Print ISSN: 2008-448X
Online ISSN: 2538-3310
International Journal of Business and Development Studies
University of Sistan and Baluchestan
Homepage: https://ijbds.usb.ac.ir

Uncertainty in Economic Policies and Stock Price Crash Risk Companies Listed in Tehran Stock Exchange

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ARTICLE INFO

Article type:
Research

Article history
Received: 21.09.2021
Accepted: 16.04.2021

Keywords:
Economic Policy Uncertainty; Stock Price Crash Risk; Exchange Rate; Economic Growth.

JEL Classification:
E61; E65; G11; G12; G18.

Abstract:
The purpose of this study was to examine the effect of uncertainty in economic policy on the stock price crash risk. In this applied descriptive-analytical ex post facto study, the statistical population included the companies listed on the Tehran Stock Exchange. Over a seven-year period, 148 companies are selected using the systematic sampling method (2015–2021). In this study, the negative skewness of return on equity (ROE) and down-to-up volatility were used to assess the stock price crash risk (dependent variable) and uncertainty in economic policy (independent variable). The data was then analyzed using the multivariate regression model. The results of the hypothesis testing indicated that volatility in the interest rate, dollar exchange rate, inflation, and economic growth had a positive significant effect on the stock price crash risk or the negative skewness of ROE and down-to-up volatility. Hence, given the effects of macroeconomic variables on the ROE, in order to achieve economic sustainability, the Government of the Islamic Republic of Iran should pay close attention to the adoption of macroeconomic policies, prevent economic policymakers and planners from implementing hasty unscientific policies, and increase the share of tax revenues from income sources.

Introduction

Financial markets are among the most important markets in every country. The dominant conditions of these markets, which are influenced by a variety of factors, have a significant impact on the real sectors of the economy. Capital markets, also known as the main principle of the financial sector, are in charge of supplying production resources in each country's financial sector. The return on equity (ROE) is a factor that investors consider when making investment

Cite this article: L. Zamani, S. Borzoian Shirvan and A. Zalbigi (2022).Uncertainty in Economic Policies and Stock Price Crash Risk Companies Listed in Tehran Stock Exchange. *International Journal Of Business and Development Studies*, 14 (1), 237-261. DOI: 10.22111/ijbds.2022.7446.

Publisher: University of Sistan and Baluchestan

decisions. In fact, the ROE can be achieved in economic sustainability. The stability of economic policies is an indicator of economic sustainability that is important in every country's economy. Many researchers have analysed the effect of uncertainty in economic policy on asset pricing. Pastor *et al.* (2013) were among the early researchers who believed that the stock price would fall at the time of high volatility in economic policy. They reasoned that increased volatility in economic policy would cause investors to seek additional compensation for holding stock, because uncertainty about companies' future outputs and profitability would rise during periods of high volatility in economic policy. Indeed, if economic policy is uncertain, economic activists will be skeptic about the economy's future developments. As a result, capital owners will no longer be able to make decisions on future investment; furthermore, the money and capital markets will face difficulties (Amiri *et al.*, 2019). Therefore, the stock price falls as volatility increases in economic policy. Consequently, the expected future returns will increase and compensate for the loss of investors who are willing to hold risky assets during the long periods of volatility in economic policies (Naghi Nahr *et al.*, 2020).

In theory, the risk of falling implies that managers are willing to conceal and accumulate bad news for an extended period of time. If managers are successful in keeping negative information out of the stock market, the ROE distribution should be asymmetrical (Hutton *et al.*, 2009). When the accumulation of bad news exceeds a certain threshold, it is immediately disclosed in the market. It will then lead to a negative decline in the stock price. Hence, for the stock price crash risk, this model can produce at least three outcomes: 1) identifying managerial motives for concealing bad news; 2) identifying a special mechanism or a set of mechanisms for identifying these motives and impetus; and 3) providing certain mechanisms that can force managers to detect and disclose bad news at the right time. Nevertheless, researchers in this field face difficulties in pursuing research avenues because managerial motives are unobservable and researchers lack control over many potential mechanisms for concealing bad news. Supposedly, it is critical to adequately analyse these challenges in order to interpret the significance of empirical findings regarding the determinants of the stock price crash risk (Kim *et al.*, 2020). In addition, the research results indicate that the capital market is considered a motive for concealing bad news, something which increases the probability of future falling of prices. Chang *et al.* (2017) used the stock liquidity to demonstrate this motive and confirmed the presence of a positive relationship between the stock price crash risk and the stock liquidity. Their empirical results indicated that effects of the stock liquidity on the risk of future falling of prices are more observable at the companies with higher stocks of transient institutional ownership; however, direct or indirect effects of the stock liquidity on the stock price crash risk are still unclear (through the channels of transient institutional investors). According to Ni and Zhu (2016), eliminating

the short-term sale constraints can increase the stock price crash risk. Using the composite strategy score, Habib and Hasan (2017) concluded that companies would more likely be prone to the stock price crash risk after innovative business strategies. Moreover, the futurists overestimate the stock value, something which increases the risk of future falling stock prices. Ni and Zhu (2016) introduced the factors affecting the ROE as an important factor in investment decisions and stated that different models would be used to analyse those factors. The most important instances of such models are linear models, nonlinear models, artificial neural networks, Fama–French model, generalised autoregressive conditional heteroskedasticity (GARCH) model, and sustainable development model, all of which indicate the applications of qualitative methods and models used in the investment industry. These models are used to help the financial economy grow. In fact, the financial economy is developed further with the concept of portfolio optimisation. Indeed, the concepts of portfolio optimisation and diversification are the principles of financial development and financial decision-making (Rahnamay-e Roudposhti, 2015). Many of the earlier studies support the macroeconomic factors in the ROE determination (Fama, 1981; Rangvid, 2006; Chen *et al.*, 1986; Campbell & Shiller, 1988). Nonetheless, the underlying mechanism that interlinks macroeconomic factors, technological shocks, and ROE are still considered an unsolved theoretical concept (Campbell & Diebold, 2009). According to Prabheesh and Vidya (2018), the high levels of financial integration and business cycle risk, especially global business cycles, can nowadays affect the stock price trend. In this regard, a business cycle can accurately explain the volatility of ROE.

Recent observations of expansionary monetary policies show a variety of effects on businesses, particularly different effects on industries and companies. The increased liquidity makes banks lower their lending standards (Kim & Rescigno, 2017). Although the interest rate in Iran is set by monetary authorities, increased facility rates reduce the interest rate in the official market when this rate is constant, and the decreased interest rate leads to upward trends in demand for stocks and then the increased stock price (Nonejad *et al.*, 2012). In addition, investors are perplexed by high levels of uncertainty in economic policies. The uncertainty in economic policy might also be inconsistent with the uncertainty in policies for domestic economy; in other words, they might change in two opposite directions (Li *et al.*, 2019). In investment policymaking and decision-making, it is necessary to identify how the uncertainty in policies for global economy can affect macroeconomic variables and different markets. The gold, stock, and currency exchange markets are known as important investment options in Iran. A global crisis may erode investor trust, leading to stock sales, stock price changes, and investment reductions (Fang *et al.*, 2018).

Accordingly, this study analyses the effect of uncertainty in economic policy on the stock price crash risk of companies listed in Tehran Stock Exchange The following section reviews the theoretical foundations and research background. After that, the conceptual research model is presented along with the research method, hypotheses, regression equations, variables, data collection tools and techniques, and research findings. Finally, the research discussion and conclusion are presented.

Theoretical Foundations and Research Background

States have played a more active role in the economy since the Financial Crisis of 2008. Although some of their policies and interventions have led to economic development, frequent changes in policies have increased the systematic risk of actual economy and financial markets. Recently, there has been an increase in "uncertainty in economic policies" around the world, and many academics, policymakers, and investors have been drawn to this concept (Jin *et al.*, 2019). Uncertainty in financial policies, monetary policies, and supervisory decisions of policymakers can have considerable outcomes and impacts on the outputs of economic agents (Wu *et al.*, 2020). In relevant studies, the main point is the method of measuring uncertainty in economic policies. Baker *et al.* (2013 & 2016) proposed a feasible method for measuring the index of uncertainty in economic policies. Many theoretical and empirical studies on the effect of uncertainty in economic policies on stocks have been conducted using the index of uncertainty in economic policies. For instance, according to Luo and Zhang (2020), companies caused the stock price crash risk by increasing uncertainty in economic policies. Pastor and Verounisi (2013) realised that uncertainty in economic policies would lead to the "mere risk" and that the stocks would lose stability in case of further uncertainty in economic policies. Chen *et al.* (2017) believed that the mechanism that affected the stock price through uncertainty in economic policies was the expectation of investors. In fact, investors are uncertain about the timing, content, and potential consequences of political decisions, and changes in expectations will have an impact on the stock price. If investors have different expectations and are constrained by short-term sales, negative opinions will not be fully reflected in the stock price. The stock price plummets when the hidden bad news reaches a maximum and is then released suddenly (Jin *et al.*, 2019). Nevertheless, a small group of researchers investigates how uncertainty in economic policies affects the stock price crash risk, which is an important feature of the ROE distribution that measures risk asymmetry. Concerning the specific decline risk of businesses, the accepted explanation is that managers are motivated to avoid disclosing bad news to their investors; thus, managers respond to this uncertainty by increasing their optional disclosure (Nagar *et al.*, 2019). The stock price falls as a result of the unexpected release of bad news that has been accumulating for a long time. In different businesses, many of the managerial features and outputs such as ambiguity in

financial reporting (Jin & Meyers, 2006; Hutton *et al.*, 2009), maintenance of credit (Ball, 2009), tax avoidance of companies (Kim *et al.*, 2011), and accounting conservatism (Kim & Zhang, 2016) as well as special events in the industry and specific news such as predictions of unspecific sales, rumors regarding the separation of qualified CEOs, and change of management affect the stock price crash risk. According to the literature, the social responsibilities of companies (Kim *et al.*, 2011) and social trust (Li *et al.*, 2017) affect the decline risk. Nonetheless, many of these studies have focused on factors at the company level, while a few have looked at the macro picture. Some studies are now reviewed with regard to the research question pertaining to the effect of uncertainty in economic policies on the stock price crash risk.

Luo and Zhang (2020) analysed the relationship between economic policy uncertainty and the stock price crash risk. According to their findings, companies' stock prices are likely to fall when there is the economic policy uncertainty. Moreover, further cross-sectional analyses show that economic policy uncertainty increases the stock price crash risk at companies with a higher ROE than a more important economic policy uncertainty. In particular, newer (younger) stocks, small-scale stocks, highly volatile stocks, and growth stocks that naturally have higher levels of uncertainty are more sensitive to the economic policy uncertainty. When it comes to the stock price crash risk, these stocks are more impacted by economic policy uncertainty. In " Economic policy uncertainty and stock price crash risk ", Jin *et al.* (2019) reported the positive effect of economic policy uncertainty on the stock price crash risk at public companies. In addition, this effect is more pronounced in companies with higher information asymmetry and in companies with more divided investors. Economic policy uncertainty can also affect the stock market through two mechanisms, *i.e.*, concealing bad news by managers and heterogeneous beliefs of investors.

Chiang (2019) analysed the uncertainty of economic policies, risk, and ROE. According to their findings, intervals of uncertainty in economic policies have a positive effect on the variance of stock price prediction. In "Effect of Uncertainty in Economic Policies on ROE of Tourism Companies in Turkey", Demir and Ersan (2018) indicated that the ROE depended apparently on the uncertainty in domestic and international economic status at tourism companies in Turkey. The index of consumer confidence was the only macroeconomic variable that had an impact on the stock market. Duan *et al.* (2018) analysed the leverage effect and the uncertainty economic policies on the market fluctuations by using the Markov switching model. According to their findings, uncertainty prediction models of economic policies and the leverage effect outperformed GARCH models. In "Analysing the Effect of Risk on Uncertainty in Economic Policies at Companies Listed in Tehran Stock Exchange", Kahzadi Tahneh (2019) reported that risk had a direct effect on the lack of uncertainty in economic policies at TSE-listed

companies. Aminian *et al.* (2018) analysed the asymmetric effects of oil price shocks and uncertainty in economic policies on the ROEs of industries in different market conditions. According to their results, the coefficients of oil shocks for severe recession, recession, and normal periods had negative significant effects on the ROEs of industries. These oil shocks, however, are insignificant in prosperous and more prosperous periods. Furthermore, the coefficient of uncertainty in economic policies during the severe recession period had no significant effect on industry ROEs; however, the coefficients of uncertainty in economic policies for recession, normal, prosperous, and more prosperous periods had negative significant effects on the ROEs of industries. According to the findings of the study, oil shocks had asymmetric effects on the ROEs of industries in different market conditions (severe recession, recession, normal, prosperous, and more prosperous). In "Analysing the Effect of Uncertainty in Economic Policies on Total Index of Tehran Stock Exchange and Dollar Exchange Rate in Iran", Khamesi (2018) reported that the data of uncertainty in economic policies had inverse relationships with different intervals. In fact, the data of this variable had inverse negative effects on the TSE index. There was also a direct relationship between the uncertainty in economic policies and the dollar exchange rate. The lower the uncertainty in economic policies, the lower the dollar exchange rate. Asadi Asadabadi *et al.* (2020) analysed the effect of uncertainty in economic policies on the stock price crash risk and the CEO power. They stated that monetary, financial, and supervisory policies, as well as taxation and the environment in which businesses operate, shape economic policies. According to their research findings, uncertainty in economic policies had positive significant effects on the stock price crash risk at TSE-listed companies. Moreover, uncertainty in economic policies and the stock price crash risk had negative significant effects on the CEO power of TSE-listed companies.

Given the findings of relevant studies, it is expected that uncertainty in economic policies will be positively related to the stock price crash risk, because managers' incentives and abilities to prevent bad news, which is an important determinant of the stock price crash risk, are both enhanced during periods of high uncertainty in economic policies. In fact, increased volatility in company revenues and cash flow, as a result of managers' increased willingness to distort financial information in order to smooth profit or reduce short-term performance profit, causes high levels of uncertainty in economic policies. However, it is impossible to predict these variables without accurate information about the state's decisions on the aforementioned issues. Unpredictable economic factors include oil price fluctuations caused by the Energy Revolution in the United States as a result of technological advancements in the oil and gas industries. There are also unpredictable political factors, such as reaching an international agreement (or disagreement) on Iran's nuclear program, which can increase or decrease the risks

of economic activity in Iran, as well as the stock price crash risk for TSE-listed companies. Based on the reviewed theoretical and empirical foundations, this study aims to answer the following questions: Is the stock price crash risk at TSE-listed companies affected by economic policy uncertainty? What positive and negative consequences will these companies face if there are significant effects? Fig. 1 depicts the conceptual research model.

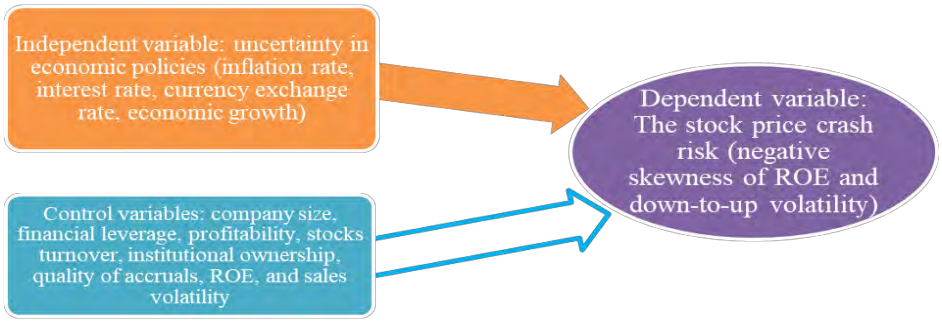

Figure 1. The conceptual research model

Research Method

This is an applied descriptive-analytical study with a focus on correlations, as it examines the status quo and determines the relationships of various variables using regression analyses. This study is classified as inductive research on accounting and actual data of company financial statements because it used a semi-experimental ex post facto study. The multivariate regression analysis was employed to test the research hypotheses with respect to the nature of research data based on actual quantitative information from the past. The next section presents the research hypotheses, defines research variables, and introduces data collection tools and methods.

Research Hypotheses

According to the results of relevant studies on the effect of uncertainty in economic policies in the stock price crash risk (*e.g.*, Luo & Zhang, 2020), uncertainty in economic policies can potentially affect the stock price at companies. Moreover, uncertainty in economic policies can have an impact on managers' motivations and abilities to control bad news. Companies face higher levels of uncertainty and volatility in their future revenues and cash flows during periods of high distrust in the economy. At the same time, higher levels of economic uncertainty are expected to have a negative impact on company output in the short run. Hence, managers will be more motivated to manipulate profit in order to smooth the corporate performance and reduce pressures in short-term periods. Therefore, when economic uncertainty is high, investors face greater levels of uncertainty and information asymmetry. In "The Effect of Uncertainty

in Economic Policies on Investor Information Management", Nagar *et al.* (2019) concluded that the uncertainty about the economic policies of a state would increase demand for information disclosure. Managers respond to this uncertainty by increasing optional disclosure; however, this disclosure only has a limited impact on demand. As a result, uncertainty in state economic policies is regarded as an important component of corporate information environments and managers' optional disclosure decisions. Thus, managers will be more capable of concealing bad news and manipulating revenues as their motivations and abilities to accumulate bad news improve. Therefore, it is expected that uncertainty in economic policies will have a significant relationship with the stock price crash risk according the theoretical foundations and empirical results reported by different researchers such as Baker and Vergler (2006; 2007), Białkowski *et al.* (2008), Pastor and Verounisi (2012), Çolak *et al.* (2017), Chen *et al.* (2017), Nagar *et al.* (2019), and Luo and Zhang (2020). To achieve the research objectives, the following hypotheses were developed.

First Hypothesis: Uncertainty in economic policies has a significant effect on the stock price crash risk (negative skewness of ROE).

Second Hypothesis: Uncertainty in economic policies has a significant effect on the stock price crash risk (down-to-up volatility).

Regression Equations

The negative skewness of ROE and down-to-up volatility were employed in this study to test the research hypotheses and measure the stock price crash risk(*i.e.*, dependent variable). Each of these criteria was used separately to test each hypothesis. The following regression equations were developed to test the research hypotheses based on research goals as well as dependent, independent, and control variables.

Regression Equation of the First Hypothesis:

$$NCSKEW_{it}= \beta_0+ \beta_1 EPUit+ \beta_2 SIZE_{it-1}+ \beta_3 LEVT_{it-1}+ \beta_4 ROA_{it-1}+ \beta_5 BMI_{it-1}+ \beta_6 RET_{it-1}+ \beta_7 IO_{it-1}+ \beta_8 DTURN_{it-1}+ \beta_9 ABACC_{it-1}+ \beta_{10} SIGMA_{it-1}+ \varepsilon_{it0} \quad \text{Equation (1)}$$

Regression Equation of the Second Hypothesis:

$$DUVOL_{it}= \beta_0+ \beta_1 EPUit+ \beta_1 SIZE_{it-1}+ \beta_3 LEVT_{it-1}+ \beta_4 ROA_{it-1}+ \beta_5 BMI_{it-1}+ \beta_6 RET_{it-1}+ \beta_7 IO_{it-1}+ \beta_8 DTURN_{it-1}+ \beta_9 ABACC_{it-1}+ \beta_{10} SIGMA_{it-1}+ \varepsilon_{it0} \quad \text{Equation (2)}$$

In the above equations:

$NCSKEW_{it}$: The negative skewness of ROE

EPU_{it}: The uncertainty in economic policies

ROA_{it-1}: The return on assets of the company

RET_{it-1}: The return on equity

IO_{it-1}: The institutional ownership

$DTURN_{it-1}$: The stocks turnover heterogeneity

$SIGMA_{it-1}$: The stocks volatility

$DUVOL_{it}$: The down-to-up volatility

$LEVT_{it-1}$: The financial leverage

BMI_{it-1}: The ratio of book value to market value
$SIZE_{it-1}$: The company size
$ABACC_{it-1}$: The quality of accruals
ε_{it}: The equation error level

Research Variables

The following sections define the dependent, independent, and control variables separately using the regression equations introduced to test the hypotheses.

Uncertainty in Economic Policies (Independent Variable)

During the research period, the GARCH model was used to assess the level of uncertainty in economic policies. For this purpose, the unit root was first calculated for inflation rate, interest rate, dollar exchange rate, and economic growth. After that, the volatility of each variable was modelled. Higher levels of volatility indicated the increased uncertainty in economic policies. This value was calculated on a yearly basis, and the variable's median was used to determine the principle of uncertainty in economic policies. In other words, if the rate of uncertainty exceeded the median of observations in economic policies of every year, the value was considered one; otherwise, it was considered zero (Adeli & Fereydooni, 2018). In fact, this variable was a virtual two-sided variable which was considered one in case of uncertainty and zero otherwise.

The Stock Price Crash Risk (Dependent Variable)

In this study, the stock price crash risk was considered the dependent variable. According to Luo and Zhang (2020), the stock price crash risk was measured by using the negative skewness of ROE and the down-to-up volatility (Equation 3). The first criterion (*i.e.*, the stock price crash risk) was estimated through the developed market model by using the monthly return based on Equations (4) and (5) (Luo & Zhang, 2020).

$$R_{it}=a_j+ \beta_{1i} R_{mt-2}+ \beta_{2i}R_{mt-1}+ \beta_{3i}R_{mt}+ \beta_{4i}R_{mt+1}+ \beta_{5i}R_{mt+2} + \varepsilon_{it0} \quad \text{Equation (3)}$$

Where R_{it} and R_{mt} denote the specific monthly return and the weighted mean return on all equity on the market, respectively. Furthermore, W_{it} indicates the base on the specific monthly return obtained from the logarithm plus a standard regression error (ε_{it}) and calculated through Equation (4) (Luo & Zhang, 2020).

$$W_{it} = Ln (1+ \varepsilon_{it}) \quad \text{Equation (4)}$$

The estimated multivariate regression and the standard regression error in Equation (4) are then utilised to calculate the specific monthly return. Finally, the following equation was employed to calculate the stock price crash risk through the negative skewness of ROE (Luo & Zhang, 2020).

$$NCSKEW_{it} = -\left[n(n-1)^{3/2}\sum w_{it}\right]/\left[(n-1)(n-2)(w_{it})^{3/2}\right] \quad \text{Equation (5)}$$

Where:

$NCSKEW_{it}$: The negative skewness of monthly return on the stocks of company *i* during the fiscal year *t*
W_{it}: The specific monthly return of company *i* in month *t*

n: The number of months for which the ROE was calculated
In this model, the higher the negative coefficient of skewness, the greater the stock price crash risk for the company.

Second Criterion: Down-to-Low Volatility

The net returns of companies (W_{it}) are first calculated through Equation (4), and the relevant data were divided into two classes: below the mean and above the mean. After that, the standard deviation of each was calculated separately. Finally, the following equation was employed to calculate the second criterion (*i.e.*, down-to-up volatility) (Luo & Zhang, 2020).

$$(DUVOL_{it}) = Log\{\frac{(n_u - 1)\sum_{DOWN}\boldsymbol{R^2_{it}}}{(n_d - 1)\sum_{up}R^2{}_{it}}\}$$

Equation (6)

High values of DUVOL indicate higher stock price crash risk. In this equation, DOWN denotes the standard of observations below the mean for specific monthly returns, whereas UP indicates the standard deviation of observations above the mean for specific monthly returns. Moreover, n_u refers to the number of months in which the ROE is above the mean, whereas n_d represents the number of months where the ROE was below the mean.

Control Variables

A few control variables were identified, selected, and defined in this study in relation to the empirical and theoretical results reported by Luo and Zhang (2020).

Company Size: This variable is defined as the logarithm of market equity or the ratio of book value to market value of equity.

Financial Leverage: The total debts divided by total assets

Profitability: The ratio of net profit to total assets

Stocks Turnover: This variable was calculated through the difference between the mean of monthly trade of stocks in the current year and mean of monthly trade of stocks in the previous year. Furthermore, the monthly trade of stocks was obtained from the division of stocks exchanged in each month by the number of turnover stock in that month.

Institutional Ownership: This parameter was defined as the held percentage of stocks from state-run and public companies such as insurances, banks, financial institutes, pension funds, investment funds, investment companies, capital supply investment, public companies, and other state-run and public organisations and institutions.

Quality of Accruals: The model proposed by Kothari *et al.* (2009) was adopted to measure the quality of accruals.

Return on Equity: This variable was calculated by measuring the mean of specific monthly return on equity over the past months.

Sales Volatility: This variable was calculated by measuring the standard deviation of monthly return on equity during a fiscal year of interest.

Statistical Population and Sample

This study's statistical population included all companies listed on the Tehran Stock Exchange within a seven-year period from 2015 to 2021. The TSE-listed companies were selected because their data and financial statements were easily accessible in comparison to other operating companies in Iran. Given the ongoing supervision of auditors and inspectors, the data of TSE-listed companies are more reliable, credible, and transparent than those of the other companies. Based on the following conditions and considerations, the systematic sampling method was employed to select 148 companies (1036 year-company) as the research sample from the statistical population:

- They must be among production companies.
- Their financial data must be accessible.
- To increase their comparability, their fiscal years must end on March 29.
- They must not have any fiscal year changes during the research period (2015–2021).
- They must not be among financial companies (*e.g.*, banks and financial institutes), investment companies, and financial broker companies.

Data Collection Tools and Methods

In this study, the theoretical foundations and empirical background were prepared by using credible websites, books, academic research articles in both Persian and English, and dissertations. Since the accounting items recorded on the audited financial statements of companies are included in the data of research variables, the necessary data were manually extracted from the financial statements available on the websites affiliated with the Securities and Stocks Exchange Organisation such as codal.ir, comprehensive information systems of publishers, Financial Information Processing of Iran, and the CDs provided by Securities and Stocks Exchange Organisation. The values of variables were calculated separately after sufficient data and information were extracted and collected from the companies. The findings were then analysed and the research hypotheses were tested using Microsoft Excel (for data collection) and EViews.

Descriptive Findings

Measures of central tendency and dispersion indices of descriptive statistics were used to analyse the general characteristics of variables accurately. Table (1) was then developed using data from the research sample, which included 148 companies over a seven-year period (2015–2021).

Table (1). Descriptive statistics of research variables

Variable	Mean	Median	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis
Company Size	14.227	14.038	19.940	10.616	1.495	0.784	4.009
Financial Leverage	0.571	0.583	2.077	0.012	0.219	0.314	5.230
Profitability	0.117	0.096	0.638	-0.404	0.143	0.702	4.452
Book Value to Market Value	0.676	0.675	2.041	0.004	0.224	0.354	4.672
Return on Equity	0.001	-0.001	0.364	-0.170	0.028	5.439	70.223
Institutional Ownership	0.701	0.741	0.998	0.110	0.183	-0.999	3.564
Stocks Turnover	0.852	0.218	10.998	-0.987	1.931	2.487	10.133
Quality of Accruals	0.290	0.227	0.844	0.001	0.210	0.681	2.473
Sales Volatility	0.018	0.001	0.644	6.800	0.051	5.044	39.381
First Criterion for the stock price crash risk	-0.801	-0.889	3.435	-3.450	1.208	0.354	3.079
Second Criterion for the stock price crash risk	-0.281	-0.277	2.062	-1.611	0.428	0.343	4.603

Following the development of the model in terms of economic volatility, the fourfold macroeconomic variables (*i.e.*, economic growth, inflation, banking interest rate, and dollar exchange rate) were used for hypothesis testing. The measures of central tendency and dispersion indices for each of the macroeconomic variables are shown in Table (2). The highest rate of growth was in 2016, when the GDP increased by nearly 12.9% at constant prices. Moreover, the highest inflation rate was reported in 2019, at more than 41.2%.

Table (2). Descriptive statistics of macroeconomic variables

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Economic Growth Percentage	7	1.6	0.066	-6.7	12.9
Inflation Rate (%)	7	21.9	3.4	9	41.20
Dollar Exchange Rate (Market – toman)	7	7035	5731	3425	15757
Banking Interest Rate (%)	7	19.4	1.5	18	22

Data Analysis and Hypothesis Testing

Before estimating regression models for hypothesis testing, the pre-tests of data normality, variable stationarity, F-Limer, Hausman, and variance inconsistency must be estimated in EViews using the data and variables. Every test is described and analysed separately to execute the econometric models in the order of application and priority.

Normality Test of Dependent Variables

The first step in hypothesis testing is to analyse the normality of data. Data normality was ensured using the Jarque–Bera test. Table (3) reports the results. Both variables had no normal distribution as their significance values were below the test's significance level (0.05). In this section, Johnson transformation (a data normalization method in EViews) was used for the normalisation of variables.

Table (3). The normality test of dependent variables

Variable	Statistic Value	Significance Level	Result
Negative Skewness of ROE	21.99617	0.000017	Not Normal
Down-to-Up Volatility	131.3844	0.00000	Not Normal

Stationarity Test of Variables

The Hadri test was used in this study to determine the stationarity of variables. For a variable to be stationary, the significance level of the test statistic should be below 0.05. Since the significance level for some of the control variables in this study was greater than 0.05, the variables were not stationary. This issue was solved by using a differentiation process on nonstationary control variables. Table (4) summarizes the findings from the analysis of the research model's stationary variables.

Table (4). The Stationarity (Hadri) test of research variables

Variable	Test Statistic	Significance	Result
Company Size	19.662	0.000	Stationary
Financial Leverage	15.899	0.000	Stationary
Profitability	10.146	0.000	Stationary
Book Value to Market Value	13.782	0.000	Stationary
Return on Equity	12.529	0.000	Stationary
Institutional Ownership	17.831	0.000	Stationary
Stocks Turnover	12.908	0.000	Stationary
Quality of Accruals	10.744	0.000	Stationary
Sales Volatility	13.778	0.000	Stationary
Negative Skewness of ROE	12.628	0.000	Stationary
Down-to-Up Volatility	11.950	0.000	Stationary

F-Limer (Chow) Test and Hausman Test

Since the research data were gathered from panels (time series and cross-sectional), F-Limer (Chow) and Hausman tests were used to determine the type of data. The results of these tests are shown in Tables 5 and 6. Since the F-Limer test or the Chow statistic had a significance level of less than 0.05, the panel data were selected.

Table (5). The results of F-Limer test (selecting pool or panel data)

Model	Test Statistic	Significance Level	Result
First Model	2.539	0.000	Panel
Second Model	2.429	0.000	Panel

After the F-Limer test results indicated that panel data should be used, the Hausman test was performed, which can be used as a guideline to determine whether to use a random effect model or a fixed effect model. The resultant probability was less than 5%, according to the Hausman test results in Table (6). Hence, in the relevant regression models, the fixed effect model should be used.

Table (6). The results of the Hausman test (selecting between fixed effects and random effects)

Model	Test Statistic	Significance Level	Result
First Model	54.202	0.000	Fixed Effects
Second Model	64.203	0.000	Fixed Effects

Variance Inconsistency Test

In the linear regression model, a hypothesis is the presence of variance consistency in the residual expressions. However, in the time series data and the cross-sectional data, the variance of residual sentences might not be fixed and might follow the delayed values. In this case, the residual expressions face the problem of variance inconsistency; thus, despite being unbiased, the regression estimators will be inefficient.

According to the results of the Breusch–Pagan–Godfrey test on Table (7), there was variance inconsistency in the residual expressions (at the significance level of below 5%) in both regression models. This issue was addressed in the final estimation of models by weighting data using the generalized least squares method (GLS).

Table (7). The results of variance inconsistency test (Breusch–Pagan–Godfery)

Research Models	Test Statistic	Significance Level	Result
First Model	3.867	0.000	Inconsistency of Variance
Second Model	2.307	0.005	Inconsistency of Variance

Serial Autoregression Test

In this study, the Breusch–Godfrey test was conducted to test the serial autoregression. The results of this test are shown in Table (8). According to the findings, the Breusch–Godfrey test significance level was less than 5%, indicating the presence of serial autoregression. The first-order auto-regression command in EViews was used to solve this problem.

Table (8). The results of the serial autoregression test (Breusch–Godfrey)

Research Models	Test Statistic	Significance Level	Result
First Model	13.124	0.000	Serial Autocorrelation
Second Model	10.372	0.000	Serial Autocorrelation

Collinearity Test

For the collinearity test, the variance inflation factor (VIF) was used. This factor examines and assesses the severity of multiple collinearity. In fact, the severity of multiple collinearity can be used to calculate the magnitude of VIF. If the VIF test statistic is close to 1, it indicates the absence of collinearity. If the VIF is greater than 10, multiple collinearity is high, according to empirical principles

(Souri, 2015). VIF values were less than 10 for nearly all independent and control variables in both regression models, indicating the absence of collinearity. The results of this test are shown in Table (9).

Table (9). The collinearity Test

Variable	Variance Inflation Factor (VIF)
Interest Rate Volatility	3.317
Dollar Exchange Rate Volatility	1.680
Economic Growth Volatility	3.098
Inflation Rate Volatility	1.671
Company Size	1.367
Financial Leverage	1.768
Profitability	2.312
Book Value to Market Value	1.345
Return on Equity	1.039
Institutional Ownership	1.138
Stocks Turnover	1.096
Quality of Accruals	1.058
Sales Volatility	1.194

Hypothesis Testing

To test the first research hypothesis, Regression Equation (1) was devised and implemented. The results of estimating the model parameters are shown in Table (10). The results showed that inflation volatility, dollar exchange rate volatility, and interest rate volatility (except for economic growth, which had a significance level of 0.0588 and a 94% absence of a significant relationship) all had positive coefficients with a significance level less than 5%. Hence, H_0 was rejected, whereas H_1 was confirmed. In other words, uncertainty and distrust in economic policies had positive significant effects on the stock price crash risk (the negative skewness of ROE) at the confidence level of 95%. In fact, increasing one unit in inflation volatility, interest rate volatility, and dollar exchange rate volatility increased the stock price crash risk by 0.125, 0.132, and 0.124 units, respectively, which was evaluated through the negative skewness of ROE in this case. The Durbin–Watson statistic was obtained 2.056 after estimation of coefficients. Since it is between 1.5 and 2.5, it means the absence of consecutive correlation in the disturbance component. As a result, there was no serial autoregression in the model estimation. The adjusted coefficient of determination was estimated at 74%, which indicates that independent and control variables explained nearly 74% of changes in dependent variables.

Table (10). Estimating the parameters of the first regression model

$NCSKEW_{it}= \beta_0+ \beta_1 EPUit+ \beta_2 SIZE_{it-1}+ \beta_3 LEVT_{it-1}+ \beta_4 ROA_{it-1}+ \beta_5 BMI_{it-1}+ \beta_6 RET_{it-1}+ \beta_7 IO_{it-1}+ \beta_8 DTURN_{it-1}+ \beta_9 ABACC_{it-1}+ \beta_{10} SIGMA_{it-1}+ \varepsilon_{it0}$ Equation (1)

Variables	Abbreviation	Coefficient	SD of Coefficient	*t* statistic	Significance Level
Interest rate volatility	EPU(INT)	0.132	0.027	4.817	0.000
Dollar exchange rate volatility	EPU(EXC)	0.124	0.013	9.277	0.0241
Economic growth volatility	EPU(GDP)	0.006	0.011	5.41	0.0588
Inflation rate volatility	EPU(Inf)	0.125	0.039	3.167	0.001
Company Size	SIZE	0.267	0.076	3.507	0.000
Financial Leverage	LEVT	0.500	0.395	1.263	0.206
Profitability	ROA	5.386	0.398	13.531	0.000
Book Value to Market Value	BMI	0.792	0.258	3.063	0.002
Return on equity	RET	-0.107	1.937	-0.055	0.955
Institutional ownership	IO	0.214	0.244	0.878	0.380
Stocks turnover	DTURN	-0.014	0.002	-6.619	0.000
Quality of accruals	ABACC	0.298	0.083	3.550	0.000
Sales volatility	SIGMA	1.400	0.769	1.820	0.069
Constant	β_0	-5.508	1.417	-3.884	0.000
Adjusted coefficient of determination	R^2	0.74	Durbin–Watson	2.056	
Fisher Statistic		17.029		0.000	

To test the first research hypothesis, Regression Equation (2) was developed and implemented. The results of estimating the model parameters are shown in Table (11). According to the findings, the volatility of macroeconomic variables (inflation rate, dollar exchange rate, interest rate, and economic growth) had positive coefficients and a significance level of less than 5%. Hence, uncertainty and distrust in economic policies had direct significant effects on the stock price crash risk (down-to-up volatility). In fact, increasing one unit in interest rate volatility, dollar exchange rate volatility, economic growth volatility, and inflation rate volatility increased stock price crash risk by 0.109, 0.050, 0.058, and 0.118 units, respectively, which was evaluated through the down-to-up volatility in this case. The Fisher statistic had a significance level of below 5%; thus, the fitted model had sufficient credibility. The Durbin–Watson statistic was reported 2.074 after the estimation of coefficient, something which means the absence of consecutive correlation in the disturbance component. As a result, there was no evidence of serial autoregression in the model. The adjusted determination of coefficient was obtained 77%, which indicated that the independent and control variables managed to explain 77% of changes in the dependent variable.

Table (11). Estimating the parameters of the second regression model

$DUVOL_{it}= \beta_0+ \beta_1 EPUit+ \beta_2 SIZE_{it-1}+ \beta_3 LEVT_{it-1}+ \beta_4 ROA_{it-1}+ \beta_5 BMI_{it-1}+ \beta_6 RET_{it-1}+ \beta_7 IO_{it-1}+ \beta_8 DTURN_{it-1}+ \beta_9 ABACC_{it-1}+ \beta_{10} SIGMA_{it-1}+ \varepsilon_{it0}$ Equation (2)					
Variables	**Abbreviation**	**Coefficient**	**SD of Coefficient**	***t* statistic**	**Significance Level**
Interest rate volatility	EPU(INT)	0.109	0.026	4.112	0.0123
Dollar exchange rate volatility	EPU(EXC)	0.050	0.012	4.063	0.032
Economic growth volatility	EPU(GDP)	0.058	0.013	4.185	0.045
Inflation rate volatility	EPU(Inf)	0.118	0.029	3.719	0.000
Company Size	SIZE	0.041	0.077	0.533	0.593
Financial Leverage	LEVT	0.300	0.332	0.903	0.366
Profitability	ROA	2.269	0.143	15.764	0.000
Book Value to Market Value	BMI	-0.485	0.168	-2.891	0.003
Return on equity	RET	0.043	1.871	0.023	0.981
Institutional ownership	IO	0.052	0.230	0.226	0.820
Stocks turnover	DTURN	0.23	0.005	4.377	0.000
Quality of accruals	ABACC	-0.330	0.097	-3.400	0.000
Sales volatility	SIGMA	-0.908	0.415	-2.186	0.029
Constant	β_0	-0.653	1.243	-0.525	0.599
Adjusted coefficient of determination	R^2	0.773	Durbin–Watson	2.074	
Fisher Statistic		19.822		0.000	

Discussion and Conclusion

The purpose of this study was to examine the effect of uncertainty in economic policy on the stock price crash risk of companies listed in Tehran Stock Exchange over a seven-year period (2015–2021). Uncertainty in economic policies was introduced and used as an independent variable based on distrust and volatility in four macroeconomic variables known as the inflation rate, interest rate, dollar exchange rate, and economic growth. The stock price crash risk was measured and introduced using the negative skewness of ROE and down-to-up volatility. In general, the results of testing the research hypotheses revealed a positive significant relationship between economic policy uncertainty and the stock price crash risk. Distrust in macroeconomic policies is a major determinant of financial markets, particularly the stock market. According to the study's findings, each factor of uncertainty in economic policies had a direct and significant effect on the stock price crash risk. In other words, growing instability about interest rates, dollar exchange rate, economic growth, and the inflation increased the stock price crash risk. The results of this study are consistent with the findings of Asadi Asadabadi et al. (2020), Luo and Zhang (2020), and Jin *et al.* (2019) as a result of the hypothesis based on the positive significant effect of uncertainty in economic policy on the stock price crash risk. The results of this study are also consistent with the findings reported by Khamesi (2018), Zomorodian *et al.* (2015), Abbasian *et al.* (2008), Demir and Ersan (2018), and Dimic *et al.* (2016), who analysed the effect of uncertainty in economic policies

on the total stock index and concluded that uncertainty in economic policies had negative significant effects on the total stock index.

According to the findings of the first research hypothesis, uncertainty in economic policy had a direct and significant effect on the negative skewness of ROE (the stock price crash risk). In other words, increasing each factor of uncertainty increased the negative skewness of ROE. According to the study's findings, companies with higher returns than uncertainty in economic policies are more affected by such uncertainty in terms of the stock price crash risk. The reason for this is that such stocks will face increased uncertainty in economic policies and a sharp drop in price. The results of this study are consistent with the findings reported by Salem Dezfouli *et al.* (2019), Luo and Zhang (2020), Jin *et al.* (2019), Nagar *et al.* (2019), Harper *et al.* (2020), and Dai *et al.* (2021) in terms of the result of the hypothesis stating the positive significant effect of uncertainty in economic policies on the negative skewness of ROE (the stock price crash risk).

According to the findings of the second research hypothesis, there was a positive significant relationship between economic policy uncertainty and down-to-up volatility (the stock price crash risk). Based on the findings of this hypothesis, the companies that are more affected by uncertainty in economic policies should be the ones that are naturally characterized by higher levels of valuation uncertainty. Uncertainty in company valuation can be inferred from various company characteristics such as company age, size, volatility, and growth, which adds the uncertainty of economic policies to market volatility. Economic uncertainty influences decline risk not only in individual stocks but also in the overall market. The results of this study were consistent with the findings of Phan *et al.* (2018) in terms of the results of the hypothesis based on the effect of uncertainty in economic policies on the down-to-up volatility (the stock price crash risk). Moreover, the results of the second hypothesis are consistent with the findings of Asadi Asadabadi *et al.* (2020) and Chiang (2020), who stated the inverse relationship between changes of uncertainty and ROE. However, the results are different from the findings of Khani and Mohammadipour (2015), who indicated that inflation rate and interest rate had significant relationships with the stock price crash risk; however, they did not report any significant relationships between the currency exchange rate and the stock price crash risk. Furthermore, Arbabian and Soltaninejad (2012) found that high or low levels of uncertainty had no effect on stock reactions to bad news during business boom periods.

According to the research findings, in order to make future stock market predictions, it is necessary to consider the behaviours of macro variables. Policymakers are recommended to always prevent the volatility of macroeconomic variables in order to improve the stock market so that investors (especially foreign investors) will be attracted to the market. It is recommended that the government pay close attention to policy formulation, particularly

macroeconomic policy, and avoid hasty unscientific policies. Due to the slow rate of moderation in the preceding model, such policies can have long-term negative and irreversible consequences in the securities exchange. Moreover, the government should seek to replace oil revenues with other sources of income in order to mitigate the effects of the recession and the effects of oil revenues on the capital market. Increasing the share of taxes and decreasing the share of oil revenues from governmental incomes can be viewed as an appropriate strategy for achieving economic sustainability and reducing the Tehran Stock Exchange's reliance on oil revenues. The Ministry of Economic Affairs and Finance plays a key role in regulating and redirecting the activities of the monetary market in addition to coordinating the monetary policies with the macroeconomic policies in the Government of Islamic Republic of Iran. This organ can develop effective monetary policies to coordinate monetary flows with actual flows in order to achieve national economic sustainability, make the national banking system efficient, and provide the necessary ground for the implementation of monetary policies. Economic sanctions are currently considered among the important factors of economic uncertainty due to the severity of economic sanctions on Iran's economy and the ever-increasing political risk resulting in the increased systematic risk of the capital market. Hence, given the impact of this phenomenon on the ROE, researchers are advised to conduct additional research on the effects of economic sanctions as a major source of uncertainty in the capital market. It is also suggested that they investigate the mutual effects of volatility in domestic and foreign economic policies, as well as other macroeconomic variables in Iran, such as economic growth and inflation. Finally, it is suggested that the effect of uncertainty in economic policies be examined in relation to the relationship between the rate of unemployment and the stock price crash risk.

Acknowledgments

I would like to express its gratitude to all the individuals who are associated, directly or indirectly, to this paper. Similarly, special thanks go to Mr. Samad Borzoian Shirvan for his contribution in terms of technical support for data analysis and finalization of this paper.

Data availability

Data used in this paper are available from public sources identified in the study.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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عدم قطعیت در سیاست های اقتصادی و ریسک سقوط قیمت سهام شرکت های پذیرفته شده در بورس اوراق بهادار تهران

چکیده:

هدف پژوهش حاضر بررسی تاثیر عدم قطعیت در سیاست‌های اقتصادی بر ریسک سقوط قیمت سهام بوده است. این پژوهش از نظر ماهیت و روش، توصیفی-تحلیلی از نوع پس رویدادی و از نظر هدف، پژوهش کاربردی است. جامعه آماری این پژوهش شامل شرکت‌های پذیرفته شده در بورس اوراق بهادار تهران می‌باشد که به روش حذف سیستماتیک تعداد 148 شرکت در دوره زمانی هفت ساله (1400-1394) به عنوان نمونه انتخاب شده‌اند. در این پژوهش، از دو معیار ضریب چولگی منفی بازده سهام و نوسان پایین به بالا برای اندازه‌گیری ریسک سقوط قیمت سهام (متغیر وابسته) و عدم قطعیت در سیاست‌های اقتصادی (متغیر مستقل) استفاده شده است.جهت تجزیه وتحلیل داده ها مدل رگرسیون چند متغیره بکارگرفته شده است. نتایج حاصل از آزمون فرضیه‌ها نشان داد بی ثباتی در نرخ بهره، نرخ دلار، نرخ تورم و نرخ رشد اقتصادی تاثیر مثبت و معنی-داری بر ریسک سقوط قیمت سهام یا ضریب چولگی منفی بازده سهام و نوسانات پایین به بالا دارند. بنابراین باتوجه به تاثیرپذیری بازده بازار سهام از متغیرهای کلان اقتصادی، به منظورثبات اقتصادی، نیاز به دقت دولت در اتخاذ سیاست‌های کلان، عدم اجرای سیاست‌های شتاب‌زده و غیر علمی-کارشناسی از سوی سیاستگذاران و برنامه‌ریزان اقتصادی و همچنین افزایش سهم درآمدهای مالیاتی از منابع درآمدی کشور دارد.

کلمات کلیدی: ضریب چولگی منفی بازده سهام، نوسان پایین به بالا، بی ثباتی نرخ تورم، بی ثباتی نرخ بهره، بی ثباتی نرخ ارز، بی ثباتی رشد اقتصادی.

طبقه بندی JEL: E61; E65; G11; G12; G18

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