Financial Flexibility and Investment Efficiency

——Based on the Empirical Data of Listed Companies

in the New Generation of Information Technology Industry

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Abstract: In recent years, the external financing environment of enterprises has deteriorated, especially since the impact of the COVID-19 epidemic, which has further limited external financing opportunities for enterprises. Therefore, it is imperative to adopt effective financial strategies to promote enterprise growth. This paper examines the influence mechanism of financial flexibility on the investment efficiency of new generation listed companies in the information technology industry from 2017 to 2020. Using the adjustment path analysis method, the paper constructs and verifies the role path of "financial flexibility → investment efficiency" to explore the impact of financial flexibility on investment efficiency and its effect on enterprise growth. The status quo of financial flexibility and investment efficiency of listed companies in the new generation of information technology industry is analyzed descriptively using stata16.0 statistical software. The paper proposes a hypothesis and constructs a multiple linear regression model to examine the influence of financial flexibility on investment efficiency. The empirical results show that the new generation of IT enterprises face challenges such as low capital flexibility and investment efficiency, particularly insufficient investment. Financial flexibility can help enterprises cope with capital demands under uncertain circumstances and improve the efficiency of enterprise investment. Therefore, in the market environment, enterprises should retain financial flexibility while strengthening internal control to improve investment efficiency and meet the needs of enterprise growth. The government and financial sector should promote supply-side structural reform in the financial sector, raise the level of regional financial development, and provide a favorable environment for external financing of strategic emerging industries such as the next-generation information technology industry.

Keywords: financial flexibility, investment efficiency, new generation information technology industry

Introduction

As the core of the new round of scientific and technological revolution, the new generation of information technology has become the driving force to promote and support economic development. With the rise of the wave of information globalization, a new round of information technology revolution is becoming the focus of global social and economic development in the post-financial era, and it has become the key to leading countries around the world to get rid of crisis troubles and seize the commanding heights of economic development in the post-crisis era (Chen Baoguo,2010) [1]. The new generation information technology industry, high-end equipment manufacturing industry, new material industry, biological industry, new energy automobile industry, new energy industry, energy saving and environmental protection industry Industry, digital creative industry, and related service industries are listed as 9 strategic emerging industries in the "Classification of Strategic Emerging Industries (2018) [1]. In the new round of scientific and technological revolution, the new generation of information technology has played a key role in promoting and it is at the core of the new technology system. According to the relevant theories of innovation economics, development economics, growth economics and historical experience since the Industrial Revolution, major technological changes in specific fields will lead to the rapid growth of emerging industries, bring about the succession and replacement of leading industries, and realize the transformation of new and old kinetic energy. Through empirical research, it is found that the proportion of strategic emerging industry companies in the sample companies is only about 30%, but more than 60% of the selected high-growth companies belong to strategic emerging industries; among the high-growth companies, 60% to 70% % belong to the new generation of information technology industry and digital creative industry(Ma Wenjun, Cai Yuezhou,2020)[2] . In the current period of deep economic transformation and adjustment in China, the new generation of information technology industry has become a new driving force for economic development. Through quantitative analysis of how the financial flexibility of listed companies in the new generation

of information technology industry affects their investment efficiency, this paper studies the problem of low investment efficiency from the perspective of financial flexibility, and provides a novel research perspective for improving the investment efficiency of the new generation of information technology industry. At the same time, it is of positive practical significance to put forward some constructive suggestions on the problem of low investment efficiency in the new generation of information technology industry.

Literature Review
The development of strategic emerging industries requires a lot of capital investment, and excessive external financing costs have become an important factor hindering the development of strategic emerging industries. Using the panel data of 422 listed companies in seven strategic emerging industries in 15 quarters from 2011 to 2014, the impact of China's banking industry and stock market development on the development of strategic emerging industries was investigated respectively. The empirical results show that the financing constraints of the seven strategic emerging industries are heterogeneous. Energy conservation and environmental protection industries, high-end equipment manufacturing and biomedical industries have less financing constraints, while new materials, new generation information technology, new energy vehicles and new energy industries have greater financing constraints (Zhang Hongyan, Wang Lei,2016)[3]. At present, Chinese enterprises are prone to encounter financing constraints in their daily business activities, especially in technological innovation activities. Compared with other enterprises, information technology enterprises are more likely to face the dilemma of financing constraints. If investment funds cannot be guaranteed, enterprises may be be forced to abandon valuable investment projects, or even suspending ongoing investment projects. To solve the problem of the constraints of resource shortages on investment, maintaining appropriate financial flexibility is an effective solution. Reserve financial flexibility can help companies cope with unanticipated adverse shocks more calmly, and can also take the initiative in a crisis, providing support for the development of investment activities and the continuous transformation of innovation results.
Financial flexibility can dynamically adjust the allocation of corporate financial resources according to changes in the corporate environment. Reasonable reserves of financial flexibility help companies maintain the sustainability of capital supply and respond effectively to future uncertainties to meet corporate growth needs.Huang Hexin(2019) compares the behavior of enterprises to reserve financial flexibility to buy an option, and the event that needs to raise funds is the exercise condition[4]. The premise of the value of financial flexible reserves is that the environment changes dynamically and the uncertainty of its own operating cash flow is strong[5]. The new generation of information technology industry is premised on technological innovation and development. A large amount of capital needs to be invested in the early development stage, and the industrial investment recovery cycle is long, which has the characteristics of high project risk and high growth. Therefore, starting from the relationship between financial flexibility and investment efficiency in the new generation of information technology industry, this paper conducts an in-depth study of the path that financial flexibility affects enterprise growth, and then provides new solutions for how to improve enterprise growth.

Theoretical Analysis and Research Hypotheses
Today, under the background of the era of more intense international operations and international competition, the speed of product and technology upgrading is accelerating, and various uncertain situations are coming one after another. The development of Chinese enterprises is faced with a more complex competitive environment and more uncertainty, and new development opportunities are likely to exist under the uncertainty and crisis. If the enterprise maintains appropriate financial flexibility and other advantageous resources of the enterprise itself, it can obtain funds at a relatively low cost, and the management has the conditions and confidence to actively explore and seek opportunities for innovation and development. As a high-tech strategic emerging industry, information technology enterprises mainly focus on innovation investment, and innovation investment has a large scale of initial investment and a long investment cycle, which has the characteristics of high risk and high return. As a result, information technology companies face stronger external financing constraints, resulting in low investment efficiency. Financial flexibility can meet the huge capital needs of information technology enterprises when investing, and at the same time can enhance the remaining debt capacity. When favorable investment opportunities come, enterprises can seize the opportunity to invest at the fastest speed, improve the efficiency of enterprise investment, and then improve business growth. Therefore, the following hypothesis is proposed:
H1: There is a positive linear relationship between financial flexibility and the investment efficiency of information technology enterprises

Research Design
Sample selection and data sources:
According to "Classification of Strategic Emerging Industries (2018)", the new-generation information technology industry includes five categories: next-generation information network, electronic core, emerging software and new information technology services, Internet and cloud computing and big data services, and artificial intelligence. It is divided into 83 sub-categories of national economic industries such as other computer manufacturing, semiconductor

device special equipment manufacturing, basic software development, Internet production service platform and basic software development.

Based on the industry classification standard as a screening condition, this research screened in the Guotai'an database, obtained the information of the new generation of information technology subsidies from the company's main business scope and the notes to the financial statements, selected the sample data from 2017 to 2020. During the research period, companies whose stocks were specially treated (ST) or whose stocks were given an early warning of delisting risk (*ST) were excluded. At the same time, in order to ensure the continuity and integrity of data, companies that were listed during the research period and companies whose data were missing and could not be perfected were excluded. Finally, a sample of 141 new-generation listed companies in the information technology industry was obtained. Since the residual model of investment efficiency needs to use the data of the previous year, and the impact of financial flexibility on investment efficiency has a lag, referring to the practices of Zhang Yuemei [6] and Xiong Zhengde [7], this paper studies the financial flexibility in the model with a one-period lag, and also treats all control variables with a one-period lag. The actual research period of investment efficiency used in the model is 2018-2020. In order to avoid the interference of outliers, this study adopted a Winsorize treatment of 1% up and down for continuous variables. Data processing mainly uses Excel2019 and Stata16.0 software.

Variable definition:

(1)Financial flexibility. There are three ways to obtain financial flexibility, cash flexibility, debt flexibility, and equity flexibility. However, considering the special institutional background of China, and referring to the research of Zeng Aiming et al.[8], financial flexibility is only measured from the cash flexibility of the level of cash held internally and the debt flexibility of the external low debt ratio. Financial flexibility is defined as the sum of cash flexibility and debt flexibility. Cash flexibility = corporate cash ratio - industry average cash ratio; Debt flexibility = MAX (industry average debt ratio - corporate debt ratio, 0).

(2) Investment efficiency. Given that investment efficiency is difficult to measure directly, the current domestic and foreign literature measure investment efficiency mainly with non-efficient investment as a surrogate variable for corporate investment efficiency. In this paper, the residual value of the investment expectation model of Richardson[9] is used to represent the inefficient investment. The expected investment amount of the enterprise can be estimated through the Richardson expected investment model. The difference between the actual investment amount and the expected investment amount is the residual in the regression model. If the residual is greater than zero, it means that the actual investment amount is greater than the expected investment amount. On the contrary, if the residual is less than zero, it means that the actual investment amount is less than the expected investment amount, which means that the investment is insufficient.

(3)Control variables. In addition to the influence of explanatory variables on the explained variables, other variables will also have an impact on the explained variables. Referring to other scholars' research on enterprise growth, this paper mainly sets the following control variables to further improve the reliability of the research : Enterprise size (Size), asset-liability ratio (Lev), equity ratio (Dir), equity concentration (Top), operating cash flow (CF), annual dummy variable (Year), industry dummy variable (Industry). The variables and definitions in this study are shown in Table 1.

Variable type	Variable	Variable symbol	Variable definition
Explained Variable	Investment efficiency	Inv	The absolute value of the residuals in the Richardson model
Explanatory Variables	Financial flexibility	FF	Cash flexibility + Debt flexibility
Control Variable	Enterprise size	Size	The natural logarithm of total assets at the end of the period
	Leverage	Lev	Total Liabilities/Total Assets
	Equity ratio	Dir	Total Liabilities/Total Owner's Equity
	Ownership concentration	Top	Proportion of shares held by the largest shareholder
	Cash flow	CF	Net cash flow from operating activities/total assets
	Year	Year	1 if it belongs to year t, otherwise 0
	Industry	industry	Belong to the industry, take 1, otherwise take 0

Table 1: Definitions and indicators of research variables

Model construction:

(1)Richardson investment expectation model

This paper uses the Richardson investment expectation model to measure the investment efficiency of enterprises, that is, the difference between the actual investment amount and the expected investment amount of the enterprise as the basis for judging whether the enterprise has under-investment or over-investment problems, see Model 1 for details.

$Inv_{i,t}=\lambda_0+\lambda_1 Growth_{i,t-1}+\lambda_2 Lev_{i,t-1}+\lambda_3 Cash_{i,t-1}+\lambda_4 Ret_{i,t-1}+\lambda_5 Size_{i,t-1}+\lambda_6 Age_{i,t-1}+\lambda_7 Inv_{i,t-1}+\sum Year+\sum Industry+\varepsilon_{i,t}$

The residual value after the regression of model 1 is greater than zero, which means that the actual investment is higher than the expected investment, indicating over-investment (OverInv). The residual value is less than zero, which means that the actual investment is lower than the expected investment, indicating insufficient (UnderInv). The specific definitions of variables are shown in the following table 2.

Variable	Variable symbol	Variable definition
New investment scale of enterprise i in year t	$Inv_{i,t}$	(Cash paid for the purchase and construction of fixed assets, intangible assets and other long-term assets in year t –Cash recovered from disposal of fixed assets, intangible assets and other long-term assets – current depreciation and amortization) / total assets at the beginning of the year
Growth of enterprise i in year t-1	$Growth_{i,t-1}$	The operating income growth rate of company i in year t-1
Leverage of firm i in year t-1	$Lev_{i,t-1}$	Leverage of company i in year t-1
Cash holdings of firm i in year t-1	$Cash_{i,t-1}$	Enterprise i Year t-1 (monetary funds + short-term investment)/total assets
Enterprise i's listing period in year t-1	$Age_{i,t-1}$	Number of years listed for company i in year t-1
Enterprise i's size in year t-1	$Size_{i,t-1}$	The natural logarithm of the total assets of firm i in year t-1
firm i's stock return in year t-1	$Ret_{i,t-1}$	Enterprise i Year t-1 (stock closing price – stock opening price)/stock opening price
New capital investment in year t-1	$Inv_{i,t-1}$	(Cash paid for the purchase and construction of fixed assets, intangible assets and other long-term assets in year t-1 –Cash recovered from disposal of fixed assets, intangible assets and other long-term assets – current depreciation and amortization)/ total assets at the beginning of the year
Year	Year	1 if it belongs to year t, otherwise 0
Industry	industry	Belong to the industry, take 1, otherwise take 0

Table 2: Definitions of variables in Richardson investment expectation model

(2)The relationship model between financial flexibility and investment efficiency
In order to analyze the relationship between financial flexibility and the investment efficiency of information technology enterprises, verify the H2 hypothesis of this paper, and build Model 2:

$Invest_{i,t}=\beta_0+\beta_1 FF_{i,t-1}+\beta_2 Size_{i,t-1}+\beta_3 Lev_{i,t-1}+\beta_4 Dir_{i,t-1}+\beta_5 Top_{i,t-1}+\beta_6 CF_{i,t-1}+\sum Year+\sum Industry+\varepsilon_{i,t}$

Empirical Analysis
Descriptive statistics:
Table 3 reports the descriptive statistics of the main variables of this study. The average value of investment efficiency is 0.025, and the 1/4 quantile is 0.031, indicating that most information technology companies deviate from the optimal investment scale. Combined with the effective residual data obtained above, about 65.72% of the companies have insufficient investment. It can be seen that it is meaningful for enterprises to improve investment efficiency through internal financial flexibility. The mean value of financial flexibility is 0.074, and the 3/4 quantile is 0.038, indicating that the current level of financial flexibility of information technology enterprises in my country is generally not high. From the perspective of control variables, the average value of enterprise size is 9.700, and the maximum value is 11.759, indicating that the scale of information technology enterprises is generally small, and there is no major difference, and the data is reasonable.

Varia	N	mean	sd	min	P25	P50	P75	max

ble								
inv	423	0.025	0.031	0.000	0.031	0.018	0.031	0.369
ff	423	0.074	0.167	-0.178	-0.051	0.174	0.038	0.671
size	423	9.700	0.483	8.591	9.371	9.985	9.689	11.759
lev	423	0.390	0.174	0.038	0.257	0.527	0.377	0.948
cf	423	0.034	0.062	-0.167	-0.003	0.066	0.027	0.315
dir	423	0.842	1.062	0.040	0.345	1.113	0.606	18.384
top	423	27.103	13.205	3.000	16.685	36.460	25.050	65.380

Table 3: Variable descriptive statistics results

Regression analysis:

Table 4 reports the results of the Pearson correlation analysis between variables. It can be seen that financial flexibility is significantly positively correlated with the investment efficiency of information technology enterprises at the level of 1%, indicating that moderate financial flexibility can improve the investment efficiency of information technology enterprises. The more effective the investment, the higher the growth of information technology enterprises.

Variable	inv	ff	size	lev	cf	dir	top
inv	1.000						
ff	0.170***	1.000					
size	-0.133***	-0.339***	1.000				
lev	-0.136***	-0.668***	0.392***	1.000			
cf	0.109**	0.120	0.087*	-0.031	1.000		
dir	-0.079	-0.369***	0.247***	0.674***	0.006	1.000	
top	-0.090*	0.151***	0.188***	0.139***	-0.036	0.358	1.000

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4: Pearson's correlation analysis results between variables

Correlation analysis:

From the regression results in Table 5, it can be seen that the relationship coefficient between financial flexibility and enterprise investment efficiency is 0.0762, and there is a significant correlation.

The regression results of the two have reached a significant level of 1% in the statistical sense, which indicates that the financial flexibility increases and the investment efficiency of enterprises increases. From this, hypothesis H1 is verified.

VARIABLES	(1) r1 inv
ff	0.0762***
	(3.23)
size	0.0665***
	(2.86)
lev	-0.1306***
	(-3.95)
cf	0.0174
	(0.59)
dir	0.0027
	(1.38)
top	-0.0002
	(-0.29)
2019.year	-0.0077**
	(-2.58)
2020.year	-0.0073**
	(-2.25)
Constant	-0.5705**
	(-2.37)

Observations	423
R-squared	0.608

*t-statistics in parentheses*** p<0.01, ** p<0.05, * p<0.1*

Table 5: Financial flexibility and investment efficiency

Robustness test:

In order to ensure and enhance the robustness and reliability of the test results, this paper conducts robustness tests in the following aspects: changing the measurement method of the internal control of the moderator variable, changing the continuous variable to a dummy variable, referring to the existing research, and checking the internal control of the explanatory variable. If the observed value is greater than the mean, the value is 1. If the observed value is less than the mean, the value is 0, and the test conclusion is basically the same as the previous one.

Results and Discussion

The new generation of information technology industry is still faced with financing difficulties. In order to resolve this dilemma, this study takes the listed companies of the new generation of information technology industry from 2017 to 2020 as a sample to construct and verify the role path of "financial flexibility → investment efficiency". The value difference of the financial flexibility of information technology enterprise reserves in investment efficiency. The research conclusions are as follows:The overall level of financial flexibility of information technology enterprises is relatively low, and there is a general problem of inefficient investment, especially insufficient investment.

Information technology enterprises can respond to the capital demand under uncertain circumstances by appropriately reserve financial flexibility, and improve the investment efficiency of enterprises. The new generation of information technology enterprises have the characteristics of high growth and high innovation. Facing more uncertain factors, they need additional funds for investment and development, so they should store financial flexibility and expand the channels of enterprise financial flexibility. By increasing the cash reserve of the enterprise, for example, increasing the operating cash flow of the enterprise, reducing the dividend payment rate, etc. Remaining borrowing capacity can also be maintained by maintaining low borrowing, such as maintaining credit lines with banks and other financial organizations, and paying back loans to banks early.

In addition, improve the level of regional financial development and improve the external financing environment for strategic emerging industries such as the new-generation information technology industry.

However, it should be noted that the number of samples selected in this paper is not very large, and the time span is only 4 years, which may affect the accuracy of the research results to some extent.

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