolute value of DA, the bigger the DA, the lower the quality of accounting information (IQ).

3.3. Model

A multiple regression is established as follows:
\[ INV_{i,t} = \varphi_0 + \varphi_1 EU_{i,t} + \varphi_2 IQ_{i,t} + \varphi_3 EU_{i,t} \times IQ_{i,t} + \varphi_4 \text{controls}_{i,t} + \sum \text{Year} + \sum \text{Ind} + \varepsilon_{i,t} \] (4)

INV is the absolute value of the residual of model (1). EU is the results from model (2). IQ is the absolute value of the residual of model (3). Controls is a set of control variables. Growth, measured by the company's Tobin Q value. Cash, measured by net cash flow from operating activities divided by asset size at the beginning of the year. Size, measured by the natural logarithm of the enterprise's asset size. Lev, measured by the asset liability ratio of the enterprise. Roa, measured by the net asset interest rate of the enterprise. Age, natural logarithm of listing years. Outdir, measured by the ratio of independent directors to the board of directors. Lnboard, Measured by the natural logarithm of the number of directors. Top, measured by the shareholding ratio of the largest shareholder. In addition, year and ind are dummy variables for year and industry.

4. Empirical analysis

4.1. Descriptive statistics

Table 1 shows the descriptive statistical analysis of the relevant variables. INV represents inefficient investment. The higher the value is, the more inefficient the investment is. EU represents environment uncertainty, and the larger the value is, the stronger the environment uncertainty is. IQ stands for the quality of accounting information. The higher the value, the worse the quality of accounting information. As we can see from the data in the table, the minimum value of INV and IQ is close to 0, it shows that there are enterprises with less inefficient investment and better accounting information quality.

| Variables | Obs. | Average | Std. | Min. | Max. |
|-----------|------|---------|------|------|------|
| INV       | 7737 | .047    | .072 | 0    | .983 |
| EU        | 7737 | 1.309   | 1.366| .01  | 23.224|
| IQ        | 7737 | .058    | .087 | 0    | 2.502 |
| growth    | 7737 | 2.3     | 2.648| .08  | 91.571|
| size      | 7737 | 22.49   | 1.296| 17.806| 28.52 |
| lev       | 7737 | .439    | .203 | .009 | 1.226 |
| cash      | 7737 | .216    | .543 | 0    | 38.474|
| age       | 7737 | 2.444   | .539 | 1.386| 3.367 |
| roa       | 7737 | .036    | .059 | -1.068| .482 |
| top       | 7737 | .341    | .149 | .003 | .9    |
| lnboard   | 7737 | 2.137   | .203 | 1.099| 2.89 |
| outdir    | 7737 | .375    | .056 | .231 | .8    |

4.2. Correlation analysis

In order to test the correlation between variables, correlation test is carried out in this paper, and the results are shown in Table 2.

As can be seen from the results of correlation analysis, there is a significant positive correlation between EU and INV at the level of 1%, and it shows that the more uncertain environment is, the more likely it is to lead to inefficient investment. IQ is significantly positively correlated with INV at the level of 1%, and it means the worse the quality of accounting information is, the more likely it is to lead to inefficient investment. The above conclusion is basically consistent with our previous hypothesis.
Table 2. Correlation Analysis.

|     | INV  | EU   | IQ   | growth | size | lev | cash | age | roa | top | lnboard | outdir |
|-----|------|------|------|--------|------|-----|------|-----|-----|-----|---------|--------|
| INV | 1.000 |      |      |        |      |     |      |     |     |     |         |        |
| EU  | 0.313*** | 1.000 |      |        |      |     |      |     |     |     |         |        |
| IQ  | 0.161*** | 0.238*** | 1.000 |        |      |     |      |     |     |     |         |        |
| growth | 0.145*** | 0.112*** | 0.059*** | 1.000 |      |     |      |     |     |     |         |        |
| size |       | 0.048*** | 0.042*** | -0.014 | 0.493*** | 1.000 |     |     |     |     |         |        |
| lev  |       | 0.060*** | 0.040*** | 0.074*** | 0.351*** | 0.516*** | 1.000 |     |     |     |         |        |
| cash |       | 0.172*** | 0.207*** | 0.200*** | 0.068*** | 0.005 | 0.075*** | 1.000 |     |     |         |        |
| age  |       | 0.082*** | 0.039*** | 0.048*** | 0.170*** | 0.280*** | 0.315*** | -0.011 | 1.000 |     |         |        |
| roa  |       | 0.045*** | 0.035*** | 0.038*** | 0.137*** | 0.025** | 0.310*** | 0.067*** | 0.068*** | 1.000 |         |        |
| top  |       | 0.034*** | -0.012  | -0.014 | 0.112*** | 0.278*** | 0.118*** | -0.005 | 0.056*** | 0.062*** | 1.000 |         |        |
| lnboard |   | 0.063*** | 0.057*** | 0.044*** | 0.164*** | 0.256*** | 0.151*** | -0.012 | 0.153*** | 0.026** | 0.043*** | 1.000 |
| outdir |   | 0.018  | 0.003  | 0.015  | 0.056*** | 0.024** | -0.001 | -0.004 | 0.043*** | 0.045*** | 0.026** | 0.531*** | 1.000 |

Notes:*, **, ***significant at 0.10, 0.05, 0.01 levels; Notes:*, **, ***significant at 0.10, 0.05, 0.01 levels

4.3. Regression analysis

Table 3 shows the results of correlation regression analysis. In this research, EU, IQ and EU*IQ are gradually added to regression.

Column (1) of Table 3 shows the regression results of EU and INV. Regression results show that EU and INV are significantly positive at the 1% level. It shows that the more uncertain the enterprise environment is, the more inefficient the investment will be, which is consistent with hypothesis 1.

Column (2) in Table 3 shows the regression results of IQ and INV. The regression results show that the quality of accounting information and inefficient investment are significantly positive at the level of 1%. It shows that the worse the quality of accounting information (the higher the IQ value), the more inefficient invests, which is consistent with the previous research.

Columns (3) and (4) in Table 3 show the results of group regression with IQ as the adjusting variable. The average value of IQ is taken as the grouping basis. The group with less than mean value is the group with better IQ, and the regression results are shown in column (3). The group with more than mean value is the group with worse IQ, and the regression results are shown in column (4). In the group with better IQ, the cross product of IQ and EU is significantly negative at the level of 1%, which shows that better IQ reduces the impact of EU on Invest results of column (4) show that in the group with poor IQ, the cross product of IQ and EU is significantly positive at the level of 1%, indicating that poor IQ has no regulating effect on the results of EU and Irvin summary, hypothesis 2 is verified.
Table 3. Regression Analysis.

|       | (1)INV | (2)INV | (3)INV | (4)INV |
|-------|--------|--------|--------|--------|
| EU    | 0.0149*** | 0.0109*** | 0.0157*** |
|       | (0.000578) | (0.00111) | (0.00128) |
| IQ    | 0.110*** | 0.0902 | 0.00533 |
|       | (0.00940) | (0.0603) | (0.0297) |
| IQ_EU | -0.0903*** | 0.0116*** |
|       | (0.0344) | (0.00443) |
| growth| 0.00240*** | 0.00321*** | 0.00287*** | 0.00199*** |
|       | (0.000355) | (0.000365) | (0.000406) | (0.000630) |
| size  | 0.00278*** | 0.00292*** | 0.000406 | 0.00615*** |
|       | (0.000854) | (0.000883) | (0.000850) | (0.00185) |
| lev   | 0.00519 | 0.0103* | 0.0233*** |
|       | (0.00510) | (0.00527) | (0.00525) | (0.0104) |
| cash  | 0.0134*** | 0.0177*** | 0.0755*** | 0.00481** |
|       | (0.00144) | (0.00149) | (0.00402) | (0.00197) |
| age   | -0.00959*** | -0.00909*** | -0.0105*** | -0.00817*** |
|       | (0.00160) | (0.00165) | (0.00158) | (0.00340) |
| roa   | 0.0326** | 0.0245* | -0.00326 |
|       | (0.0143) | (0.0148) | (0.0184) | (0.0234) |
| top   | -0.0134** | -0.0141** | -0.0164*** | -0.00806 |
|       | (0.00544) | (0.00563) | (0.00520) | (0.0122) |
| Inboard| -0.0144*** | -0.0204*** | -0.00802* | -0.0241*** |
|       | (0.00472) | (0.00487) | (0.00458) | (0.0103) |
| outdir| -0.0105 | -0.0225 | 0.00631 | -0.0503 |
|       | (0.0164) | (0.0169) | (0.0157) | (0.0365) |
| Constant| 0.00744 | 0.0292 | 0.0268 | -0.0230 |
|       | (0.0208) | (0.0215) | (0.0206) | (0.0457) |
| Observations| 7737 | 7737 | 5096 | 2641 |
| R-squared| 0.153 | 0.096 | 0.177 | 0.191 |

Notes: *, **, ***significant at 0.10, 0.05, 0.01 levels

5. Conclusions
This paper uses listed companies from 2014 to 2018 as research samples. On the basis of studying the impact of environment uncertainty on inefficient investment of enterprises, further study the moderating effect of the quality of enterprise accounting information on the relationship between environment uncertainty and enterprise inefficient investment. Mainly draw the following conclusions: (1) The stronger the environment uncertainty facing the enterprise, the easier it is to lead to inefficient investment. (2) Good quality of accounting information can suppress the inefficient investment of enterprises caused by environment uncertainty.

The above conclusion shows that, on the one hand, enterprises should carefully review the operating environment to improve investment efficiency. On the other hand, enterprises and regulatory authorities should strengthen the emphasis on the quality of accounting information. The improvement of accounting information helps to improve the transparency of enterprises and reduce agency costs, which can effectively suppress the impact of environment uncertainty on inefficient investment of enterprises.

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