Investigating Role of Uncertainty and Asymmetric Information on Relationship Between Intrinsic and Market Value of Stock Price

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Abstract

Price is known to be a very important indicator for evaluating the performance of firms in the stock market. This study aims to investigate the role of uncertainty and asymmetric information as the main variables influencing the stock price fluctuations on the intrinsic value and market price relationship of firms active in the Tehran Stock Exchange during 2013-2022.The present study attempts to investigate relationship of stock price and mentioned variables in firms active in the Tehran Stock Exchange by modelling the relationship between the stock price and mentioned variables. The results indicate that asymmetric information has a positive and significant effect on the relationship between stock intrinsic price and market price in firms active in Tehran Stock Exchange. Furthermore, the variables relevant to firm performance and economic significantly impact the firm's stock prices. Earnings per share, expected return on risk and economic growth rate have a positive effect and financial leverage, inflation and exchange rate have a negative effect on the stock prices. Overall, the study underscores that uncertainty, asymmetric information, and both firm-specific and economic factors play a pivotal role in explaining fluctuations in stock prices, providing a valuable framework for understanding market behavior in the context of an emerging economy. From a practical standpoint, these findings emphasis the necessity for policymakers and market regulators to enhance transparency and information quality, thereby reducing asymmetric information and fostering investor confidence.

Highlights

- This study attempts to modeling the intrinsic value and market price relationship considering the conditions of uncertainty and asymmetric information
- Asymmetric information significantly influences the intrinsic-market price relationship of firms listed on the Tehran Stock Exchange
- Firm performance and economic conditions significantly affect stock prices.

1. Introduction

The stock price indicates the value of the stock market and shareholders' investment (Ilham etal., 2022). Stock mispricing means that the firm's stock price is not appropriately valued due to various reasons (Mulchandani et al., 2023). These reasons could be linked to asymmetric information, flawed corporate governance structures and more, potentially leading to challenges for firms down the line. (Abdeldayem, 2015). On the other hand, one of the impediments to investment and capital market stagnation is the destruction of trust and confidence in the economy and conditions (Han et al., 2023).

Overall, two primary issues that can emerge in the economy are uncertainty and asymmetric information. Uncertainty about the return on invested assets has worried many investors and financial analysts. Uncertainty arises when both a regulator and participants in a specific area possess the same information prior to making a decision, yet a variable, parameter, or function remains unpredictable, and asymmetric information exists when individuals operating in a field share information about a parameter, variable or function and they have more or better information compared to the regulator (He et al., 2020).

Information flow affects market participants in the market environment (Babajani & Akbari, 2021). Accuracy of financial information is a determining variable in investment strategy in financial markets (Assad & Alshurideh, 2020). If some investors active in capital markets are in a better position in terms of information compared to others, they can influence the supply and demand in the market and develop a price gap. The main reason is the existence of asymmetric information in the capital market, so that people who are aware of the earnings announcement (or any other important news) are in a better position to make decisions (Blankespoor et al., 2020). Asymmetric information can appear as one of the most important competitive functions of firms in the market (Abdi et al., 2022). Moreover, firms operating in monopolistic markets and industries have access to a more ambiguous information environment and, consequently, asymmetric information is more common in such firms.

In the capital market, information is a valuable asset. The stock exchange is known as the main part of the Iranian capital market, and every day millions of securities are traded in this market using various instruments and methods. This market structure is the result of the interaction of various variables, and each variable influences the information communication and the size of firms active in the stock exchange in an exclusive way and intensity, and it also determines the direction of market. Efficient market theory is known as one of the basic foundations of modern financial theory. As stated in most financial and investment literature, the most important theme of this theory is information, so an efficient market is defined as a market in which the price of securities, including common stocks, indicates all the information available in the market (Ehiedu & Obi, 2022). Asymmetric information problem can be considered as an important step in increasing the efficiency of markets (Derakhshan & Hosseini Kondelaji, 2017). Measuring asymmetric information together with uncertainty

can provide valuable insights and operate efficiently for all participants in the market. They will have a better understanding of the market mechanism and will be able to clearly see the results of their decisions. Investors will be more focused and have more points to choose from when selecting their stock portfolio. By applying the results of this study, firms that list shares on the stock exchange can attain optimal performance in setting prices and managing the supply of their shares, while brokers can enhance their effectiveness through information sharing.

The present study attempts to investigate the influencing factors on the intrinsic value and market price relationship considering uncertainty and asymmetric information by using the data obtained from firms operating in Tehran Stock Exchange from 2013 to 2022. In this context, first the theoretical foundations and the specification of research model are discussed, then the results of GH model for investigated industries are reported, and finally, based on the specified model, the results of main research models are presented. To assess asymmetric information, the Glosten & Harris (GH) model is employed. Next, to evaluate how stock prices fluctuate due to shifts in the uncertain environment and market information, a theoretical security or a collection of securities is analyzed. This examination is based on the generalized model developed by Cox, Ingersoll, and Ross (CIR). This study makes a unique contribution to the existing literature by integrating two critical dimensions (uncertainty and asymmetric information) into the analysis of stock price dynamics. In particular, it focuses on the relationship between intrinsic value and market prices in the context of the Tehran Stock Exchange. According to the above, the research hypotheses are as follows:

Hypothesis 1: The existence of uncertainty affects the stock prices of firms.

Hypothesis 2: The existence of asymmetric information has an impact on the intrinsic-market price relationship of firms.

Hypothesis 3: The performance-related variables affect the intrinsic-market price relationship of firms.

Hypothesis 4: Economic condition variables affect the intrinsic-market price relationship of firms.

2. Literature Review

Based on the theoretical principles that define the price and intrinsic (or real) value, the overall supply and demand among investors, as well as their perceptions of investment returns, are shaped by the information they acquire (Leonardo et al., 2022), however, in reality, the market price does not always accurately represent the available information (Zhou et al., 2020), and The market often fails to respond rationally to information due to the absence of perfect competition and insufficient market efficiency, which leads to a discrepancy between intrinsic value and the stock market price. In addition, the measurement of intrinsic value is difficult and transaction costs are very significant. Therefore, the process of price adjustment to reach intrinsic value takes time (Zhang et al., 2018). In this context, it is worth noting that prices may not always accurately reflect the

intrinsic value of a stock. This could result in a discrepancy between the intrinsic value and the market price of the stock. Some researchers believe that disconnect between intrinsic value and market price is due to the inappropriate valuation of stock prices (BadavarNahandi & Sarafraz, 2018).

As a general concept, asymmetric information describes a situation where economic agents and stakeholders possess varying sources and types of information. (Mahinizadeh et al., 2018). The concept of information asymmetry, sometimes referred to as information failure, arises when one participant in an economic transaction possesses more information than the other (Rahmanian & Bahremandjouy, 2022). Accurate information related to the decision problem is one of the efficient factors in decision making. When information is unevenly shared among individuals, it can result in varied outcomes regarding the same issue (Coutts, 2019). Thus, it's essential to evaluate the quality of information distribution before presenting information crucial to decision-makers. If the asymmetry of information related to a firm's stock grows, its intrinsic value may differ from the value perceived by investors in the capital market (Hejazi & et al., 2018). The more efficient the market and the greater symmetry of information, the greater security of the market and the higher economic growth can be achieved by directing investment towards production.

A key challenge in modern capital markets is accurately modeling and assessing the intrinsic value of stocks. The pricing mechanism such securities is such that the short-term interest rate of the traded asset is assumed as a fixed asset. Because securities are strongly linked to short-term interest rates, their price fluctuations are largely influenced by the movements of these rates. Time structure models have been provided for short-term interest rates to analyze the above behavior, and some of these models are constantly volatile. Some researchers, including Vasicek (1977) and Cox, Ingersoll and Ross (1985) have made significant contributions to this field. They have developed term structure models for short-term interest rates, with some accounting for continuous volatility. The Vasicek model, based on the Ornstein–Uhlenbeck process, describes short-term interest rate changes with the equation $dr_t = \lambda(\bar{r} - r_t)dt + \sigma dW_t$ where W_t is Brownian motion. Though it follows a Gaussian distribution, the model allows for negative rates. To address this, Cox, Ingersoll and Ross (1985) modified the diffusion term to $\sigma\sqrt{r_t}$, ensuring r_t stays positive. In both models, λ governs mean reversion, $\bar{r}$ is the long-term average rate, and σ reflects volatility (Safaei et al., 2018). Given the non-negative nature of interest rates, volatility tied to the current value of r_t, and convergence to the average $\bar{r}$ at a speed of λ, this study focuses on the generalized CIR stochastic interest rate model proposed by Mishura and Yurchenko (2018).

3. The Methodology and Model

The present study is a type of multiple correlation research and a type of ex-post facto from another aspect. Since, it firstly investigates the correlation between more than two variables; and it uses data and information after the event.

The data of this study is based on figures and real information obtained from the firms active in Tehran Stock Exchange and the financial statements provided by these firms. The information and data required for conducting the research were also obtained from the Information Centre of Tehran Stock Exchange and by referring to the financial statements, notes and reports of the firms active in Tehran Stock Exchange.

The study's statistical population comprises all firms listed on the Tehran Stock Exchange that were actively traded between the beginning of 2013 and the end of 2022. This period allows for a comprehensive analysis of stock price dynamics across various market conditions. The screening method has been applied in the present study so that the statistical sample will be a proper representative of the appropriate statistical population. Accordingly, 4 restrictive criteria are considered and if a firm meets all the criteria, it is selected as a research sample and the rest are eliminated. The screening method applied is a systematic approach to the exclusion of firms that fail to meet the specified criteria, thus ensuring that only those that meet the requisite standards are included in the study.

The sample selection process is described in Table (1).

1. The firm must be active before 2013 and should be active in the stock exchange until the end of 2022. In order to ensure the reliability of the data and the meaningfulness of the insights gained, it is necessary that firms have a minimum level of trading activity. This can be demonstrated by the average daily trading volume or the number of trading days per year. The criterion of sufficient market engagement is therefore applied in order to select only those firms that are able to provide reliable data and meaningful insights into stock price dynamics.

2. The firm must not be an investment, holding or financial intermediary. Because the structure of corporate governance, investment motivation and the quality of financial information disclosure in these firms diverge from those observed in other firms.

3. The firm's financial year ends at the end of March and the financial year does not change during the research period. The objective of this criterion is to exclude firms whose stock prices may be influenced by anomalous factors resulting from exceptional circumstances, thereby enabling a more focused analysis on firms operating under more typical conditions.

4. The firm's financial information should be available. It is imperative that firms adhere to consistent and regular financial reporting throughout the study period. This entails the timely filing of financial statements and compliance with relevant accounting standards. This ensures that the selected firms provide adequate and reliable financial information, which is crucial for analyzing intrinsic and market price relationships.

After applying all the aforementioned criteria, 167 firms remained as the screening population and were selected as the sample. The number of sampled firms is described by industry in figure (1).

Table1. The sample selection process

Total number of listed firms at the end of 2022	650
Criteria	
Firms that were inactive in the stock market from 2013 to 2022	(209)
Firms that joined the stock market after 2013	(117)
Firms categorized as banks, financial intermediaries, holdings and investments	(45)
Firms that have changed their financial year during the period under review or whose financial year does not end in March	(56)
Firms for wich information is not available in the research period	(8)

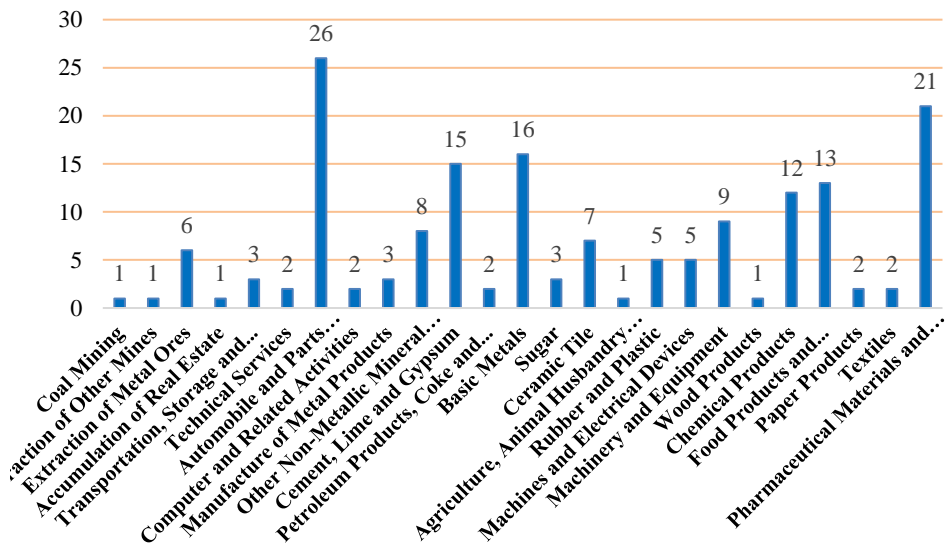*Source: Research Findings*

Figure 1. Frequency distribution of sample firms by industry
Source: Research Findings

After calculating the asymmetric information using the Gloston-Harris model, the relationship between the identified factors and changes in the firm's stock prices is estimated using the GLS panel estimator.

3.1 The Study Model

For perfect extraction of environmental structure and market information, observed security prices must correspond to the total number of payment dates linked to the security (Brunnermeier, 2001), a condition that is challenging to fulfill in practice. To address this issue, inferential methods can be employed (Suimon et al., 2020; Karahan & Soykök, 2023),), where efficiency curves are extracted using the available information, or inductive methods can be used (Pan et al., 2020) where environmental structures are defined and constrained based on theory. Obviously, the first method seems more attractive because, according to economic theories, very complex structures are often better modelled with

inferential methods, unless the inductive approaches used are derived from multivariate models that sacrifice computational ease for richer theory to fit the data.

Many studies that measure uncertainty in the market use a proxy for uncertainty and measure the effect of this proxy on the stock price or some characteristic of the stock. This proxy is an exogenous variable that is not precise. Some other studies, such as Clark and Lakshmi (2007) and Mishura & Yurchenko (2018), try to measure uncertainty in the market environment with an endogenous variable (elasticity) instead of an exogenous variable. According to the efficient market theory, any deviation between the intrinsic price and the market price of a stock can be caused by uncertainty in the market environment. Based on this, the intrinsic value and market price relationship is estimated, and the elasticity coefficient obtained represents an endogenous variable of market uncertainties. This section necessitates a reputable and trustworthy model, supported by a solid theoretical framework and precise empirical validation; therefore, the generalized CIR model is utilized. This model has been extensively tested in various markets. The CIR model can be used not only to value independent and risk-free securities, but also to price warrants, options, redeemable bonds and other financial claims (Mishura & Yurchenko, 2023).

The theoretical robustness of the CIR model provides a robust foundation for understanding the underlying mechanics of stock price processes. This is particularly advantageous in a market such as the Tehran Stock Exchange (TSE), where conventional valuation models may be insufficient in accounting for the complexities involved. The TSE has been subject to fluctuations driven by various economic and political events over the years, resulting in an evolving stock pricing environment. The capacity of the CIR model to accommodate historical data enables researchers and investors to conduct effective trend and relationship analyses within the confines of the available dataset. The CIR model has been designed to capture mean-reverting processes, which are a common phenomenon in financial markets. In the TSE, stock prices frequently demonstrate a tendency to revert to intrinsic values as a result of market corrections that follow periods of overvaluation or undervaluation. This characteristic renders the CIR model an appropriate choice for capturing such dynamics within the TSE. The CIR model can be modified to account for the effects of asymmetric information, which is prevalent in emerging markets, including the TSE. While the CIR framework is primarily an interest rate model, it can be effectively adapted to reflect the influence of macroeconomic factors on stock prices, such as inflation rates and economic growth. Given the challenging economic environment of the TSE, characterized by high inflation and economic volatility, the ability to integrate such macroeconomic indicators into the model adds analytical depth and relevance.

The univariate model used here is based on the studies of Mishura & Yurchenko (2018 & 2023). This model suggests that a single variable, the current interest rate, governs an uncertain environment and incorporates all available

information regarding security prices. The CIR model is based on equilibrium pricing. Accordingly, it is assumed that the special expectations hypothesis is the main focus of the interest rate structure formulation (Ghorbani & Korzeniowski, 2020).

To assess fluctuations in the stock prices of companies listed on the Tehran Stock Exchange, this study considers a stock or a group of theoretical stocks while accounting for shifts in the uncertain environment and market information. The focus is on modeling intrinsic value and market price relationship of firms using the CIR model. In the absence of credit risk, any changes in the intrinsic stock price will be attributed exclusively to variations in the market environment and available information. Thus, it is assumed that $Pinc_i$ represents the intrinsic price, P_i denotes the observed stock price, r_i indicates the risk-free interest rate, and R_i reflects the market interest rate, factoring in risk, information flow, and environmental structure. Additionally, F_i signifies the cash flow. In this context, following the methodology of Clark and Lakshmi (2007), the intrinsic and market stock prices relationship is determined as follows:

$$P_i = \sum_{i=1}^{n} F_i R_i^{-i} \tag{1}$$

$$Pinc_i = \sum_{i=1}^{n} F_i r_i^{-i} \tag{2}$$

If the above relationships are derived from the interest rate, then:

$$dP_i = -i \sum_{i=1}^{n} F_i R_i^{-i} \frac{dR_i}{R_i} \tag{3}$$

$$dPinc_i == -i \sum_{i=1}^{n} F_i r_i^{-i} \frac{dr_i}{r_i} \tag{4}$$

It is assumed that the changes in the market environment, and hence in market information, are related to the risk-free interest rate with time functions as follows:

$$\frac{dR_i}{R_i} = \theta(i) \frac{dr_1}{r_1} \tag{5}$$

$$\frac{dr_i}{r_i} = \varphi(i) \frac{dr_1}{r_1} \tag{6}$$

Then:

$$\frac{dP_i/_{P_i}}{dr_1/_{r_1}} = -\frac{\sum_{i=1}^{n} i F_i R_i^{-i} \theta(i)}{P_i} \tag{7}$$

$$\frac{dPinc_i/_{Pinc_i}}{dr_1/_{r_1}} = -\frac{\sum_{i=1}^{n} i F_i r_i^{-i} \varphi(i)}{Pinc_i} \tag{8}$$

Equation 7 offers insight into the price elasticity relative to the market price, adjusted for the risk-free interest rate. Equation 8 presents a measure of the price elasticity based on the intrinsic price, which also demonstrates responsiveness after accounting for the risk-free interest rate. The summaries of Equations 7 and 8 are as follows:

$$\frac{dP_i}{P_i} = \frac{\tau_i}{\pi_i} \cdot \frac{dPinc_i}{Pinc_i} \tag{9}$$

Equation 9 measures the percentage change in the market value relative to the percentage change in the intrinsic price. This ratio is equal to the ratio of observed and intrinsic stock price elasticity, taking into account the risk-free

interest rate, which is defined as the structural coefficient of the market environment. Furthermore, equation 9 also includes the market risk or uncertainty for the stock of firm i, as the net changes in the structure of environment show changes in equilibrium conditions of the capital markets. As a result, the basic model for measuring the effect of uncertainty on stock prices is as follows:

$$\frac{dP_i}{P_i} = \beta_1 + \beta_2 \frac{dPinc_i}{Pinc_i} + \varepsilon_i \tag{10}$$

P_i is the market price and $Pinc_i$ is the intrinsic price. It is anticipated that β_1 will be zero, while β_2 is expected to be positive; the coefficient β_2 serves as a measure of uncertainty. It should be noted that the Gordon model has been used to calculate the intrinsic price of stocks, the general formula of which is as follows:

$$Pinc_i = Div_i \times \frac{(1+G)}{(E-G)} \tag{11}$$

Div_i is the last dividend per share, G is the growth rate of dividend per share and E is the rate of return expected by shareholders. In the subsequent step, we sought to gain insight into the impact of asymmetric information on the intrinsic-market price relationship. To this end, we employed the following equation, which incorporates both the intrinsic price coefficient, which serves as a measure of uncertainty, and the information criterion in the estimation:

$$\frac{dP_i}{P_i} = \beta_1 + \beta_2 \frac{dPinc_i}{Pinc_i} + \beta_3 AsInf_i + \varepsilon_i \tag{12}$$

In the present study, the Glosten & Harris (GH) model is used to measure asymmetric information ($AsInf_i$). According to Gloston and Harris model, each component of inappropriate selection (selection bias), inventory maintenance and order processing is represented as a linear function of transaction volume.

The Glosten and Harris model is applied following ordinary least squares regression (equation 13) to estimate the inappropriate selection component of the price range (Shamsoddini et al., 2017):

$$\Delta P_i = c_0 \Delta Q_i + c_1 \Delta Q_i V_i + z_0 Q_i + z_1 Q_i V_i + \varepsilon_i \tag{13}$$

Where P_i is the market price, V_t is the number of stocks traded, ε_i is error component and Q_i is transaction sign indicator, accordingly, if the transaction has a purchase origin, the value will be +1, and for transactions with a sale origin, the value will be -1. By adding the estimated values of c_0, c_1, z_0 and z_1 for each stock, the inappropriate selection component of the proposed price range can be estimated through equation 14:

$$Z_0 = 2(z_0 + z_1 V_i) \tag{14}$$

The sum of the remaining two components of the proposed price range, i.e., the order processing component and the stock maintenance component, is also calculated using Equation 15:

$$C_0 = 2(c_0 + c_1 V_i) \tag{15}$$

In general, the inappropriate selection component is estimated as a proportion of the total proposed price range. Thus, by using the average transaction volume ($\overline{V_i}$) for stocks of firm i, then:

$$Z_i = \frac{2(z_{0,i} + z_{1,i}\overline{V_t})}{2(c_{0,i} + c_{1,i}\overline{V_t}) + 2(z_{0,i} + z_{1,i}\overline{V_t})} \qquad (16)$$

Where Z_i represents the inappropriate selection component of the proposed price range for buying and selling, or in other words, the asymmetric information criterion of the firm. Finally, two categories of variables are added to the model:

$$\frac{dP_i}{P_i} = \beta_1 + \beta_2 \frac{dPinc_i}{Pinc_i} + \beta_3 AsInf_i + \beta_4 FP_i + \beta_5 ME_i + \varepsilon_i \qquad (17)$$

The variables FP_i and ME_i represent the factors relevant to the firm's performance and the macroeconomic influences, respectively.

4. Findings
4.1. Descriptive Statistics

This section aims to apply structures of risk free to the stocks of firms active in the Tehran Stock Exchange that are part of the sample, with a view to estimating their intrinsic prices. 1670 observations (167 firms x 10 years) were gathered from the Tehran Stock Exchange for this study. Following the calculation of intrinsic prices, it became apparent that some data were not relevant and could be removed from the sample. The variables used in the model include price as a dependent variable, intrinsic price and information asymmetry as independent variables.

Since the index calculated for asymmetric information is very important, the results of calculating the asymmetric information index through the Gloston and Harris (GH) model were briefly examined. The names of active industries in Tehran Stock Exchange (as mentioned in the research sample) and their average asymmetric information index are presented in Table (2).

***Table 2. Active industries in the Tehran Stock Exchange and their average asymmetric
information index***

Industry	GH	Industry	GH
Coal Mining	2.504	Sugar	1.892
Automobile and Parts Manufacturing	3.789	Agriculture, Animal Husbandry and...	4.693
Extraction of Metal Ores	4.082	Ceramic Tile	4.628
Accumulation of Real Estate	2.330	Machinery and Equipment	1.212
Technical Services	2.612	Rubber and Plastic	3.275
Extraction of Other Mines	7.129	Computer and Related Activities	1.072
Wood Products	5.318	Chemical Products	1.086
Pharmaceutical Materials and Products	3.186	Other Non-Metallic Mineral Products	2.292
Food Products	1.884	Paper Products	5.297
Manufacture of Metal Products	2.310	Machines and Electrical Devices	3.404
Basic Metals	2.478	Textiles	2.739
Petroleum Products, Coke and...	4.017	Machines and Electrical Devices	3.404
Cement, Lime and Gypsum	3.035		

Source*: Research Findings*

On average, according to the data obtained from the years studied, firms operating in the Chemical Products, Computer and Related Activities, and

Machinery and Equipment industries have experienced the lowest coefficient of asymmetric information, and accordingly these firms can be assumed to be the clearest stock market firms from the investors' point of view during the period studied. On the other hand, firms operating in Extraction of Other Mines, Wood Products and Paper Products have experienced the highest weighted average coefficient of asymmetric information.

4.2. Model Estimation by Composite Data Method

This study employed a multivariate regression model utilizing composite data to test the hypotheses. To determine the appropriate estimation method (composite or panel data), Limer's F test was conducted, while the Hausman test was applied to ascertain the type of model (Ola et al., 2018). The outcomes of the tests mentioned above are shown in Tables 3 and 4, respectively.

Table 3. Limer's F test results

Dependent Variable	F-Stat	Prob.	Result
$Pinc_i$	1.615	0.000	Panel

Source: *Research Findings*

The results of Limer's F-test for the research model indicate a statistic of 1.615 and a probability value of 0.000; since the probability obtained for the F-statistic is less than 0.05, the data are used as a panel to test the research model.

Table 4. Hausman test results

Dependent Variable	χ^2-Stat	Prob.	Result
$Pinc_i$	43.412	0.000	Fixed Effects

Source: *Research Findings*

The results obtained from the Hausman test in Table (4) show the chi-square statistic value of 43.412 and the probability of 0.000, since the probability value of the Hausman statistic is less than 0.05, there is no logical reason to reject the fixed effects model.

4.3. Regression Assumptions Analysis

Before estimating the model, it is necessary to examine the classical assumptions of linear regression. In cases where composite data are used, the classical assumptions of regression, the assumption of normality of the error distribution with zero mean, the existence or absence of autocorrelation, the equality of variances and the absence of collinearity between variables are significantly considered (Nourani & Shamsoddini, 2024). Since the model has an intercept, the assumption of zero mean errors is accepted; furthermore, there is a large number of observations (more than 30), in accordance with central limit theorem and large numbers law, the normality of the model error distribution can be accepted. To test the assumption of zero covariance between error components over time, or to diagnose first-order autocorrelation, the Voldrich test was applied

to the panel model with fixed effects. The results of the Voldrich autocorrelation test show the statistic 1.382 and there is a first order autocorrelation between the residuals of the panel model with fixed effects. In order to test the assumption of heterogeneity of variance, the modified Wald test was applied to the panel model with fixed effects. The results obtained from the modified Wald test for the panel model with fixed effects indicate that the fitted model residuals have a significance level of less than 0.05; therefore, the research model has a variance heterogeneity problem. The generalized least squares method was used to solve the problem of variance heterogeneity and autocorrelation in the fixed effects panel model. In addition, the variance inflation factor (VIF) criterion was used to check for collinearity between variables. In the VIF collinearity test, the test statistic values for the independent variables are below 5, indicating that there is no collinearity among them.

Since the amount of data for estimating the model is large, we may face the variable inconsistency problem for the estimation act. Therefore, it is essential to examine the cointegration of variables in the regression matrix. If the model is cointegrated, there is no problem to estimate the main model. Therefore, using Im, Pesaran and Shin (2003), the cointegration of the model was tested and based on the obtained results (statistic 143.73 and probability of 0.000) the model cointegration is confirmed.

4.4. Testing Research Hypotheses

The first hypothesis: The existence of uncertainty affects the stock prices of firms.

To test the first hypothesis of this research, the relationship between the market price variables and the intrinsic price of research sample firms' stocks is tested through equation 10; the results are reported in Table (5).

Table 5. The effect of uncertainty on intrinsic-market price relationship

Variable	Coefficient	Prob.	T-Stat	St. D
$Pinc_i$	0.201	0.019	2.850	0.304
R^2	F-Stat	Prob.	Wald Test	
0.489	40.647	0.000	186.80 (0.000)	

Source: Research Findings

The results presented in Table 5 indicate that the coefficient for intrinsic price is both positive and significant. This means that the structural diversity of environment explicitly indicates price changes in the stocks of the firms under study, thus confirming the first research hypothesis.

The second hypothesis: The existence of asymmetric information has an impact on the intrinsic-market price relationship of firms.

Equation 12 was employed to examine the impact of asymmetric information on the relationship between intrinsic and market prices of the stocks of the sampled firms. In this estimation, both the intrinsic price, serving as a measure of

uncertainty, and the information criterion of the firms' market were included. The results are shown in Table (6).

Table 6. The effect of uncertainty and asymmetric information on intrinsic-market price relationship

Variable	Coefficient	Prob.	T-Stat	St. D
$Pinc_i$	0.289	0.000	3.443	0.257
$AsInf_i$	0.548	0.000	4.361	0.073
R^2	F-Stat	Prob.	Wald Test	
0.532	33.046	0.000	170.66 (0.000)	

Source: Research Findings

The results shown in Table 6 indicate that the coefficients of intrinsic price and asymmetric information are positive and significant. The findings suggest that there may be a significant influence of asymmetric information on the intrinsic and market prices relationship. It is possible that this information gap may have an impact on the alignment between a firm's intrinsic value and its observed market price, as investors may not have full access to relevant data when valuing the stock. In light of these findings, we can conclude that the second research hypothesis, which suggested that asymmetric information may have an impact on the intrinsic-market price relationship, is indeed confirmed. This indicates that there may be instances where discrepancies arise between the intrinsic value of a stock and its market price, potentially due to variations in the availability or quality of information. This highlights the importance of transparency and information flow in maintaining efficient pricing.

The third hypothesis: The performance-related variables affect the intrinsic-market price relationship of firms.

In order to gain a deeper understanding of the influence of other fundamental variables within this framework, we have integrated two categories of variables into the model: factors related to the firm's performance and macroeconomic factors. It would be remiss of us not to consider the factors related to the firm's performance, which are often referred to as internal factors. These are essential for analyzing the company's internal conditions and how these conditions affect stock prices and investor decisions. It might be helpful to consider including financial metrics such as revenue growth, profit margins, return on equity, and other key financial ratios in this context. By examining these ratios, investors may gain valuable insights into the firm's operational efficiency and overall health, which could prove helpful in making informed investment decisions. Macroeconomic factors, on the other hand, are a broader category that encompasses conditions that may impact the entire market or specific industries. These may include interest rates, inflation rates, economic growth, and unemployment levels. It would be beneficial for investors to have an understanding of these external influences in order to contextualize a firm's performance relative to the economic environment in which it operates. Overall, it is thought that including both internal and macroeconomic factors in the model

allows for a comprehensive assessment of the variables that affect a firm's stock price and provides a deeper understanding of the dynamics influencing investor behavior over time. In the present study, earnings per share (Eps_i), financial leverage (Lev_i) and expected return to risk ratio (ERR_i) have been included in the equations as factors affecting the stock prices of firms active in Tehran Stock Exchange and their effects have been examined. The results are presented in Table (7).

$$\frac{dP_i}{P_i} = \beta_1 + \beta_2 \frac{dPinc_i}{Pinc_i} + \beta_3 AsInf_i + \beta_4 Eps_i + \beta_5 Lev_i + \beta_6 ERR_i + \varepsilon_i \qquad (18)$$

Table 7. The effect of firm's performance, uncertainty and asymmetric information on intrinsic-market price relationship

Variable	Coefficient	Prob.	T-Stat	St. D
$Pinc_i$	0.218	0.000	8.443	0.133
$AsInf_i$	0.349	0.000	4.842	0.093
Eps_i	0.098	0.031	2.256	0.097
Lev_i	-0.011	0.001	2.940	0.024
ERR_i	0.452	0.000	3.556	0.128
R^2	F-Stat	Prob.	Wald Test	
0.588	56.007	0.000	262.53 (0.000)	

***Source**: Research Findings*

The findings presented in Table 7 validate the third research hypothesis. It may be observed that when a firm shows strong performance in areas, there is a tendency for its intrinsic value to rise. This can potentially narrow the gap between the intrinsic value and market price, as investors may be more likely to recognize the firm's worth, which could drive the stock price closer to its true value. Conversely, if performance-related variables deteriorate, there is a possibility that the intrinsic value may fall, which could cause the market price to drop as investors reassess the firm's worth. In such cases, there is a risk that the market price might deviate significantly from intrinsic value.

The fourth hypothesis: Economic condition variables affect the intrinsic-market price relationship of firms.

While stock market fluctuations are linked to economic shifts and macro variables, this study incorporates economic growth rate (Gr_i), inflation rate (Inf_i) and exchange rate (ER_i) into the equation as primary influences on the stock prices of the studied firms in Tehran Stock Exchange. The results are shown in Table (8).

$$\frac{dP_i}{P_i} = \beta_1 + \beta_2 \frac{dPinc_i}{Pinc_i} + \beta_3 AsInf_i + \beta_4 Eps_i + \beta_5 Lev_i + \beta_6 Err_i + \beta_7 Gr_i +$$
$$\beta_8 Inf_i + \beta_9 ER_i + \varepsilon_i \qquad (19)$$

Based on the findings in Table (8), economic growth and inflation rate are significant at 95% level and the coefficient of the exchange rate at 90% level. Also, the overall equation is evaluated well where R^2 is greater than 0.71 and there is no evidence of autocorrelation in the results; thus, the fourth research hypothesis is confirmed. Sometimes, even if performance-related variables are

strong, market sentiment (driven by external factors like economic trends, investor confidence, or news) may cause the market price to diverge from the intrinsic value. However, over time, performance-related variables often play a key role in aligning the market price with the firm's intrinsic value.

Table 8. The effect of macroeconomic, performance, uncertainty and asymmetric information on intrinsic-market price relationship

Variable	Coefficient	Prob.	T-Stat	St. D
$Pinc_i$	0.152	0.000	6.640	0.095
$AsInf_i$	0.192	0.000	3.912	0.051
Eps_i	0.005	0.001	2.907	0.094
Lev_i	-0.0102	0.000	3.454	0.085
ERR_i	0.411	0.000	5.175	0.107
Gr_i	0.001	0.022	2.472	0.088
Inf_i	-0.183	0.001	2.916	0.193
ER_i	-0.085	0.065	-1.905	0.164
R^2	F-Stat	Prob.	Wald Test	
0.712	64.121	0.000	283.16 (0.00)	

Source: *Research Findings*

5. Discussion and Conclusion

Asymmetry of information plays a crucial role in financial decision-making. The quality of the distribution of information is more important than the information itself. Another powerful factor in financial decisions is increasing uncertainty. When uncertainty in the economy increases, economic agents tend to invest in assets with less risk and guaranteed returns. This study examines the impact of asymmetric information and uncertainty, along with intra-firm and macroeconomic variables, in the Tehran Stock Exchange. According to the results of the first research hypothesis, variation in the environmental structure and the existing uncertainties indicate changes in the stock prices of the studied firms to a large extent. These results align with the findings of Choi (2014), Sharif et al. (2020) and Luo & Zhang (2020).

The results of the second research hypothesis show that the diversity of the information structure of the firms' market explains to a large extent the price changes in the stocks of the investigated firms. The effect of information is quickly observed in the prices and the risk of investing in the stocks of related firms is reduced when the information of the firm is provided regularly and transparently. It would be remiss of us not to mention the noteworthy aspect of this variable, namely that the presence of asymmetric information has a positive influence on stock prices. This effect could be linked to a number of factors, including uncertainty, fluctuations in financial and economic conditions, the structure of the Tehran Stock Exchange, the nascent nature of this market, and the limited participation of individuals in the Iranian economy. The results of this hypothesis align with the findings of Wang et al. (2018), Cheryta et al. (2018) and Hewamana et al. (2022).

The results of the third research hypothesis show that, firstly, the higher the EPS, the higher stock profitability and the higher stock price. Secondly, when investors anticipate that the expected return will surpass the expected risk, they develop an optimistic outlook for the future, which can result in a long-term increase in stock prices. Third, the higher debt ratio, the lower firm's stock price. These findings align with the research conducted by Vakilifard & Salehi (2011) and Carpenter et al. (2021).

The fourth hypothesis shows that stock market trends and stock prices affect each other in different ways, depending on economic and macroeconomic changes. The growth rate has a positive effect on stock prices, while inflation and exchange rates have a negative effect. This is in line with what we would expect. Changes in inflation and exchange rates can affect the way investors choose to invest their money. These findings align with the research conducted by Megaravalli & Sampagnaro (2018) and Huy et al. (2020).

The insights derived from this study not only enhance theoretical comprehension but also furnish stakeholders in the Tehran Stock Exchange with actionable strategies, thereby contributing to the advancement of a more robust financial ecosystem in Iran. From a practical standpoint, the findings of this study have significant implications for investors, regulators, and firms within the Tehran Stock Exchange. In light of the evidence indicating that transparent and timely information plays a pivotal role in mitigating investment risk, it is imperative for firms to priorities the enhancement of their information disclosure practices. This focus will not only help to reduce the asymmetry of information that is prevalent in the market, but will also attract a greater number of participants, thereby bolstering market liquidity and stability. It is incumbent upon individual investors to be aware of the broader economic indicators that affect their investment choices, particularly in a volatile environment characterized by fluctuating inflation and exchange rates. Such awareness can facilitate more informed decision-making, in accordance with the investor's risk tolerance profile. Moreover, regulatory bodies must recognize the pivotal role of macroeconomic factors, particularly inflation and currency stability, in influencing investor behavior and market performance. Implementing policies that promote economic stability and transparency in firm communications can create a more favorable investment landscape.

Finally, it should be noted that the general results of this study are consistent with the theoretical foundations and research background. According to the theory, factors such as uncertainty, asymmetric information, intra-firm factors and economic factors can explain changes in the stock prices of listed firms. Accordingly, it is suggested to consider the effect of these variables in studies of stock prices. Additionally, given the relatively high level of asymmetric information in the Tehran Stock Exchange, it is essential for regulators to work towards improving the transparency of firms' information environments. Managing inflation and stabilizing exchange rate fluctuations are crucial steps for maintaining balance in the investment process within the Tehran Stock Exchange

as an incipient market, which is the only official and organized capital market in Iran.

Author Contributions

Conceptualization, all authors; methodology, M. Shamsoddini; validation, all authors; formal analysis, all authors; resources, M. Shamsoddini; writing—original draft preparation, M. Shamsoddini; writing—review and editing, all authors; supervision, H. Nourani. All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

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Data Availability Statement

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

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