A Study on Economic Policy Uncertainty, Financing Constraints and SME Financing Structure Choice Based on Intermediary Effects

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Abstract: Since the sub-prime crisis, policies in major economies have been subject to frequent and substantial adjustments in response to changes in the environment. Macroeconomic policy formulation has been characterised by "de-cyclicalisation" and "uncertainty". This paper selects the data of listed SMEs from 2009 to 2019, which uses financing constraints as the mediating variable between economic policy uncertainty and enterprises' internal or external sources of financing, which establishes a two-by-two mediating effect mathematical model on the correlation between economic policy uncertainty, financing constraints and financing structure according to the three-step method of testing mediating effects. The coefficients of the independent variables in each OLS regression model are tested for significance. The coefficients of the independent variables in each OLS regression model are tested for significance. This study provides implications for the financing strategies and responses of SMEs under economic volatility and financing constraints.

Keywords: economic policy uncertainty, financing constraints, financing structure

1 INTRODUCTION

In the aftermath of the US sub-prime mortgage crisis, a number of economic crises have exacerbated market fears and scholars have proposed theories of "de-cyclicalisation" of economic fluctuations, bringing the indicator of economic policy uncertainty into the spotlight. This indicator was developed by Scott R. Baker, Nicholas Bloom and Steven J. Davis of Stanford University and the University of Chicago, and reflects economic and policy uncertainty in the world's major economies, henceforth referred to as uncertainty. The financing constraint is a barrier created by firms in the financing process, i.e. due to the imperfect nature of the release and processing of financing information in capital markets, firms pass on limited financing information, resulting in differences in the cost of financing, with the cost of external financing being higher than the cost of internal financing. The adjustment of policies and the difference in the cost of internal and external financing arising from financing constraints together affect the direction of the choice of financing channels for enterprises.

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2 RESEARCH BACKGROUND AND LITERATURE REVIEW

Scholars have studied the impact of uncertainty at the micro level in terms of channels, policies, and operations. Yao Zhen and Zheng Yu (2000)[1]explored the impact of uncertainty with respect to firms' financing channels, conducting research on firm heterogeneity and financing channels and finding that uncertainty can prompt financial institutions that issue debt financing to tighten their borrowing efforts for credit facilities and form barriers to capital raising. Song Xinyun, Chen Zhenling and Zhao Zhenzhen (2020)[2]studied financing efficiency and investment preferences and found that increased uncertainty significantly inhibits the improvement of corporate financing efficiency

Researchers introduced financing factors into the investment model, and the model verified the magnitude of investment-cash flow sensitivity of firms under different financing constraints, thus proving the existence of financing constraints. Chinese scholars Yao Yaojun and Dong Gangfeng (2015)[3]examined empirically the degree of association between the two and financing constraints, starting from both the level of financial development and the financial structure, and concluded that the government needed to make policy adjustments around the structure of the banking sector. Huang Bingyi and Lu Yujie (2019)[4]found through an empirical study that bank correspondence can alleviate financing constraints, especially after experiencing a financial crisis, that the alleviation of such financing barriers is more significant.

This paper combines the former research directions and findings with a regression model and a mediating effects model, in which the financing constraint, as a mediating variable, will disperse part of the direct impact of uncertainty on the financing structure, thus forming a transmission mechanism whereby uncertainty first affects the financing constraint and then influences the financing behaviour of SMEs.

3 THE RELATIONSHIP BETWEEN ECONOMIC POLICY UNCERTAINTY, FINANCING CONSTRAINTS AND SME FINANCING

The relationship between uncertainty and financing constraints and the structure of corporate finance is as follows. The first is that equity financing can change the original return on investment due to uncertainty, increasing the return on investment at a risk premium, and the rising cost of financing makes the capital market significantly less willing to invest. Equity financing is limited and financing constraints deepen. Secondly, under the influence of increased uncertainty, there is a "lending hesitation" by banks in corporate debt financing. Because of the uncertainty of risks and the bias of forecasts, banks are unable to truly believe in the financial situation of enterprises, so they reduce their credit limits and raise interest rates, which increases the financing costs of enterprises and leads to increased financing constraints. Finally, there is a "precautionary saving" motive behind corporate finance. When uncertainty increases in the environment, companies need to hedge their risk by increasing their liquidity in the event of a break in their capital chain or a shortage of funds to finance their investments, so the additional cost of financing also increases the financing constraint. The effect of the financing constraint on the financing structure is that a stronger financing constraint means that the firm's budgeted costs are less accurate and it needs to pay higher financing costs than

budgeted to meet its targets. Faced with the result of lower earnings from higher financing costs, firms will perceive this as a financing risk.

4 STUDY DESIGN

4.1 Formulate a hypothesis

- In the fixed panel effects model, the explanatory variables are taken to be first-order differences at t-1. Because there is likely to be a strong correlation between the explanatory and explained variables in year t, using a first-order difference at t-1 avoids the chance of such a strong correlation, excludes endogeneity issues, and results in more accurate regression coefficients.
- Hypothesis 1: Uncertainty is positively related to the financing constraint index WW. That is, the greater the uncertainty EPU, the stronger the financing constraint.
- Hypothesis 2: Economic policy uncertainty is positively related to endogenous financing. That is, an increase (decrease) in the "uncertainty" index will lead to an increase (decrease) in endogenous financing for firms

$$\begin{aligned} Initial_{i,t} = {} & \alpha_i + \beta_1 EPU_{t-1} + \beta_2 GR_{i,t-1} \\ & + \beta_4 Q_{i,t-1} + \beta_5 Cfo_{i,t-1} \\ & + \beta_6 Cost_{i,t-1} + \beta_7 Size_{i,t-1} \\ & + \sum Nature + \varepsilon_{i,t} \end{aligned} \tag{1}$$

$$\begin{aligned} WW_{i,t} = {} & a_i + b_1 EPU_{t-1} + b_2 GR_{i,t-1} \\ & + b_3 Q_{i,t-1} + b_4 Cfo_{i,t-1} \\ & + b_5 Cost_{i,t-1} + b_6 Size_{i,t-1} \\ & + \sum Nature + \gamma_{i,t} \end{aligned} \tag{2}$$

$$\begin{aligned} Initial_{i,t} = {} & \delta_i + c_1 EPU_{t-1} + c_2 WW_{i,t-1} \\ & + c_3 GR_{i,t-1} + c_4 Q_{i,t-1} \\ & + c_5 Cfo_{i,t-1} + c_6 Cost_{i,t-1} \\ & + c_7 Size_{i,t-1} + \sum Nature + \theta_{i,t} \end{aligned} \tag{3}$$

- Hypothesis 3: Economic policy uncertainty is negatively related to exogenous financing. That is, a rise (fall) in uncertainty leads to a rise (fall) in exogenous financing for firms.

$$\begin{aligned} External_{i,t} = {} & \alpha_i + \beta_1 EPU_{t-1} + \beta_2 GR_{i,t-1} \\ & + \beta_4 Q_{i,t-1} + \beta_5 Cfo_{i,t-1} \\ & + \beta_6 Cost_{i,t-1} + \beta_7 Size_{i,t-1} \\ & + \sum Nature + \varepsilon_{i,t} \end{aligned} \tag{4}$$

$$WW_{i,t} = a_i + b_1 EPU_{t-1} + b_2 GR_{i,t-1} + b_3 Q_{i,t-1} + b_4 Cfo_{i,t-1} + b_5 Cost_{i,t-1} + b_6 Size_{i,t-1} + \sum Nature + \gamma_{i,t} \quad (5)$$

$$External_{i,t} = \delta_i + c_1 EPU_{t-1} + c_2 WW_{i,t} + c_3 GR_{i,t-1} + c_4 Q_{i,t-1} + c_5 Cfo_{i,t-1} + +c_6 Cost_{i,t-1} + c_7 Size_{i,t-1} + \sum Nature + \theta_{i,t} \quad (6)$$

4.2 Sample Selection and Data Sources

In this paper, A-share SMEs listed on the Shenzhen Stock Exchange were selected as the subject of the empirical study, a total of 585 companies, and a total of 11 years from 2009-2019 were selected as the analysis interval. ST and *ST companies were excluded from the sample, companies delisted in the middle of the period were removed, companies with serious missing data were excluded, and the effects of outliers were eliminated by shrinking the tails of the 1% and 99%+ quartiles of the main continuous variables.

4.3 Variable Description

The independent and dependent variables needed to establish the formulae in this paper we can clearly visualise in Table 1.

TABLE 1 DESCRIPTION OF STATISTICAL VARIABLES

The explanatory variable y	Changes in financing structure (Structure) 1. Initial 2. External	Ratio of endogenous to exogenous financing to total financing Endogenous financing / total financing (own funds) = Retained earnings in period t / total assets in period t External financing/total financing (external borrowings) = net cash flows from financing activities in period t/total assets in period t
Explanatory variable x	Economic Policy Uncertainty (EPU)	Taking the logarithm of economic policy uncertainty
Control variables	Growth rate of revenue from main business (GR)	Reflects the strength of the financing capacity.Main operating income in period t - Main operating income in period (t - 1) / Main operating income in period t
	Tobin's Q (Q)	Market capitalisation / total assets
	Net cash flow from operations as a percentage of total assets (Cfo)	Net cash flow from operations/total assets
	Cost of financing debt (Cost)	Interest expense/(short-term borrowings + long-term borrowings)
	Financing size (Size)	Natural logarithm of total assets financed Total assets financed = short-term borrowings + financial assets held for trading + long-term borrowings + bonds payable + long-term payables + paid-in capital (equity)

Dummy variables	Nature of business (Nature)	State-owned enterprises take 1, non-state-owned enterprises take 0

4.4 Experimental test results and analysis

1) Descriptive statistics

Table 2 presents descriptive statistics for the variables of interest, where retained earnings assets as a percentage of total assets, representing endogenous financing, have a mean value of 0.184, a minimum value of -0.249 and a maximum value of 0.545. net financing y2 has a mean value of 0.043, a minimum value of -0.178 and a maximum value of 0.586. in general, management decision makers in capital markets prefer exogenous financing with diversified sources. The explanatory variable EPU has been calculated by taking the log of the annual mean in order to have a reasonable range, where the mean value is 5.463, the minimum value is 0.631 and the maximum value is 6.674. This indicates that the EPU has changed significantly and increased year by year during the 11 years from 2009-2019, indicating the increased volatility of our economy.

TABLE 2 DESCRIPTIVE STATISTICS OF VARIABLES

	Samplesize	**Average**	**Standarddeviation**	**Minimumvalue**	**1point**	**Median**	**99thpercentile**	**Maximumvalue**
y1	5828	.184	.125	-.249	-.249	.173	.545	.545
y2	5828	.043	.137	-.178	-.178	.002	.586	.586
EPU	5828	5.463	.631	4.707	4.707	5.2	6.674	6.674
Size	5828	20.543	1.105	18.329	18.329	20.488	23.479	23.479
WW	5828	.827	.355	0	0	.966	1.148	1.148
Cfo	5828	.048	.069	-.154	-.154	.047	.234	.234
Q	5828	2.095	1.167	.949	.949	1.697	7.315	7.315
GR	5828	.18	.307	.425	.425	.129	1.622	1.622
Cost	5828	.057	.09	0	0	.042	.61	.647
y1r2	5828	027	.018	.003	.003	.023	.092	.092
y2r2	5828	.375	.189	.041	.041	.359	.816	.816

2) Regression analysis of economic policy uncertainty on the financing structure of SMEs

The regression results in Table 3 are cross-sectional fixed effects, and the coefficients are calculated by building a regression model on the data in the balanced panel. Models 1 and 4 represent the effect of the independent variable uncertainty on the preference for the financing structure of endogenous and exogenous financing. The experiments demonstrate that the coefficient of direct effect of the dependent variable EPU with endogenous financing y1 in model 1 is 0.018 and with exogenous financing in model 2 is -0.032, both significant at the 1% level, which indicates that uncertainty EPU is positively correlated with endogenous financing, and Hypothesis 1 holds; hypothesis 3 holds, i.e. the stronger the uncertainty in economic policy, the more policy makers prefer to adopt an endogenous financing strategy based on retained earnings, depreciation and fixed liabilities, and curtail exogenous financing such as bank loans, equity issues and corporate bonds in a high-risk, volatile financing environment.

3) Analysis of the mediating effects of economic policy uncertainty and financing structure

Regarding the test of intermediation effects, the coefficient of direct effect model 1 with fixed panel effects cross-sectional data is 0.018 and the t-value is significant at the 1% level, indicating that EPU is correlated with endogenous financing y1, i.e. increased economic policy uncertainty strengthens endogenous financing in the financing structure of enterprises. The coefficients in the indirect effects of intermediation models 2 and 3 are -0.293 and -0.007 respectively, which are significant at the 1% level and 10% level respectively, and the coefficient of the total effect of EPU and endogenous financing y1 is 0.015, which is significant at the 1% level. We can intuitively see from the table that the product of the indirect effect coefficients of the independent variable EPU, the mediating variable WW and the dependent variable Initial of endogenous financing in the model has the same sign as the product of the total effect coefficients, and according to Wen Zhonglin's testing process, the hypothesis of the mediating effect of the WW index in 1a holds. Similarly, the coefficient in model 4 is -0.032, which is significant at the 1% level, which indicates increased uncertainty and reduced exogenous financing. The coefficients of the indirect effects in the intermediation and total models 5 and 6 are -0.293 and 0.021 respectively and are both significant at the 1% level, and the coefficient of the total effect of EPU and exogenous financing y2 is -0.026, also significant at the 1% level. The product of the two indirect effect coefficients and the product of the total effect coefficients are both negative, therefore, the mediation effect of the WW index in hypothesis 2 holds. The validity of the two mediating effects confirms that uncertainty can influence the choice of financing structure of SMEs by influencing the financing constraint and hence this mechanism.

TABLE 3 INTERMEDIARY EFFECTS AND REGRESSION RESULTS

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

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	m1	m2	m3	m4	m5	m6
	y1	ww_r	y1	y2	ww_r	y2
ww_r			-0.007*			0.021***
			(-1.72)			(3.67)
L. EPU	0.018***	-0.293***	0.015***	-0.032***	-0.293***	-0.026***
	(3.57)	(-16.92)	(3.04)	(-4.81)	(-16.92)	(-3.76)
L. Size	-0.014***	0.087***	-0.013***	-0.014***	0.087***	-0.016***
	(-6.41)	(11.40)	(-6.03)	(-4.92)	(11.40)	(-5.48)
L. Q	0.005***	-0.009*	0.005***	0.019***	-0.009*	0.019***
	(4.10)	(-1.86)	(4.05)	(10.66)	(-1.86)	(10.78)
L. Cfo	0.178***	0.153**	0.179***	-0.029	0.153**	-0.032
	(9.76)	(2.41)	(9.82)	(-1.17)	(2.41)	(-1.30)
L. Cost	-0.035***	0.203***	-0.033***	-0.032**	0.203***	-0.036**
	(-2.88)	(4.85)	(-2.75)	(-1.98)	(4.85)	(-2.25)
L. GR	-0.004	0.015	-0.004	0.032***	0.015	0.032***
	(-1.11)	(1.28)	(-1.07)	(7.01)	(1.28)	(6.95)
Nature	-0.063***	-0.056	-0.063***	-0.025*	-0.056	-0.024
	(-5.80)	(-1.49)	(-5.84)	(-1.71)	(-1.49)	(-1.63)
Constant	0.370***	0.651***	0.374***	0.454***	0.651***	0.440***

	(9.41)	(4.73)	(9.51)	(8.61)	(4.73)	(8.34)
Observations	5,033	5,033	5,033	5,033	5,033	5,033
R-squared	0.054	0.266	0.055	0.092	0.266	0.095
Number of stkcd	584	584	584	584	584	584
F	17.04	106.9	16.16	30.07	106.9	29.11

4) Robustness tests

We perform robustness tests on the above models to verify the accuracy of the models. Table 4 presents the robustness of Models 3 and 6, with surplus reserves to total assets replacing the dependent variable of endogenous financing and the gearing ratio replacing the value of the share of financing cash flows, both of which were selected based on the structural composition of endogenous financing and the nature of the liabilities of exogenous financing. The coefficient of the replacement variable surplus reserves to total assets for the uncertainty EPU and y1 is 0.006 and the ratio of the replacement variable gearing to y2 is -0.051, both of which are simultaneously significant at the 1% level, indicating that the model is robust.

TABLE 4 ROBUSTNESS ANALYSIS

	(1)	(2)
	m7	m8
VARIABLES	y1_r2	y2_r2
L. EPU	0.006***	-0.051***
	(9.51)	(-8.09)
L. Size	-0.004***	0.074***
	(-15.63)	(26.62)
L. Q	0.001***	0.007***
	(7.98)	(4.05)
L. Cfo	0.010***	-0.112***
	(4.69)	(-4.78)
L. Cost	-0.000	0.005
	(-0.30)	(0.32)
L. GR	-0.005***	0.022***
	(-12.00)	(5.15)
Nature	-0.001	0.065***
	(-0.71)	(4.70)
Constant	0.079***	-0.860***
	(16.98)	(-17.07)
Observations	5,033	5,033
R-squared	0.123	0.230
Number of stkcd	584	584
F	41.50	88.50

5 CONCLUSION

By analysing the results of the empirical study on the relationship between uncertainty and financing constraints and firms' internal and external source financing, we can conclude that

financing constraints have a mediating effect in the transmission mechanism between economic policy uncertainty and the financing structure of SMEs. This means that the financing constraint diffuses part of the direct impact of economic policy uncertainty on endogenous and exogenous financing. When policy changes occur in the economy, they first affect the impact of financing constraints due to the contraction of financing costs, and then indirectly affect the structure of financing for SMEs.

6 Research Summary and Recommendations for Countermeasures

This paper uses the Economic Policy Uncertainty Index to quantify this dramatic and frequent macroeconomic volatility as a whole, using data to verify that economic policy uncertainty affects the financing structure of SMEs, i.e. as uncertainty increases, endogenous financing rises while exogenous financing becomes more difficult. The higher the uncertainty, the more policy makers prefer a financing strategy based on endogenous financing with retained earnings, depreciation and fixed liabilities in a high-risk, volatile economic financing environment, and curtail exogenous financing such as bank loans, equity issues and corporate bonds. When the uncertainty index starts to rise, the cost of exogenous financing rises significantly and SMEs turn to endogenous financing, which is original, autonomous, low-cost and risk-resistant to corporate capital formation. This paper also quantifies the financing constraint and verifies the mediating effect of the financing constraint as a mediating variable between macroeconomic policy uncertainty and SMEs' choice of financing structure. Further subsequent research can attempt to quantify the financing constraint from the perspective of market information and costs, and study the specific impact of economic policy uncertainty on SMEs' financing channels and financing methods to make the study more in-depth and provide more valuable theoretical and practical guidance.

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