The Impact of Economic Policy Uncertainty on Stock Returns: The Role of Corporate Environmental Responsibility Engagement

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Highlights

- We examine the impact of EPU on two types of stock returns.
- GDMF model is used to decompose stock returns.
- EPU has lower negative impact on the common stock returns of high-CER firms.
- EPU has higher positive impact on the idiosyncratic stock returns of high-CER firms.

Abstract

This paper examines the impact of economic policy uncertainty (EPU) on market-driven common stock returns and individual-driven idiosyncratic stock returns as well as explores the role of corporate environmental responsibility (CER) engagement on this impact based on a sample of 175 firms listed on Shanghai and Shenzhen 300 index from 2008 to 2016. The results show that an increase in EPU significantly reduces the market-driven common stock returns but increases individual-driven idiosyncratic stock returns. Further, EPU has a lower negative impact on the common stock returns of high-CER firms comparing with low-CER firms. EPU has a higher positive impact on idiosyncratic stock returns of high-CER firms comparing with low-CER firms. Overall, the findings of this paper extremely relevant for the government, investors and firm's managers and can be utilised for policy and investment decision-making.

Keywords: Economic Policy Uncertainty; Stock Returns; Generalized Dynamic Factor Model; Corporate Environmental Responsibility

JEL classification: C23; E44; G11; G32; M14

1. Introduction

Economic policy uncertainty (EPU) is not only an important factor in causing stock price volatility at the macro level but also has a key impact on stock returns at the micro level. Numerous studies have been published on the effect of EPU on the stock prices and stock returns (Johnson and Lee, 2014; Ko et al., 2015; Liu and Zhang, 2015; Bali et al., 2017; Li et al., 2018a; McMillan, 2018). Frequent changes in economic policies will exacerbate market volatility, increase economic uncertainty, and thus affect the activities of investors and companies, and ultimately impact the stock market (Chen et al, 2017). However, most related research relies on the overall macro data, while the evidence at the micro level is relatively scarce (Bali et al., 2017). Further, previous research lacks of considering the decomposition of stock returns caused by macro and micro factors.

In addition to this, the value of corporate environmental responsibility (CER) has become increasingly important in stock returns (Harjoto and Jo, 2015). As a part of corporate social responsibility, CER is primarily focus on corporate sustainability. Further, with the ecological environment and natural resources overload, CER is more likely to attract investors (Harjoto and Jo, 2015). Previous research also show that CER will affect consumers' brand attitude and purchase intention; it helps improve firm's legitimacy and improve society's commitment and responsibility for its sustainable development; it can also improve resource utilization efficiency, reduce costs and expenses and help firms gain good reputation (Qiu et al., 2016; Dixon-Fowler et al.,2017; Escrig-Olmedo et al., 2017; Bali et al., 2017; Li et al., 2018b). Firm's environmental responsibility has become an industry competitive strategy that can create higher barriers to entry for excess returns and ensuring competitive advantage (Lins et al). Therefore, this paper considers the value of CER when studying the impact of EPU on stock returns and the two-step generalized dynamic factor model (GDFM) proposed by Barigozzi and Hallin (2017) is used to decompose stock returns into common stock returns and idiosyncratic stock returns.

Comparing with previous research, this paper has three main contributions. First, we offer a micro perspective to study the impact of EPU on stock returns. Second, previous research lacks of considering the decomposition of stock returns caused by macro and micro factors. Thus, to the best of our knowledge this paper is the first of using the two-step

generalized dynamic factor model (GDFM) proposed by Barigozzi & Hallin (2017) to decompose stock returns into common stock returns and idiosyncratic stock returns when exploring the effect of EPU on the volatility of stock returns. Third, we study the impact of EPU on stock returns by taking in consideration an important non-financial factor which is CER to be the first paper showing the role of CER on the impact of EPU on common stock returns and idiosyncratic stock returns.

The remainder of this paper is structured as follows. Section 2 introduces research methods which have been applied to decompose stock returns into common components of stock returns and idiosyncratic components stock returns. Section 3 presents data which has been used and variables. Section 4 introduces the empirical results. Section 5 concludes this paper and puts forward policy recommendations.

2. Research hypotheses

Existing empirical studies have concluded that EPU is negatively related to stock returns. Ozoguz (2009) used the two-zone Markov system transfer model to analyze the uncertainty of stock market returns and total returns, and found that the level of uncertainty and asset value showed a negative correlation. Pastor and Veronesi (2012) point out that the decline of the price should be large if the uncertainty about government policy is large, and also if the policy change is preceded by a short or shallow economic downturn. Antonakakis et al. (2013) analyzed the dynamic correlation between S&P500 stock returns and EPU, and found that stock returns are negatively related to EPU. Kang and Ratti (2013) found that the impact of US oil price shocks is closely related to EPU, and the impact of unanticipated EPU will cause stock returns to decline. Baker et al. (2016) found that EPU has a significant positive correlation with stock volatility at the firm level, and when EPU increases, firms will have lower investment rates and employment rates. Arouri et al. (2014) found that the EPU of major oil importing countries from May 2005 to January 2014 had a negative impact on the oil-producing countries' stock market, that is, the increase in EPU would lead to a decline in stock returns. Brogaard and Detzel (2015) found that EPU has a negative impact on US equity assets in the relatively mature capital markets of the United States. Thus, we propose:

H1: EPU is negatively related to the market-driven common stock returns.

EPU is an important asset pricing factor which can increases the risk premium of stocks (Brogaard and Detzel, 2015; Liu et al., 2019). Pástor and Veronesi (2013) develop a general equilibrium model, this model implies that EPU commands a risk premium of stocks. When the risk of policy changes rises, it means that the company's future rate of return and the

volatility of the stochastic discount factor increase. According to the dividend discount model, the stock price depends on the company's future cash flow and the stochastic discount factor. The fluctuation of the two factors will inevitably lead to the rise of the stock risk premium and the price fluctuation. Therefore, when investors make investment decisions, they will consider more micro-factors at the firm level. The firm's idiosyncratic information will bring more attention to investors, which will lead to the improvement of individual-driven idiosyncratic stock returns. Thus, we propose:

H2: EPU is positively related to the individual-driven idiosyncratic stock returns.

CER will increase corporate value and attract investors to invest in EPU as it increases, thereby reducing the adverse impact of systemic risk and increasing its value. The essential tool for improve firm value is managing the core business stakeholders relationships (Hammann et al., 2010). Tantalo and Priem (2016) believe that each essential stakeholder group exist the multiple potential sources of value creation. CER is a manifestation the concern of various stakeholders on environmental issues including government, regulators, investors, customers and employees. Clarkson et al. (2011) examines whether pursuing proactive environmental strategies leads to improved financial performance and find the positive relationship between environmental activities and financial performance is robust. Lee (2016) show that the relationships between environmental responsibility performance and firms' ROE and ROA are positive and statistically significant. CER can increase investor willingness to invest. When investors face higher EPU, they tend to invest in firms with higher firm value. Thus, we propose:

H3: CER plays a positive role in the process of EPU affecting stock returns.

3. Methodology

3.1. Decompose stock returns

According to the well-known Asset Pricing Theorem (APT) and the Capital Asset Pricing Model (CAPM), asset returns can be decomposed into market-driven common stock returns and individual-driven idiosyncratic stock returns. Essentially, the market-driven risks matter for asset prices, while the idiosyncratic one can be eliminated by appropriate portfolio diversification. To investigate the impact of EPU on energy stock returns, we followed the idea of Barigozzi and Hallin (2017) to decompose stock returns into the common and idiosyncratic components.

When calculating the stock returns, logarithmic transformation of the closing data is firstly subtracted from each other to get stock returns data. Then stock returns at time t is subtracted from the average of the stock returns multiplied by 100 to get stock returns rate.

$$y_{i,t} = \ln(p_{i,t}) - \ln(p_{i,t-1}) \quad (1)$$

$$v_{i,t} = (y_{i,t} - \bar{y}) \times 100 \quad (2)$$

We use GDFM to decompose the rate of stock returns into market-driven common stock returns and individual-driven idiosyncratic stock returns. For $n \times T$ rate of stock returns $v = \{v_{it} | i = 1,...,n; t = 1,...,T\}$, let $v_n = \{v_{nt} = (v_{1t}, v_{1t},..., v_{nt})'\}$. Assumption (1), v_n is a second-order stationary vector process with mean zero and limited variance. Assumption (2), with respect to Lebesgue measure on $[-\pi, \pi]$, v_n is absolutely continuous, that is, v_n admits a spectral density matrix $\sum_{v;n}(\theta), \theta \in [-\pi, \pi]$. For any $\theta \in [-\pi, \pi]$, denote by $\lambda_{v;n,1}(\theta),...,\lambda_{v;n,1}(\theta)$ the eigenvalues of $\sum_{v;n}(\theta)$; the mapping $\theta \mapsto \lambda_{v;n,i}(\theta)$ is also called the i th dynamic eigenvalue of v_n. Assumption (3), as $n \to \infty$, for any θ in $[-\pi, \pi]$, the q th dynamic eigenvalue $\lambda_{v;n,q}$ of $\sum_{v;n}(\theta)$ diverges, while the $(q+1)$th dynamic eigenvalue $\lambda_{v;n,q+1}$ is bounded. For $\{v_{nt}\}$ satisfying the assumptions (1), (2), and (3), that is, it satisfies the GDFM decomposition. For any n, $\{v_{nt}\}$ can be decomposed into the common component $\{CV_{it}\}$ and the idiosyncratic component $\{IV_{it}\}$ as:

$$v_{nt} = CV_{nt} + IV_{nt} \quad (3)$$

Where CV_n is the common component and IV_n is the idiosyncratic component. According to Hallin and Liška (2007), there is a unique common component for the stock returns, which means $q = 1$.

3.2. Estimation of the model

First, we estimate two-panel regressions on CV and IV as a function of EPU. The model can be expressed by Eq.(4) and Eq.(5) . Then, we investigate whether this impact is different among different firms' CER. Specifically, we divide firms into CER quartiles and construct two panel regressions on CV and IV for EPU with different levels of CER. The model is expressed by Eq.(6) and Eq.(7).

$$CV_{it} = \alpha_0 + \alpha_1 EPU_{it} + \alpha_2 'CONTROL_{lt} + \varepsilon_{it} \quad (4)$$

$$IV_{it} = \alpha_0 + \alpha_1 EPU_{it} + \alpha_2 'CONTROL_{lt} + \varepsilon_{it} \quad (5)$$

$$\begin{aligned} CV_{it} = {} & \beta_0 + \beta_1 CER1_{it} * EPU_{it} + \beta_2 CER2_{it} * EPU_{it} + \beta_3 CER3_{it} * EPU_{it} \\ & + \beta_4 CER4_{it} * EPU_{it} + \beta_5 'CONTROL_{lt} + \mu_{it} \end{aligned} \quad (6)$$

$$IV_{it} = \beta_0 + \beta_1 CER1_{it} * EPU_{it} + \beta_2 CER2_{it} * EPU_{it} + \beta_3 CER3_{it} * EPU_{it} + \beta_4 CER4_{it} * EPU_{it} + \beta_5 ' CONTROL_{lt} + \mu_{it} \quad (7)$$

Where CV_{it} is the monthly common component of stock returns; IV_{it} is the monthly idiosyncratic component of stock returns; EPU_{it} is the economic policy uncertainty index; $CER1_{it}$ - $CER4_{it}$ is the dummy variables for CER quartiles 1 through 4, and $CONTROL_{lt}$ is control variables.

4. Sample and variable selection

4.1. Sample

This paper selected firms listed on China Shanghai and Shenzhen 300 index that publish corporate social responsibility reports from January 2008 to December 2016. We exclude firms which listed after 2008 and firms with a large number of missing data. Our final sample consists of 175 firms. Data has been collected from China Stock Market & Accounting Research (CSMAR) database,Chinese Research Data Services Platform (CNRDS) and Wind database.

4.2. Variables measurement

4.2.1. Economic policy uncertainty

Previous research confirms that EPU index accurately reflects the degree of uncertainty in economic policy (Gulen and Ion 2015 and Dong et al., 2019). Thus, this paper adopts the EPU index from the economic policy uncertainty website (http://www.policyuncertainty.com/).

4.2.2. Corporate environmental responsibility engagement

In order to make a comprehensive evaluation, this paper establishes a CER evaluation system as shown in Table 1 by considering five dimensions (legal consciousness, social evaluation, eco-friendly production, low-carbon technology, and green management) consisting of 13 indicators in total similar to Li et al., 2019.

The conscious dimension of the law mainly examines whether the firm follows relevant environmental laws and whether it follows the government guideline. The dimension of social evaluation mainly considers whether the environmental behavior of firms has a good reputation in society. The eco-friendly production dimension mainly inspects whether the firm causes or reduces pollution during the production process. The low-carbon technology dimension mainly

focuses on whether firms have achieved green and low-carbonization in terms of technology use. Further, in order to keep the direction of all indicators consistent, firms subject to environmental penalties take the value of 0, and firms not subject to environmental penalties take the value of 1. For the remaining indicators, if the answer is yes, the firm takes the value of 1 and 0 otherwise. The indicators selected in this paper are all reflections on the objective facts of the firms' behavior, and in order to avoid subjectivity of empowerment, getting a more reasonable calculation of CER, this paper endows all indicators with the same weight. The score of each dimension of CER is the sum of the values of the indicators under the dimension, and the CER score is the sum of the scores of the five dimensions.

Table 1

CER engagement measurement

Dimensions	Indicator
Legal consciousness	1. Whether firm follows GRI Sustainability Reporting Guidelines; 2. Whether firm discloses environment and sustainable development information; 3. Whether firm subjected to environmental penalties.
Social evaluation	1. Whether firm receives environmental commendation; 2. Whether firm has environmental advantages.
Eco-friendly production	1. Whether firm adopts a circular economy; 2. Whether firm carries out green production.
Low-carbon technology	1. Whether firm save energy; 2. Whether firm develop or apply environmentally friendly technologies.
Green management	1. Whether firm has third-party verification; 2. Whether firm has an idea or vision of being responsible for the environment; 3. Whether firm has ISO 14001 certification; 4. Whether firm adopts a green office.

In order to compare the differences in the impact of EPU on stock returns of different CER firms, we used dummy variable for CER quartiles such CER1 takes the value of 1 if the firm is in the first CER quartile and 0 otherwise. CER2, CER3, and CER4 respectively indicates that the firm is in the second CER quartile, third CER quartile and fourth CER quartile.

4.2.3. Control variables

Three control variables have been used which can reflect the characteristics of stock

trading. The market capitalization (MC) represents the size of the firm; the stock turnover rate (TR) represents the investor's activity; the price-earnings ratio (PE) represents the profitability of the firm.

5. Results

Descriptive statistics are presented in Table 2. The first row shows that *CV* is slightly negative with a mean value of -0.0008 and a median value of 0.9241. The next row shows that *IV* is slightly positive with a mean value of -0.0008 and a median value of -0.4832. That means the market is slightly negative to stock returns, but most of the time the market is positive to stock returns. The effect of individual-driven on stock returns is the opposite of that of market-driven. The CER descriptive statistic indicates that Chinese firms' environmental responsibilities are at a low level. We also provide a descriptive statistic of control variables.

Table 2

Descriptive statistics.

Variables	Mean	Std. Dev.	25th perc.	Median	75th perc.
CV	-0.0008	9.56	-4.2918	0.9241	5.4193
IV	0.0008	9.0104	-5.0563	-0.4832	4.3771
EPU	178.58	106.6035	102.2317	153.0111	236.0895
CER	5.6053	2.7262	4	6	8
MC	103.8878	253.6171	16.8977	33.5567	76.6018
TR	28.9734	31.3465	9.6406	18.772	36.7861
PE	62.5575	705.1448	12.4116	22.4843	41.3461

The estimation results are shown in Table 3. In Model (7), EPU has negative impact on the common component of stock returns (-0.0181). The common component of stock returns is the overall stock returns of the market caused by macroeconomic factors. When EPU increases, it means that the stock market risk increases and the stock market returns level will decline.

Table 3

Estimation of EPU on the stock returns.

Variables	*CV* (7)	*IV* (8)	*CV* (9)	*IV* (10)

EPU	-0.0181***	0.0035***		
	(0.000)	(0.000)		
*CER*1**EPU*			-0.0219***	0.001***
			(0.000)	(0.54)
*CER*2**EPU*			-0.0174***	0.0038***
			(0.000)	(0.021)
*CER*3**EPU*			-0.0179***	0.0028***
			(0.000)	(0.031)
*CER*4**EPU*			-0.0156***	0.0061***
			(0.000)	(0.000)
MC	0.0947***	0.0745***	0.0949***	0.0747***
	(0.000)	(0.000)	(0.000)	(0.000)
TR	0.0799***	0.0985***	0.0799***	0.0985***
	(0.000)	(0.000)	(0.000)	(0.000)
PE	0.0006***	-0.0008***	0.0006***	-0.0008***
	(0.000)	(0.000)	(0.000)	(0.000)
N	15370	15370	15370	15370
R^2	0.1404	0.1144	0.1408	0.1148

Note: t-statistics are in parentheses. *, **, and *** statistical significance at the 10%, 5%, and 1%

Model (8) indicates that EPU has positive impact on the idiosyncratic component of stock returns, since an increase in EPU reduces future investment and consumption opportunities. In order to hedge against this unfavorable shift, investors are more likely to hold stocks of high quality which depend on the stocks idiosyncratic feature. Hence, when EPU increases, it means that the idiosyncratic component of stock returns will increase.

Model (9) indicates that EPU has a lower negative impact on the common stock returns of high-CER firms than that of low-CER firms. The coefficient of EPU is the lowest (-0.0219) in the worst CER quartile, and the coefficient of EPU is the highest (-0.0156) in the best CER quartile, that means firms with high level of CER will reduce the negative impact of EPU on the common component of stock returns. The high-CER firms have stronger ability to face the market risks.

Model (10) indicates that EPU has higher positive impact on the idiosyncratic stock returns of high-CER firms than low-CER firms. The coefficient of EPU is not significant in the worst CER quartile, but the coefficient of EPU is the highest (0.0061) in the best CER quartile, that means firms with high levels of CER will increase the positive impact of EPU on the idiosyncratic component of stock returns. The lowest quartile of CER firms do not have the

ability to attract investors, so the impact of EPU on the idiosyncratic component of stock returns is not significant. There is no significant difference between the 2nd and 3rd quartile of CER firms. The highest quartile of CER firms are significantly better than others.

Table 4

SYS-GMM estimation result of EPU on stock returns.

Variables	*CV* (7)	*IV* (8)	*CV* (9)	*IV* (10)
CV_{t-1}	0.0293***		0.0299***	
	(0.000)		(0.000)	
IV_{t-1}		-0.0580***		-0.0738***
		(0.000)		(0.000)
EPU	-0.0150***	0.0029***		
	(0.000)	(0.000)		
*CER*1**EPU*			-0.0211***	0.0009
			(0.000)	(0.152)
*CER*2**EPU*			-0.0151***	0.0029***
			(0.000)	(0.000)
*CER*3**EPU*			-0.0148***	0.0023***
			(0.000)	(0.000)
*CER*4**EPU*			-0.0109***	0.0054***
			(0.000)	(0.000)
MC	0.2163***	0.0632***	0.2049***	0.0686***
	(0.000)	(0.000)	(0.000)	(0.000)
TR	0.1131***	0.0631***	0.1133***	0.0662***
	(0.000)	(0.000)	(0.000)	(0.000)
PE	0.0010***	-0.0009***	0.0011***	-0.0010***
	(0.000)	(0.000)	(0.000)	(0.000)
N	15370	15370	15370	15370
cons	0.1048***	0.0250***	0.0960***	-0.0037***
	(0.000)	(0.000)	(0.000)	(0.000)

Note: t-statistics are in parentheses. *, **, and *** statistical significance at the 10%, 5%, and 1%

Considering the stock returns may be affected by its previous period stock returns, and as robustness test, we added the first-order lag term of the dependent variable to develop a dynamic panel model. Further, we used the system generalized method of moments (SYS-GMM) to estimate the dynamic panel model. The results shown in Table 4 confirm that the previous results are robust.

6. Conclusion

This paper examines the impact of EPU on different types of stock returns, and explores the role of firms' CER value on this impact. GDFM has been used to decompose stock returns into market-driven common stock returns and individual-driven idiosyncratic stock returns using data from January 2008 to December 2016. The results show that an increase in EPU significantly reduces the market-driven common stock returns similar to Antonakakis et al. (2013) and Brogaard and Detzel (2015) but increases individual-driven idiosyncratic stock returns. We also find that CER plays a positive role in the process of EPU affecting stock returns. In particular, EPU has a lower negative impact on the common stock returns of high-CER firms than that of low-CER firms. EPU has a higher positive impact on idiosyncratic stock returns of high-CER firms than that of low-CER firms.

The findings of this paper would be extremely relevant for the government, investors and firm's managers. For instance, firms may improve CER in order to enhance the ability to cope with uncertainty shocks and minimize the adverse impact of EPU on stock returns. In addition to this, policy makers have to increase both transparency and coherence of economic policies and reduce uncertainty caused by changes in macroeconomic policies, thereby reducing stock market risks. This paper mainly focuses on the impact of China's EPU on common and idiosyncratic stock returns as well as the role of CER on this impact. One limitation in this paper could be that the sample included in this research is limited to Chinese firms, and it has to be verified whether we can get a consistent conclusion on international perspective. In addition to this, the heterogeneity between industries has not been considered in this paper. Therefore, future research can investigate this issue further by considering another country or testing whether EPU from different countries would have different impact on stock returns. Furthermore, further studies can also consider the industry-level stock returns while investigating the role of CER.

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Endnotes

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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