

# Economic Policy Uncertainty, Credit Rating Inflation and Credit Spread

## -- Evidence from Chinese Corporate Bond Market

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**Abstract.** Utilizing data of corporate bonds issued by Chinese companies in Shanghai and Shenzhen Stock Exchanges, this paper examines the impact and mechanism of China's economic policy uncertainty on corporate bond credit spreads. The research finds: (1) Generally speaking, the increase of economic policy uncertainty will lead to larger credit spreads. (2) The impact of economic policy uncertainty on credit spreads will have an asymmetric effect due to factors such as property rights, corporate size and equity concentration. (3) Credit rating inflation plays a certain mediating effect in the influence of economic policy uncertainty on credit spreads. Government should pay more attention to the policy consistency and coherence, strengthen the information exchange and communication with enterprises, improve the bond pricing system and broaden the financing channels of small and medium-sized enterprises.

**Keywords:** Economic Policy Uncertainty, Rating Inflation, Credit Spread.

### 1. Introduction

Financing difficulty has been a long-standing problem for Chinese small and medium-sized enterprises, which is also an important bottleneck that has plagued the development of market economy since the reform and opening up. Due to the high entry threshold of the securities market and the imperfect venture capital system, SMEs rely on bank loans as their main financing channels. To address this problem, China put forward the mission to perfect the multi-tiered capital market system and improve direct financing channels at the third plenary session of the eighteenth in 2014. Recently in 2022 government work report, China has further proposed to improve the bond financing support mechanism for private enterprises. However, research shows that there are still many difficulties in SME bond financing and the scale of private enterprise bond financing has long been below 10% of the total bond market according to CCDC. In this background, it is of great theoretical and practical significance to reduce the financing cost of corporate bonds by studying the influencing factors of bond risk premium, and formulating targeted policies to establish an effective pricing system.

China is in a period of economic transformation. In order to trigger the economic vitality, a series of policies are implemented to drive economic transformation. At the same time, the financial crisis in 2008 and the rising trade protectionism have brought severe challenges to the Chinese economy. In response to that, government has continuously introduced bunches of policies to regulate macro economy, but the frequent intervention has significantly increased policy uncertainty. According to Huang and Luk (2019), China's economic policy uncertainty index has been continuously rising since 2008. Prior researches reveal that risen EPU could trigger a chain reaction of economic activities. The uncertainty of monetary policy can explain a large part of the bond premium (Wright, 2008), and the volatility of corporate earnings will also increase due to this policy uncertainty (Zhou Hong et al., 2014). In view of this possibility, this paper attempts to empirically explore the impact and mechanism of economic policy uncertainty on bond financing cost.

As a basic institutional arrangement, credit rating has a significant impact on financing costs (Kidwell, 1988; Liu and Ping, 2014). A high rating conveys positive information about the issuer's operating conditions and credit quality, significantly reducing financing costs. Therefore, this kind of influence gives companies an incentive to collude with rating agencies to inflate their rating. Research

reveals that the rating standards of Chinese rating agencies have undergone significant relaxation, with an average increase of one notch since 2009. After the 2008 financial crisis, problems such as "inflated" ratings, insufficient rating differentiation, and weak risk warning capabilities have become more prominent. Existing research mainly focuses on the corporate governance factors that affect the ratings itself and the information content of ratings, few studies touched on the phenomenon of rating inflation. In view of this, this paper intends to fill this gap and analyze the role of rating inflation in the impact of economic policy uncertainty on bond financing costs.

Using corporate bonds information from 2005 to 2018, this paper attempts to explore the impact and mechanism of economic policy uncertainty on credit spreads. Evidence shows that corporate bond credit spreads are positively correlated with economic policy uncertainty. We also find that the results are more concentrated in non-SOEs, unlisted and smaller companies. As for the channels, we discover that rating inflation serves as a mechanism in the impact of economic policy uncertainty on credit spreads. When economic policy instability increases, rating agencies tend to be more prudent and conservative, which reduced inflation, leading to an increase in credit spreads.

We contribute to the literature in the following ways. First, we fill the gap of studies related to credit ratings. We investigate the phenomenon of rating inflation and link it with corporate financing behavior, which provides a new analytical perspective for explaining corporate bond pricing. Meanwhile, this paper has deepened the understanding of the rating system, which has certain practical significance for optimizing the rating ecology. Second, our study is a natural extension of the default risk pricing literature, providing a macro explanation mechanism for debt financing costs and risk pricing from a perspective of policy uncertainty. Third, we enrich the research on economic policy uncertainty: combines economic policy uncertainty with ratings to provide an updated microscopic interpretation for the impact of policy volatility on financial markets and social financing.

We structure the paper as follows. Section 2 reviews the literature and develops hypotheses. Section 3 provides the research design and describes the sample. Section 4 presents empirical results and additional analyses. Section 5 concludes.

## 2. Literature and Hypotheses

### 2.1 Credit spread

Early studies on credit spread focused on default risk and advanced a few models. Merton (1974) was the first to propose a model when analyzing the probability of default, and demonstrated that fluctuations in company value are the main cause of default risk which is the only factor to determine credit spread. Later research carried out different models based on Merton (Geske, 1974; Longstaff and Schwartz, 1995; Leland and Toft, 1996; Collin-Dufresne and Goldstein, 2001). To date, wider factors were introduced into the research on credit spread, mainly divided into macroscopic and microscopic studie.

Interest rate, inflation and monetary policies had been confirmed to be significantly relevant to credit spread. Longstaff and Schwartz (1995) demonstrated that credit spread is negatively correlated with the interest rate; in the same vein, Duffee (1998) proposed that corporate bonds yields fall when Treasury yields rise and this relation is much stronger for callable bonds; Campbell and Taksler (2003) showed that stock volatility has a certain explanatory power to credit spreads when credit rating is controlled; Guo Ye et al. (2016) reckon that in addition to conventional macro factors, unexpected monetary policy changes are also crucial to solve the "mystery of credit spreads". The rise of target interest rate will lead to the increase of credit spreads, and the longer the period, the greater the impact of policy changes. Zhou Hong et al. (2011) further expanded the research scope and investigated that business cycle like financial crisis could affect the credit risk of bonds.

At the micro level, Leland (1998) proposed that the risk premium would rise when the potential possibility of assets substitution increased; Collin et al. (2001) and Flannery et al. (2012) discovered that credit spreads can reflect leverage information, and the willingness to adjust future capital

structure will also affect the expected credit spreads; At the same time, many scholars had conducted extensive investigations based on information asymmetry: Fan Yu (2004) thought that the higher the quality of information disclosure, the smaller the credit spread; this view was supported by Du Jing et al. (2015) who demonstrated disclosure mainly affects the credit spread indirectly through affecting credit rating; similarly, Zhou Hong et al. (2014) believed that enterprises can reduce their own financing costs by reducing information uncertainty in the primary market.; meanwhile, corporates can also relieve information asymmetry by actively undertaking social responsibilities; other researchers complemented these microscopic studies by examining other factors such as the property rights (Fang Hongxing et al., 2013) and customer concentration (Wang Xiongyuan et al., 2017) also wield influences on the risk premium.

## 2.2 Economic policy uncertainty and credit spread

Economic policies are imperative means for government to regulate economy, which have the power to stimulate demand and trigger recovery during economic downturn, and to curb overheated domestic demand and achieve steady and sound economic development. In 2008, during the financial crisis, China launched the "Four Trillion" stimulus package to help domestic economy withstand the test of financial disaster; the outbreak of COVID-19 pandemic at the end of 2019 led to the global production disruption and economic woes. Governments had introduced various policies to regulate production. Such external shocks result in strong uncertainties in the economic policies, and it is of great difficulties for corporate decision-makers to anticipate policies.

In financial market, economic policy uncertainty can increase stock price volatility and also correlation between stocks, boosting systematic risk (Pastor and Veronesi, 2012; Li and Zhang, 2015). On the one hand, the rise of systematic risk raises uncertainty of the overall business environment. Once there is a sudden change in policies, the corporate business strategy can be heavily distracted, which may result in serious deviation from its business objectives. Therefore, the performance will fluctuate dramatically (Chu Jian et al., 2018). At the same time, the impact of policy instability on performance will also give rise to a lower stability of future cash flow and aggravate the fluctuation of corporate value; On the other hand, environment uncertainty can cause deterioration of the information quality and boost risk of decision failure. For investors, information opacity reduces the financial information reliability and thus the valuation accuracy (Zhou Hong et al. 2014). In addition, due to the rise of information asymmetry, the accuracy of assessment of project income and company performance can be weakened, which makes it more challenging to supervise the management. As a result of that, the agency problem becomes prominent and consequently audit quality decreases. (Chu Jian et al., 2018).

Therefore, based on the above analysis, we formally state our first hypothesis:

H1: The economic policy uncertainty is positively correlated with the credit spread of corporate bonds. *Ceteris paribus*, the higher the uncertainty, the larger the credit spread.

We also believe that owing to implicit government guarantee, state-owned enterprises have relatively lower credit risks, so the economic policy uncertainty may have less impact on them than non-state-owned firms. The same assumption applies to businesses of different sizes. Therefore, the second hypothesis is as follows:

H2: The influence of economic policy uncertainty on credit spread varies as corporates' property rights and size changes.

## 2.3 Credit rating inflation

In terms of channel research, economic policy uncertainty can affect the cost of debt through the level of risk taking, investment and company performance (Gulen et al., 2016; Cai Guowei et al., 2018; Wang Chao, 2020). ; Yang Yuanjie et al., 2020); on the other hand, policy instability can indirectly affect bond pricing by reducing financial market liquidity (Radde, 2015; Demir and Ersan, 2017) and boosting market volatility (Dakhlaoui and Aloui, 2016; Amengual and Xiu, 2018). However, previous

studies have failed to demonstrate a link between economic policy unstableness and corporate performance from a market perspective. Therefore, this paper examines the influence of economic policy uncertainty on credit spread from the perspective of interaction between enterprises and market by introducing a mediating variable, rating inflation.

Credit ratings effectively alleviate information asymmetry between bonds issuers and investors, and reduce the cost of information collection (Millon and Thakor, 1985). Preliminary work on ratings was undertaken by Kidwell (1988) and he concluded that higher credit ratings signals better credit quality and significantly reduce financing costs. Altmon (1988) pointed out that the higher credit rating, the lower yield to maturity; similarly, Ziebart (1992) examined that corporate financial information can not only affect yield to maturity directly but also influence YTM indirectly through ratings.

As a kind of commodity provided to issuers, when the competition gets fierce in the rating market, ratings tend to get higher and rating fee become lower as a result of decreasing of independence of third-party agencies. Detailed examination by Bolton et al. (2012) showed that competition can reduce efficiency as it facilitates rating shopping and rating inflation can result in information distortion because rating results no longer accurately reflect financial conditions. A recent study by Liu and Wang (2020) reported that inflated ratings can lower financing costs, promote debt financing, and raise financial leverage.

When unstableness of policy environment surges, information transparency decreases, resulting in a much higher rating risk. Therefore, in times of instability, credit rating agencies (CRAs) tend to be more cautious and conservative. Several surveys had revealed that when policy environment shifts, CRAs tend to tighten their standards, and rating conservatism will be greatly enhanced. Both Alp (2013) and Baghai et al. (2014) had reported that after 2008 financial crisis, when uncertainty of global economic policy rised, CRAs in U.S. significantly tightened their standards and tended to be more conservative, resulting in declining or even negative rating inflation. In an investigation in 2012, Bolton divided market into “sophisticated” and “trusting” investors clientele and argued that during boom times, when more investors are trusting and more ratings inflation is likely to occur. While during a downturn, more investors are cautiously skeptical of rating information, rating inflation is likely to be relieved.

It can be seen from the above analysis that rating inflation may be one of the channels through which economic policy uncertainty wield influence on credit spreads. Therefore, we state our third hypothesis:

H3: An increase in economic policy uncertainty can significantly relieve rating inflation, and a reduction in rating inflation can lead to an increase in credit spreads.

### 3. Research Design

#### 3.1 Sample and Data

**Table 1.** Sample Selection

Description	Observation
All firm-years issued on Shanghai and Shenzhen Stock Exchanges from 2005 to 2018	55748
Less firm-years with missing data on credit ratings	(8652)
Less firm-years with missing financial data	(15720)
Sample size for the main test for H1	31376

We select our sample from corporate bonds issued on Shanghai and Shenzhen Stock Exchanges and use debt ratings of each firm, with a sample period from January 1, 2005 to December 31, 2018. The original data contain 55748 firm-year observations with information including issuer, rating, rating date and corporate financial data. To measure the channel mechanism of rating inflation, 8652 observations with missing rating are excluded; since we plan to construct inflation proxy using

corporate financial data, so 15720 firm-year observations with missing fundamentals are removed. The final sample for our main regression includes 31376 firm-year observations. We describe the sample selection procedure in Table 1. All the data is obtained from WIND and variables are minorized at 1 and 99 percent to avoid the effect of outliers.

### 3.2 Variable Definition

**Dependent Variable:** Credit spread (SPREAD). Following Wang Xiongyuan et al. (2017), we calculate credit spread by subtracting the t-year Treasury bond yield from bond yield of the same maturity. If there is a missing Treasury bond of a certain maturity, then interpolation method is used to figure out the corresponding yields.

**Independent Variable:** Economic Policy Uncertainty(EPU). We use the annual average of the economic policy uncertainty index constructed by Huang and Luk(2019) as our main explanatory variable, which is based on 10 mainland Chinese newspapers and captures key words related to economy, uncertainty and policies. At the same time, to ensure robustness, another EPU index constructed by Baker et al. (2016) is introduced as substitute explanatory variable, which is composed of information from a Hong Kong-based English newspaper, South China Morning Post (SCMP).

**Mediating Variable:** Credit rating inflation. Inspired by the measurement of the rating Conservatism by Baghai et al. (2014), we measure the credit rating inflation in China by running regression estimates using data from 2005 to 2012, and estimated parameters are then used to predict debt ratings from 2013 to 2018. INFLATION is defined as the difference between the firms' actual rating and its predicted rating.

**Control Variables:** we select our control variables following 2 levels: in the first level, we control for scale of the natural logarithm of bonds issuance amount (AMOUT), term, defined as the natural logarithm of maturity (TERM) and yield to maturity (YTM); in the second level, we control for the firm characteristics including total leverage, defined as total debt-to-asset ratio (Debt-Ratio) and profitability, measured as return on assets (ROA). Four dummies, the indicator of property rights (SOE), listed or not (PUBLIC), equity concentration (CONCETRATION) and firm size (SIZE) are included. Last, we introduce year, industry and province fixed effects to absorb variation by year, industry and provinces.

**Table 2.** Variable Definition

Type	Symbol	Definition
Dependent Variable	SPREAD	Difference between YTM of a t-year bond and that of a Treasury bond with the same maturity
Independent Variable	EPU	Annual Average of economic policy uncertainty index constructed by Huang and Luk(2019)
Mediating Variable	INFLATION	Difference between the firms' actual rating and its predicted rating
Bonds	AMOUNT	Nature logarithm of bonds issuance amount
	YTM	Yield to maturity when bonds are issued
	TERM	Natural logarithm of bond maturity
Firms	Debt-Ratio	Ratio of total liabilities to total assets
	ROA	Ratio of net profit to total assets
	SOE	=1 if the firm is state-owned, and 0 otherwise
	PUBLIC	=1 if the firm is listed on the Shanghai or Shenzhen exchange, and 0 otherwise
	CONCENTRATION	=1 if the largest shareholder equity ratio exceeds 50%, and 0 otherwise
	SIZE	Dummy for firm size, takes the value of 1 if the assets held by the firm ranks in the top 50% of the sample, and 0 otherwise

### 3.3 Model

#### 3.3.1 Measure of INFLATION<sub>i,t</sub>

Following Baghai et al.(2014), we treat ratings as a function of a series of firm characteristics and therefore the regression model is as follows:

$$RATING\_NUM = CHARACTERISTICS + \epsilon_t \quad (1)$$

We follow Liu and Wang(2020)to select the characteristic variables and assign RATING\_NUM 1 to 21 respectively from C- to AAA. We estimate the rating models over the period 2005 to 2012; for each year in the period 2013 to 2018 we use the firms' characteristics to predict their debt ratings based on the estimated coefficients. Predicted ratings smaller than 1 are set equal to 1 and predicted ratings larger than 21 are set equal to 21. Therefore, INFLATION is defined as the difference between the firm's actual rating and its predicted rating. Thus. For each firm-year starting from 2013, we compute:

$$INFLATION_{i,t} = ACTUAL\_RATING_{i,t} - PREDICTED\_RATING_{i,t} \quad (2)$$

#### 3.3.2 Regression Model

We first test the impact of economic policy uncertainty (EPU) on corporate bond credit spread (SPREAD), and the baseline regression model is composed as follows:

$$SPREAD = \beta_0 + \beta_1 EPU + \beta_2 CONTROLS + u \quad (3)$$

In the above baseline regression, control variables of different levels are added successively. Base on this, proxy for credit rating (INFLATION) is introduced to construct the following mechanism model to test whether rating inflation plays a role of transmiss channel.

$$SPREAD = \theta_0 + \theta_1 EPU + \theta_2 INFLATION + \theta_3 INTERACT + \theta_4 CONTROLS + \xi \quad (4)$$

where the INTERACT is the product of independent variable (EPU) and channel variable (inflation).

## 4. Empirical Results

### 4.1 Descriptive Statistics

Table 3 presents the summary statistics of the sample. The mean (median) value of credit spread is 1.62 (1.26) and maximum (minimum) value is 5 (0.41); EPU takes a mean (median) value of 118.25 (108.59), indicating that China's economic policy is relatively uncertain during the sample period; the mean value of rating inflation is 0.04, which implies there is a certain degree of rating inflation during the sample period.

### 4.2 Correlations

**Table 3.** Descriptive Statistics

Variable	Mean	SD	Min	Med	Max	T-value
SPREAD	1.62	1.08	0.41	1.26	5	323
EPU	118.25	58.39	50.44	108.59	277.81	439.49
INFLATION	0.04	0.35	-1.11	0.01	0.81	20.14
AMOUNT	20.74	0.69	19.09	20.72	22.33	6486.36
TERM	1.48	0.39	0.69	1.61	2.3	812.76
YTM	4.53	1.17	2.65	4.2	7.8	842.8
ROA	0.4	0.47	0.00	0.25	2.19	163.5
Debt-Ratio	0.63	0.42	0.03	0.66	0.92	292.01

Table 4 reports correlations among our main variables. Credit spread and economic policy instability is positively and significantly related (correlation of 0.04), which can be preliminarily

interpreted as a positive correlation between risk premium and policy volatility; the correlation between credit spread and rating inflation is negative (correlation of -0.12), which implies that overestimated ratings signal a reduction of default risk a lower risk premium; and we also find that our main dependent variable is positively correlated with bond issuance, consistent with the expectation that when the issuance amount is expanded, the liquidity is enhanced and the default risk is relatively reduced.

**Table 4.** Correlation

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) SPREAD	1.00							
(2) EPU	0.04	1.00						
(3) INFLATION	-0.12	0.01	1.00					
(4) AMOUNT	-0.27	-0.04	0.09	1.00				
(5) TERM	-0.04	-0.01	-0.02	-0.03	1.00			
(6) YTM	0.90	0.04	-0.08	-0.26	0.09	1.00		
(7) ROA	0.04	-0.09	0.02	0.02	-0.12	0.00	1.00	
(8) Debt-Ratio	-0.01	0.04	0.03	0.08	-0.03	-0.02	0.06	1.00

### 4.3 Baseline Analysis

#### 4.3.1 Economic policy uncertainty and credit spread

Table 5 provides baseline results of the correlation between economic policy uncertainty and corporate bonds credit spread. In column 1, industry, year and province fixed effects are included but we do not add any control variables; regressions in columns 2 and 3 add characteristic proxies of bonds and issuers respectively based on column 1.

The results of 3 column show that credit spread is positively associated with economic policy uncertainty at 99% significance level, implying that firms' cost of bond financing is more likely to rise when economic policy unstableness increases, proving H1. Meanwhile, from column 2 to column 3, coefficients of EPU rise with the increasing number of control variables. As we can see from column 3, firms' credit spread will increase by 2.2BP if the economic policy uncertainty index rises by 100 points. As for control variables, the estimated results are basically consistent with expectations: the issuance scale is negatively correlated with credit spread while asset-liability ratio and yield to maturity are significantly positively correlated with credit spread.

#### 4.3.2 Cross-Sectional Partition

**Table 5.** Cross-sectional Partition

Variable	(1)		(2)		(3)		(4)	
	SOE=1	SOE=0	LIST=1	LIST=0	CON=1	CON=0	SIZE=1	SIZE=0
EPU	0.016*** (2.84)	0.039*** (4.09)	0.007 (0.85)	0.031*** (4.68)	0.039*** (5.23)	0.005 (0.66)	0.012 (1.38)	0.031*** (4.62)
CONTROLS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	24710	6666	9271	22105	19910	11466	15686	15690
R-squared	0.77	0.90	0.86	0.83	0.82	0.85	0.79	0.86

Table 5 presents the baseline test. In column (5) and (6), CON equals 1 if the largest shareholder equity ratio exceeds 50%, and 0 otherwise. \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% using two-tailed tests and standard errors clustered at the firm-level. Robust standard errors are used in all regressions.

TABLE 6 reports the results. First, we examine the cross-sectional variation between SOEs and non-SOEs. Column (1) and (2) present that the effect of EPU on credit spread is more significant on non-SOEs than SOEs (0.016/0.039). The results may be due to the government's implicit guarantee, which means state-owned enterprises are funded by the government, so the credit risk is lower. In addition, salary system of management team of SOEs is not closely related to performance and SOEs

has undertaken the major task of maintaining the value of state-owned assets. Therefore, the managers will pay more attention to the steady development and tend to avoid risks when the uncertainty of economic policies increases. In a result, EPU has less impact on SOEs than non-SOEs.

**Table 6.** Baseline Results

Variable	Model 1	Model 2	Model 3
	SPREAD	SPREAD	SPREAD
EPU	0.094*** (8.44)	0.019*** (3.83)	0.022*** (4.41)
AMOUNT		-0.030*** (-14.35)	-0.030*** (-14.52)
TERM		-0.171*** (-49.12)	-0.168*** (-48.04)
YTM		0.445*** (344.70)	0.445*** (344.68)
ROA			0.036*** (10.69)
Debt-Ratio			0.031*** (4.37)
INDUSTRY	Yes	Yes	Yes
YEAR	Yes	Yes	Yes
PROVINCE	Yes	Yes	Yes
N	31376	31376	31376
R-squared	0.17	0.83	0.84

Table 6 presents the baseline test. \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% using two-tailed tests and standard errors clustered at the firm-level. Robust standard errors are used in all regressions.

Column (3) to (7) presents the cross-sectional variations of different listed situation, ownership concentration and corporate size. The results indicate that listed and bigger companies are less affected by economic policy uncertainty as the lower financial constraints, which reflect in the insignificant coefficients. In contrast, unlisted, smaller and highly-concentrated firms response to this instability more intensely due to higher financial restrictions.

#### 4.3.3 The Mechanism: rating inflation

**Table 7.** Evidence of Mechanism

Variable	(1)
	SPREAD
EPU×INFLATION	-0.016* (-1.66)
INFLATION	0.010 (0.21)
EPU	0.023*** (4.69)
AMOUNT	-0.028*** (-13.57)
TERM	-0.168*** (-48.46)
YTM	0.444*** (345.16)
ROA	0.037*** (10.94)
Debt-Ratio	0.034*** (4.71)
INDUSTRY	Yes
YEAR	Yes
PROVINCE	Yes
N	31376
R-squared	0.84

Table 7 reports the results of the mechanism. Credit rating inflation reflects the overvaluation of corporate ratings, so the higher the inflation, the lower the risk premium. Therefore, we expect the direction of this interaction to be negative.

According to the results in Table 7, the coefficient of the interaction is significantly negative (-0.016) at the level of 90%, which is consistent with expectations. The results indicate that rating inflation plays a role in the mechanism between economic policy uncertainty and credit spreads. The higher the EPU is, the more pessimistic and conservative the rating agencies are, which leads to a lower rating inflation and higher risk compensation.

#### 4.4 Robustness Tests

##### 4.4.1 Endogeneity Concern

###### (1) Potential uncertainty of macro economy and enterprises operation

Prior researches pointed that the main problem in studies on economic policy uncertainty is the omitted variables (Chu et al., 2018), which means that the influence of EPU may include instability of macro economy or the unstableness of corporate operations. Therefore, on the basis of the above analysis, we successively add macroeconomic climate index, entrepreneur confidence index, enterprise climate index and consumer confidence index as the measure of macroeconomic instability, and adopts the annualized stock volatility as the measure of corporate operating unstableness. Table 10 presents that after controlling these uncertainties, our conclusion remains the same.

###### (2) Approach

Following Wang et al. (2014), we adopt the US economic policy uncertainty as the instrumental variable. We reestimate equation (3) using 2SLS approach. Table 11 presents the results that our main conclusion remains robust.

**Table 8.** Robustness Test (1):Control for uncertainty of macro economy and operations

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
	SPREAD	SPREAD	SPREAD	SPREAD	SPREAD
EPU	0.027*** (5.29)	0.020*** (4.49)	0.022*** (4.99)	0.020*** (3.40)	0.024*** (5.23)
Macroeconomic Sentiment Index	-0.004*** (-3.98)				
Entrepreneur Confidence Index		-0.001*** (-3.59)			
business climate index			-0.000*** (-3.98)		
consumer confidence index				0.000 (0.99)	
stock volatility					0.000** (2.29)
CONTROLS	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	36256	36256	36256	36256	36256
R-squared	0.83	0.83	0.83	0.83	0.84

###### (3) Exclude data from special years

Considering that conclusions may only observe the policy uncertainty caused by the global financial crisis in 2008 or the change of Chinese central leadership in 2012, we exclude the observations in 2008 and 2012. The results are in Table 12 and again out outcomes remain robust.

**Table 9.** Robustness Test (2):IV approach

SPREAD	Model 1	Model 2
	2SLS	2SLS
EPU	0.010*** (3.60)	0.011*** (4.04)
LNAMOUNT	-0.030*** (-4.48)	-0.031*** (-4.53)
LNTERM	-0.172*** (-14.35)	-0.169*** (-14.09)
YTM	0.446*** (97.77)	0.445*** (97.47)
ROA		0.034*** (3.46)
Debt-Ratio		0.034* (1.84)
INDUSTRY	Yes	Yes
YEAR	Yes	Yes
PROVINCE	Yes	Yes
N	31376	31376
R-squared	0.83	0.84

**Table 10.** Robustness Test (3):exclude samples from 2008 or 2012

Variable	Model 1	Model 2	Model 3
	SPREAD	SPREAD	SPREAD
EPU	0.097*** (8.61)	0.020*** (3.99)	0.022*** (4.35)
AMOUNT		-0.029*** (-12.90)	-0.030*** (-13.30)
TERM		-0.171*** (-45.63)	-0.167*** (-44.61)
YTM		0.445*** (322.33)	0.444*** (322.52)
ROA			0.035*** (9.36)
Debt-Ratio			0.064*** (6.72)
INDUSTRY	Yes	Yes	Yes
YEAR	Yes	Yes	Yes
PROVINCE	Yes	Yes	Yes
N	27188	27188	27188
R-squared	0.17	0.84	0.84

#### 4.4.2 Other robustness tests

To further ensure the robustness of our inferences, we implement additional analyses. The first approach is to adopt the economic policy uncertainty index constructed by Baker et al. (2016) based on South China Morning Post as substitute variable. Second is to change the calculation of channel, credit rating. Referring to Baghai et al. (2014), we use the estimators modeled from 2013 to 2018 to predict the ratings of the same period, and use the difference as the alternative variable of inflation.

Changing the economic policy uncertainty

TABLE 8 reports the results after alternating the core explanatory variable. Column (1) shows that the alternative variable of economic policy uncertainty is positively correlated with credit spreads, which is consistent with the results in Table 4. The coefficient of the interaction is negative, but not significant, which verifies the basic conclusion.

**Table 11.** Robustness Test (4):alternating rating inflation

Variable	Model 1	Model 2
	INFLATION2	SPREAD
EPU×INFLATION2		-0.020** (-2.45)
EPU	-0.184*** (-13.31)	-0.003 (-0.44)
INFLATION2		0.059 (1.50)
AMOUNT		-0.022*** (-7.97)
TERM		-0.166*** (-35.30)
YTM		0.434*** (237.28)
ROA	-0.081*** (-7.72)	0.015*** (3.03)
Debt-Ratio	0.011 (0.37)	0.138*** (10.32)
Constant	1.018*** (13.54)	-1.052*** (-15.40)
INDUSTRY	Yes	Yes
YEAR	Yes	Yes
PROVINCE	Yes	Yes
N	17926	17926
R-squared	0.10	0.84

Changing Rating Inflation

Table 9 presents the test of mechanism after replacing rating inflation. The coefficient is negative (-0.02) and significant at 95% level, indicating that credit rating inflation plays a part in the mechanism of economic policy uncertainty and credit spread.

**Table 12.** Robustness Test (5):alternative variable of EPU

Variable	Model 1
	SPREAD
EPU2×INFLATION	-0.009 (-1.40)
EPU2	0.020*** (4.66)
INFLATION	-0.016 (-0.46)
AMOUNT	-0.028*** (-13.56)
LNTERM	-0.168*** (-48.45)
YTM	0.444*** (345.15)
ROA	0.037*** (10.94)
Debt-Ratio	0.034*** (4.71)
INDUSTRY	Yes
YEAR	Yes
PROVINCE	Yes
N	31376
R-squared	0.84

## 5. Conclusion

We investigated the relation and mechanism between economic policy uncertainty and corporate credit spreads. Relied on the economic policy uncertainty index constructed by Huang and Luk(2019)based on mainland Chinese newspapers, we discussed the influence of policy instability on bond issuance cost. Our evidence shows that: first, the rise of economic policy uncertainty will significantly increase credit spreads; second, this kind of influence varies because of firms' property rights, size and ownership concentration and unlisted, small and medium-size companies are affected more by instability; third, rating inflation serves as a channel between economic policy uncertainty and credit spread.

Our study is a natural extension of government' policy uncertainty and shed light on the micro interpretation of the effect of economic policy uncertainty on financial market and social funding. Based on our conclusions, we put forward to the following recommendations:

First, the government should make rational use of fiscal and monetary policies when regulate social economy, and at the same time pay more attention to maintaining the policy consistency and coherence. In particular, China is in the period of economic recovery after the pandemic. Prevention policies has been frequently changed along with the epidemic situation, which directly leads to the rapid increase of uncertainty in economic policy. Moreover, the government should do a good job in information exchange and communication with enterprises to create a stable financing environment for enterprises.

Second, the government should attach more importance to the financing support for small and medium sized companies and private enterprises and implement supporting measures to reduce the fluctuation of credit spreads. Our conclusion shows that due to the single financing channel, economic policy uncertainty has a more severe impact on the small and medium-sized and also unlisted enterprises. Therefore, it is of great practical value to further promote the reform of registration system, lower the threshold of bond financing, enhance market inclusiveness and broaden the financing channels for enterprises.

Third, strengthen the construction of laws and regulations of rating market, encourage the "investor pay" mode and actively disclose the rating results to reduce the interest connection between issuers and rating agencies to reduce rating inflation, induce credit rating to return to its basic function of risk disclosure and pricing and promote the healthy development of the rating industry.

## References

- [1] Merton, R C. 1974. On the Pricing of Corporate Debt: The Risk Structure of Interest Rates[J]. *The Journal of Finance*, 29(2): 449–470.
- [2] Longstaff F A, Schwartz E S. 1995. A Simple Approach to Valuing Risky Fixed and Floating Rate Debt[J]. *The Journal of Finance*, 50(3): 789–819.
- [3] Eom Y H, Helwege J, Huang J Z. 2004. Structural Models of Corporate Bond Pricing: An Empirical Analysis[J]. *The Review of Financial Studies*, 17(2): 499–544.
- [4] Duffee G R .1998. The Relation between Treasury Yields and Corporate Bond Yield Spreads[J]. *The Journal of Finance*, 53(6): 2225–2241.
- [5] Campbell J Y, Taksler G B. 2003. Equity Volatility and Corporate Bond Yields[J]. *The Journal of Finance*, 58(6): 2321–2349.
- [6] Wright J H. 2011. Term premia and inflation uncertainty: Empirical evidence from an international panel dataset[J]. *American Economic Review*, 101(4): 1514-34.
- [7] Chu J, Qin X, Fang J X. 2018. Economic Policy Uncertainty and Audit Decisions: Evidence Based on Audit Fees [J]. *Accounting Research*, (12): 85-91. (in Chinese)
- [8] Liu S, Wang H. 2020. The Real Effects of Rating Inflation: Evidence from the Chinese Corporate Credit Ratings[J]. Available at SSRN 3680291.
- [9] Huang Y, Luk P. 2020. Measuring economic policy uncertainty in China[J]. *China Economic Review*, 59: 101367.

- [10] Baghai R P, Servaes H, Tamayo A. 2014. Have rating agencies become more conservative? Implications for capital structure and debt pricing[J]. *The Journal of Finance*, 69(5): 1961-2005.
- [11] Leland H E, Toft K B. 1996. Optimal capital structure, endogenous bankruptcy, and the term structure of credit spreads[J]. *The Journal of Finance*, 51(3): 987-1019.
- [12] Collin-Dufresne P, Goldstein R S. 2001. Do credit spreads reflect stationary leverage ratios?[J]. *The journal of finance*, 56(5): 1929-1957.
- [13] Guo Y, Huang Z, Wang Y. 2016. Unexpected Monetary Policy and Corporate Bond Credit Spread: A Study Based on the Decomposition of Fixed and Floating Spreads [J]. *Financial Research*, 432(6): 67-80. (in Chinese)
- [14] Zhou H, Xu Z M, Peng L H, et al. 2011. The Impact of Macroeconomic Uncertainty on China's Corporate Bond Credit Risk: Based on Monthly Panel Data from 2007 to 2009 [J]. *Accounting Research*, 12: 41-45. (in Chinese)
- [15] Leland H E. 1998. Agency costs, risk management, and capital structure[J]. *The Journal of Finance*, 53(4): 1213-1243.
- [16] Flannery M J, Öztekin Ö. 2012. Leverage expectations and bond credit spreads[J]. *Journal of Financial and Quantitative Analysis*, 47(4): 689-714.
- [17] Yu F. 2005. Accounting transparency and the term structure of credit spreads[J]. *Journal of financial economics*, 75(1): 53-84.
- [18] Du J, Li X J. 2015. An Empirical Study on the Impact of Internal Control Quality on Bond Credit Spreads [J]. *Friends of Accounting*, (20): 49-54. (in Chinese)
- [19] Zhou H, Lin W F, Li G P. 2014. Uncertainty Information, Asymmetry Information and Credit Spread of Bond[J]. *Statistical Research*, (5): 66-72. (in Chinese)
- [20] Zhou H, Jian L, Li G P. 2016. Corporate Social Responsibility and Credit Spreads on Corporate Bonds: An Empirical Study Based on China's Public Companies[J]. *Accounting Research*, (5): 18-25. (in Chinese)
- [21] Fang H X, Shi J K, Zhang G B. 2013. Property rights, information quality and corporate bond pricing: Empirical evidence from China's capital market[J]. *Journal of Financial Research*, (4): 170-182. (in Chinese)
- [22] Customer-based Concentration and Bond Yield Spread in Secondary Market[J]. *Journal of Financial Research*, 439(1): 130-144. (in Chinese)
- [23] Bloom N. 2009. The impact of uncertainty shocks[J]. *econometrica*, 77(3): 623-685.
- [24] Bloom N. 2014. Fluctuations in uncertainty[J]. *Journal of Economic Perspectives*, 28(2): 153-76.
- [25] Pastor L, Veronesi P. 2012. Uncertainty about government policy and stock prices[J]. *The journal of Finance*, 67(4): 1219-1264.
- [26] Li X M, Zhang B, Gao R. 2015. Economic policy uncertainty shocks and stock-bond correlations: Evidence from the US market[J]. *Economics Letters*, 132: 91-96.
- [27] Millon M H, Thakor A V. 1985. Moral hazard and information sharing: A model of financial information gathering agencies[J]. *The Journal of Finance*, 40(5): 1403-1422.
- [28] Altman E I. 1998. The importance and subtlety of credit rating migration[J]. *Journal of Banking & Finance*, 22(10-11): 1231-1247.
- [29] Ziebart D A, Reiter S A. 1992. Bond ratings, bond yields and financial information[J]. *Contemporary Accounting Research*, 9(1): 252-282.
- [30] Bolton P, Freixas X, Shapiro J. 2012. The credit ratings game[J]. *The Journal of Finance*, 67(1): 85-111.
- [31] Alp A. 2013. Structural shifts in credit rating standards[J]. *The Journal of Finance*, 68(6): 2435-2470.
- [32] Baker S R, Bloom N, Davis S J. 2016. Measuring economic policy uncertainty[J]. *The quarterly journal of economics*, 131(4): 1593-1636.