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Effect of Economic Policy Uncertainty on Stock Returns: Analysing the Moderating Role of Government Size

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Abstract

This study investigates whether the response of stock returns to economic policy uncertainty depends on the level of government size in the economy. Although there is a consensus in the literature that stock markets react negatively to policy-related uncertainties, the factors that determine the magnitude of this effect have been ignored. This study is the first to demonstrate that the magnitude of this effect depends on the size of the government in the economy. In the study, data for the period 1997Q1–2021Q4 pertaining to 18 countries are used. According to results of fixed-effects estimations with Driscoll-Kraay robust standard errors, economic policy uncertainty affects stock returns negatively. In addition, the coefficient of interaction term formed by the variables of policy uncertainty and government size is also negative and significant. These results indicate that the negative response of stock returns to policy uncertainty grows as government size increases. The sensitivity analysis results show that the findings are not sensitive to the estimations made by alternative approaches and are therefore robust. The findings of the study contain important implications for policymakers. Investors can also benefit from the results at the point of international asset allocation against future policy-related uncertainties.

Keywords: Economic policy uncertainty, stock returns, government size, moderating effect, Driscoll-Kraay robust standard errors

JEL Classification: C55, D80, G18, G38

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1. Introduction

The uncertainty in economic policymakers' acts that influence the choices made by economic actors is known as economic policy uncertainty (EPU) (Wu *et al.*, 2016). This concept has become increasingly important in recent years, as policy decisions have become more complex and global economic conditions more interdependent. The importance of economic policy uncertainty lies in its ability to shape investment decisions, consumer behaviour and overall economic activity. According to the EPU index developed by Baker *et al.* (2016), the peak periods of EPU are economic and financial crises, political tensions, wars, election periods and epidemics. In the literature, the aggregate demand component most associated with uncertainty is investment expenditures. When policy uncertainty is high, investors may become more risk-averse, leading to lower levels of investment and reduced economic growth. The uncertainty-investment relationship can be explained by the irreversibility of investments. Irreversibility means that investment expenditures are partially or completely sunk costs (Dixit and Pindyck, 1994). This issue arises for various reasons. The irreversibility of investments means that firms cannot sell their capital stocks (Demers *et al.*, 2003). The capital owned by the firm may be largely specific to that firm or the industry in which the firm operates (Bernanke, 1983). Therefore, it cannot be easily used in another industry. During EPU, investors follow a "wait and see" policy rather than embarking on a costly business with uncertain results (Bloom *et al.*, 2007). Ultimately, uncertainty makes the process of capital accumulation more rigid. As the degree of uncertainty increases, investors who have some flexibility in the timing of the investment may delay their investments until the uncertainty disappears or until they have more information. Companies may change or postpone their important decisions such as investment and employment decisions until the EPU disappears (Gulen and Ion, 2016). Additionally, businesses may hold off on hiring and expanding, causing a slowdown in job creation and economic growth. Moreover, people can increase their precautionary savings by reducing consumption, leading to a decrease in aggregate demand (Kazarosian, 1997). By affecting both the supply and demand sides, EPU can increase finance and production costs, accelerating the lack of investment and economic contraction, particularly in emerging countries (Pastor and Veronesi, 2012). These impacts might stagnate economic activity. For politicians, investors and companies alike, it is critical to comprehend the significance of economic policy uncertainty since it may guide choices and support a stable and thriving economy.

In many studies in the literature, it has been concluded that policy uncertainty affects financial markets negatively. There is nothing new in reaffirming this relationship. In addition, analysing this relationship alone is insufficient in terms of policy implications. Decisionmakers face *fundamental uncertainty* in real life. This concept is the type of uncertainty that states that the future is unpredictable, that decisionmakers do not have a list of possible future events, and it is not known with what probability these events will occur (Dequech, 2011). This indicates that there may be periods of high uncertainty in the future, but this cannot be predicted. Therefore, rather than revealing the negative effects of uncertainty, revealing the factors that reduce this effect should be the focus of studies in this field.

This study focuses on the role of government size in the EPU-stock returns nexus. There are possible factors that may affect the EPU-stock returns relationship, such as countries' institutional structures and the domestic risk level. The reason why we focus on government size in this study is that societies put pressure on governments for strong action in times of high uncertainty and the measures taken often result in higher government size. The duty of protecting the economy against uncertainty has traditionally been assigned to governments (Rodrik, 1998). Governments tend to abandon orthodox policies and increase spending in times of crisis (Armingeon, 2012). To avoid the negative effect of uncertainty, the government may adopt a protective policy that may increase the risk on financial markets (Arouri and Roubaud, 2016). Governments, according to Pastor and Veronesi (2012), determine the rules of the game and affect firms in a variety of ways, including through taxes, subsidies and regulations. Because of the government's involvement in the economy during times of significant uncertainty, this leads to a larger government. Governments occasionally alter the rules and regulations, and these unpredictable modifications affect financial market prices. However, when policies are unpredictable, the government itself becomes a source of uncertainty. This may increase the sensitivity of economic variables to policy uncertainty in economies with large governments. Findings from the study contain important policy implications at this point. Government policies against uncertainty may create greater sensitivity to political uncertainty in the future. Rising government size may cause stock markets to react more to political uncertainties and may pave the way for financial crises. This issue has been neglected in the literature. The main idea of this study is that the size of the price reaction of financial markets to EPU depends on government size. Although situations that increase uncertainty may arise in the future, it is extremely difficult to predict them, and it is impossible to avoid uncertainty completely. Therefore, revealing the factors that deepen or reduce the negative impacts of uncertainty will contribute more to the literature. Based on this idea, this study puts the discussion one step forward.

The moderating effect of government size on the relationship between EPU and stock returns is examined in this study. It is anticipated that this study will make two additional contributions to the literature. Firstly, this is the first study to show how government size affects how markets react to policy uncertainty. As stated above, there is a growing body of literature that examines the response of stock markets to EPU. However, no study has been found on the factors affecting the magnitude of this response. The share of government expenditures in GDP is used as an indicator of government size. In times of uncertainty, government responses are mostly in the form of increased public spending. For example, in the 2008 financial crisis, governments around the world announced large stimulus packages. The additional spending package approved by the US Congress was $787 billion (Cwik and Wieland, 2011). Secondly, by employing reliable panel data estimate strategies under cross-sectional dependence, the EPU-stock returns nexus is reviewed. Cross-sectional dependence occurs when shocks that occur in one country also affect other countries. Cross-sectional dependence is a product of political and economic integration across countries, claim Menyah *et al*. (2014). In the study, 18 countries were analysed using data from 1997Q1–2021Q4. The estimation was made with robust standard errors developed by Driscoll and Kraay (1998), which gave reliable results under cross-sectional dependence. Standard panel data analysis methods involve a very strict assumption of independence between cross sections. Ignoring this effect may lead to biased results and misleading implications (De Hoyos and Sarafidis, 2006; Chudik and Pesaran, 2013). Therefore, ignoring cross-sectional dependence can lead to misleading consequences in terms of policy implications. Today, with the effect of technological development, the interdependence between financial markets is at an extremely high level. Therefore, we employ robust methods under the existence of cross-sectional dependence. A review of the empirical literature is presented in the second part of the study. Information about the data set, model and estimation method is given in the third chapter. Afterwards, empirical findings are presented and discussed. Finally, policy recommendations are given in the conclusion section.

2. Literature Review

The association between stock market returns and EPU soon after the outbreak of the global financial crisis in 2008 has drawn a lot of attention, in contrast to past research that focused on impacts of EPU on various macroeconomic factors (Li *et al*., 2016). In the literature, a limited amount of research examined the effects of EPU on stock market performance (using various proxies such as indices, stock prices and returns) using a variety of approaches on various country markets. The empirical studies in the context of the EPU-stock market relationship are summarized in Table 1.

Table 1: Empirical literature

Study	Period	Sample	Methodologies	Results
Sum (2012)	1985M2–2012M6	the USA	VAR model, time-varying OLS regression	EPU affects stock returns negatively.
Kang and Ratti (2013)	1985M1–2011M12	the USA	VAR model	EPU affects stock returns negatively.
Ko and Lee (2015)	1998M1– 2014M12	G7 countries and China, India, Russia, Spain	Wavelet analysis	EPU affects stock returns negatively.
Kang and Ratti (2015)	1998–2011	China	VAR model	EPU affects stock returns negatively.
Bekiros *et al.* (2016)	1900M1–2014M2	The US	Both linear and nonlinear causality tests	EPU affects stock returns negatively. However, no significant causality was found according to the nonlinear causality test.
Li *et al.* (2016)	1995M2–2013M2 in China and 2003M2–2013M2 in India	China and India	Bootstrap rolling-window causality test	a bidirectional causal relationship exists between EPU and stock returns.
Wu *et al.* (2016)	2003M1–2014M12	nine countries	Bootstrap panel Granger causality test	EPU affects stock prices only in the UK.
Christou *et al.* (2017)	1998M1–2014M12	six countries	Panel VAR model	EPU affects stock returns negatively in all countries except Australia.
You *et al.* (2017)	1995M1–2016M3	China	Quantile regression approach	EPU affects stock returns negatively.
Raza *et al.* (2018)	1989M1–2015M12	G7 countries	Quantile regression approach	EPU affects stock returns negatively.
Guo *et al.* (2018)	1985M2–2015M8	G7 countries, BRICS (Russia, India)	Quantile regression approach	EPU affects stock returns negatively in all countries except the UK and France.
Das and Kumar (2018)	1998M1–2017M2	17 countries	Partial wavelet coherence analysis	Emerging markets are less sensitive to EPU shocks.
Li *et al.* (2020)	1997M11–2018M11	China and India	Both linear and nonlinear causality tests Granger causality tests	a bi-directional causal relationship exists between EPU and stock returns.
Asafo-Adjei *et al.* (2020)	2010M12–2019M12	eight African countries	wavelet coherence analysis	the interaction between GEPU and stock returns is weak in the short term but gradually becomes stronger in the long term.
Istiak and Alam (2020)	1992–2018	GCC countries	VAR model	EPU affects stock market returns negatively.

Kannad-hasan and Das (2020)	1997M1–2018M5	9 Asian emerging markets	Quantile regression analysis	EPU has a negative impact on stock market.
Xu *et al.* (2021)	2005M7–2020M6	China	OLS regression	EPU has a negative impact on next month's stock returns. In addition, the predictive ability of the EPU is strong over 36-month period.
Dash *et al.* (2021)	Daily data from 2000M1 to 2017M7	G7 countries	Linear and non-linear causality and wavelet coherence analysis.	Significant causal relationship exists between EPU and stock market liquidity. Moreover, EPU and liquidity co-moves in the opposite direction.
Chiang (2021)	2000M1–2020M5	China	Dynamic conditional correlation analysis	EPU is negatively associated with stock returns.
Yuan *et al.* (2022)	2003M1–2021M9	BRIC	Multivariate quantile VAR analysis	EPU has a negative impact on stock market.
Ma *et al.* (2022)	2000M1–2019M5	G7 countries	Fourier spillover model	Spillover effect of EPU is large in Japan, Canada and the US stock market volatility. The duration of this effect is longer in France, Germany and Italy.
Kundu and Paul (2022)	1998M1–2018M8	G7 countries	MSVAR model	An increase in EPU reduces stock returns.

Source: Authors' own preparation

Considering the empirical studies conducted in the previous literature, it can be said that there is a consensus that policy-related uncertainties negatively affect stock markets. Therefore, it cannot be said that there is an innovative aspect in reconstructing the negative relationship between EPU and stock returns. Analysing this relationship alone also has insufficient consequences for policy implications.

Governments traditionally have a duty to protect the economic structure against risks and uncertainties. According to Rodrik (1998), as the degree of openness of countries increases, the share of the government in the economy also increases. This result stems from the fact that governments act as insurance against external risks. However, government size can have the opposite effect when government itself is a source of uncertainty. The larger the government, the greater the size of decisionmakers' response to policy uncertainty. These theoretical linkages have been ignored in empirical studies. Only Belo *et al*. (2013) concluded on firm data that higher exposure of firms to government causes them to be more affected by political cycles. In addition to the existing consensus that EPU negatively affects stock prices, this study is the first in the literature to show that the size of this effect will depend on government size.

3. Model Specification and Methodology

3.1 Data and model

Decisions made by governments, businesses and people are significantly affected by uncertainty. According to Al-Thaqeb and Algharabali (2019), this has driven many scholars to develop indicators of uncertainty, particularly with reference to uncertainty in economic policy. Previous literature has drawn on various uncertainty measures such as geopolitical risks, political risks, economic growth and the stock market volatility index (VIX). The news-based EPU index developed by Baker *et al*. (2016) is a kind of new proxy of uncertainty. The index is calculated by scanning digital archives of major newspapers in mainstream media of countries. Based on the number of "uncertainty", "uncertain", "economy" and related policy phrases in the articles published in these publications, economic policy uncertainty is computed. Higher index values indicate higher degrees of uncertainty. By taking the GDP-weighted average of the economic policy uncertainty indices across countries, Davis (2016) generated the global economic policy uncertainty index. Both indices are used to generate estimations for this investigation. According to Istiak and Serletis (2018), the EPU index has several advantages over other uncertainty indicators. Firstly, it can simulate certain significant incidents in history involving changes in economic uncertainty connected to policy. Comparing it to other uncertainty indices, it is also more inclusive. Thirdly, compared to other uncertainty indices, its range is wider. Finally, it can explain cross-sectional patterns in some economic variables, although it is measured at the aggregate level.

The study's major research issue is whether the size of government in the economy affects how stock returns react to economic policy uncertainty. There are various government size measures in the literature such as shares of GDP in total government spending, tax revenues and government final consumption (Ram, 1986; Sheehey, 1993; Bergh and Henrekson, 2011; Asimakopoulos and Karavias, 2016). Due to availability of high-frequency data, government final consumption expenditure percentage share of GDP is used as the indicator of government size. We also multiply government size with EPU to analyse the interaction effect. Models estimated in this study are given in the following equations.

$$sr_{it} = \beta_{1i} + \beta_2 epu_{it} + \beta_3 gs_{it} + \beta_4 epu_{it} x gs_{it} + \beta_5 cpi_{it} + \beta_6 reer_{it} + \beta_7 oil_{it} + \beta_8 gold_{it} + \varepsilon_{it} \quad (1)$$

$$sr_{it} = \gamma_{1i} + \gamma_2 gepu_{it} + \gamma_3 gs_{it} + \gamma_4 gepu_{it} x gs_{it} + \gamma_5 cpi_{it} + \gamma_6 reer_{it} + \gamma_6 oil_{it} + \gamma_6 gold_{it} + \epsilon_{it} \quad (2)$$

where *sr* is real stock returns deflated with *cpi*, *epu* is the economic policy uncertainty index, *gepu* is global EPU and *gs* is government size. There are also four control variables to reduce omitted variable bias. *reer* is the real effective exchange rate, *oil* is the oil price index and *gold* is the gold price index. Table 2 lists the definitions and sources of the variables.

Table 2: Variable definitions and sources

Variable	Definition	Source
sr	Logarithmic difference of real share prices index of companies traded on national or foreign stock exchanges (2015 = 100)	OECD, 2022
epu	Economic policy uncertainty index	Baker *et al.*, 2016
gepu	Global EPU index	Davis, 2016
gs	Government final consumption expenditure (% GDP)	OECD, 2022
cpi	Consumer price index (2015 = 100)	OECD, 2022
reer	Real effective exchange rate (2015 = 100)	OECD, 2022
oil	Oil price index (2015 = 100)	IMF, 2022
gold	Gold price index (2015 = 100)	IMF, 2022

Note: All the variables are used in logarithmic form. Data from 18 countries[1] covering the period 1997Q1–2021Q4 are used in the study.

Source: Authors' own preparation

There are four different kinds of policy implications based on the coefficients of the variables and interaction terms (Ehigiamusoe and Lean, 2020). The policy implications that can be obtained from Equation (1) are given below.

(i) $\beta_2 > 0$ and $\beta_4 > 0$: EPU has a positive impact and government size strengthens this positive relationship.

(ii) $\beta_2 < 0$ and $\beta_4 > 0$: EPU has a negative impact and government size weakens this negative relationship.

(iii) $\beta_2 > 0$ and $\beta_4 < 0$: EPU has a positive impact and government size weakens this positive relationship.

(iv) $\beta_2 < 0$ and $\beta_4 < 0$: EPU has a negative impact and government size strengthens this negative relationship.

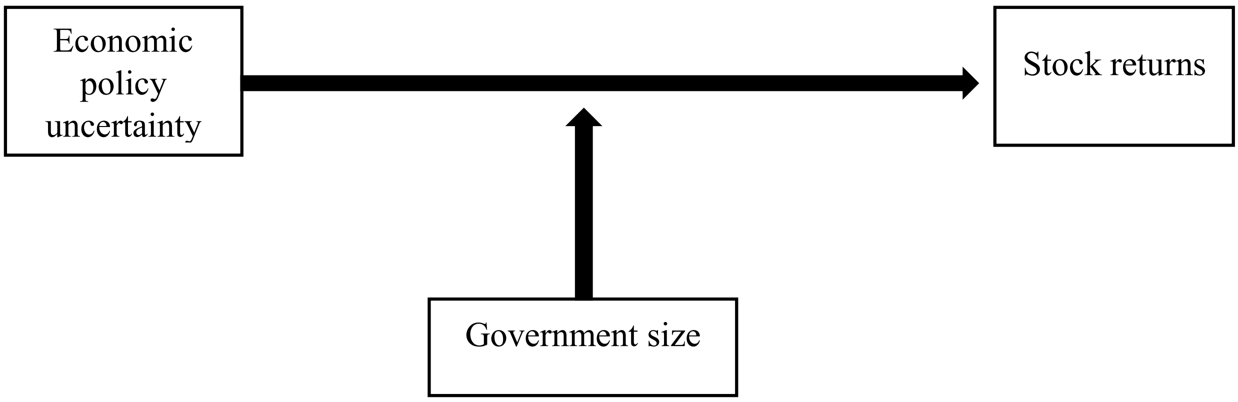
We can also calculate marginal effects using partial derivatives of economic policy uncertainty.

$$\frac{\partial SP_{it}}{\partial EPU_{it}} = \beta_2 + \beta_4 gs_{it} \quad (3)$$

1 Australia, Brazil, Canada, Chile, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, Korea, the Netherlands, Spain, Sweden, the UK and the US.

The main hypothesis tested in our analysis is that the response of the stock market to policy-related uncertainties depends on government size. The higher the size of the public sector in the economy, the greater the impact of policy uncertainties on the stock market. Figure 1 shows the hypothesis of our research.

Figure 1: Research hypothesis



Source: Authors' own preparation

3.2 Methodology

3.2.1 Cross-sectional dependence

Standard panel data analysis techniques involve an assumption of cross-sectional independence. Because of the growing economic, social, financial and political interconnectedness of countries, as was said in the introduction, it is difficult to meet the premise that cross-sectional dependence does not exist. The presence of such dependence should be considered to avoid producing inaccurate findings (Chudik and Pesaran, 2013). The LM test, proposed by Breusch and Pagan (1980), has been frequently used in the investigation of cross-sectional dependence. This method is based on the following equation.

$$LM = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N} \hat{\rho}_{ij}^{\,2} \tag{4}$$

where $\hat{\rho}_{ij}$ is the correlation coefficient obtained from OLS estimations. Pesaran (2004) revealed CD and CD_{LM} that have better small sample properties compared to LM test. CD and CD_{LM} test statistics can be calculated as follows.

$$CD = \sqrt{\frac{2T}{N\left(N-1\right)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right) \tag{5}$$

$$CD_{LM} = \left(\frac{1}{N\left(N-1\right)}\right)^{\frac{1}{2}}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\left(T\hat{\rho}_{ij}^{\,2}-1\right) \tag{6}$$

Equations (5) and (6) show CD and CD_{LM} test statistics respectively. The null and alternative hypothesis are:

H_0: No cross-sectional dependence exists.

H_1: Cross-sectional dependence exists.

While the results of the cross-sectional dependence tests on a variable basis are used in the selection of the unit root test, the results of the test for the error terms are important for the selection of the estimator to be used.

3.2.2 CADF unit root test

With the factor modelling strategy developed in his work, Pesaran (2006) provided a solution to the issue of cross-sectional dependence. The foundation of this approach is the use of cross-sectional averages in the regression model. On the basis of this methodology, the author further developed a unit root test. We apply Pesaran's (2007) cross-sectionally augmented Dickey-Fuller (CADF) unit root test for the initial examination of the unit root. Pesaran (2007) enhanced the ADF regression by using lagged and first-differenced cross-sectional averages to address cross-sectional dependence. This approach takes into account cross-sectional dependence and is applicable when $N > T$ and $T > N$.

$$\Delta y_{it} = \alpha_i + \rho_i^{*} y_{i,t-1} + d_0\overline{y}_{t-1} + d_1\Delta\overline{y}_t + \epsilon_{it} \tag{7}$$

The regression model that forms the basis of the CADF unit root test is shown in Equation (7). The average of all N observations is given by $\overline{y}_t$. In order to avoid serial correlation, the regression should be extended with lagged first differences of both y_{it} and $\overline{y}_t$.

$$\Delta y_{it} = \alpha_i + \rho_i^{*} y_{i,t-1} + d_0\overline{y}_{t-1} + \sum_{j=0}^{p} d_{j+1}\Delta\overline{y}_{t-j} + \sum_{k=1}^{p} c_k\Delta y_{i,t-k} + \epsilon_{it} \tag{8}$$

The CIPS statistic, which is defined as the average of the t statistics computed for each cross-section ($CADF_i$), was subsequently calculated by Pesaran (2007). The calculation of the *CIPS* is given in Equation (11).

$$CIPS = \frac{1}{N}\sum_{i=1}^{N} CADF_i \tag{9}$$

There are two observed common factors in equations such as the oil price index and the gold price index. Since they are common for all countries, the ADF unit root test is applied to these variables.

3.2.3 Estimation of coefficients

Since traditional panel data estimation techniques inconsistently estimate standard errors under cross-sectional dependence, Driscoll and Kraay (1998) developed a robust non-parametric covariance matrix estimation method. These standard errors are also robust to possible autocorrelation and heteroscedasticity. Driscoll-Kraay (hereafter, D-K) robust standard errors rely on large T asymptotics and provide robust results regardless of the size of the N dimension (Hoechle, 2007). Our T dimension is sufficiently large ($T = 100$) and N is relatively small ($N = 18$). Therefore, estimations with D-K standard errors are appropriate for our data structure.

D-K standard errors can be calculated for pooled OLS and fixed-effects estimations. However, pooled OLS estimations are inconsistent when the appropriate model is fixed effects. Therefore, a Hausman test is applied to choose the true estimation method. However, the pooled OLS estimator should not be compared with the fixed effects using the Hausman test. According to Hoechle (2007), the null hypothesis of the Hausman test states that the random-effects model is valid. Therefore, the validity of the fixed-effects estimation should be compared with coefficients obtained from the FGLS regression. In this study, a fixed-effects estimation is compared with an FGLS estimation via the Hausman test to choose between fixed-effects and pooled OLS estimations. We also report the results of Arellano and Bond (1991) GMM estimations to check sensitivity of the results.

4. Empirical Results and Discussion

Results of the preliminary analyses of cross-sectional dependence are reported in Table 3.

Table 3: Cross-sectional dependence

	CD		CD_{LM}	
	Statistic	***p*-value**	**Statistic**	***p*-value**
sr	41.33	0.000	260.44	0.000
epu	58.76	0.000	231.93	0.000
gs	15.63	0.000	210.54	0.000
cpi	111.31	0.000	740.44	0.000
reer	13.12	0.000	187.21	0.000
Model 1	26.91	0.000	45.29	0.000
Model 2	30.00	0.000	49.39	0.000

Source: Authors' own calculations

The CD and CD_{LM} tests show that the null hypothesis of cross-sectional independence is rejected at 1% for all the variables and models. Therefore, cross-sectional dependence should be taken into consideration when using estimation techniques. The use of first-generation tests that presume cross-sectional independence yields biased and inconsistent outcomes, as noted in the introduction. Since the null hypothesis has been rejected for all the variables, a second-generation unit root test has to be performed. Therefore, as we perform the CADF unit root test, the cross-sectional dependence is taken into consideration. The ADF findings are presented for the variables *gepu*, *oil and gold* as they are common factors. As it is the first difference in the natural logarithm of real stock prices, the dependent variable is stationary. On independent variables, unit root tests are employed. Results are given in Table 4.

Table 4: Unit root test results

	CIPS statistics		
	Level	**First difference**	**Results**
epu	−4.406***	–	I_0
gs	−2.378	−5.814***	I_1
cpi	−2.567	−3.930***	I_1
reer	−2.577	−6.123***	I_1
	ADF statistics		
	Level	**First difference**	**Results**
gepu	−3.6398**	–	I_0
oil	−1.6992	−7.8968***	I_1
gold	−1.5267	−7.5979	I_1

Notes: ** and *** indicate rejection of the null hypothesis at 5% and 1% respectively. The 5% critical values for the CIPS statistics are −2.7 and −2.2 for models with constant and trend and with constant respectively. 5% MacKinnon's (1996) critical values for the ADF test are −3.45 (constant + trend) and −2.89 (constant).

Source: Authors' own calculations

While both constant and trend are applied at the level, only constant is added at the first differences. The maximum lag levels are set at 8, and the optimal lag values for CADF and ADF, respectively, are found using the F-joint test and the Schwarz information criterion. According to the results, *epu* and *gepu* are both stationary. Government size, the consumer price index, real effective exchange rate, oil prices and gold prices are non-stationary. Since the dependent variable is stationary, the cointegration relationship is not investigated in this study. The first differences of I_1 variables are used in the regression analysis.

According to the results of the preliminary analysis, there is a strong cross-sectional dependence in the error terms of Models 1 and 2. This result necessitates the use of estimators that give reliable results under cross-sectional dependence. For this reason, panel regression analysis is applied with D-K robust standard errors. Since *epu* and *gepu* variables are stationary, they are used at level, while the first differences of the other variables are taken. The uncertainty indices are multiplied with the initial difference in the government size in order to form the interaction term, which is then used to investigate the moderator impact of government size. Table 5 presents the findings of the estimation of Model 1. To capture the direct and moderating effects of government size, the results are reported with and without an interaction term.

Table 5: Estimation results of Model 1 with D-K robust standard errors

	Fixed effects		Pooled OLS	
epu	−0.0332 (−3.34)***	−0.0328 (−3.31)***	−0.0296 (−3.01)***	−0.0292 (−2.97)***
Δgs	−0.1005 (−1.94)*	0.9066 (2.32)**	−0.1027 (−1.97)*	0.9219 (2.29)**
Δcpi	−1.5009 (−4.15)***	−1.4902 (−4.12)***	−1.1744 (−4.06)***	−1.1679 (−4.02)***
Δreer	0.1776 (2.09)**	0.1841 (2.15)**	0.1744 (2.03)**	0.1810 (2.09)**
Δoil	0.2176 (3.61)***	0.2107 (3.45)***	0.2156 (3.61)***	0.2087 (3.45)***
Δgold	−0.0382 (−0.42)	−0.0335 (−0.37)	−0.0361 (−0.39)	−0.0314 (−0.34)
epuxΔgs		−0.2176 (−2.50)**		−0.2214 (−2.47)**
c	0.1705 (3.55)***	0.1685 (3.53)***	0.1512 (3.14)***	0.1493 (3.11)***
F	10.17***	11.60***	11.84***	14.15***
R^2	0.20	0.20	0.19	0.19
Hausman	15.26**	14.94**		
NxT	1,782	1,782	1,782	1,782

Notes: *, ** and *** indicate rejection of the null hypothesis at 10%, 5% and 1% respectively.
Source: Authors' own calculations

The fixed-effects and pooled OLS estimation results of Model 1 are shown in Table 5. According to the results of the Hausman test, fixed-effects estimations are consistent. Since the true model is the fixed-effects model, the coefficients of the pooled OLS regression are inconsistent (Hoechle, 2007). However, it should be noted that there is no significant difference between the results obtained from both estimators. The fixed-effects estimation results indicate that a 1% increase in EPU reduces stock returns by 0.03% both with and without an interaction term. These effects are significant at the 1% level. The direct effect of government size is also negative and significant. A 1% increase in government size leads to a 0.1% decrease in stock returns.

The moderator effect of government size is also negative. The negative coefficients of the EPU and the interaction term indicate that as government size increases, rates of return become more sensitive to economic policy uncertainty. The conclusion that EPU negatively affects stock returns supports empirical findings of Sum (2012), Kang and Ratti (2013), Kang and Ratti (2015), Ko and Lee (2015), You *et al*. (2017), Raza *et al*. (2018) and Kannadhasan and Das (2020). No study has been found in the literature to compare the moderator effect of government size. However, it can be said that the results support the approach of Belo *et al*. (2013). According to the authors, increased exposure of firms to government spending causes them to be more affected by political cycles.

Considering the effects of control variables, the effect of inflation on stock returns is negative and significant at 1%. A 1% increase in inflation rate leads to about a 1.5% decrease in stock returns. Recent literature does not indicate a deterministic relationship between inflation and stock market. The focus of the debate in literature is whether stocks protect against inflation (Li *et al*., 2010). Our estimations show that the stock market does not provide a hedge against inflation. It is also difficult to put forward a theoretically precise relationship between the real exchange rate and stock returns. In our study, the positive effect of the change in the real effective exchange rate can be explained by the competitive power that the depreciation of the national currency brings to the companies. A high exchange rate can increase the profitability of exporting companies and thus their stock returns (Bahmani-Oskooee and Sohrabian, 1992). According to the results, a 1% increase in the real effective exchange rate leads to about a 0.18% increase in stock returns.

The theoretical relationship between oil prices and stock returns is very complicated. According to Smyth and Narayan (2018), the relationship can be both positive and negative. As high oil prices increase firms' production costs, it reduces future earnings, dividends and thus stock returns. On the other hand, investors may associate the increase in oil demand and hence its price with the vitality of the economy. The estimation results support the second idea. A 1% increase in oil price increases the rate of return by approximately 0.22%. This effect is significant at the 1% level. The coefficient of gold prices is negative, as expected, as gold is seen by investors as a safe haven and an alternative for low-risk gains. However, this relationship is not statistically significant.

In Model 2, global economic policy uncertainty is used as measure of policy related uncertainty. The estimation results are given in Table 6.

Table 6: Estimation results of Model 2 with D-K robust standard errors

	Fixed effects		**Pooled OLS**	
epu	−0.0266 (−2.02)**	−0.0265 (−2.02)**	−0.0261 (−1.98)**	−0.0259 (1.98)**
Δ*gs*	−0.0953 (−1.81)*	0.8627 (2.58)**	−0.0987 (−1.86)*	0.8555 (2.50)**
Δ*cpi*	−1.6498 (−4.63)***	−1.6406 (−4.69)***	−1.2470 (−4.31)***	−1.2385 (−4.32)***
Δ*reer*	0.1971 (2.31)**	0.2007 (2.34)**	0.1919 (2.26)**	0.1956 (2.30)**
Δ*oil*	0.2218 (3.61)***	0.2165 (3.43)***	0.2172 (3.57)***	0.2119 (3.39)***
Δ*gold*	−0.0371 (−0.40)	−0.0347 (−0.38)	−0.0338 (−0.36)	−0.0314 (−0.34)
epu*x*Δgs		−0.1927 (−3.00)***		−0.1919 (−2.92)***
c	0.1407 (2.19)**	0.1406 (2.19)**	0.1355 (2.11)**	0.1354 (2.14)**
F	7.90***	15.21**	9.75***	16.37***
R^2	0.19	0.19	0.18	0.19
Hausman	14.32**	14.58**		
NxT	1,782	1,782	1,782	1,782

Notes: *, ** and *** indicate rejection of the null hypothesis at 10%, 5% and 1% respectively.
Source: Authors' own calculations

The Hausman tests show that the fixed-effects estimations provide consistent results and therefore, the pooled OLS estimations are inconsistent. The directions of the control variables are quite similar to the results of Model 1. The impact of *gepu* is also negative and significant at 5%. The negative response of stock returns to a 1% increase in *gepu* is about 0.026%. The negative moderator effect of government size is also valid in Model 2. While stock returns are negatively affected by global policy uncertainties, the increase in government size amplifies this effect. Marginal effects of *epu* and *gepu* can be calculated using partial derivatives of the uncertainty variables.

$$\frac{\partial sr_{it}}{\partial epu_{it}} = -0.0328 - 0.2176\Delta gs_{it} \text{ (Model 1)} \tag{10}$$

$$\frac{\partial sr_{it}}{\partial gepu_{it}} = -0.0265 - 0.1927\Delta gs_{it} \text{ (Model 2)} \tag{11}$$

As seen in Equations (10) and (11), the marginal effect of policy uncertainty is negative and this effect grows as the government size increases. To test the sensitivity of the obtained results to alternative specifications, a sensitivity analysis was performed as shown in Table 7.

Table 7: Sensitivity analysis

	Fixed effects		Pooled OLS		GMM			
sr_{t-1}					0.2054 (9.96)***	0.2657 (12.25)***	0.2165 (10.39)***	0.2854 (13.02)***
epu	−0.0471 (−3.84)***		−0.0413 (−3.46)***		−0.0274 (−6.11)***	−0.0390 (−8.18)***		
gepu		−0.0384 (−2.45)**		−0.0384 (−2.44)**			−0.0184 (−4.40)***	−0.0273 (−6.11)***
Δgs	1.8961 (2.88)***	−0.0384 (−2.45)**	1.9153 (2.86)***	1.5925 (5.62)***	0.9709 (2.67)***	1.8324 (4.73)***	1.2054 (3.50)***	1.9214 (5.18)***
epuxΔgs	−0.4505 (−2.89)***		−0.4550 (−2.87)***		−0.2277 (−2.91)***	−0.4302 (−5.18)***		
gepuxΔgs		−0.3596 (−6.27)***		−0.3579 (−6.11)***			−0.2577 (−3.74)***	−0.4167 (−5.64)***
Δcpi					−1.5754 (−6.59)***		−1.6663 (−6.89)***	
Δreer					0.1105 (1.83)*		0.1331 (2.19)**	
Δoil					0.1927 (14.65)***		0.1971 (14.95)***	
Δgold					0.0143 (0.45)		0.1122 (0.38)	
c	0.2291 (4.09)***	0.1892 (2.59)**	0.2015 (3.66)***	0.1892 (2.59)**	0.1406 (6.56)***	0.1888 (8.30)***	0.0995 (4.90)***	0.1341 (6.24)***
F	8.00***	14.67***	7.08***	14.43***				
R^2	0.08	0.06	0.07	0.06				
X^2_{Wald}					639.14***	333.93***	614.56***	298.72***

Notes: *, ** and *** indicate rejection of the null hypothesis at 10%, 5% and 1% respectively.

Source: Authors' own calculations

In Table 7, the fixed-effects and pooled OLS estimations with D-K robust standard errors of Models 1 and 2 without the control variables are shown. In addition, dynamic panel data estimation results using the GMM estimator developed by Arellano and Bond (1991) are reported. The results show that the main findings of the study are not sensitive to alternative specifications. It is also valid for the control variables. Only the direction of the effect of gold prices is changed with the GMM estimations. However, the relationship is still insignificant. Overall, our findings that an increase in government size increases the response of stock returns to policy-related uncertainty seem to be robust.

5. Conclusion

Participants in the financial markets attach great importance to the current and future economic policy outlook in the country of investment. Under economic policy uncertainty, it becomes very difficult for market participants to make the right investment decisions and transfer existing funds to the right resources. Such policies are mostly implemented through government spending, taxes, subsidies, etc. If the size of the government in the economy is high, firms and other decisionmakers are expected to be more sensitive to policy changes due to high exposure to government policy instruments. Therefore, the larger the government size, the greater the expected stock market response to policy uncertainties. This study aimed to investigate whether the response of the stock markets to EPU depends on the government size in 18 countries. For this purpose, an interaction term considering government size as a moderator variable was created. Our quarterly dataset covered the period 1997Q1–2021Q4. According to fixed-effects estimations with D-K robust standard errors, both EPU and GEPU have negative effects on stock returns. In addition, the signs of the interaction terms are negative. Therefore, the greater the size of the government in the economy, the stronger the negative effect of EPU. Our results show that financial markets are more sensitive to policy uncertainty in economies with high government intervention. The results of our sensitivity analysis with alternative specifications show that the findings are robust. Additional findings of the study indicate that the real effective exchange rate and oil prices are positively associated with stock returns while the effect of the inflation rate is negative. No significant relationship was found between gold prices and real stock returns.

This study offers important implications for both policymakers and investors. Governments should be transparent about their future actions and avoid increasing uncertainty. Policymakers are suggested not to increase government size excessively in times of high uncertainty to mitigate the economic effects of uncertainty. As an alternative to this policy, non-budgetary measures to ensure predictability should be preferred. These measures often involve structural transformations that improve institutional quality. Strengthening institutions through transparency and accountability and strengthening the communication between the government and market actors will reduce policy uncertainty. By providing clear, consistent and predictable policy frameworks, policymakers can reduce economic policy uncertainty and increase confidence on the financial markets. Regular communication from policymakers about the state of the economy and any upcoming policy changes can help reduce uncertainty and promote stability on the financial markets. In this way, the need to spend to eliminate the destructive effects of uncertainty can be reduced or eliminated. This can help companies prepare for and mitigate the effects of policy uncertainty on the stock market. However, policymakers should keep the government size at an optimal level to ensure that financial markets are less affected by possible future uncertainties. Investors follow a “wait and see” policy during periods of high uncertainty until the factors causing the uncertainty are gone. Big government size may delay investments for longer due to policy-related uncertainty. In terms of investors, it can be said that the loss of return to be experienced in countries with larger governments will be higher during periods of uncertainty.

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