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Research Article

Economic Policy Uncertainty as a Driver of Volatility Dynamics in the Tehran Stock Exchange

Ali Soltani Ghombavani[1], Mohamad Ahadzadeh*[2], Marzieh Ebrahimi Shaghaghi[3]

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ABSTRACT

This research investigates whether fluctuations in economic policy uncertainty (EPU) are reflected in the volatility behavior of the Tehran Stock Exchange (TSE). Using daily market information from January 2, 2015, to September 23, 2025, along with observations from 183 listed firms, the study develops an empirical framework to evaluate the interaction between uncertainty conditions and equity market performance. The analysis combines several econometric procedures, including ARCH diagnostics, GARCH-based volatility estimation, and GLS regression with an AR(1) adjustment, to identify the characteristics of market volatility and assess the role of EPU. The empirical evidence indicates substantial variability in the TSE index and confirms the existence of time-dependent variance behavior and persistent volatility effects, supporting the use of GARCH specifications. The results show that earlier market disturbances contain significant information for explaining future volatility movements. Furthermore, the estimated GLS model suggests that changes in EPU are associated with a statistically meaningful inverse effect on the dependent variable (coefficient = -0.3451; p-value = 0.0262), providing support for the research hypothesis. The analysis of the Sharpe Ratio also reveals differences in risk-adjusted outcomes across periods characterized by varying uncertainty levels. By focusing on an emerging financial market exposed to repeated policy changes, this study contributes empirical evidence on the interaction between uncertainty conditions and market volatility. The findings suggest that improving policy predictability, monitoring uncertainty indicators, and incorporating uncertainty measures into financial decision processes may help market participants better manage risk exposure.

1. Ph.D Student in Accounting, Caspian Campus, University of Tehran, Tehran, Iran.
2. Master of financial management, Science and Research Branch, Islamic Azad University, Tehran, Iran.
3. Assistant Professor, Department of Management & Accounting, Shahriar Branch, Islamic Azad University, Shahriar, Iran
* **Corresponding Author Email Address**: mohamad.ahadzadeh@srbiau.ac.ir.

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1. Introduction

Financial market behavior is shaped by a combination of macroeconomic conditions, institutional developments, and expectations regarding future policy directions. Among these factors, Economic Policy Uncertainty (EPU) has emerged as an important source of risk because it reflects uncertainty about forthcoming regulatory measures, government decisions, and economic strategies. Variations in policy expectations may influence investors' perceptions of future market conditions and contribute to changes in stock price movements and volatility patterns. In particular, the effect of economic uncertainty and policy adjustments on market volatility has been well-documented, with studies confirming that shifts in these factors can significantly influence stock market behavior (Bomfim, 2003; Pastor & Veronesi, 2012). Volatility, particularly in stock indices, serves as a key indicator of market stability and investor sentiment. In emerging markets such as the Tehran Stock Exchange (TSE), the interplay of EPU and index volatility significantly shapes market behavior and guides investor decisions.

Iran provides a distinctive empirical setting for analyzing how uncertainty arising from economic policy conditions may be reflected in equity market behavior. The country's financial environment has been shaped by frequent policy adjustments, external pressures, and macroeconomic fluctuations, creating conditions in which uncertainty may play an important role in market volatility. Therefore, examining the Tehran Stock Exchange offers an opportunity to assess the extent to which policy-related uncertainty is transmitted into fluctuations in stock market conditions. This research investigates the magnitude and characteristics of this transmission process within the Iranian market context.

EPU represents a situation in which future government decisions, regulatory actions, and macroeconomic policies cannot be predicted with sufficient confidence. Such ambiguity may influence the expectations and responses of investors by increasing uncertainty regarding future economic conditions. Sources of EPU may include changes in fiscal arrangements, modifications in trade regulations, and unexpected policy interventions that affect market expectations. In financial markets, volatility reflects the intensity and persistence of movements in asset prices over a specific period and is commonly used as an indicator of changing risk conditions. Higher levels of volatility generally indicate greater disagreement among investors regarding future market developments and a less predictable investment environment. Consequently, analyzing volatility behavior is essential for understanding risk transmission mechanisms and evaluating market exposure. Accurate assessment of volatility patterns can assist investors and financial institutions in developing more effective risk management frameworks (Brooks and Persand, 2003; Bollerslev et al., 2018).

The Tehran Stock Exchange (TSE) stands as Iran's central stock market, offering a broad array of securities critical to the nation's economic activity. Volatility within the TSE index is heavily influenced by both domestic economic policies and external factors. Changes in economic policies often induce significant market movements, underlining the importance of understanding the relationship between EPU and stock market volatility in this context. By examining this relationship, we gain insights into the broader economic consequences of policy uncertainty on market performance. Stock market volatility is often defined as the dispersion around the mean or average stock price or return, and one of the common methods to measure this volatility is through the use of standard deviation or variance (Jakobsen, 2018).

Prior empirical studies have provided substantial evidence regarding the interaction between policy-related uncertainty and equity market fluctuations. Nevertheless, the existing evidence is predominantly derived from advanced economies with relatively predictable institutional frameworks and stable policy environments. Such findings may not fully represent the behavior of emerging markets, where structural constraints, policy adjustments, and economic disruptions can generate different uncertainty transmission mechanisms. Iran’s financial market represents a distinct case in this context, as the Tehran Stock Exchange operates under conditions characterized by frequent economic policy changes, institutional challenges, and exposure to various domestic and external disturbances. Therefore, examining the role of EPU in shaping TSE volatility offers an opportunity to extend current knowledge on how uncertainty is incorporated into market dynamics in emerging economies.

This study holds significant relevance as it sheds light on the Iranian stock market while contributing to the broader understanding of how EPU impacts emerging markets. Several recent studies have explored the critical influence of economic uncertainty and policy changes on stock markets, confirming that these elements play a crucial role in determining market behavior (Zeng et al., 2024; Kundu & Paul, 2022; Li et al., 2023; Ghani, 2024). The empirical evidence generated in this study can provide useful guidance for market participants in evaluating uncertainty-related risks and adjusting their investment strategies accordingly. In addition, the results may offer policymakers a clearer perspective on how policy uncertainty is reflected in financial market fluctuations. By identifying the connection between uncertainty conditions and volatility behavior, the study contributes to discussions on improving risk management practices, strengthening market confidence, and supporting more effective financial decision-making.

This research investigates the role of EPU in explaining fluctuations in stock market volatility, focusing on the Tehran Stock Exchange as an emerging financial market. The study seeks to determine whether changes in policy uncertainty are transmitted into market behavior and whether such uncertainty contributes to variations in investment outcomes and volatility patterns.

Although the relationship between policy uncertainty and financial market responses has received considerable attention, several aspects remain insufficiently explored. A large proportion of previous studies relies on evidence from advanced economies where institutional structures and policy environments differ substantially from those of emerging markets. As a result, the extent to which existing theoretical explanations of uncertainty transmission apply to markets exposed to persistent economic, institutional, and geopolitical pressures remains uncertain.

Furthermore, research on the Tehran Stock Exchange has mainly concentrated on traditional macroeconomic factors, while the role of policy-related uncertainty as a determinant of volatility behavior has received comparatively limited attention. This study attempts to fill this gap by providing empirical evidence on the connection between EPU and market volatility within an environment characterized by frequent policy changes and elevated uncertainty.

Accordingly, the study addresses the following research questions. These questions are developed to clarify the mechanism through which economic policy uncertainty may influence volatility behavior in the Tehran Stock Exchange.

RQ1: How does economic policy uncertainty impact stock price volatility in the TSE, particularly in terms of the destabilizing effect that unpredictable policy changes have on investor behavior and market dynamics?

Sub-RQ1: To what extent does an increase in EPU affect the decision-making performance of investors in the stock market, and how does heightened uncertainty contribute to investor hesitance and suboptimal investment choices, thereby further intensifying market volatility?

The article is structured into five sections. Following the introduction, Section 2 presents the theoretical background and reviews the relevant literature related to the research topic. Section 3 describes the methodology, including the empirical design and estimation procedures. Section 4 discusses the empirical findings, while Section 5 summarizes the main conclusions and provides relevant recommendations.

2. Literature Review

2-1. Analysis of Index Trends in the Tehran Stock Exchange

The time profile of the Tehran Stock Exchange (TSE) index is presented in Figure 1, covering observations from 2015 through 2025. The figure identifies successive turning points in the market trajectory, distinguishing intervals characterized by sustained appreciation from those marked by prolonged declines. A magnified view of the last 100 trading days is included to highlight the behavior of prices over a shorter horizon, where fluctuations become considerably more pronounced. These visual patterns indicate that the market underwent repeated shifts in direction during the sample period, suggesting that investor expectations were continuously revised as new economic information became available. Since changes in policy conditions constitute one potential source of such expectation revisions, the empirical analysis that follows investigates whether EPU is associated with the observed variation in market volatility.

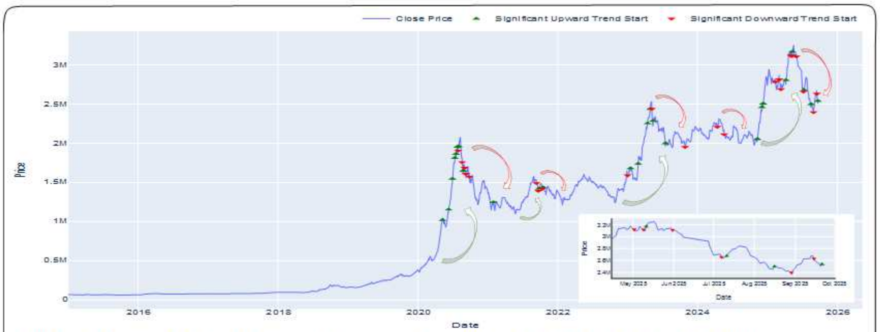

Fig 1. Market Volatility and Key Trend Reversals: A Comprehensive Analysis of Price Volatilities
Source: Authors' Findings

2-2. EPU and Stock Market Volatility

Among the macroeconomic factors affecting financial markets, Economic Policy Uncertainty (EPU) has received considerable attention because of its influence on stock market behavior. EPU captures uncertainty about future government policy actions, including fiscal, monetary, and regulatory policies. Such uncertainty weakens the predictability of economic conditions, making it more difficult for investors and firms to form reliable expectations about future market developments. As a result, investors may adopt a more cautious approach to investment, leading to increased market volatility. The foundations of the uncertainty literature are commonly attributed to the pioneering contributions of Markowitz (1952), Roy (1952), and Tobin (1958), whose studies established the theoretical basis for analyzing risk and uncertainty in financial decision-making, which laid the foundations for understanding how uncertainty affects decision-making under risk. When there is uncertainty regarding future policies, the risk associated with asset prices rises, causing investors to adjust their portfolios more frequently. This uncertainty is often exacerbated by global economic events, political instability, or changes in government leadership, all of which increase the perceived risk in the market and, in turn, elevate stock market volatility. Empirical research has shown that periods of heightened EPU are associated with large swings in asset prices, as the unpredictability of future economic conditions makes it difficult for investors to form stable expectations. Furthermore, stock market volatility, often defined as the dispersion around the mean or average stock price or return (Jakobsen, 2018), can be measured using statistical tools such as standard deviation or variance, which are commonly employed to quantify the extent of fluctuations in asset prices.

Riyath et al. (2026) investigated the impact of EPU, market volatility, global uncertainty, and market movements on India's IT sector using an ARDL bounds-testing approach based on monthly data from 2008 to 2024. The study found that domestic EPU has a positive long-run relationship with the Nifty-IT index, indicating that uncertainty does not always generate adverse effects and may depend on sector-specific characteristics.

Econometric approaches are frequently employed to analyze how variations in EPU are associated with changes in stock market volatility and asset returns. In financial economics, volatility is generally interpreted as the degree to which the anticipated future value of an asset deviates from its expected path. It reflects uncertainty regarding future price movements and is commonly quantified using statistical measures such as the variance or the standard deviation (Bhowmik and Wang, 2020). Empirical evidence from previous research generally suggests that increases in EPU are associated with lower stock market returns. During periods characterized by greater uncertainty, investors often require additional compensation for bearing risk, which can place downward pressure on asset valuations. Moreover, the continued presence of volatility following periods of high uncertainty indicates that policy-related disturbances may generate lasting consequences for financial market behavior. Such persistence can be attributed to the gradual process through which market participants revise their expectations and reassess risk conditions, resulting in extended variations in asset prices over subsequent periods.

2-3.Conceptual Framework of EPU and its Impact on Decision-Making Performance

Figure 2 presents the conceptual framework illustrating how Economic Policy Uncertainty (EPU) influences decision-making performance through three interrelated mechanisms: unpredictability, emotional responses, and market volatilities. Specifically, higher levels of EPU increase the unpredictability of market conditions, reducing investors' ability to form reliable expectations about future market developments.

This heightened uncertainty intensifies emotional responses, which, together with increased market volatilities, further disrupt objective information processing and rational judgment. The combined influence of unpredictability, emotional responses, and market volatilities ultimately weakens decision-making performance by making investment decisions more difficult under uncertain market conditions. As summarized in the framework, economic fluctuations reinforce these mechanisms by increasing market volatility, thereby further limiting the predictability of market conditions and exacerbating the adverse effect of EPU on decision-making performance in the Tehran Stock Exchange.

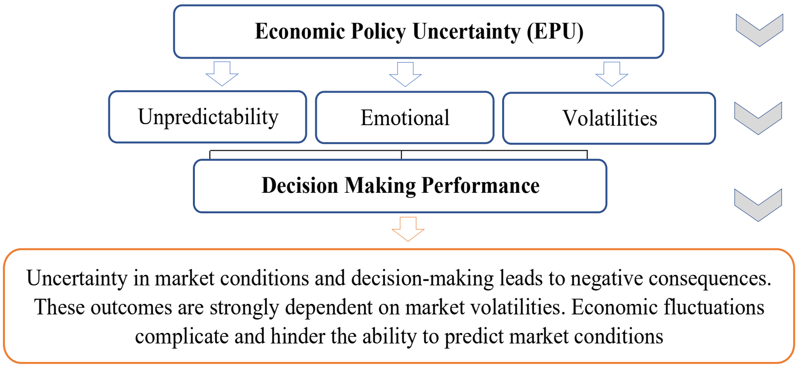

Fig 2. Conceptual Framework of EPU and Its Impact on Decision-Making Performance
Source: Authors' Findings

2-4. Research Hypotheses

The relationship between EPU and stock market volatility has attracted increasing research attention, particularly in emerging markets. This study examines how EPU influences stock price volatility in the TSE, emphasizing the role of policy uncertainty in shaping market dynamics and investor behavior. The research hypotheses are presented below.

H1: EPU has a significant negative impact on stock price volatility in the Tehran Stock Exchange, highlighting the destabilizing effect that unpredictable policy changes have on investor behavior and market dynamics.

Sub-H1:An increase in EPU leads to a decline in the decision-making performance of investors in the stock market, with heightened uncertainty exacerbating investor hesitance and leading to suboptimal investment choices that further intensify market volatility.

2-5. The Impact of EPU on Stock Market Dynamics

Figure 3 illustrates the conceptual transmission mechanism through which EPU affects stock market dynamics. EPU serves as the primary source of market instability by directly increasing stock market volatility through fluctuations in financial flows, abrupt market movements, and disruptions to market growth. At the same time, heightened policy uncertainty encourages a flight-to-safety response, leading investors to reallocate capital toward lower-risk assets.

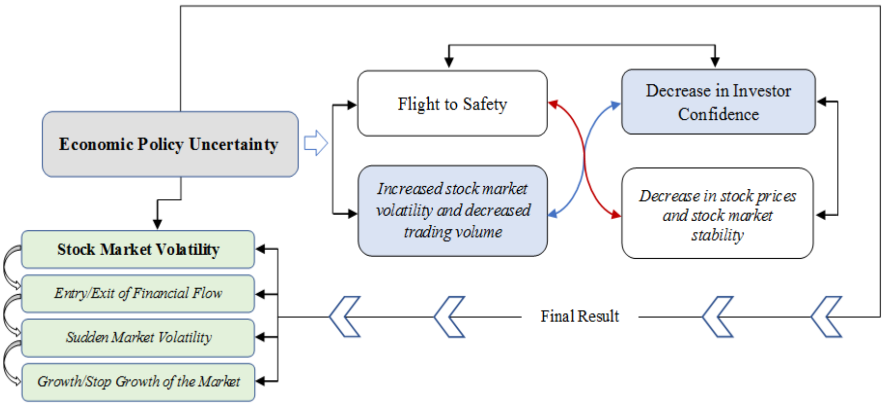

Fig 3. The Impact of EPU on Stock Market Dynamics

This behavioral adjustment reduces trading activity, weakens investor confidence, and ultimately contributes to declining stock prices and lower market stability. These effects reinforce one another through feedback mechanisms, further amplifying market volatility and sustaining financial instability. Overall, the model highlights that the impact of EPU extends beyond its direct effect on price fluctuations, operating through interconnected behavioral and market channels that collectively intensify stock market volatility.

2-6. Research Background

This section synthesizes previous empirical evidence concerning the effects of EPU on equity market behavior, with particular attention to volatility modeling, estimation techniques, and the principal empirical outcomes reported in earlier studies. To facilitate comparison across the existing body of research, Table 1 summarizes the analytical approaches adopted by prior investigations together with their major empirical conclusions.

Table 1. Research Background

Research Title	Author(s)	Year	Methodology	Key Findings
The Nexus Between Economic Policy Uncertainty and Stock Market Volatility in the CEE-3 Countries	Güngör and Sami Güngör			- A positive and significant one-period lagged impact of economic policy uncertainty on long-run stock market volatility in CEE-3 countries.
				- The quality of political signals plays a significant role in predicting stock market volatility.
Economic Policy Uncertainty and Stock Market Volatility: A Causality Check (Burkhard Raunig)				
			GARCH family of models to analyze non-linear EPU-volatility relationship	- EPU is an essential determinant of stock market volatility. - Higher EPU leads to a significant increase in volatility. - Understanding the EPU-volatility relationship can help investors better predict stock market volatility.
				- EPU leads to significant increases in market volatility. - Incorporating EPU into volatility prediction models significantly improves their forecasting ability. - The improvement is robust to model specifications.

Sources: Authors' Findings

3. Methodological Framework

3-1. Study Framework

The research framework is structured to analyze the association between economic policy uncertainty and volatility movements in the TSE through an empirical investigation of historical market data. The study combines explanatory and practical objectives by developing evidence on the mechanisms through which uncertainty may influence financial market behavior while also offering insights relevant to market participants and decision-makers. By utilizing a longitudinal dataset covering approximately ten years of observations, the analysis captures changes in volatility behavior over time It evaluates whether the effects of policy uncertainty vary across different market conditions.

3-2. Sample Selection and Data Coverage

The research sample comprises daily observations of the TSE Index covering the period from January 2, 2015, to September 23, 2025, together with information from 183 listed firms included in the study. The required data were obtained from Rahavard 365, which serves as a financial data platform for the Iranian capital market. A non-probability sampling strategy was adopted due to the use of available market records. The selected time horizon incorporates different phases of market conditions and price movements, thereby supporting the reliability of the empirical investigation. All econometric estimations were performed in EViews, whereas Python 3 was utilized to generate graphical representations and examine changes in TSE volatility patterns across different market environments.

3-3. Data Analysis Methods

The empirical investigation is designed to evaluate how EPU is reflected in the volatility behavior of the TSE. The estimation procedure follows a structured analytical pathway, starting with preliminary evaluations of the variables' statistical characteristics and continuing with the application of volatility models and regression approaches. This framework allows the study to assess both the uncertainty–market volatility linkage and the underlying dynamics governing market fluctuations.

3-3-1. ARCH Effect Test

Prior to the estimation of volatility models, the error structure of the TSE return series is investigated to identify whether variance dynamics are present. The ARCH diagnostic procedure is employed to evaluate the stability of the conditional variance and to determine whether past disturbances contain information about future volatility movements. Evidence of such effects would support the use of GARCH-based specifications for modeling the evolving volatility behavior of the TSE.

3-3-2. GARCH Model Estimation and Model Selection

Following confirmation of ARCH effects, GARCH models are employed to estimate and forecast conditional volatility in the TSE. The GARCH framework is appropriate for financial time-series analysis because it captures both the persistence of past volatility and the impact of previous shocks on current market uncertainty. Several specifications, including GARCH (1,1), GARCH (2,2), GARCH (3,3), and GARCH (4,4), are estimated and compared to identify the model with the strongest explanatory and forecasting capability. The selected volatility model is subsequently used to construct the EPU measure.

3-3-3. Goodness-of-Fit Evaluation of the GARCH Model

Model comparison among the alternative GARCH specifications is conducted through three information-based indicators: the AIC, BIC, and HQC. These measures provide a basis for identifying the specification that achieves a suitable trade-off between explanatory capability and model parsimony. Therefore, the preferred volatility model is selected by considering both statistical adequacy and the number of estimated parameters.

3-3-4. Diagnostic Testing of the Estimated GARCH Model

Following the estimation of the preferred GARCH specification, additional diagnostic checks are performed through the ARCH test to assess whether any unexplained variance dynamics remain after model estimation. The diagnostic outcomes suggest that the estimated framework has successfully accounted for the major volatility patterns in the TSE series, with no statistically meaningful evidence of additional ARCH-type behavior.

3-3-5. Descriptive Analysis and Variable Construction

Descriptive measures are computed for the key variables of the study, namely EPU and the Sharpe Ratio, to examine their statistical properties and distribution patterns. The reported indicators include location measures, variability statistics, and distributional moments, providing preliminary evidence regarding the characteristics of the dataset. The Sharpe Ratio is derived from the daily return series of 183 listed firms selected from the TSE over the 2015–2025 sample horizon, reflecting the risk-adjusted performance of the examined companies.

3-3-6. Stationarity Assessment of the Sharpe Ratio Series

The stationarity of the Sharpe Ratio variable is examined using the LLC panel unit root test. This test evaluates whether the variable contains a unit root, which may affect the validity of econometric estimations. Rejecting the null hypothesis confirms the stationarity of the Sharpe Ratio variable and supports its use in subsequent regression analysis.

3-3-7. Hypothesis Testing Framework: OLS and GLS Estimation

The empirical investigation begins with an OLS specification to obtain preliminary evidence on the association between EPU and the selected market performance indicator. This initial estimation also provides a reference point for evaluating whether the underlying regression assumptions are satisfied before proceeding to the final estimation stage. Following the preliminary estimation, a series of residual-based diagnostic procedures is conducted to identify possible irregularities in the error structure. The Breusch–Pagan LM procedure is employed to assess the stability of error variance, while the Durbin–Watson measure is considered to evaluate the dependence pattern among residual observations. Given that financial market data often contain dynamic variance behavior and time-related dependencies, an estimation method capable of addressing these characteristics is required. Accordingly, when diagnostic evidence indicates departures from the standard OLS assumptions, the model is re-estimated using a GLS framework incorporating an AR(1) adjustment. This approach accounts for the structure of the disturbance process and enhances the efficiency of the estimated parameters. The resulting specification provides a more reliable basis for evaluating how economic policy uncertainty is associated with fluctuations in stock market behavior.

3-3-8. EPU Measurement

EPU is derived from the volatility structure estimated through the selected GARCH model. By incorporating information from historical shocks and conditional volatility, the constructed EPU measure reflects time-varying uncertainty conditions in the Tehran Stock Exchange. The measure is generated using daily return data from 183 active listed companies over the period 2015–2025 and is subsequently incorporated into the hypothesis-testing framework.

4. Results and Discusion

4-1. Statistical Overview of TSE: Key Metrics and Distribution Characteristics

Table 2 reports the descriptive statistics of the TSE index over the study period. The index exhibits substantial variability, with values ranging from 61,163.7 to 3,252,219.41 and a relatively high standard deviation of 932,982.70 compared with its mean value of 990,055.68, reflecting considerable fluctuations in the market index. The positive skewness (0.4874) indicates a moderately right-skewed distribution, suggesting the presence of occasional higher index values. The negative excess kurtosis (-1.1267) indicates a platykurtic distribution, implying a flatter shape with lighter tails and lower concentration around the mean compared with a normal distribution.

Table 2. Statistical Overview of TSE: Key Metrics and Distribution Characteristics

Index	Max	Min	Mean	SD	Kurtosis	Skewness
TSE	3,252,219.41	61,163.7	990,055.68	932,982.70	-1.126679	0.487431

Source: Authors' Findings

4-2. Stationarity Analysis: Augmented Dickey-Fuller Test Results

Table 3 reports the outcomes of the ADF procedure conducted to examine the stationarity properties of the TSE index. The obtained ADF statistic (-2.9203) does not exceed the corresponding critical thresholds at the 1%, 5%, and 10% significance levels (-3.9623, -3.4122, and -3.1281, respectively). Given the p-value of 0.1557, there is insufficient statistical evidence to reject the unit root hypothesis. This result suggests that the TSE index exhibits a non-stationary behavior in its original level form. Accordingly, the series is transformed through first-order differencing before the subsequent econometric analysis to achieve stationarity and improve the reliability of the estimation results.

Table 3. TSE Variable Stationarity

		t-statistic	Prob.*
Augmented Dickey-Fuller Test Statistic		-2.9203400	0.15572
Test critical values:	1% level	-3.9623204	
	5% level	-3.4122110	
	10% level	-3.1280633	
***Mackinnon (1996) One-Sided P-Values**			

Source: Authors' Findings

Table 4 summarizes the ADF test outcomes for the first-differenced TSE series. The results indicate a substantial improvement in the stationarity properties of the variable following the differencing procedure. The calculated test statistic (-10.8803) is well below the reported critical thresholds at the 1%, 5%, and 10% significance levels (-3.9623, -3.4122, and -3.1281, respectively). Moreover, the associated probability value (0.0000) provides strong statistical evidence against the unit root hypothesis. Therefore, the transformed TSE series can be considered stationary after the first difference, allowing the subsequent econometric estimations to be performed without additional data transformation.

Table 4. TSE Variable Stationarity

		t-statistic	**Prob.***
Augmented Dickey-Fuller Test Statistic		-10.8803123	0.0000
Test critical values:	1% level	-3.96232043	
	5% level	-3.41221109	
	10% level	-3.12806337	
***Mackinnon (1996) One-Sided P-Values**			

Source: Authors' Findings

4-3. Testing for ARCH-Type Behavior

Table 5 reports the estimation outcomes of the ARCH specification applied to the TEDPIX series. The lagged TSE coefficient is estimated at 1.000943, with a standard error of 0.000391, and the corresponding test statistic reaches 2559.555. The associated probability value (0.0000) indicates that the estimated coefficient is statistically significant at conventional significance levels. These findings provide evidence of time-varying conditional variance and confirm the existence of ARCH-type behavior in the return series. Consequently, the volatility pattern of the Tehran Stock Exchange exhibits volatility persistence, supporting the application of volatility models in the subsequent analysis.

Table 5. TSE Model Fitting Assuming the Presence of ARCH Effects

Variable	Coefficient	Std. Error	t-statistic	Prob.
TSE (-1)	1.000943	0.000391	2559.555	0.0000

Source: Authors' Findings

Table 6 presents the diagnostic results of the ARCH test performed to evaluate the existence of conditional heteroskedasticity in the TSE series. The test statistics provide strong evidence of non-constant variance behavior, as indicated by the F-statistic value of 608.9387 and the corresponding probability value of 0.0000. Similarly, the Obs*R-Squared statistic (495.4963) yields a highly significant Chi-square probability value (0.0000). These outcomes indicate that the residual variance contains ARCH effects, suggesting the presence of volatility dependence in the TSE data and supporting the use of appropriate volatility modelling techniques.

Table 6. The Results of the ARCH Existence Test

Heteroskedasticity Test: ARCH			
F-statistic	608.9387	Prob. F (1.2649)	0.0000
Obs*R-Squared	495.4963	Prob. Chi-square (1)	0.0000

Source: Authors' Findings

4-4. GARCH Model Estimation

Table 7 summarizes the estimation results of the GARCH(1,1) specification employed to characterize the conditional volatility behavior of the TEDPIX series. The estimated model incorporates two key components of volatility persistence: the lagged squared innovation and the previous period's conditional variance, as expressed by the variance equation GARCH = C(3) + C(4)*RESID(-1)^2 + C(5) * GARCH(-1). The coefficient associated with the lagged TSE term is estimated at 0.999994, with a standard error of 0.000234 and a Z-statistic of 4272.981. The corresponding probability value (0.0000) confirms the statistical significance of the estimated parameter. The strong significance of the GARCH component indicates a high degree of volatility persistence in the Tehran Stock Exchange index. In other words, shocks affecting market uncertainty tend to influence future volatility over time rather than disappearing immediately. These findings demonstrate that the GARCH(1,1) framework is appropriate for describing the time-varying volatility pattern of the TSE series and can serve as a suitable basis for subsequent volatility analysis.

Table 7. GARCH Model Fitting Results (1,1)

GARCH = C (3) + C (4)*RESID (-1)^2 + C (5) * GARCH (-1)				
Variable	Coefficient	Std. Error	Z-Statistic	Prob.
TSE (-1)	0.999994	0.000234	4272.981	0.0000

Source: Authors' Findings

4-4-1. GARCH Model Estimation Results

Table 8 provides the comparative estimation results obtained from several GARCH specifications, including GARCH(1,1), GARCH(2,2), GARCH(3,3), and GARCH(4,4), for evaluating the volatility structure of the Tehran Stock Exchange index. The estimated variance equations indicate that most lagged innovation and conditional variance parameters are statistically meaningful, suggesting that previous market disturbances contain valuable information for explaining subsequent volatility movements. The significance of the estimated ARCH components highlights the influence of recent shocks on the conditional variance, whereas the GARCH parameters reflect the degree to which volatility effects are carried forward across periods. Although the magnitude and significance of individual coefficients differ among the alternative specifications, the overall findings indicate that volatility in the TSE series follows a persistent pattern. These comparative results support the application of GARCH-based models for representing the evolving risk characteristics of the market and provide the foundation for examining the impact of economic policy uncertainty on stock market volatility.

Table 8. GARCH Model Variance Equation (1,1)

C	3409.103	354.8045	9.608397	0.0000
RESID (-1)^ 2	0.228155	0.009326	24.46537	0.0000
GARCH (-1)	0.816201	0.004852	168.2159	0.0000
GARCH Model Fitting (2,2) Variance Equation				
C	3134.048	467.7332	6.700504	0.0000
RESID (-1)^ 2	0.371472	0.020074	18.50511	0.0000
RESID (-2)^ 2	-0.0108787	0.022156	-4.910122	0.0000
GARCH (-1)	0.431565	0.071528	6.033479	0.0000
GARCH (-2)	0.0357620	0.061512	5.813864	0.0000
GARCH Model Fitting (3,3) Variance Equation				
C	103.0242	38.41576	2.681821	0.0073
RESID (-1)^ 2	0.399190	0.023151	17.24271	0.0000
RESID (-2)^ 2	-0.289708	0.055165	-5.251661	0.0000
RESID (-3)^ 2	-0.0901628	0.046197	-1.981420	0.0473
GARCH (-1)	1.050660	0.102475	10.25279	0.0000
GARCH (-2)	0.0306576	0.155864	1.966948	0.0492
GARCH (-3)	-0.371713	0.061134	-6.080308	0.0000
GARCH Model Fitting (4,4) Variance Equation				
C	132.7482	49.23785	2.696060	0.0070
RESID (-1)^ 2	0.374340	0.022003	17.01286	0.0000
RESID (-2)^ 2	-0.382591	0.073920	-5.175773	0.0000
RESID (-3)^ 2	0.231787	0.078724	2.944305	0.0032
RESID (-4)^ 2	-0.200995	0.041331	-4.863066	0.0000
GARCH (-1)	1.280831	0.173348	7.388776	0.0000
GARCH (-2)	-0.309496	0.238183	-1.299405	0.1938
GARCH (-3)	0.076608	0.163517	0.468502	0.6394
GARCH (-4)	-0.066202	0.079884	-0.828724	0.4073

Source: Authors' Findings

4-4-2.Best Fit and Forecasting Volatility in the Tehran Stock Exchange: A Comparison of GARCH Models

Table 8 presents the estimation results of alternative GARCH specifications to identify the most appropriate model for forecasting volatility in the Tehran Stock Exchange. The findings indicate that all examined models successfully capture volatility persistence, as evidenced by the statistically significant GARCH terms and ARCH effects. The GARCH(1,1) model demonstrates strong volatility persistence, with both the ARCH and GARCH coefficients being positive and highly significant, suggesting that recent shocks and past volatility play a substantial role in explaining current market fluctuations. Although higher-order models (GARCH(2,2), GARCH(3,3), and GARCH(4,4)) also capture additional lagged effects, several higher-order parameters become less stable or statistically insignificant, indicating limited improvement in volatility modeling. Therefore, considering the parsimony and consistent significance of its parameters, the GARCH(1,1) specification provides an efficient and reliable framework for forecasting conditional volatility in the Tehran Stock Exchange.

4-5. Goodness-of-Fit Criteria for the GARCH (1,1) Model

Table 9 reports the information-based measures used to assess the adequacy of the estimated GARCH(1,1) specification. The calculated values for the AIC, Schwarz BIC, and HQC are 5.177133, 5.181572, and 5.178740, respectively. These indicators provide a basis for assessing the relative efficiency of the estimated model by considering both explanatory performance and model parsimony. The relatively close values obtained across the three criteria suggest consistency in the model evaluation results. Given the trade-off between statistical fit and parameter complexity, the estimated GARCH(1,1) structure appears to offer an appropriate representation of the conditional volatility process of the TSE series. Therefore, the specification is considered suitable for subsequent empirical analysis of market volatility behavior.

Table 9. Goodness-of-Fit Criteria for the GARCH (1,1) Model

Akaike Info Criterion	5.177133
Schwarz Criterion	5.181572
Hannan-Quinn Criterion	5.178740

Source: Authors' Findings

4-6. Analysis of ARCH Effects and Model Appropriateness in the GARCH (1,1) Model

The diagnostic outcomes reported in Table 10 indicate that the estimated GARCH(1,1) specification adequately captures the conditional variance behavior of the series. The ARCH test produces an F-statistic of 2.047017 and an Obs*R-Squared statistic of 2.046980, with associated probability values of 0.1526 and 0.1525, respectively. Since these probability values exceed conventional significance thresholds, the residuals do not provide sufficient evidence of remaining ARCH-type effects after the volatility model has been estimated. This finding suggests that the selected GARCH(1,1) structure successfully incorporates the volatility dynamics of the TSE series, leaving no significant unexplained conditional heteroskedasticity in the residual process. Therefore, the model specification is considered appropriate for subsequent empirical analysis.

Table 10. Test of ARCH Effects in the GARCH (1,1) Model

Heteroskedasticity Test: ARCH			
F-statistic	2.047017	Prob. F (1.2649)	0.1526
Obs*R-Squared	2.046980	Prob. Chi-square (1)	0.1525

Source: Authors' Findings

The diagnostic evidence supports the use of the GARCH(1,1) specification for representing the volatility process of the Tehran Stock Exchange index. As shown by the estimates summarized in Table 8, both components associated with recent innovations and past conditional variance contribute significantly to explaining changes in market volatility. The combined magnitude of these parameters indicates a strong persistence effect, implying that volatility disturbances are not absorbed immediately but continue to influence subsequent periods. Therefore, the estimated model captures the prolonged nature of volatility transmission in the TSE market.

4-7. Descriptive Analysis

Table 11 reports the descriptive statistics of the variables employed in the empirical analysis. The Sharpe Ratio exhibits considerable variability over the sample period, with values ranging from -5.5125 to 4.3634 and a standard deviation of 0.8809 relative to a mean value of 0.1387, indicating substantial fluctuations in risk-adjusted market performance. The positive skewness (0.3371) suggests a mildly right-skewed distribution, implying the presence of occasional higher Sharpe Ratio observations that extend the upper tail of the distribution. Moreover, the kurtosis value of 7.3081 indicates a leptokurtic distribution, characterized by heavier tails and a higher likelihood of extreme observations compared with a normal distribution. In contrast, the EPU indicator demonstrates a relatively stable pattern, with a narrow range between 0.6280 and 0.7820 and a low standard deviation of 0.0467. The positive skewness of EPU (0.9719) indicates a right-skewed distribution, suggesting that episodes of elevated economic policy uncertainty occurred during specific periods. The kurtosis value of EPU (3.1541) is slightly above the normal distribution benchmark, indicating a mildly leptokurtic distribution with slightly heavier tails and a limited occurrence of extreme values. Overall, the descriptive statistics reveal that while economic policy uncertainty remains relatively stable across the sample, risk-adjusted stock market performance exhibits greater dispersion and sensitivity to market conditions.

Table 11. Descriptive Analysis of Research Variables

Statistic	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
SHARPE	0.138742	0.044389	4.363371	-5.51251	0.880869	0.337078	7.308134
EPU	0.67483	0.66745	0.782	0.628	0.046722	0.971855	3.154086

Source: Authors' Findings

4-8. Unit Root Test for the Sharpe Ratio Variable

Prior to estimating the econometric model, the time-series properties of the Sharpe Ratio indicator were evaluated to determine whether the variable satisfies the required stationarity condition. For this purpose, the Levin, Lin, and Chu (LLC) panel-based procedure was applied, with the findings summarized in Table 12. The estimated LLC statistic (-23.6532) and its associated probability value (0.0000) provide strong statistical evidence that the Sharpe Ratio does not exhibit unit-root behavior in its original specification. Therefore, the variable can be incorporated into the subsequent empirical framework without applying additional differencing or transformation procedures.

Table 12. Unit Root Test for the Sharpe Ratio Variable

Method	**Statistic**	**Prob.****
Levin. Lin & Chu t*	-23.6532	0.0000

Source: Authors' Findings

4-9. Testing Model Using the OLS Method

Table 13 summarizes the outcome of the Breusch–Pagan diagnostic applied to the preliminary OLS specification to examine the stability of the error variance. The obtained statistic (19288.57) with a probability value of 0.0000 provides strong evidence that the disturbance variance is not constant across observations. This finding implies that the original OLS framework suffers from an inefficient variance structure, which may affect the reliability of standard errors. Accordingly, the estimation procedure is modified by employing the GLS method, which is more appropriate under the detected variance irregularity.

Table 13. Breusch–Pagan LM Test for Heteroskedasticity in the Disturbance Terms of the OLS Model

Test	**Statistic**	**d.f**	**Prob.**
Breusch-pagan LM	19288.57	16653	0.0000

Source: Authors' Findings

Table 14 presents the Durbin–Watson diagnostic obtained from the preliminary OLS estimation. The reported value of 1.317914 indicates that the residuals may not be completely independent over time, suggesting that the initial OLS specification does not fully account for the dynamic structure of the error term. To improve the efficiency of the estimations and correct for the identified residual dependence, the final specification is subsequently estimated within a GLS framework incorporating an AR(1) adjustment.

Table 14. Autocorrelation of Disturbance Components in the Hypothesis Testing Model Using the OLS Method

Durbin-Watson Stat	1.317914

Source: Authors' Findings

4-10. Results of Fitting the Final Model Using the GLS Method with an AR (1) Variable

Table 15 summarizes the estimates obtained from the GLS framework augmented with an AR(1) correction to investigate the association between EPU and stock market volatility. The estimated coefficient of EPU is -0.345133, with a probability value of 0.0262, suggesting that variations in policy uncertainty are significantly related to movements in the dependent variable. The negative sign of the coefficient implies that changes in EPU are associated with a decline in the measured volatility indicator within the estimated specification. The autoregressive parameter is positive and highly significant (0.375764; p-value = 0.0000), confirming the existence of serial dependence that requires adjustment through an AR(1) process. After accounting for this dynamic component, the model achieves an R-squared value of 0.148916, indicating that the included explanatory factors capture a meaningful proportion of the variation in the dependent variable. The overall validity of the estimated model is supported by the significant F-statistic (143.8267; p-value = 0.0000). In addition, the Durbin–Watson statistic

(1.965912) suggests that the residual series does not exhibit a notable first-order autocorrelation problem after the autoregressive adjustment. These results indicate that the GLS-AR(1) specification provides an appropriate econometric framework for examining the relationship between EPU and stock market volatility.

Table 15. Results of Fitting the Final Model Using the GLS Method with an AR (1) Variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EPU	-0.345133	0.136424	-2.529858	0.0262
C	0.194183	0.093369	2.079743	0.0377
AR (1)	0.375764	0.022257	16.88299	0.0000
Weighted statistics				
R-Squared	0.148916	Mean Dependent Var		0.131812
Adjusted R-Squared	0.147880	S.D Dependent Var		0.869098
S.E. Of Regression	0.804055	Sum Squared RESID		1062.853
F-Statistic	143.8267	Durbin-Watson Stat		1.965912
Prob (F-Statistic)	0.000000			

Source: Authors' Findings

5. Conclusion and recommendation

This study investigated the relationship between EPU and stock market volatility in the Tehran Stock Exchange (TSE) using a comprehensive econometric framework combining volatility modeling and regression analysis. The empirical findings provide evidence that EPU is significantly associated with TSE market dynamics. The preliminary analysis revealed considerable fluctuations in the TSE index, characterized by substantial variation between minimum and maximum values and a high standard deviation, reflecting the volatile nature of the Iranian stock market. The ARCH test confirmed the existence of conditional heteroskedasticity, supporting the application of GARCH-based volatility modeling. The estimated GARCH models further identified significant ARCH and GARCH effects, indicating the presence of volatility clustering and persistence in market fluctuations. These findings suggest that shocks affecting the TSE may generate sustained volatility responses rather than being immediately absorbed by the market.

Regarding the first research question (RQ1), the findings confirm a statistically significant relationship between EPU and stock market volatility in the Tehran Stock Exchange. The GLS estimation incorporating an AR(1) correction indicates that EPU has a negative and statistically significant coefficient (-0.3451, $p = 0.0262$), providing empirical support for H1. This result suggests that increases in economic policy uncertainty are associated with unfavorable changes in market performance by influencing investors' expectations and perceptions of future economic conditions. The AR(1) coefficient is positive and statistically significant (0.3758, $p < 0.001$), indicating moderate first-order positive serial dependence in the error structure and confirming the importance of accounting for temporal dependence in the model specification. Moreover, the significant F-statistic (143.8267, $p < 0.001$) confirms the overall statistical significance of the model, while the Durbin–Watson statistic (1.9659) indicates that no substantial residual autocorrelation remains after applying the AR(1) correction. Therefore, the findings demonstrate that EPU represents an important factor associated with changes in financial market behavior within the TSE.

Regarding the sub-research question (Sub-RQ1), the findings indicate that higher levels of EPU are associated with greater challenges in investment decision-making and market efficiency. The persistence of volatility identified through the GARCH framework suggests that uncertainty-related shocks may continue influencing market conditions over subsequent periods, potentially affecting investors' risk perceptions, portfolio decisions, and responses to new information. Furthermore, the descriptive analysis of the Sharpe Ratio revealed considerable variation in risk-adjusted performance among firms, indicating heterogeneous market responses under uncertain economic conditions. These results provide support for Sub-H1 by demonstrating that elevated policy uncertainty is associated with reduced predictability of investment outcomes and intensified volatility patterns in the TSE. By focusing on an emerging market characterized by frequent policy adjustments and economic uncertainty, these findings extend current knowledge by providing fresh evidence on how policy uncertainty propagates through financial markets and shapes volatility dynamics.

The findings also provide important policy and practical implications. Policymakers should prioritize transparency, consistency, and predictability in economic decision-making processes, as unexpected policy changes may increase uncertainty and negatively influence investor confidence. Improving communication regarding fiscal, monetary, and regulatory policies can reduce uncertainty premiums and enhance market stability. Financial regulators and Tehran Stock Exchange authorities should establish monitoring frameworks for periods of elevated policy uncertainty and strengthen investor protection mechanisms through improved information disclosure, financial education, and risk-awareness programs. Institutional investors and portfolio managers should incorporate economic policy uncertainty indicators into investment strategies and risk management frameworks to better anticipate volatility dynamics. Finally, promoting credible economic governance and stable policy environments can contribute to improving capital market resilience, enhancing investment efficiency, and supporting the long-term development of the TSE.

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Conflicts of interest

The authors declare no conflict of interest.

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Appendix

Table 16. Abbreviation

	Full Term
ADF	Augmented Dickey–Fuller Test
AIC	Akaike Information Criterion
ARCH	Autoregressive Conditional Heteroskedasticity
BIC	Bayesian Information Criterion
DW	Durbin–Watson Statistic
EPU	Economic Policy Uncertainty
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GLS	Generalized Least Squares
HQC	Hannan–Quinn Criterion
LM	Lagrange Multiplier
LLC	Levin–Lin–Chu Unit Root Test
OLS	Ordinary Least Squares
TSE	Tehran Stock Exchange

Source: Authors' Findings