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The Impact of Domestic Economic Policy Uncertainty on Stock Returns in US States: An Empirical Study on the S&P500 Index

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Abstract

Uncertainties, which have significant effects on investment decisions, can have significant effects not only on investors' decisions but also on investment instruments and markets. In this context, uncertainties that may arise in economic policies that closely concern stocks and investors, which have an important place among investment instruments, can complicate investment processes and cause pricing in securities markets to be subject to deviations. In this study, the effect of the local economic policy uncertainty (EPU) index on the price movements of the S&P500 stock market index in the US states, developed in Baker et al. (2022) and obtained from the digital archive of approximately 3500 local newspapers, is tested. The study, which includes 52 variables in total, utilizes the EPU index of 51 US states and the monthly data of the S&P500 (SPX) index, the leading stock market index of the US, for the period February 2006-December 2023. The findings of the Granger (1969) causality test indicate that there is no statistically significant causality from the EPU index data of states such as Arkansas, District of Columbia, Delaware, Minnesota, Nebraska, New Hampshire, Rhode Island and South Dokato to the price movements of the S&P500 stock market index, while there is a statistically significant causality from the EPU index of the other 43 states to the price movements of the S&P500 stock market index.

Key words: Economic Policy Uncertainty Index, Stock Market Index, Granger Causality Test, Local Economic Policy Uncertainty in US States

JEL Code: C22, D80, G12, G23

1. Introduction

The concepts of uncertainty and risk are accepted as important concepts in financial decision-making processes due to the unpredictability of how future events will take shape. Although the concepts of uncertainty and risk are confused in daily life, Knight (1921) points out that the concepts of uncertainty and risk are different (Quintana, 2012). On the other hand, uncertainty is associated with the

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conditions and situations that may occur, while risk is related to the calculability of probabilities (Kıyılar & Akkaya, 2016).

Possible uncertainties in the markets not only affect investors' investment decisions but may also complicate their investment processes. It can be said that these variables affecting investment decisions are economic, social, cultural, political and psychological factors. The uncertainties experienced in financial markets in recent years bring along many criteria that affect the process of individual investors' preference of investment alternatives, and if the future is full of uncertainties, it may complicate the decision-making process of investors (Yılmaz & Talas, 2010).

While making investment decisions, investors may make decisions by following various indicators and may also consider economic stability and political events. The main reason for this is that imbalances that may occur in economic and political events may cause uncertainties in the markets (Ünal and Süsay 2021:28). In this context, although economic uncertainties can be shaped based on the decisions taken by financial authorities, it is important to try to measure the uncertainties that may arise. In this context, it has become widespread that the uncertainties that may occur in the economy can be measured and used as an indicator (Akdağ, 2020).

Among the various uncertainty indices created for economic policies, the first one is EPU index developed for the US in Baker et al. (2013) and based on the frequency of use of various keywords in newspaper news, and this index developed for the US in Baker et al. (2016) was improved by expanding EPU index measures for 11 major economies (Ilgın, 2022: 458).

When the literature is observed, it is possible to find studies testing the relationship between EPU index and unemployment rates, export figures, exchange rate price movements, oil price movements and price movements of crypto assets and various macroeconomic indicators (Yılmaz Özekenci 2024). On the other hand, it is possible to find many studies that test the effect of EPU index, which is used as an uncertainty indicator, on the price movements of securities market instruments (Meriç & Kamışlı, 2024:171).

A review of past studies reveals many studies that have found statistically significant effects of EPU index on the prices and volatilities of various country stock market indices. Among these studies, Sum et al. (2012), Brogaard and Detzel (2015), Arouri et al. (2016), Chen et al. (2017), Guo et al. (2018), Gemici (2020), Sadeghzadeh and Aksu (2020), Batabyal & Killins (2021), Akdağ and Yıldırım (2021), Aydın et al. (2022), Camgöz (2022), Zhang et al. (2023), Kaya et al. (2023), Li et al. (2023), Yılmaz Özekenci (2024), Aydın et al. (2024), Ünlü (2024) and Seçme (2024), but there are no empirical studies in the literature that test the effect of EPU index on securities markets at the local level in US states.

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Unlike similar studies in the literature, this study aims to test the causality from the state-specific EPU index developed in Baker et al. (2022) and obtained from the digital archive of approximately 3500 local newspapers to the S&P500 stock market index price changes. In this context, the study is expected to contribute to the literature by testing the effect of the local EPU index on the S&P500 stock market index in each US state.

The study consists of five sections. The first section provides theoretical information on EPU index at the national and state level, while the second section presents empirical studies that test the impact of EPU index on securities markets. The third section presents the data set and methodology of the model used in the study, and the fourth section presents the empirical findings. The last section of the study provides a general evaluation of the findings and recommendations.

2. Literature Review

This part of the research includes empirical studies that test the link between EPU index and share markets. A review of the literature reveals that while there are many studies testings the link between EPU and stock markets of various countries, there is a limited number of studies testing the relationship between the US state-based EPU index and the stock market. In this context, Pastor and Veronesi (2012), which can be considered as the first study in this context, points out that EPU index leads to decreases in stock returns, while Sum et al. (2012), another similar study, tests the impact of EPU index on stock returns for Turkey, Norway, Croatia, Russia, Switzerland, Ukraine and European Union member countries and finds that EPU has statistically significant effects on stock market returns. Unlike Sum et al. (2012), Brogaard and Detzel (2015) test the effect of EPU index on stock market volatility and find that changes in EPU index have statistically significant impacts on stock market volatility.

In Chang et al. (2015), the causality between EPU index and the stock market index is tested for countries such as the USA, Germany, France, the UK, Spain, Italy and Canada, and as a result of the Boostrap panel causality test, it is reached that there is a statistically significant causality from EPU index to the stock market indices of Italy and Spain. In a similar study, Wu et al. (2016), where different findings are obtained, because of the Boostrap panel causality test applied, it is found that EPU index is effective only on the UK Stock Exchange among the 9 selected countries.

As a result of the Markov-Switching model applied in Arouri et al. (2016), where a different model is applied, it is found that increases in EPU index in the US have negative and permanent effects on stock returns. Chen et al. (2017), another study testing the impact of EPU index on the price changes in the Chinese securities market, finds that the probability of a sharp decline in stock prices increases during periods of increased EPU index because of the regression analysis. Guo et al. (2018), using the quantile regression model, finds that EPU index for BRIC and G7

countries has a dampening effect on stock market returns in all countries except France and the UK. In Gemici (2020) study, in which countries like Guo et al. (2018) are tested, the causality between EPU index and the stock market indices of G7 countries is tested, and the findings obtained because of the panel causality analysis show that EPU index has a negative effect on stock market indices for all G7 countries. In Hoque & Zaidi (2020) study, which has overlapping results with Gemici (2020), the impact of the GEPU index on the Malaysian stock market is tested with SVAR and GARCH models and the findings obtained are statistically significant. Sadeghzadeh & Aksu (2020), which can be considered as a similar study, examined the link between EPU index and the BIST100 stock market index and found that shocks in EPU index in the long run have a statistically significant and negative effect on the BIST100 index. In Batabyal & Killins (2021), the link between EPU index for Canada and the stock market index price movements is tested, and because of the ARDL Frontier test applied, it is found that there is a statistically significant and negative relationship for the two variables in the short and long run.

Akdağ and Yıldırım (2021) tested the impact of EPU index on the BIST100 Index. As a result of the VEC model, Johansen cointegration test, FMOLS and DOLS estimators applied, the findings show that there is a statistically significant and long-run relationship between the uncertainty index used and the BIST100 index, while the BIST100 index decreases in periods when EPU index increases. Unlike Hoque & Zaidi (2020), Aydın et al. (2022) test the relationship between EPU and stock price movements for BRIC countries. According to the frequency causality test's findings, the variables have a significant mutual relationship. As opposed to the analysis conducted in Akdağ & Yıldırım (2021), Camgöz (2022) applied the NARDL modeling and obtained rather interesting findings to the effect that the EPU definitely affects stock prices traded on the BIST index-the stock market index of Turkey-in both short and long-run.

In Zhang et al. (2023), which has similar findings but for a different country, the effect of EPU index on the price changes of the Chinese stock market index is tested. The findings obtained because of the regression model applied indicate that EPU index has a statistically significant and negative impact on the stock market index. Kaya et al. (2023), which includes more than one country, tested the effect of the US economic policy uncertainty index on the volatility and returns of selected country stock market indices for Germany, the US, the UK and Japan. As a result of the applied GARCH model, it is found that the uncertainty index has statistically significant effects on the stock market index return volatilities of the selected countries. In Li et al. (2023), the impact of EPU index on the price changes in the Asian and US stock markets is tested and because of the findings, it is found that there are statistically significant impacts on both stock market indices, while the effect on the US stock market has a higher effect than the Asian stock market. Özekenci (2024) tests the link between the EPU index and the OECD stock market indices and finds that, by applying the Dumitrescu and Hurlin (2012) panel causality test, it is revealed that the uncertainty index exerts significant effects on the stock market indices of Germany, Australia, France, Ireland, Spain, Japan,

Chile, and Greece. As a result of the cointegration test applied in Aydın et al. (2024), where similar findings are obtained, it is found that EPU has statistically significant effects on the stock market. In Seçme (2024), the relationship between EPU index and 16 different leading sector indices and the BIST100 index is tested with the NARDL model and because of the findings obtained, it is found that EPU index has statistically significant effects on most of the indices. Ünlü (2024) tests the effect of EPU index on stock price movements and finds that there is a statistically significant and negative relationship between EPU index and the BIST index as a result of the structural VAR analysis. Kim et al. (2024) point out that during periods of high EPU, there is an increase in bad news and this leads to a significant decline in stock prices in future periods. As a result of the nonlinear ARDL (NARDL) analysis applied in Simran & Sharma (2024) study, it is found that increases in EPU have negative effects on the prices of stocks traded on the Indian stock exchange. Younis et al. (2024) tested the impact of trade policy uncertainty (TPU) and EPU on stock markets of different sectors traded on the Chinese stock exchange. As a result of the wavelet-based quantile-on-quantiles technique applied, the findings show that in the long run, TPU has a negative impact on construction, banking and healthcare sectors, while it has a positive impact on pharmaceuticals, personal goods and financial sector stocks. On the other hand, the other finding of the study is that EPU has low and consistent effects on construction, pharmaceuticals, personal goods, health and financial sector stocks, while it has a strong and positive effect on the banking sector. Elroukh (2025) tested the relationship between EPU and stock returns of G7 countries. As a result of the panel ARDL and nonlinear ARDL (NARDL) tests applied, it is concluded that the increases in EPU indicate that stock prices fall in the short run due to the reactions of investors, while this negative effect is in the long run. In Cao & Vo (2025), the impact of the level of geopolitical risk (GPR) and economic policy uncertainty (EPU) of the countries with which Vietnam trades on the Vietnamese stock market is tested. As a result of the time-varying parameter vector autoregressive (TVP-VAR) analysis, it is found that EPU plays a stronger determinant role on market volatility than GPR. Another different finding in the study is that EPU has stronger effects on the Vietnam stock market, especially during the COVID-19 period. Adibian et al. (2025) tested the impact of US and Chinese geopolitical risk (GPR) and economic policy uncertainty (EPU) indices on the returns and volatility of the Iranian stock market. The findings of the Generalized Additive Model (GAM) suggest that the US-origin EPU has a limited impact on the Iranian stock market, while China-origin EPU has a stronger impact on the Iranian stock market. Another result obtained in the study is that the Chinese GPR has a direct and strong effect on the returns and volatility of the Iranian stock market Yang, X & Nie (2025) test the impact of EPU and climate policy uncertainty (CPU) on renewable energy share prices. Using a vector autoregressive model with time-varying parameters (TVP-VAR-SV), the study finds that the impact of CPU on renewable energy share prices differs in different periods, while the impact of EPU on prices is negative.

3. Methodology

In this research, monthly data for the period between February 2006 and December 2023 on the price movements of the state-specific EPU index and the S&P500 stock market index, developed in Baker et al. (2022) and obtained from the digital archive of approximately 3500 local newspapers, are used. While the data on the state-specific economic policy uncertainty index are obtained from www.policyuncertainty.com, the data on the S&P500 (SPX) index are obtained from www.investing.com. The abbreviations and explanations of the variables in the study, in which 52 variables are used in total, are given in Table 1.

Table 1. Variables Used in Empirical Analysis

Variable	Description	Variable	Description	Variable	Description	Variable	Description
EPU_{AK}	EPU_{Alaska}	EPU_{ID}	EPU_{Idaho}	EPU_{MT}	EPU_{Montana}	EPU_{RI}	$EPU_{\text{Rhode Island}}$
EPU_{AL}	EPU_{Alabama}	EPU_{IL}	EPU_{Illinois}	EPU_{NC}	$EPU_{\text{North Carolina}}$	EPU_{SC}	$EPU_{\text{South Carolina}}$
EPU_{AR}	EPU_{Arkansas}	EPU_{IN}	EPU_{Indiana}	EPU_{ND}	$EPU_{\text{North Dakota}}$	EPU_{SD}	($EPU_{\text{South Dakota}}$
EPU_{AZ}	EPU_{Arizona}	EPU_{KS}	EPU_{Kansas}	EPU_{NE}	EPU_{Nebraska}	SPX	S&P500
EPU_{CA}	$EPU_{\text{California}}$	EPU_{KY}	EPU_{Kentucky}	EPU_{NH}	$EPU_{\text{New Hampshire}}$	EPU_{TN}	$EPU_{Tennessee}$
EPU_{CO}	EPU_{Colorado}	EPU_{LA}	$EPU_{\text{Louisiana}}$	EPU_{NJ}	$EPU_{\text{New Jersey}}$	EPU_{TX}	EPU_{Texas}
EPU_{CT}	$EPU_{\text{Connecticut}}$	EPU_{MA}	$EPU_{\text{Massachusetts}}$	EPU_{NM}	$EPU_{\text{New Mexico}}$	EPU_{UT}	EPU_{Utah}
EPU_{DC}**	$EPU_{\text{District of Columbia}}$**	EPU_{MD}	EPU_{Maryland}	EPU_{NV}	EPU_{Nevada}	EPU_{VA}	$EPU_{Virginia}$
EPU_{DE}	EPU_{Delaware}	EPU_{ME}	EPU_{Maine}	EPU_{NY}	$EPU_{\text{New York}}$	EPU_{VT}	$EPU_{Vermont}$
EPU_{FL}	EPU_{Florida}	EPU_{MI}	EPU_{Michigan}	EPU_{OH}	EPU_{Ohio}	EPU_{WA}	$EPU_{\text{Washington}}$
EPU_{GA}	EPU_{Georgia}	EPU_{MN}	$EPU_{\text{Minnesota}}$	EPU_{OK}	EPU_{Oklahoma}	EPU_{WI}	$EPU_{\text{Wisconsin}}$
EPU_{HI}	EPU_{Hawaii}	EPU_{MO}	EPU_{Missouri}	EPU_{OR}	EPU_{Oregon}	EPU_{WV}	$EPU_{West\ Virginia}$
EPU_{IA}	EPU_{Iowa}	EPU_{MS}	$EPU_{\text{Mississippi}}$	EPU_{PA}	$EPU_{\text{Pennsylvania}}$	EPU_{WY}	EPU_{Wyoming}

** Economic Policy Uncertainty Index for a special status region

As shown in Table 1, a total of 52 variables is used, 51 of which are EPU index of the US states, while the other variable refers to the price movements of the S&P500 stock market index. In Table 1, where the abbreviations and explanations for EPU index of each state are given, it is also stated that the variable EPU_{DC} is EPU index of the special status region.

To test whether EPU index of 51 different states of the USA and the S&P500 stock market index contain unit roots, the unit root tests developed in Dickey & Fuller (1981) and Phillips & Perron (1988), which are frequently used in economics and finance literature, were applied.

After the unit root tests, the Granger (1969) causality test was applied to test the short-run relationship between the variables, and the series must be stationary for the causality findings to give accurate results. The equation below assumes that there is no relationship between the error terms of x and y variables. In addition, the series used must be stationary to obtain accurate findings on the existence of

causality. The equation below assumes that there is no relationship between the error terms of x and y (Asteriou and Hall, 2011, pp.322-323).

$$y_t = a_1 + \sum_{i=1}^{n} \beta_i \, x_{t-i} + \sum_{j=1}^{m} \gamma_i \, y_{t-j} + \varepsilon_{1t} \quad (1)$$

$$x_t = a_2 + \sum_{i=1}^{n} \Theta_i \, x_{t-i} + \sum_{j=1}^{m} \delta_i \, y_{t-j} + \varepsilon_{2t} \quad (2)$$

While the Granger (1969) causality test in the equation above shows whether there is a statistically significant relationship between the two series, the dependence or independence of the variables is not considered in this analysis (Türkoğlu, 2016).

4. Findings

Firstly, descriptive statistics of the variables in the analysis were calculated and the related findings are shown in Table 2.

Table 2. Descriptive Statistics

Variables	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
EPU_{AK}	191.1648	1488.170	15.60603	180.4561	3.410522	20.02392
EPU_{AL}	70.03544	466.6173	0.000000	64.79702	2.987550	15.82176
EPU_{AR}	84.04177	787.2367	0.000000	100.7689	3.956094	22.21645
EPU_{AZ}	130.4416	1438.118	8.641018	186.4098	3.327222	16.90181
EPU_{CA}	134.8890	743.6186	33.90145	103.1054	2.771484	12.99113
EPU_{CO}	111.1656	1465.775	6.749340	155.0491	4.958765	35.46396
EPU_{CT}	105.4515	649.2788	3.611267	87.65380	2.889972	15.18759
EPU_{DC}	23.22396	93.06118	0.000000	15.09126	1.268457	4.927626
EPU_{DE}	119.6056	508.1237	0.000000	99.04333	1.492361	5.168673
EPU_{FL}	91.04846	628.4234	5.688473	74.20414	4.164200	25.51763
EPU_{GA}	74.05561	532.3539	6.633640	73.48782	3.551381	18.41861
EPU_{HI}	108.0830	730.8867	0.000000	119.9932	2.666276	11.21404
EPU_{IA}	68.93082	405.0260	5.355713	54.59473	2.989894	15.94721
EPU_{ID}	92.34755	959.9551	0.000000	98.52630	4.576323	33.98446
EPU_{IL}	108.9387	1072.947	11.62827	136.7788	4.087852	22.83310
EPU_{IN}	77.32788	565.8333	5.729388	73.80545	2.954432	15.32456
EPU_{KS}	111.6868	1233.724	7.005697	130.9567	4.218026	30.33040
EPU_{KY}	79.62329	808.5029	9.283524	96.37121	4.288100	26.20596
EPU_{LA}	100.8402	722.2500	0.000000	97.87940	3.131961	16.34421
EPU_{MA}	123.5829	1151.104	3.094220	132.0855	4.055665	25.71198
EPU_{MD}	91.34597	809.1488	7.247959	95.11919	4.338485	27.83355
EPU_{ME}	145.7131	1128.293	10.50748	152.4500	3.782470	19.92517
EPU_{MI}	103.7626	877.7474	5.369354	106.7089	4.052080	24.96292
EPU_{MN}	102.5514	699.3540	8.072205	100.2168	3.283605	16.48827
EPU_{MO}	72.85214	743.9572	3.138068	75.38565	4.795890	35.85189
EPU_{MS}	117.9056	867.0605	0.000000	123.0515	2.571287	11.80301
EPU_{MT}	75.14024	509.2242	0.000000	68.47269	2.928638	15.92737
EPU_{NC}	81.06747	606.4313	7.036203	72.49190	4.032293	25.97865
EPU_{ND}	43.67834	324.7413	0.000000	44.93127	3.630932	19.73035
EPU_{NE}	82.75503	496.6728	6.582361	66.81929	2.562926	12.99604
EPU_{NH}	99.04987	668.3010	0.000000	103.2868	3.040203	14.27556
EPU_{NJ}	124.4567	1086.399	4.937823	155.4626	3.517612	18.08718

EPU_{NM}	122.3713	920.0582	12.59564	133.5125	3.206494	16.23612
EPU_{NV}	106.3309	983.5318	19.62566	126.5259	4.853503	31.28189
EPU_{NY}	102.9876	748.5054	4.103140	103.6554	3.076656	14.70003
EPU_{OH}	70.88037	602.2407	4.845742	70.78047	4.256031	27.13661
EPU_{OK}	81.73584	766.6402	9.148695	104.9855	4.034519	22.13182
EPU_{OR}	98.84973	889.4168	6.931036	109.7021	3.925809	23.36576
EPU_{PA}	67.89262	563.1755	6.597982	78.96881	4.023613	21.52390
EPU_{RI}	128.5857	901.5490	17.61878	129.4118	2.924822	13.82356
EPU_{SC}	55.62948	409.5159	5.537330	50.85619	3.440468	18.85326
EPU_{SD}	58.48634	354.5882	0.000000	50.92565	1.776495	8.285547
SPX	2257.308	4769.830	735.1000	1098.169	0.764022	2.397038
EPU_{TN}	62.43327	700.7972	4.957462	78.95134	4.982123	33.85216
EPU_{TX}	68.08951	471.7745	4.648295	63.80209	3.665257	19.76162
EPU_{UT}	62.60440	626.4812	0.000000	80.63757	4.067983	23.69860
EPU_{VA}	116.8015	1005.821	4.768023	128.3796	3.385111	17.75300
EPU_{VT}	75.00723	608.6445	8.757713	83.36979	3.661453	19.93884
EPU_{WA}	90.68558	809.3128	6.755118	106.6909	4.203614	23.48866
EPU_{WI}	97.00415	626.0579	8.495531	81.67761	3.262522	19.05413
EPU_{WV}	56.61847	376.4582	8.366950	50.92022	3.139278	16.62188
EPU_{WY}	144.9052	1319.127	0.000000	145.4441	3.658383	24.19641

When Table 2, which includes descriptive statistics, is analyzed, it is found that the variables with the highest volatility among 52 different variables are SPX, EPU_{AK}, EPU_{AZ}, EPU_{NJ} and EPU_{CO}, while the variables with the lowest volatility are EPU_{DC}, EPU_{ND}, EPU_{SC}, EPU_{WV} and EPU_{SD} respectively.

Tables 3 and 4 present the unit root tests for EPU index changes and S&P500 stock market index price changes of the US states, while Table 3 presents the Augmented Dickey-Fuller (ADF) Unit Root Test results, Table 4 presents the Philips-Perron (PP) Unit Root Test results.

Table 3. Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variables	ADF		Variables	ADF	
	Constant	Constant & Trend		Constant	Constant & Trend
EPU_{AK}	-6.4777***	-7.1112***	EPU_{NC}	-5.7536***	-5.7590***
EPU_{AL}	-7.6532***	-7.6464***	EPU_{ND}	-8.2810***	-8.8718***
EPU_{AR}	-4.6217***	-4.7950***	EPU_{NE}	-7.0134***	-6.9931***
EPU_{AZ}	-4.6623***	-5.0049***	EPU_{NH}	-3.9475***	-3.9916**
EPU_{CA}	-4.9362***	-5.1711***	EPU_{NJ}	-3.5852***	-4.7995***
EPU_{CO}	-5.7526***	-6.2572***	EPU_{NM}	-5.7351***	-6.2049***
EPU_{CT}	-7.2364***	-7.6466***	EPU_{NV}	-6.7578***	-6.8365***
EPU_{DC}	-9.6017***	-9.5877***	EPU_{NY}	-3.9385***	-4.0664***
EPU_{DE}	-6.3038***	-6.3926***	EPU_{OH}	-5.3526***	-5.4461***
EPU_{FL}	-4.7496***	-4.7687***	EPU_{OK}	-5.7807***	-6.2144***
EPU_{GA}	-4.3377***	-4.6158***	EPU_{OR}	-4.9104***	-5.3102***
EPU_{HI}	-3.7840***	-4.2899***	EPU_{PA}	-4.4663***	-4.7487***
EPU_{IA}	-8.4798***	-9.0692***	EPU_{RI}	-6.2810***	-6.5046***
EPU_{ID}	-6.4326***	-6.7186***	EPU_{SC}	-5.2985***	-7.0948***
EPU_{IL}	-6.7857***	-7.2942***	EPU_{SD}	-7.0386***	-7.0619***
EPU_{IN}	-6.1594***	-6.2691***	**SPX**	**0.6778**	**-2.0066**
EPU_{KS}	-7.4574***	-8.0751***	**ΔSPX**	**-16.2636*****	**-16.4391*****
EPU_{KY}	-8.8228***	-9.0124***	EPU_{TN}	-5.6267***	-5.6514***
EPU_{LA}	-4.8848***	-5.3255***	EPU_{TX}	-3.5703***	-3.6243**
EPU_{MA}	-5.0246***	-5.4153***	EPU_{UT}	-5.8067***	-6.1302***
EPU_{MD}	-6.0377***	-6.1697***	EPU_{VA}	-4.6173***	-4.9219***
EPU_{ME}	-3.7120***	-3.9466**	EPU_{VT}	-6.3025***	-6.4735***

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EPU_{MI}	-6.8480***	-6.9527***	EPU_{WA}	-5.5870***	-5.7649***
EPU_{MN}	-5.3674***	-5.4925***	EPU_{WI}	-6.0703	-6.1602***
EPU_{MO}	-6.2177***	-6.3965***	EPU_{WV}	-5.6931***	-6.2784***
EPU_{MS}	-6.1133***	-6.3759***	EPU_{WY}	-3.2911**	-3.5466**
EPU_{MT}	-7.7339***	-7.9593***			

***, ** denote 1% and 5% significance level, respectively.

Table 4. Philips-Perron (PP) Unit Root Test Results

Variables	PP		Variables	PP	
	Constant	Constant & Trend		Constant	Constant & Trend
EPU_{AK}	-6.3351***	-7.0709***	EPU_{NC}	-5.7400***	-5.7524***
EPU_{AL}	-7.8686***	-7.8692***	EPU_{ND}	-8.3868***	-8.9380***
EPU_{AR}	-6.5247***	-6.8301***	EPU_{NE}	-11.0442***	-11.0221***
EPU_{AZ}	-4.4007***	-4.6719***	EPU_{NH}	-6.0307***	-6.1637***
EPU_{CA}	-4.6756***	-4.9633***	EPU_{NJ}	-5.4802***	-6.2143***
EPU_{CO}	-5.6732***	-6.1944***	EPU_{NM}	-5.5850***	-6.1039***
EPU_{CT}	-7.4625***	-7.9361***	EPU_{NV}	-6.7974***	-6.8901***
EPU_{DC}	-9.8131***	-9.8018***	EPU_{NY}	-5.1538***	-5.0242***
EPU_{DE}	-6.2903***	-6.3885***	EPU_{OH}	-5.3965***	-5.5099***
EPU_{FL}	-4.7855***	-4.8182***	EPU_{OK}	-5.7375***	-6.2094***
EPU_{GA}	-7.3002***	-7.7984***	EPU_{OR}	-6.9838***	-7.6317***
EPU_{HI}	-7.3701***	-8.4876***	EPU_{PA}	-4.4783***	-4.8315***
EPU_{IA}	-8.5675***	-9.1382***	EPU_{RI}	-6.3891***	-6.6491***
EPU_{ID}	-6.4848***	-6.7939***	EPU_{SC}	-7.2677***	-7.4838***
EPU_{IL}	-6.8892***	-7.4561***	EPU_{SD}	-6.9695***	-6.9981***
EPU_{IN}	-6.1594***	-6.2691***	**SPX**	**0.8282**	**-1.7991**
EPU_{KS}	-7.4574***	-7.7600***	**ΔSPX**	**-16.3762*****	**-16.539*****
EPU_{KY}	-9.0775***	-9.2586***	EPU_{TN}	-5.5357***	-5.5617***
EPU_{LA}	-7.2808***	-7.8217***	EPU_{TX}	-6.4753***	-6.7288***
EPU_{MA}	-5.3082***	-5.6830***	EPU_{UT}	-5.6577***	-6.0237***
EPU_{MD}	-6.0037***	-6.0671***	EPU_{VA}	-6.4591***	-6.9626***
EPU_{ME}	-7.5193***	-8.0360***	EPU_{VT}	-6.1771***	-6.3773***
EPU_{MI}	-7.1028***	-7.2341***	EPU_{WA}	-5.4846***	-5.7100***
EPU_{MN}	-5.1564***	-5.3116***	EPU_{WI}	-5.9034***	-6.0098***
EPU_{MO}	-6.2525***	-6.4525***	EPU_{WV}	-9.3508***	-9.9725***
EPU_{MS}	-10.3588***	-10.5571***	EPU_{WY}	-8.6869***	-8.9645***
EPU_{MT}	-7.9122***	-8.1410***			

***, ** denote 1% and 5% significance level, respectively.

The findings of the Philips-Perron (PP) Unit Root Test in Table 4 indicate that all of series of EPU index of the US states are stationary at level, while the price changes of the S&P500 stock market index are stationary at first difference. Table 5 indicates the findings of Granger (1969) Causality Test.

Table 5. Granger Causality Test Results

Direction of Causality	Lag	F Statistic	Result	Direction of Causality	Lag	F Statistic	Result
EPU_{AK} → ΔSPX	8	2.38033**	✓	EPU_{MT} → ΔSPX	6	2.78264**	✓
EPU_{AL} → ΔSPX	7	3.46273***	✓	EPU_{NC} → ΔSPX	7	3.64658***	✓
EPU_{AR} → ΔSPX	**2**	**2.18856**	**✗**	EPU_{ND} → ΔSPX	8	3.83350***	✓
EPU_{AZ} → ΔSPX	2	5.42559***	✓	**EPU_{NE} → ΔSPX**	**2**	**0.45044**	**✗**
EPU_{CA} → ΔSPX	2	7.41819***	✓	**EPU_{NH} → ΔSPX**	**2**	**2.22382**	**✗**
EPU_{CO} → ΔSPX	8	3.42299***	✓	EPU_{NJ} → ΔSPX	8	2.92361***	✓
EPU_{CT} → ΔSPX	8	2.21728**	✓	EPU_{NM} → ΔSPX	8	2.89854***	✓
EPU_{DC} → ΔSPX	**1**	**1.17188**	**✗**	EPU_{NV} → ΔSPX	5	2.69364**	✓

EPU_{DE} → ΔSPX	**1**	**0.83556**	**×**	EPU_{NY} → ΔSPX	8	3.47186***	✓
EPU_{FL} → ΔSPX	2	4.98270***	✓	EPU_{OH} → ΔSPX	1	7.16310***	✓
EPU_{GA} → ΔSPX	6	2.15801**	✓	EPU_{OK} → ΔSPX	8	4.56463***	✓
EPU_{HI} → ΔSPX	8	3.30248***	✓	EPU_{OR} → ΔSPX	2	4.52607**	✓
EPU_{IA} → ΔSPX	2	5.49746***	✓	EPU_{PA} → ΔSPX	8	5.32809***	✓
EPU_{ID} → ΔSPX	7	3.27334***	✓	**EPU_{RI} → ΔSPX**	**2**	**2.19615**	**×**
EPU_{IL} → ΔSPX	8	5.32821***	✓	EPU_{SC} → ΔSPX	8	3.30223***	✓
EPU_{IN} → ΔSPX	4	4.45262***	✓	**EPU_{SD} → ΔSPX**	**1**	**1.69096**	**×**
EPU_{KS} → ΔSPX	1	8.56683***	✓	EPU_{TN} → ΔSPX	1	7.26501***	✓
EPU_{KY} → ΔSPX	7	5.23808***	✓	EPU_{TX} → ΔSPX	8	4.05026***	✓
EPU_{LA} → ΔSPX	3	5.07657***	✓	EPU_{UT} → ΔSPX	1	13.1811***	✓
EPU_{MA} → ΔSPX	7	3.64723***	✓	EPU_{VA} → ΔSPX	8	3.42275***	✓
EPU_{MD} → ΔSPX	7	3.38179***	✓	EPU_{VT} → ΔSPX	2	5.87591***	✓
EPU_{ME} → ΔSPX	8	2.64416***	✓	EPU_{WA} → ΔSPX	7	4.46692***	✓
EPU_{MI} → ΔSPX	6	2.72955**	✓	EPU_{WI} → ΔSPX	2	4.24046**	✓
EPU_{MN} → ΔSPX	**2**	**2.26145**	**×**	EPU_{WV} → ΔSPX	8	4.60230***	✓
EPU_{MO} →ΔSPX	1	14.1388***	✓	EPU_{WY} → ΔSPX	4	3.00372**	✓
EPU_{MS} → ΔSPX	7	2.19328**	✓				

*****, ** denote 1% and 5% significance level, respectively.**

The findings of the Granger (1969) causality test indicate that there is no statistically significant causality from variables EPU_{Arkansas}, $EPU_{\text{District of Columbia}}$, EPU_{Delaware}, $EPU_{\text{Minnesota}}$, EPU_{Nebraska}, $EPU_{\text{New Hampshire}}$, $EPU_{\text{Rhode Island}}$ and $EPU_{\text{South Dakota}}$ to the S&P500 index, while there is a statistically significant causality from EPU index of the other 43 states to the S&P500 (SPX) index. The findings are shown on a state-by-state basis on the map in Figure 1.

Figure 1: Map of Granger Causality Test Findings

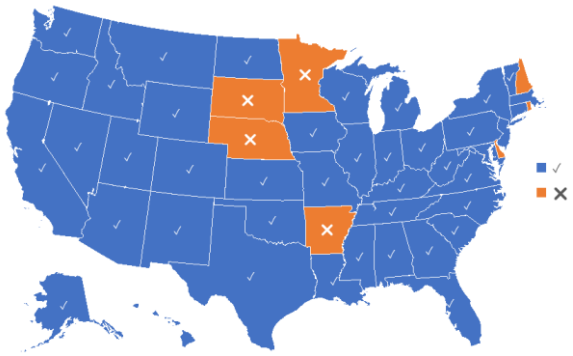

Figure 1 shows a map of the US states, but the causality from EPU index to the S&P500 stock market index is not statistically significant for 8 states. On the other hand, the causality is statistically significant for 43 states.

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5. Conclusions

As a concept, uncertainty corresponds to the probabilities of the future and is closely related to households, market actors, policymakers and managers (Bloom, 2014). While it is known that investors' decisions are negatively affected in the event of increased uncertainty, it is reached that there may be an expectation that there may be negative effects on both stock price movements and expected returns (Chen and Chiang, 2020). Recently, changes in economic policies shaped by policymakers and changes in economic policies have serious effects on the financial sector. It is noteworthy that the effects of increased EPU index on financial markets, especially during crisis periods, have become an important research topic (Albrecht et al., 2023). Although there are many studies that test the impact of increasing EPU on stock markets, it is found that empirical studies are evaluated through the country-based EPU index. In this context, statistically revealing the power of EPU index, which is among the important uncertainty indicators, to predict stock market price movements and enabling investors to use the relevant uncertainty index as an indicator when buying and selling stocks can be considered as an important situation, especially for individual investors. This study tests whether there is a statistically significant causality from the state-specific EPU index developed in Baker et al. (2022) and obtained from the digital archive of approximately 3500 local newspapers to the price movements of the S&P500 stock market index. The findings of the Granger (1969) causality test applied to the monthly data for the period between February 2006 and December 2023 are as follows: Arkansas, District of Columbia, Delaware, Minnesota, Nebraska, New Hampshire, Minnesota, Nebraska, New Hampshire, Delaware, Minnesota, Nebraska, New Hampshire, New Hampshire, Arkansas, District of Columbia, District of Columbia, Delaware, Delaware, Minnesota, Nebraska, New Hampshire, New Hampshire, and Arkansas, While there is no statistically significant causality from EPU index data of states such as Rhode Island and South Dokato to the price movements of the S&P500 stock market index, there is a statistically significant causality from EPU index of the other 43 states to the price movements of the S&P500 stock market index. In this context, the findings obtained by Sum et al. (2012), Brogaard and Detzel (2015), Arouri et al. (2016), Chen et al. (2017), Guo et al. (2018), Gemici (2020), Sadeghzadeh and Aksu (2020), Batabyal & Killins (2021), Akdağ and Yıldırım (2021), Aydın et al. (2022), Camgöz (2022), Zhang et al. (2023), Kaya et al. (2023), Li et al. (2023), Yılmaz Özekenci (2024), Aydın et al. (2024), Ünlü (2024) and Seçme (2024) are similar to studies such as. In the study, the most prominent reason for the causality from EPU uncertainty index to the stock market index for 43 different states of the US is the US-based 2008 Global crisis and the COVID-19 pandemic in the last quarter of 2019. In this context, increased uncertainty in these periods may have led to a market environment with sharp declines. Stock markets, which are an important indicator for national economies regardless of their size and have become an extremely important field of activity for the financial sector, can be adversely affected by uncertainties.

As in the literature, the stock market, which is adversely affected by EPU index, should be reassured by policymakers by adopting a transparent communication approach, trying to improve the economic outlook through permanent methods and, most importantly, adopting a stable governance approach to take these actions may enable stock markets to be more robust against possible shocks. In this way, investors may act more rationally when making investment decisions, especially in times of crisis. On the other hand, investors trading in the stock market may make significant contributions to the risk management process if they consider the changes in the EPU index in addition to the various indicators they follow before making an investment decision.

This study has several limitations. The first limitation is that the causality test is not a new generation causality test and the persistence of causality cannot be revealed. The second limitation is that although the effect of EPU on the US stock market is tested in detail and for each state, similar and different economies are not included in the study. In this context, in future similar studies, testing the effect of EPU indices of different countries on the price changes and volatility of stock market indices, precious metals and exchange rates in the short and long run with new generation models such as frequency causality test, time-varying parameter vector autoregressive (TVP-VAR) model and ARDL Bound Test will contribute to the literature.

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