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Fluctuations and Changes in Expected Rate of Return Based on Comparability and Environmental Uncertainty in Oil, Gas, and Petrochemical Firms

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ABSTRACT

The purpose of this study is to investigate the effect of comparability and environmental uncertainty on the expected rate of return. The current study utilizes panel regression method estimator to investigate the relationship between comparability, environmental uncertainty, and the expected rate of return of 500 firm-year observations in oil, gas, and petrochemical firms listed in Iran Securities and Stock Exchanges for the period of 2009 to 2018. The results show that the comparability and uncertainty have a significant effect on the expected rate of return. In other words, the expected rate of return is a function of comparability, and it varies at different levels of comparability.

1. Introduction

Investors and creditors are always trying to make the best choices by obtaining information about the financial and operating status of the companies and comparing them with those of other competitors. Undoubtedly, corporate financial reports are one of the most useful sources used in this context. The usefulness of these reports is derived from their many qualitative features. In its definition of comparability, the Financial Accounting Standards Board states that comparability is the qualitative characteristic of information that enables users to identify and understand the similarities and differences between two sets of economic phenomena. De Franco, Kothari, and Verdi (2011) also considered the accounting system as a system the responsibility of which is to draw maps of economic events in the form of financial statements. They believed that if the accounting system of two companies produces similar financial statements for the same set of economic events, the two systems are comparable. Comparability enhances the speed of information processing and understanding of the similarities and differences in reports and reduces the costs and errors associated with the information processing by investors and analysts. In other words, as the comparability of accounting figures improves, this information becomes clearer to outsourced users and market participants (Sohn, 2016). Therefore, investors are interested in receiving reports that are more comparable. The comparability feature of accounting information is a relative feature and, like other accounting properties, is not absolute and independent.

Information flow is a key parameter in an economic activity and acts as a key factor in the emergence, stability, and efficiency of capital markets (Stiglitz, 2003, 2004). The flow of information in a market

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environment affects the behavior of market participants. It is natural for marketers to have a different share of this flow of information. It is also empirically clear that individuals have different types of information. The information they have can affect their behavior in many cases. This indicates the information asymmetry between the two sides of a transaction (Lauri, 2003). Environmental uncertainty is compounded by the increasing information divergence that leads to a change in investor risk taking and fluctuations in expected returns.

The information environment in which investors trade is constantly changing with the dissemination of information. This change in information flow leads to a reassessment of risk by investors. Information risk is due to various factors. What is more important is the existence of an information environment that reduces ambiguity and uncertainty, thereby enhancing investor forecasting and analysis. Using financial and accounting information to balance risk and return leads to improved investor decision-making because most financial decisions are made in uncertainty, and information in such cases will play an important role in reducing uncertainty. What is almost commonplace among research works is accounting information as the most important source of information environment, which is defined as a system of information transfer and reduction of uncertainty; this is the information approach to accounting. Accounting information enables investors to evaluate the company as well as the inherent risks (Armstrong et al., 2011).

In relation to accounting information, there are two main characteristics: the origin of this information and its distribution. In fact, the risk of accounting information can be divided into two components in the context of the capital market environment: the component that is related to the uncertainty about the efficiency of the market of the information source and the component that is the distribution of this information. The inefficiency that leads to environmental uncertainty weakens the relationship between accounting figures and economic realities and thus increases information asymmetry. Therefore, having a favorable and efficient accounting environment increases the financial reporting capability of the company and hence reduces risk among market participants. Therefore, the mission of an efficient market is to reduce and eliminate uncertainty. In this study, the impact of each of these two environmental characteristics of the accounting information on the prices is examined. Hence, the main questions of this research are as follows:

- What are the variables affecting the expected rate of return?
- Does the degree of environmental uncertainty affect the expected rate of return?
- Can the relationship between the characteristics of the information environment (including environmental uncertainties) and the cost of company capital be examined by considering comparability?

In the remainder of the study, first, the theoretical basis and background of the research and hypotheses, then the research models and methods, and finally the conclusions and suggestions are presented.

2. Hypothesis Development

According to the investor cognition hypothesis (Merton, 1987), investors are more likely to invest in companies that are transparent or are judged that they are transparent. If comparability is increased, the visibility of the company increases, and the costs of processing specific company information are reduced; thus comparability will lead to more trading by unsuspecting investors (Brown and Hillegiest, 2007). Diamond and Verrecchia (1991) also argued that disseminating public information makes beliefs more homogeneous and reduces the severity of speculative situations by informed traders. Previous research has also shown that comparability correlates negatively with the frequency of private information events. Lundholm and Myers (2002) found that when comparability is high, current stock returns reflect information about future earnings. These results suggest that bringing the present to the future reduces the comparability of all the information about future profits that can be discovered privately about the company (Brown and Hillegiest, 2007). As this information is less available to be discovered, we expect comparability to reduce access to private information. Experimental findings on comparability are also different. Economic theories and previous empirical evidence (Cohen, 2008; Leuz and Verrecchia, 2000) state that if higher comparability leads to less information asymmetry, firms with high asymmetry have stronger incentives to choose higher comparability to reduce asymmetry. Theoretical models such as the model of Diamond (1985) and that of Diamond and Verrecchia (1991) predict that higher comparability will result in less information asymmetry among market participants.

2.1. Comparability and Expected Rate of Return

While the quality of financial information provided to investors is low due to high information asymmetry, they seek higher expected returns in order to protect themselves against information inefficiencies, which consequently increases the expected rate of return. In this regard, increasing the transparency and the quality of information as a result of the comparability of financial statements can reduce information asymmetry and cost of capital. With increased comparability, financial information reflects the company's economic events and enables investors to analyze them (De Franco et al., 2008). Investors need appropriate and transparent information in order to reduce the risk of adverse selection and to achieve optimal investment portfolios. Comparability makes it possible for them to explore and analyze different investment options. In other words, by increasing the quality of the information provided and comparing it, investors determine the investment risk and determine the expected return on it. As the risk of information differences between informed traders and other traders diminishes, the cost of capital decreases. Information asymmetry among investors leads to the increased risk of adverse selection. In order to control misstatement, some information may be disclosed, or conditions may be provided by analysts to evaluate the risk by comparing financial information with a company as an industry index (Campbell and Yeung, 2016). In this case, it is possible to review and predict the firm's strategies and to estimate future cash flows more accurately (Chen et al., 2007). Under these circumstances, comparability will reduce information asymmetry, and the associated risk leads to a reduction in the expected rate of return.

Hypothesis 1 (H_1): Environmental uncertainty has a significant effect on the expected rate of return in oil, gas, and petrochemical firms.

2.2. Environmental Uncertainty and Expected Rate of Return

In efficient information environments, the symmetrical distribution of information reduces the opportunistic cash flows of managers for a personal gain. Reducing environmental uncertainty improves the intrinsic value of the company and reduces the expected rate of return. On the other hand, the quality of the information environment changes the expected risk associated with cash flows and hence affects the cost of capital of the firm (Lambert, Leuz, and Verrecchia, 2007). The general prediction of the accounting literature is that the expected rate of return is higher when information quality is low (Francis et al., 2005). The most important benefit of a high quality information environment is improved liquidity and reduced expected rate of return. In uncertainty, the information content of the profits reported by market-leading companies is reduced, resulting in low quality profits. Investors have the ability to process information on the earnings, so low earning quality can lead to an increased information imbalance in financial markets (Diamond and Verrecchia, 1991).

Accounting accruals include items that express management expectations of uncertain future events and therefore contain a measurement error. In the context of high environmental uncertainty, accounting accruals are inaccurate and may contain biased measurements of future events, so investors must incur significant information processing costs. Environmental uncertainty is associated with the risk of adverse selection. Informed investors have a greater advantage in companies operating in volatile and ambiguous environments. Under these circumstances, the abnormal returns earned by informed investors increase, but for the other shareholders, there is an increased risk of misstatement resulting in higher capital costs.

Hypothesis 2 (H_2): Comparability has a significant effect on the expected rate of return in oil, gas, and petrochemical firms.

3. Research Method

3.1. Sample Selection

This research is based on oil, gas, and petrochemical firms listed on the Tehran Stock Exchange in Iran. We begin with an initial sample of 4,983 firm-year observations from 2009 to 2018; the Rahavard provides the relevant variables. A total of 4,483 firm-year observations relating to finance, investment, equity trust, funds, and other industries were excluded because of their different practices. Also, financial institutions have distinct requirements to hold cash to meet operating and financing activities, so they were excluded from the sample. Further, we excluded all the firm-year observations when the variables of the expected rate of return were not available. Therefore, the final sample has 500 firm-year observations across oil, gas, and petrochemical companies listed on the Tehran Stock Exchange.

3.2. Dependent Variable Measurement

Drawing on prior research, the expected rate of return (*CC*) is measured to calculate equal-weighted returns

over the subsequent twelve months. Thus, the following equation is estimated based on the monthly variables return:

$$(R_p - R_f) = \alpha_H + \alpha_{mkt}(R_{mkt} - R_f) + \alpha_{smb}SMB_{it} + \alpha_{hml}HML + \varepsilon \quad (1)$$

where R_p is the monthly portfolio return, R_f represents the risk free rate, R_f denotes the risk-free return rate, and R_m indicates the return of the market portfolio. *SMB* stands for small [market capitalization] minus big, and *HML* represents high [book-to-market ratio] minus low. SMB and HML are the three Fama and French (1993) factors. The expected rate of return was used as the dependent variable to test both H_1 and H_2.

3.3. Independent Variable Measurement

Our independent variables are financial statements comparability and environment uncertainty. Comparability is a unique across-firm accounting attribute that captures an aspect of the accounting information different from the firm-specific measures in the prior literature. To examine our hypotheses, this work uses the primary comparability measure developed by De Franco et al. (2011) as expressed in Equation (2):

$$Earnings_{it} = \alpha_0 + \beta_1 return_{it} + \epsilon \quad (2)$$

where *Earnings* is the ratio of quarterly net income before extraordinary items to the beginning-of-period market value of equity. *Return* is the stock return during the quarter.

For each firm-year observation, this study uses five previous semi year of data to obtain $\hat{\alpha}$ and $\hat{\beta}$ from Equation (2), which represents the accounting function for firm *i* in semi year *t*. It is similar to the method used to calculate accounting functions $\hat{\alpha}$ and $\hat{\beta}$ for firm *j*.

Next, we estimate the "closeness" of the accounting functions between two firms, that is, the comparability between the firms.

$$E(Earnings)_{iit} = \hat{\alpha}_i + \hat{\alpha}_1 return_{it} + \epsilon \quad (3)$$

$$E(Earnings)_{ijt} = \hat{\alpha}_j + \hat{\alpha}_1 return_{jt} + \epsilon \quad (4)$$

where $E(Earnings)_{iit}$ is the predicted earnings of firm *i* given the accounting function of firm *i* and the return in period *t* of firm *i*. $E(Earnings)_{ijt}$ represents the predicted earnings of firm *j* given the accounting function of firm *j* and the return in period *t* of firm *i*. The logic is that the more comparable the firms' accounting systems are, the more comparable their financial statements are if the firms experience the same economic events. *Return* is the stock return during the quarter.

Finally, accounting comparability between firms *i* and *j* ($CompAcct_{ijt}$) is measured as follows:

$$CompAcct_{it} = -\frac{1}{5} \times \sum_{t-4}^{t} \left| E(Earnings)_{iit} - E(Earnings)_{ijt} \right| \quad (5)$$

A greater $CompAcct_{ijt}$ indicates greater financial statement comparability. To produce a firm-year measure of comparability, we aggregate the firm *i*–firm *j* $CompAcct_{ijt}$ for each firm *i* by ranking all the *j* values of $CompAcct_{ijt}$ from the highest to the lowest value. $CompAcct_{it}$ is the average $CompAcct_{ijt}$ of the first four firms *j* with the highest comparability to firm *i* during period *t*. $CompAccInd_{it}$ is the median $CompAcct_{it}$ for all firms *j* in the same industry as firm *i* during period *t*. Therefore, firms with higher $CompAcct_{it}$ and $CompAccInd_{it}$ have accounting functions more comparable to those in the peer group and in the industry respectively. In other words, these firms should have less information asymmetry and fewer agency problems, leading to more efficient internal capital markets and a higher excess value than the firms with low financial statement comparability.

Also, a measure of environmental uncertainty (*VIX*) is used to calculate the environmental uncertainty proxy based on the work of Anvari Rostami and Kiani (2016) which is used as the independent variable to test H_2. The changes in the standard deviation of profitability over three years are used to measure environmental uncertainty (*VIX*). The use of standard deviations to measure environmental uncertainty has been reported by many researchers.

3.4. Models

a. Regression specification for testing H_1 and H_2

To investigate the fluctuations in the expected rate of return based on the comparability of the financial statements and the environment uncertainty, the following regression is employed to examine the linear impact of the comparability of the financial statements and the environment uncertainty on the fluctuations in the expected rate of return:

$$CC_{it} = \alpha_0 + \alpha_1 Comparability_{it} + \alpha_2 VIX_{it} + \alpha_3 Comparability \times VIX_{it} + \alpha_4 ROA_{it} + \alpha_5 STDOCF_{it} + \alpha_6 STDRET_{it} + \alpha_7 LEV_{it} + \alpha_8 BTM_{it} + \alpha_9 SIZE_{it} + IND\ \&\ YEAREFFECT + \varepsilon \quad (6)$$

where *CC* is a measure of the expected rate of return; *Comparability* and *VIX* are the comparability of the financial statements and the environmental uncertainty respectively as defined earlier; *SIZE* denotes the natural logarithm of the market value of equity in millions at the end of year *t*; *BTM* represents the ratio of the book value of equity to the market value of equity at the end of the fiscal year; *ROA* is the income before extraordinary items scaled by lagged total assets; *LEV* indicates total long-term debt plus total debt in current liabilities scaled by total assets; *STDRET* stands for the standard deviation of the stock returns over the three past years; *STDOCF* is the standard deviation of the operating cash flow over the three past years; *IND* and *YEAREFFECT* represent regression analysis control for the industry and the year effect respectively.

In the above regression, the coefficient testing the impacts of the comparability of the financial statements and the environmental uncertainty on the expected rate of return is the correlation coefficient between them. The coefficients of the variables of the comparability of the financial statements and the environmental uncertainty show the distinct effects of these variables.

4. Results

4.1. Descriptive Analysis

Table 1 presents the descriptive statistics for the comparability of the financial statements and the environmental uncertainty and other control variables used in the multivariate regression analyses. The average expected rate of return is 0.2852, indicating that this rate is higher than the risk-free rate of return due to investor's acceptance of 35% risk (deviation). The average value for the comparability of the financial statements and the environmental uncertainty are –0.0844 and 0.1553 respectively, which indicates a relatively good turnover and improvement in the floating stock status of the companies under study; it can also be expressed with respect to the average comparability. The figures of the different companies in this industry are not significantly different from the average of the industry figures. The mean of leverage is 0.6562, indicating that firms' resources are financed from debt, and the sample firms are highly leveraged. The mean of return on assets is 0.1190, which indicates the turn of 12 money units on investment in 100 money unit assets. The average value of 0.8762 for the book-to-market ratio reflects a conservative approach to identifying assets across the firms. The mean volatility of returns and cash flows are 0.3597 and 0.014 respectively, implying higher changes in profitability than liquidity. By analyzing the coefficient of variation of the data, we can state that the independent and dependent variables have a normal distribution.

4.2. Correlation Analysis

Table 2 lists the coefficients of the correlation between the expected rate of return and the explanatory variables. These coefficients also have expected signs. This table includes pairwise Pearson correlation coefficients among the important variables.

4.3. Regression Analysis

While the descriptive statistics and the correlation analysis are informative, more conclusive evidence can be obtained through the multivariate regression analysis that controls many firm-specific variables (Bhuiyan and Hooks, 2019) affecting the expected rate of return.

Before fitting the model, it is necessary to perform the restricted *F*-test in order to investigate the use of the pooled data method versus the combined data method with constant effects for the above model. According to the statistics of 1.2017 and the *Prob* of 0.1241 for the constrained *F*-test and the confirmation of the null hypothesis for the research model, the pooled method is employed to estimate the model.

Table 3 presents the multivariate regression analysis for H_1 and H_2. The results show that *Comparability* has a negative association with the measure of the expected rate of return, indicating that the firms with high comparability have a lower expected rate of return compared to other firms. The coefficient of comparability (coefficient = –2.7110, *t*-statistics = –5.0929) shows a negative association with the expected rate of return. The result is statistically significant at the level of 1%. Thus, the coefficients and the statistical significance of the findings support H_1.

Table 1. Descriptive statistics for the comparability of the financial statements and the environmental uncertainty and other control variables used in the multivariate regression analyses.

Variable	*N*	Mean	Median	Minimum	Maximum	Standard Deviation
CC	500	0.2852	0.2029	–0.2123	1.1574	0.3712
Comparability	500	–0.0844	–0.0822	–0.2891	–0.0014	0.0500
VIX	500	0.1553	0.1054	0.0001	0.9984	0.1512
ROA	500	0.1190	0.0512	–0.4323	1.2046	0.2051
SIZE	500	12.9011	12.8437	16.2464	8.5200	0.6153
LEV	500	0.6562	0.6560	0.0964	1.8244	0.2351
BTM	500	0.8762	0.8962	–0.9898	3.5890	0.3819
STDOCF	500	0.0140	0.0099	0.0100	0.1206	0.0145
STDRET	500	0.3597	0.3054	0.1056	0.9800	0.2271

Table 2. Coefficients of the correlation between the expected rate of return and the explanatory variables.

Variable	*CC*	*Comparability*	*VIX*	*BTM*	*LEV*	*ROA*	*SIZE*	*STDOCF*	*STDRET*
CC		–0.168650	0.066297	0.038524	–0.026306	0.019369	–0.018713	6.73×10^{-05}	–0.099710
Comparability	–0.168650		–0.128554	0.062686	0.122681	–0.033102	–0.001269	–0.005347	0.199811
VIX	0.066297	–0.128554		–0.013517	–0.165763	–0.061459	0.136869	–0.184293	–0.036192
BTM	0.038524	0.062686	–0.013517		0.018435	0.030115	–0.094548	0.014326	–0.003119
LEV	–0.026306	0.122681	–0.165763	0.018435		–0.110135	–0.049258	–0.111042	–0.090541
ROA	0.019369	–0.033102	–0.061459	0.030115	–0.110135		–0.313335	0.132757	–0.053495
SIZE	–0.018713	–0.001269	0.136869	–0.094548	–0.049258	–0.313335		–0.096545	0.017099
STDOCF	6.73×10^{-05}	–0.005347	–0.184293	0.014326	–0.111042	0.132757	–0.096545		0.027716
STDRET	–0.099710	0.199811	–0.036192	–0.003119	–0.090541	–0.053495	0.017099	0.027716	

The results indicate that firms which are active in unstable environments (*VIX*) have a higher expected rate of return (coefficient = 0.1827; *t*-statistics = 3.4787), and the coefficients are statistically significant at the level of 1%. Thus, H_2 is supported.

With regard to the control variables, large firms (*SIZE*) (coefficient = 0.0400; *t*-statistics = 0.8549) have a chief executive officer with higher risk taking, and firms with more return of assets (coefficient = 0.0557; *t*-statistics = 1.6345) show a positive association; also, book-to-market value (coefficient = 0.0102; *t*-statistics = 0.5850) show a positive association with the expected rate of return. Moreover, *LEV* demonstrates a negative association (coefficient = –0.0662; *t*-statistics = –1.479) which indicates that firms with a higher leverage expect a low expected rate of return. Our results are robust considering the industry and year effect, and our multivariate regression models present an adjusted R^2 of 17.68%. For the auto-correlation test, the Wooldridge test is used. Due to the fact that this test is not available in the data panel models of Eviews software, STATA software is utilized to perform the test. As shown in Table 3, the auto-correlation test results indicate an

insignificant level (more than 5%). Accordingly, the null hypothesis that there is no serial auto-correlation is not rejected. Breusch-Pagan heteroscedasticity tests allow to check if the residuals of a regression have a changing variance. As tabulated in Table 3, the results of the heteroscedasticity test indicate an insignificant level (more than 5%). Accordingly, the null hypothesis that there is no heteroscedasticity is not rejected.

Overall, the results in our earlier analyses are consistent with our hypotheses that the expected rate of return changes with the comparability of the financial statements and the environmental uncertainty.

Table 3. Regression result.

Variables	Coefficient	*t*-Statistic	*Prob.*	Variance Inflation Factor
Comparability	–2.7110	–5.0929	0.0000	1.25
VIX	0.1827	3.4787	0.0005	1.46
VIX×Comparability	–1.4903	–2.9068	0.0038	–
ROA	0.0557	1.6345	0.1027	1.12
SIZE	0.0400	0.8549	0.3979	1.30
LEV	–0.0662	–1.0479	0.2951	1.19
BTM	0.0102	0.5850	0.5588	1.17
STDOCF	1.3226	1.6208	0.1055	1.94
STDRET	–0.0954	–1.8549	0.0641	1.42
Intercept	–0.0056	–0.0428	0.9658	–
Observations	**500**			
Adjusted R^2	0.1768			
***F*-statistic**	14.575(0.000)			
Breusch-Pagan	1.290(0.427)			
Serial Auto-correlation	1.495 (0.241)			

5. Conclusions

In this study, the expected rate of return is studied based on the comparability of the financial statements and the environmental uncertainty in oil, gas, and petrochemical firms. The results of the first hypothesis of the research confirm the significant impact of the environmental uncertainty on the expected rate of return. In this context, we can state that information asymmetry and market inefficiency increase the expected rate of return of the company since less informed traders recognize that they are in a bad information situation and thus hold fewer assets. On the other hand, limited circulation of the stocks leads to capital stagnation and reduced liquidity and limits the willingness to invest (Armstrong et al., 2011). As a result, this drives the price of securities with a high degree of private information downward, thereby increasing the environmental uncertainty and thus raising the expected rate of return for these companies. The results of the first hypothesis are consistent with the findings of Easley and O'Hara (2004). They found that under conditions of high environmental uncertainty, where the trading volume and the stock liquidity are low, the environmental uncertainty leads to increased mismatch and inefficient investment. Under these circumstances, the investors' expected return for offsetting the investment risk is increased.

The results of the second hypothesis of the research on the effect of the comparability of the financial statements on the expected rate of return are confirmed. Investors need clear and uniform information to identify optimal investment opportunities. Fu et al. (2012) argued that increased comparability facilitates the analysis and

identification of financial information to avoid adverse selection and prevents the imposition of surplus costs. The results of this hypothesis are consistent with the work of Lambert et al. (2012). The result of the effect of the comparability of the financial statements on the expected rate of return of oil, gas, and petrochemical firms operating at a high environmental uncertainty differs from that of the oil, gas, and petrochemical firms operating at a low environmental uncertainty. Comparability through the generation of quality information reduces the overall ambiguity and thus decreases the benefit that certain investors gain from acquiring private information about the company. In the case of high comparability, the effect of the reduction in liquidity is due to the unwillingness of some specific investors to collect private information and participate in the trading of shares of a negligible company. In the case of high comparability, the effect of the reduction in liquidity is due to the unwillingness of some specific investors to collect private information and participate in the trading of shares of a negligible company.

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