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Financing Constraints, Financial Flexibility and Corporate Sustainability Innovation

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Abstract: *Continuous innovation plays an important role in promoting high-quality economic development and is a core driver for companies to maintain long-term competitive advantages. Financial flexibility, as a comprehensive regulatory capability, can adapt to environmental changes and prevent risks, and has an important impact on sustainable corporate innovation. Using the panel data of A-share listed companies in Shanghai and Shenzhen Stock Exchange from 2012 to 2020, this paper examines the impact of financial flexibility on corporate innovation sustainability and analyses the moderating effect of financing constraint. The research shows that total financial flexibility promotes innovation sustainability, single cash flexibility and single debt flexibility positively affects innovation sustainability, and financing constraints positively moderate the relationship between financial flexibility and corporate sustainability innovation. Compared with state-owned enterprises, the promotion effect of financial flexibility is greater in non-state-owned enterprises. The findings of this paper provide a decision reference for corporate sustainability innovation.*

Keywords: *Financial flexibility, Innovation persistence, Financing constraints*

1. Introduction

China's economy has entered a stage of high-quality development, and innovation has become an important driver of development in the face of the complex and changing international situation and the reality of deep economic adjustment. In 2020, the 14th Five-Year Plan and the proposal of the 2035 Vision were released, and the Party Central Committee re-emphasized the core position of innovation in China's modernization. During the 13th Five-Year Plan period, China's R&D investment intensity increased from 2.06% to 2.23%, basic research funding nearly doubled, and the global innovation index ranking rose to 14th, making significant progress in building an innovative nation. However, we should also see that core technologies in certain fields are still restricted. During the period of trade friction between China and the U.S., the U.S. tightened its control over core technologies, which has restricted the development of communication enterprises such as ZTE and Huawei in our country, reminding us that only by adhering to continuous innovation can we achieve long-term development. The year 2021 is the opening year of the 14th Five-Year Plan, and innovation is still the first driving force to lead the development. As the main body of innovation, enterprises should consciously put the concept of innovation into all aspects of production and operation. But innovation is a continuous process, and short-lived innovation activities do not bring long-term development to enterprises (AVASSOLI S et al., 2015). Studies have shown that only continuous innovation can help enterprises maintain long-term competitive advantage (GANTER et al., 2013).

After the financial crisis in 2008, research on financial flexibility has received increasing academic attention. Financial flexibility capability is a comprehensive regulatory capability that adapts to dynamic changes in the financial environment and system uncertainty. It can facilitate optimal resource allocation and risk management for companies (Zhao H. and Zhang D.Z., 2010). It is found that financial flexibility has the attributes of "utilization" and "prevention". The financial flexibility of enterprises can compensate for the loss caused by innovation failure, and also release external financing constraints, which has a positive effect on maintaining innovation sustainability. Therefore, the smart use of available resources is one of the most important ways to achieve sustainable innovation.

Therefore, this paper conducts an empirical study on the relationship between financial flexibility and corporate sustainability innovation based on the data of China's listed A-share enterprises in Shanghai and Shenzhen Stock Exchange from 2012 to 2020. At the same time, financing constraints are introduced into the research framework to analyze its moderating effect on the relationship between financial

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flexibility and corporate sustainability innovation. The role of financial flexibility in promoting corporate sustainability innovation under different property rights is further discussed[1-9].

2. Literature Review

The concept of sustainability innovation was first introduced by GEROSKI et al. (1997), which argued that the longer the firm's innovation activities are carried out, the higher the level of sustainability. The current related research focuses on two aspects: first, the influence of internal factors such as profitability, executive characteristics (Pan, 2017), technological diversification (He et al., 2017), corporate social responsibility (Bai et al., 2020), and external factors such as industry characteristics, government subsidy (Yu et al., 2021) and economic policy uncertainty (Fan et al., 2020). The second is the smoothing mechanism of firms' continuous innovation through working capital (Ju et al., 2013), cash holdings, organizational redundancy (Li et al., 2016) and government guarantees (Fan and Chen, 2020).

Financial flexibility can be divided into cash flexibility, debt financing flexibility, and equity flexibility. Ferreira and Vilela (2004) argue that firms holding a certain amount of cash can meet their sudden funding needs and reduce the probability of financial distress. Marchica and Mura (2010) emphasize the importance of low leverage policy to retain future borrowing capacity to obtain debt financing flexibility. Payment policies and hedging strategies can also affect a company's financial flexibility (Bonaimé et al., 2014). Existing literature shows that financial flexibility can promote corporate R&D investment (Chen et al., 2018; Cui et al., 2020), enhance corporate innovation efficiency (Fan et al., 2018), and also have an important impact on corporate performance as well as corporate value (Yang et al., 2019; Tong, 2021).

In summary, the literature has examined the impact of financial flexibility on firm innovation, but only a few papers explored the relationship from the perspective of innovation persistence (Xiao et al., 2020). This paper investigates the relationship between financial flexibility and firm persistence innovation based on the moderating role of financing constraints, and further explores the impact of the nature of property rights. The findings of this paper can provide important theoretical guidance and decision-making reference for corporate sustainability innovation[10-17].

3. Theoretical Analysis and Hypothesis Development

3.1. Financial Flexibility and Corporate Sustainability Innovation

Innovation is characterized by high risk, high investment, irreversibility and lagging revenue (Liu et al., 2019), which requires enterprises not only to have sufficient financial support, but also to bear the risk of innovation failure. Financial flexibility is a comprehensive control ability of enterprises, which can systematically integrate enterprise resources and prevent risks.

First of all, financial flexibility can prevent risks. Once the external environment changes bring a crisis to the enterprise, financial flexibility can help the enterprise to have a certain buffer time, reduce the probability of the enterprise into financial difficulties, and ensure the cash flow of the enterprise, which is beneficial to maintain the continuity of the enterprise innovation activities. Second, financial flexibility brings better financial security to enterprises in terms of both internal capital accumulation and external financing. In terms of internal capital accumulation, firms tend to rely more on internal capital for investment and innovation activities, and insufficient internal financing usually inhibits corporate innovation (Fazzari et al., 1988). By reserving cash to gain financial flexibility, firms have internal financial resources that can be used flexibly, giving management greater confidence to invest in innovation when facing high-risk innovation projects. In terms of external financing, a firm's financial flexibility can release the negative impact of financing constraints on innovation activities (Xiao et al., 2020). Influenced by the specificity of innovation projects and external information asymmetry, financing suppliers may not be willing to provide funds, but firms that obtain financial flexibility by low financial leverage are able to convey good information to the outside, so that investors' trust in the firm is enhanced and the firm is relatively less constrained in external financing. In conclusion, reserve financial flexibility can well meet the future financial needs of the firm and provide long-term guarantee and perspective for the firm's future R&D activities (Kuratko et al., 1997). Based on the above analysis, this paper proposes hypothesis I:

H1: Financial flexibility is positively related to corporate sustainability innovation.

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3.2. Financing Constraints, Financial Flexibility and Corporate Sustainability Innovation

When companies develop their corporate strategies, they generally forecast future capital market conditions in advance and reserve a certain amount of financial flexibility. If management expects to face greater financing constraints, companies increase the amount of cash flexibility reserves or reduce financial leverage by paying off some debt in advance to enhance the company's residual debt raising capacity. When the current financing constraint is large, the financial flexibility of early reserves can be significantly useful, and the firm can directly invest the reserved cash in innovation projects, while being able to quickly raise innovation funds at a lower cost to ensure the sustainability of the firm's innovation. Conversely, because cash holdings entail certain opportunity and agency costs, and shareholders would prefer managers to operate with debt, cash flexibility reserves and debt financing flexibility reserves may only be kept within certain limits. If management expects to face less financing constraints in the future, firms will not reserve too much financial flexibility in advance, and the stimulus for sustained corporate innovation is relatively small. Therefore, hypothesis II is proposed:

H2: The financing constraint positively moderates the relationship between financial flexibility and sustainable innovation, i.e., the greater the financing constraint, the stronger the effect of financial flexibility on sustainable innovation[18-21].

4. Research design

4.1. Sample and data collection

In this paper, the data of A-share listed companies in Shanghai and Shenzhen Stock Exchanges in China from 2012 to 2020 are selected as the initial sample, and then the collected data are screened as follows: (1) financial listed companies are excluded; (2) ST, *ST, PT and companies listed in the current year are excluded; (3) samples with missing relevant variables are excluded. In order to mitigate the possible impact of extreme values on the research results, this paper applies a two-sided 1% tailing process to the continuous variables involved. Our final sample contains 14,269 firm-year observations. The data are obtained from the CSMAR database.

4.2. Related concepts and measurements

4.2.1. Sustainability Innovation(srd)

We refer to the studies of Ju et al. (2013) and Fan et al. (2020), where incremental intangible assets are divided by total assets at the beginning of the period to reflect a firm's continuous innovation. Intangible assets are the direct result of innovation investment and contain more comprehensive information about innovation investment. In order to ensure the robustness of the results, the incremental R&D investment divided by the total assets at the beginning of the period is used as a proxy variable in the robustness test.

4.2.2. Financial Flexibility(ff)

Based on the special institutional background in China, there are few companies with equity financing flexibility, so equity financing flexibility is not considered in the study. This paper adopts the multi-indicator method used in most of the literature, which measures the sum of cash flexibility and debt financing flexibility. Referring to Zeng, A. et al. (2011) and Tong, W. X. et al. (2021), the variable was calculated as follows.

Financial flexibility (ff) = cash flexibility (cff)+ debt financing flexibility (dff)

Cash flexibility = corporate cash ratio - industry cash ratio

Debt financing flexibility = Max (0, the average debt ratio of the same industry - corporate debt ratio)

Also, because of the lagging nature of financial flexibility, this paper uses financial flexibility with a one-period lag as the explanatory variable.

4.2.3. Financing Constraints(kz)

The KZ index is estimated by referring to the method of Tan and Xia (2011) and Wei et al. (2014), using variables such as net cash flow from operations, Tobin's Q, gearing ratio, cash dividends and cash holdings. The larger the KZ index, the higher the financing constraint faced by the firm.

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4.2.4. Controls

In order to ensure the reliability of the empirical results, it is necessary to control for the factors that influence firms' continuous innovation. Referring to the relevant literature, the following control variables are selected in this paper: enterprise scale, profitability, enterprise growth, ratio of liabilities, equity concentration, enterprise age, nature of property right, operating cash flow, and whether the chairman and managing director are combined. The effects of year and industry are also controlled.

The specific definitions of the variables are shown in Table 1.

Table 1: Definition of variables.

Variable type	Variable name	symbol	Variable definition
Dependent Variable	Sustainability innovation	srd	Incremental intangible assets divided by total assets at the beginning of the period
Independent Variable	Financial flexibility	ff	Sum of cash flexibility and debt financing flexibility
Controls	Enterprise scale	size	Natural logarithm of total assets
	profitability	roa	Net profit divided by average total assets
	Enterprise growth	growth	Annual growth rate of operating income
	Ratio of liabilities	lev	total liabilities divided by total assets
	Equity concentration	topshare	The percentage of shares held by the largest shareholder
	Enterprise age	age	Year of observation minus year of listing
	Nature of property right	soe	State-owned enterprises take 1, non-state-owned enterprises take 0
	Operating cash flow	cfo	Net cash flow from operating activities divided by total assets
	Whether the chairman and the general manager are the same person	dual	Yes take 1, otherwise take 0
Moderator Variable	Financing constraints	kz	KZ index

4.3. Research Models

First, model (1) was constructed in order to test the previous hypothesis I. For further study, the paper continues to explore the impact of cash flexibility and debt financing flexibility, which are important components of financial flexibility, and models (1-1) and (1-2) was constructed.

$$srd = \alpha_0 + \alpha_1 ff + \alpha_2 controls + \sum Year + \sum Ind + \varepsilon \quad (1)$$

$$srd = \gamma_0 + \alpha_1 cff + \alpha_2 controls + \sum Year + \sum Ind + \varepsilon \quad (1\text{-}1)$$

$$srd = \lambda_0 + \alpha_1 dff + \alpha_2 controls + \sum Year + \sum Ind + \varepsilon \quad (1\text{-}2)$$

Second, to test the moderating effect of financing constraints, the interaction term c_kz*c_ff of financing constraints and financial flexibility is introduced, and Model (2) is constructed as follows:

$$srd = \beta_0 + \beta_1 c\_ff + \beta_2 c\_kz + \beta_3 c\_ff * c\_ff + \beta_4 controls + \sum Year + \sum Ind + \varepsilon \quad (2)$$

5. Empirical Analysis

5.1. Descriptive Statistics

As shown in Table 2, the average innovation sustainability is 0.008, and the highest value is 0.164 and the lowest is only -0.025, which indicates that the level of continuous innovation of listed companies in China is low and has some differences. The maximum value of financial flexibility is 0.701, the minimum value is -0.216, and the mean value is 0.087. This indicates that most of the listed enterprises in China have carried out the reserve of financial flexibility, but there are still some enterprises with reserve of financial flexibility less than 0. Overall, the financial flexibility of the sample enterprises is at a low level. The maximum value of financing constraint is 5.249 and the minimum value is -5.973, which indicates that there are differences in the financing constraints faced by the sample enterprises[22-26].

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Table 2: Descriptive Statistics.

variable	N	mean	sd	min	max
srd	14269	0.008	0.024	-0.025	0.164
ff	14269	0.087	0.193	-0.216	0.701
cff	14269	-0.009	0.120	-0.230	0.391
dff	14269	0.097	0.114	0	0.403
kz	14269	0.723	2.202	-5.973	5.249
size	14269	22.259	1.237	20.144	26.212
roa	14269	0.042	0.060	-0.225	0.213
lev	14269	0.406	0.191	0.055	0.851
topshare	14269	33.525	14.263	8.420	72.110
soe	14269	0.318	0.466	0	1
age	14269	9.842	6.711	2	26
growth	14269	0.164	0.347	-0.453	2.075
cfo	14269	0.051	0.062	-0.116	0.234
dual	14269	0.285	0.452	0	1

5.2. Correlation Analysis

Table 3: Correlation Analysis.

	srd	ff	kz	size	roa	lev	topshare
srd	1						
ff	0.073***	1					
kz	-0.081***	-0.499***	1				
size	0.039***	-0.329***	0.147***	1			
roa	0.100***	0.209***	-0.557***	0.007	1		
lev	0.007	-0.603***	0.611***	0.537***	-0.334***	1	
topshare	0.010	0.032***	-0.065***	0.189***	0.093***	0.079***	1
soe	-0.051***	-0.170***	0.191***	0.376***	-0.114***	0.300***	0.244***
age	-0.092***	-0.249***	0.196***	0.440***	-0.104***	0.310***	-0.008
growth	0.311***	0.022***	-0.088***	0.016*	0.255***	0.009	-0.035***
cfo	-0.004	0.033***	-0.588***	0.054***	0.413***	-0.154***	0.093***
dual	0.023***	0.085***	-0.082***	-0.177***	0.038***	-0.134***	-0.037***
(Continued table)							
	soe	age	growth	cfo	dual		
soe	1						
age	0.510***	1					
growth	-0.104***	-0.120***	1				
cfo	-0.037***	0.008	0.001	1			
dual	-0.287***	-0.217***	0.037***	0.002	1		

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

Table 4: Variance inflation factor (VIF) test.

Variable	VIF	1/VIF
kz	3.49	0.286709
lev	2.86	0.350099
cfo	1.91	0.524217
size	1.85	0.539858
ff	1.81	0.552925
roa	1.63	0.612136
age	1.61	0.622752
soe	1.60	0.625595
topshare	1.16	0.865306
growth	1.13	0.887888
dual	1.10	0.906649
Mean VIF	1.83	

Table 3 reports the correlation analysis between the main variables. The results are shown in Table 3, the correlation coefficients of the variables are less than 0.7, and there is no multicollinearity among the variables.

To increase the reliability of the basic regression, the paper further carries out variance inflation factor

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(VIF) test for the main variables. If the VIF value is greater than 10, it indicates the existence of multicollinearity among the variables. The test results are shown in Table 4. The VIF values are all less than 3.5, and the average VIF value is 1.83, which further indicates that there is no multicollinearity condition.

5.3. Regression Analysis

First, this paper regresses model (1) and the results are reported in column (1) of Table 5, which shows that the coefficient of financial flexibility (ff) is 0.012, which is significant at 1% confidence level, verifying that financial flexibility has a positive effect on corporate sustainability innovation. Next, the regressions of the models (1-1) (1-2) are conducted separately and the results are reported in columns (2) and columns (3) of Table 5, which show that the coefficient of cash flexibility (cff) is 0.013, which is significantly positive at the 1% level. The coefficient of debt financing flexibility (dff) is 0.017, which is also significant at the 1% confidence level. Overall, the results indicate that both total financial flexibility and single cash flexibility and single debt financing flexibility are conducive to promoting sustainable innovation in firms[27].

Table 5: Basic regression results.

	(1) srd	(2) ssrd	(3) srd
ff	0.012*** (9.03)		
cff		0.013*** (7.44)	
dff			0.017*** (6.58)
size	0.002*** (7.72)	0.002*** (7.56)	0.002*** (7.75)
roa	0.007* (1.74)	0.005 (1.14)	0.010*** (2.62)
lev	0.006*** (3.57)	0.000 (0.23)	0.006*** (3.35)
topshare	-0.000 (-1.22)	-0.000 (-1.19)	-0.000 (-0.75)
age	-0.000*** (-5.69)	-0.000*** (-6.01)	-0.000*** (-5.69)
soe	-0.001 (-1.58)	-0.001 (-1.57)	-0.001 (-1.46)
growth	0.021*** (35.71)	0.021*** (36.17)	0.021*** (35.17)
cfo	-0.006 (-1.61)	-0.006* (-1.81)	-0.006* (-1.87)
dual	0.001 (1.25)	0.001 (1.23)	0.001 (1.36)
constant	-0.028*** (-6.12)	-0.024*** (-5.30)	-0.029*** (-6.14)
F	67.25	66.37	65.96
N	14269	14269	14269
Adj R2	0.1364	0.1348	0.1340

t statistics in parentheses

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

Table 6 reports the results of the moderating effect of financing constraints, mainly observing the coefficient of the interaction term. It can be seen that the coefficient of financing constraint is significantly negative and the coefficient of the interaction term between financial flexibility and financing constraint is positive and significant at the 1% confidence level, indicating that the effect of financial flexibility on firm sustainability innovation is moderated by financing constraint and an increase in financing constraints enhances the facilitative effect of financial flexibility on sustained innovation.

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Table 6: The moderating effect of financing constraints.

	srd
c_ff	0.011***
	(7.80)
c_kz	-0.002***
	(-9.56)
c_ff*c_kz	0.003***
	(7.49)
size	0.001***
	(5.27)
roa	-0.003
	(-0.81)
lev	0.015***
	(8.36)
topshare	-0.000*
	(-1.69)
age	-0.000***
	(-5.29)
soe	-0.001
	(-1.22)
growth	0.020***
	(34.72)
cfo	-0.028***
	(-6.54)
dual	0.000
	(1.12)
constant	-0.016***
	(-3.37)
F	67.443
N	14269
Adj R2	0.1436

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

5.4. Further Analysis

To further examine the influence of property rights nature, this paper divided the research sample into two groups according to property rights nature and conducted regressions separately, and the results are reported in Table 7. As can be seen from Table 7, the coefficient of financial flexibility in the state-owned enterprises group is 0.004, which is significant at 10% confidence level, while the coefficient of financial flexibility in the non-state-owned enterprises group is 0.015, which is significant at 1% confidence level, and is significantly higher than the state-owned enterprises group in terms of coefficient size and significance level. The paper also uses the seemingly uncorrelated model to test the difference of regression coefficients, and the p-value is equal to 0.0018, which is significant at 1% confidence level, indicating that the financial flexibility coefficients of the two groups are different.

Table 7: Heterogeneity analysis

	State-owned enterprises	Non-state-owned enterprises
ff	0.004*	0.015***
	(1.93)	(9.16)
controls	yes	yes
constant	-0.017***	-0.046***
	(-2.60)	(-7.07)
Year & industry	yes	yes
F	31.97	44.15
N	4534	9735
Adj R2	0.1794	0.1242
Regression coefficient difference test	chi2(1) =9.78 Prob > chi2 = 0.0018	

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

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For state-owned listed companies, they can obtain additional government grants and subsidies to ease financing constraints, and are more likely to obtain "implicit guarantees" from the government when borrowing from financial institutions (Lin et al., 2004; Ghosh and Moon, 2010). For non-state-owned listed companies, they are more likely to suffer from credit constraints and discrimination because they do not have political backgrounds, lack political guarantees and policy guidance, and are at a certain disadvantage when it comes to financing, so the financial flexibility of corporate reserves is more effective in promoting sustainable innovation[28].

5.5. Robustness Test

This paper re-runs the regression using incremental R&D investment divided by total assets at the beginning of the period as a proxy variable for corporate sustainability innovation. As shown in columns (1), (2) and (3) of Table 8, the coefficients of total financial flexibility, cash flexibility and debt financing flexibility are still significantly positive, which proves that hypothesis I is robust. The moderating effect on financing constraints is regressed again, and the results are reported in table 8 column (4). The coefficient of the interaction term is significantly positive at the 1% confidence level, which proves that Hypothesis II is also robust.

Table 8: Robustness Test

	(1) srd1	(2) srd1	(3) srd1	(4) srd1
ff	0.005***			
	(4.22)			
cff		0.003**		
		(2.37)		
dff			0.011***	
			(4.94)	
c_ff				0.001***
				(2.66)
c_kz				-0.000**
				(-1.94)
c_ff* c_kz				0.000***
				(2.86)
size	0.000	0.000	0.000*	0.000
	(1.63)	(1.55)	(1.71)	(1.35)
roa	0.019***	0.018***	0.021***	0.023***
	(5.57)	(5.37)	(6.18)	(16.03)
lev	0.005***	0.003**	0.007***	0.003***
	(3.75)	(2.24)	(4.63)	(5.07)
topshare	-0.000	-0.000	-0.000	-0.000***
	(-0.76)	(-0.66)	(-0.57)	(-5.15)
age	-0.000	-0.000	-0.000	-0.000***
	(-1.37)	(-1.55)	(-1.24)	(-6.01)
soe	0.000	0.000	0.000	0.000**
	(0.83)	(0.85)	(0.87)	(2.33)
growth	0.016***	0.017***	0.016***	0.010***
	(33.00)	(33.21)	(32.51)	(47.10)
cfo	0.006**	0.006*	0.006**	-0.001
	(2.10)	(1.95)	(2.07)	(-0.53)
dual	0.001**	0.001**	0.001**	0.000***
	(2.25)	(2.26)	(2.30)	(2.99)
_cons	-0.008**	-0.006	-0.009**	-0.000
	(-1.97)	(-1.54)	(-2.34)	(-0.17)
F	47.447	47.048	47.661	123.659
N	14269	14269	14269	14269
Adj R2	0.0997	0.0989	0.1001	0.2363

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

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6. Conclusions

Through this research, we draw the following conclusions. First, financial flexibility positively affects corporate sustainability innovation, and single cash flexibility and single debt financing flexibility promote corporate sustainability innovation. Second, financing constraints positively regulate the relationship between financial flexibility and sustainability innovation, i.e., the higher the degree of financing constraints a company faces, the stronger the role of financial flexibility in promoting corporate sustainability innovation. Third, compared with state-owned enterprises, financial flexibility has a stronger facilitating effect in non-state-owned enterprises.

Based on the above findings, this paper puts forward two suggestions: first, financial flexibility has a significant role in promoting corporate sustainability innovation, but listed companies still face certain challenges in sustainable innovation, and some companies lack understanding of financial flexibility, and the reserve of financial flexibility is still at a low level, so companies should combine their own reality, establish the concept of risk management, improve the awareness of financial flexibility. Secondly, when facing high financing constraints, enterprises should combine their actual situation and reasonably reserve financial flexibility in advance. They can choose to reserve sufficient cash flexibility to make funds flexible enough, and at the same time reduce the debt ratio and reserve certain debt flexibility to alleviate the negative impact brought by financing constraints and ensure the sustainability of their innovative investment activities.

References

[1] A.A. Bonaimé, K.W. Hankins, J. Harford. Financial Flexibility, Risk Management, and Payout Choice [J]. The Review of Financial Studies, 2014, 27(4): 1074-1101.
[2] Fazzari S.M., Hubbard R.G., Petersen B.C. Financing Constraints and Corporate Investment [J]. Brookings Papers on Economic Activity, 1988(1): 141-206.
[3] He Y.B., Zhou H., Ding J.M. How does technological diversification affect a firm's continuous innovation? [J]. Scientology Research, 2017, 35(12): 1896-1909.
[4] M. Marchica, R. Mura. Financial Flexibility, Investment Ability, and Firm Value: Evidence from Firms with Spare Debt Capacity [J]. Financial Management, 2010, 39(4): 1339-1365.
[5] Yu F., Fan X., Zhang Q.L. Government subsidies promote or inhibit firms' innovation persistence - based on heterogeneous innovation motivation perspective [J]. China Science and Technology Forum, 2021(05): 67-78+89.
[6] Bai M., Wang R. How corporate social responsibility affects sustainable corporate innovation [J]. China Science and Technology Forum, 2020(01): 107-115.
[7] Chen F., Han X.Y. Environmental uncertainty, financial flexibility and R&D investment-empirical evidence based on small and medium-sized listed companies [J]. Industrial Technology Economics, 2018, 37(10): 19-25.
[8] Cui L. Q., Zhang Z. A study on the impact of financial flexibility on R&D investment in emerging manufacturing firms--a dual effect based on competitive strategy [J]. Management Modernization, 2020, 40(03): 68-73.
[9] Fan S.R., Chen Z.B., Shen L. The impact of corporate financial flexibility policy on innovation efficiency: empirical evidence from the context of the new economic normal [J]. Journal of Northeastern University (Social Science Edition), 2018, 20(01): 36-43.
[10] Fan X., Chen Y., Zhang Q. L. Economic policy uncertainty, implicit government guarantees and firm innovation persistence [J]. Journal of Management, 2020, 17(09): 1347-1354.
[11] Ferreira M.A., Vilela A.S. Why Do Firms Hold Cash? Evidence from EMU Countries [J]. European Financial Management, 2004, 10(2): 295-319.
[12] GANTER A, HECKER A. Persistence of innovation: discriminating between types of innovation and sources of state dependence [J]. Research Policy, 2013, 42(8): 1431-1445.
[13] GEROSKI P. A., van Reenen J, Walters C F. How persistently do firms innovate? [J]. Research Policy, 1997, 26 (1): 33-48.
[14] Ghosh AA, Moon D. Corporate debt financing earnings quality [J]. Journal of Business Finance & Accounting ,2010, 37(5): 538-559.
[15] JU X.S., LU D., YU Y.H. Financing constraints, working capital management and corporate innovation sustainability [J]. Economic Research, 2013, (1): 4-16.
[16] Kuratko D F, Hornsby J S, Naffziger D W. An Examination of Owner's Goals in Sustaining Entrepreneurship [J]. Journal of Small Business Management, 1997, 35(1): 24-33.
[17] Li J., Li T.T., Pan Z. Organizational redundancy, product market competition and innovation

ISSN 2616-5902 Vol. 4, Issue 14: 1-10, DOI: 10.25236/AJBM.2022.041401

sustainability [J]. China Science and Technology Forum, 2016(01): 88-92.
[18] Liu D., Chen S. Q., Chen C. The impact of equity increases and external financing dependence on corporate innovation in manufacturing listed companies [J]. Journal of Management, 2019, 16(8): 1168-1178.
[19] Pan Z., Li Y.Z., Li J. General manager control, chairman-general manager vertical pair characteristics and innovation continuity [J]. Economic Management, 2017, 39(09): 82-99.
[20] Tan Y., Xia F. Stock prices and investment in Chinese listed companies - a cross-sectional study of surplus management and investor sentiment [J]. Accounting Research, 2011(08): 30-39+95.
[21] TAVASSOLI S, KARLSSON C. Persistence of various types of innovation analyzed and explained [J]. Research policy, 2015, 44 (10): 1887-1901.
[22] Tong H. X. A study on the relationship between financial flexibility, inefficient investment and corporate value of listed companies [J]. Forecast, 2021, 40(01): 31-37.
[23] Wei C.H., Zeng A.M., Li B. Financial ecological environment and corporate financing constraints-an empirical study based on Chinese listed companies [J]. Accounting Research, 2014(05): 73-80+95.
[24] Xiao Z.Y., Lin L., Chen Z.Y., Xu D.B. Financial flexibility capability and sustainable innovation of Chinese listed companies--Also on coordinated innovation effect and adaptive effect [J]. Statistical Research, 2020, 37(05): 82-93.
[25] Yang L., Pan Z. The dynamic relationship between financial flexibility and firm performance-an analysis of moderating effects based on financing constraints and agency costs [J]. Economic and Management Research, 2019, 40(04): 125-144.
[26] Yifu Lin, Eddie Li. Policy burden, moral hazard and soft budget constraint [J]. Economic Research, 2004, (2): 17-28.
[27] Zeng A.M., Zhang C., Wei Z. H. Financial crisis shock, financial flexibility reserve and corporate investment behaviour--Empirical evidence from Chinese listed companies [J]. Management World, 2013(4): 107-120.
[28] Zhao H., Zhang D.Z. Research on the original attributes of corporate financial flexibility [J]. Accounting Research, 2010(06): 62-69+96.