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A Study of the Impact of Accounting Information Quality and Information Asymmetry on Underinvestment in Iran

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Abstract

Purpose - The main purpose of the current study is to examine the impact of accounting information quality and information asymmetry on the underinvestment phenomenon among the listed companies on the Tehran Stock Exchange (TSE).
Research design, data, and methodology - The population includes 94 firms selected through systematic sampling. The data is collected from the audited financial statements of the firms provided by TSE's website from 2010 to 2015. Accounting information quality and information asymmetry is considered as independent variables, and their impact is examined on the dependent variable (underinvestment).
Results - The statistical results, based on data collected from 94 listed companies on the TSE during 2010–2015, revealed positive impact of accounting information quality and positive impact of information asymmetry on underinvestment. There was a significant relationship between accrual quality (AQ) and underinvestment, and spread and underinvestment. The results also showed that information asymmetry is the main factor in the creation underinvestment.
Conclusions - Findings of this article can assist accounting researchers and theoreticians in comparing Real world facts with hypotheses developed with respect to accounting information quality, information asymmetry and underinvestment. However, the results of fuzzy regression analysis indicate significant relationships between the independent variable except underinvestment.

Keywords: Accounting Information Quality, Information Asymmetry, Underinvestment.

JEL Classifications: G31, G34, M41, M48.

1. Introduction

Verdi (2006) studied the relation between financial reporting quality and investment efficiency on a sample of 38,062 firm-year observations between 1980 and 2003. Financial reporting quality has been posited to improve investment efficiency, but to date there has been little empirical evidence to support this claim. They found that proxies for financial reporting quality are negatively associated with both firm underinvestment and overinvestment. The relation between financial reporting quality and underinvestment (overinvestment) is mainly driven by the innate (innate and discretionary) component of reporting quality. Further, financial reporting quality is more strongly associated with overinvestment for firms with large cash balances and dispersed ownership, which suggests that financial reporting quality mitigates information asymmetries arising from agency conflicts. However, they found mixed evidence for the hypothesis that financial reporting quality is more strongly associated with underinvestment for firms facing financing constraints. Finally, the relation between financial reporting quality and investment efficiency is stronger for firms with low quality information environments.

Richardson (2006) examined the extent of firm level over-investment of free cash flow. Using an accounting based framework to measure over-investment and free cash flow, they found evidence that, consistent with agency cost explanations, over-investment is concentrated in firms with the highest levels of free cash flow. Morgado (2003) investigated the relationship between firm value and

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investment to test the underinvestment and overinvestment hypotheses. The results obtained, using panel data methodology as the estimation method, indicated that the abovementioned relation is quadratic, which implies that there exists an optimal level of investment.

In this study, we examined the relationship between accounting information quality and information asymmetry on underinvestment. Section 2 motivates the study and lists the hypotheses to be tested. Section 3 describes our research design, including measurements of primary variables and empirical specification. Section 4 describes sample selection and descriptive statistics, the results from our regression analyses. Section 5 is concluded with limitations and directions for future research.

2. Review of Literature

Chen et al (2011) examined the role of FRQ in private firms from emerging markets, a setting in which extant research suggests that FRQ would be less conducive to the mitigation of investment inefficiencies. They found that the relation between FRQ and investment efficiency is increasing in bank financing and decreasing in incentives to minimize earnings for tax purposes. Such a connection between tax-minimization incentives and the informational role of earnings has often been asserted in the literature. They provided explicit evidence in this regard. Myers (1984) considered a firm that must issue common stock to raise cash to undertake a valuable investment opportunity. Management is assumed to know more about the firm's value than potential investors do. Investors interpret the firm's actions rationally. An equilibrium model of the issue-invest decision is developed under these assumptions. Their models showed that firms may refuse to issue stock, and therefore may pass up valuable investment opportunities. The model suggested explanations for several aspects of corporate financing behavior, including the tendency to rely on internal sources of funds, and to prefer debt to equity if external financing is required. Extensions and applications of the model are discussed. Biddle et al. (2009) provided evidence of both in documenting a conditional negative (positive) association between financial reporting quality and investment for firms operating in settings more prone to over-investment (under-investment). Firms with higher financial reporting quality also are found to deviate less from predicted investment levels and show less sensitivity to macro-economic conditions. These results suggested that one mechanism linking reporting quality and investment efficiency is a reduction of frictions such as moral hazard and adverse selection that hamper efficient investment. Biddle and Hilary (2006) examined how accounting quality relates to firm-level capital investment efficiency. their first hypothesis was that higher quality accounting enhances investment efficiency by reducing information asymmetry between managers and outside suppliers of capital. their second hypothesis was that this effect should be stronger in economies where financing is largely provided through arm's-length transactions compared with countries where creditors supply more capital. Their results were consistent with these hypotheses both across and within countries. They were rousted to alternative econometric specifications, different measures of accounting quality and investment-cash flow sensitivity, and numerous control variables.

Cheng et al. (2013) provided more direct evidence on the causal relation between the quality of financial reporting and investment efficiency. They examined the investment behavior of a sample of firms that disclosed internal control weaknesses under the Sarbanes-Oxley Act. They found that prior to the disclosure, these firms under-invest (over-invest) when they are financially constrained (unconstrained). More importantly, they found that after the disclosure, these firms' investment efficiency improves significantly. Garsia et al. (2009) found a negative association between conditional conservatism and measures of over- and under-investment, and a positive association between conservatism and future profitability. This was consistent with firms reporting more conditionally conservative numbers investing more efficiently and in more profitable projects. Their results added to a growing stream of literature suggesting that eliminating conservatism from accounting regulatory frameworks may lead to undesirable economic consequences. Lenard and Yu (2012) investigated how earnings quality affects the investment decisions of Chinese companies who employ non-Big 4 auditors. They found that more important clients have significantly higher investment than less important clients, and that discretionary accruals are significant indicators of over-investment. Less important clients are more conservative in their investments, although they have more investment opportunities. They also observed that the proportion of over-investment drops for clients, regardless of their importance, whose auditors have a long tenure. Gomariz and Juan (2014) examined the role of financial reporting quality and debt maturity in investment efficiency. The results showed that financial reporting quality mitigates the overinvestment problem. Likewise, lower debt maturity can improve investment efficiency, reducing both overinvestment and underinvestment problems. They further found that financial reporting quality and debt maturity are mechanisms with some degree of substitution in enhancing investment efficiency: firms with lower (higher) use of short-term debt, exhibit higher (lower) financial reporting quality effect on investment efficiency. Hoshi et al. (1991) evidence suggested that information and incentive problems in the capital market affect investment. They came to this conclusion by examining two sets of Japanese firms. The first set has close financial ties to large Japanese banks that serve as their primary source of external finance and are likely to be well informed about the firm. The second set of firms has weaker links to a main bank and presumably faces greater

problems raising capital. Investment is more sensitive to liquidity for the second set of firms than for the first set. The analysis also highlights the role of financial intermediaries in the investment process. We extend this work by investigating the following question: What is the relationship between accounting information quality and information asymmetry on the underinvestment? This question leads to the two following hypotheses in this paper:

<H_1> : There is a significant relationship between information asymmetry and underinvestment.
<H_2> : There is a significant relationship between Accounting information quality and underinvestment.

3. Methodology

The current study is considered as a semi-experimental study. An inductive method was applied on the ex-post data (using historical data), and correlation analysis was used for the statistical analysis. The initial sample included data from all the firms listed on TSE during the years 2010–2015. The firms that did not meet any of the following conditions were omitted:

- Availability of necessary data for measuring the variables
- Listed at least from 2009 on TSE, and continued to be listed till 2015.
- Fiscal year ended March 21 every year (end of calendar year in Iran).
- Did not operate as financial intermediaries.

Considering the above conditions, the final sample included 94 firms (470 firm years). The required data for the study were collected using Iranian databases including Rahavard Novin, firms' prospectuses, and their audited financial statements. The statistical analysis used EViews and SPSS software, and the hypotheses were tested using t-student statistic at the significance level of 95 per cent.

Variables

The present research uses the model proposed by (chen et al., 2011; Yang & Jiang, 2008):

$$UI_{i,t} = \beta_0 + \beta_1 AQ_{i,t-1} + \beta_2 Sp_{i,t-1} + \beta_3 LD_{i,t} + \beta_4 EQ_{i,t} + \varepsilon_{i,t} \quad (1)$$

$UI_{i,t}$: $investment$ For firm i in year t
$AQ_{i,t-1}$: accrual quality For firm i in year t-1
$SP_{i,t-1}$: Spread For firm i in year t-1
$LD_{i,t}$: Debts ratio on total assets for firm i in year t
$EQ_{i,t}$: Equity ratio on total assets for firm i in year t

Research variable

Dependent variable

In this study, the dependent variable the present research uses the model proposed by (Li & Wang, 2010):

$$investment_{i,t} = \beta_0 + \beta_1 GROW_{i,t-1} + \beta_2 CASH_{i,t-1} + \beta_3 ROA_{i,t} + \beta_4 LEV_{i,t} + SIZE_{i,t-1} + \varepsilon_{i,t}$$

$GROW_{i,t-1}$: $Grow_{i,t-1}$ Natural log of total assets at the end of year t-1 divided by total assets at the end of year t-1.
$CASH_{i,t-1}$: Cash flows and short-term investment ratio on assets average assets for firm i in year t-1
$ROA_{i,t-1}$: Net income ratio on assets average assets for firm i in year t-1
$LEV_{i,t-1}$: Financial Leverage for firm i in year t-1.
$SIZE_{i,t-1}$: Natural logarithm of total assets for firm i in year t-1.

Independent variable

In this study, the independent variables are accounting information quality and information asymmetry.

Accounting information quality:

The present research uses the model proposed by (Francis et al 2004):

$$\frac{TCA_{i,t}}{assets_{i,t}} = \alpha_0 + \alpha_1 \frac{CFO_{i,t-1}}{assets_{i,t}} + \alpha_2 \frac{CFO_{i,t-1}}{assets_{i,t}} + \alpha_3 \frac{CFO_{i,t-1}}{assets_{i,t}} + \varepsilon_{i,t}$$

Information asymmetry

The present research uses the model proposed by (Venkatesh and Chiang, 1986):

$$SPREAD_{i,t} = \frac{AP - BP}{\frac{AP + BP}{2}} \times 100$$

$SPREAD_{i,t}$: The price difference offers to buy and sell shares for firm i in year t.
AP : The average price of offered for buying stock for firm i in year t.
AP : The average price of offers to buy shares for firm i in year t.

Control variable

In this study, the control variables are the ratio of debt to total assets (LD), the ratio of equity to total assets (EQ).

4. Findings and Descriptive Statistics

Descriptive statistics of independent, dependent, and control variables for data from the 94 sample firms, including mean, median, standard deviation, minimum, and maximum are presented in <Table 1>. Multivariate regression analysis was applied at the 5% significance level for testing the hypotheses. Descriptive and inferential (multivariate regression analyses) analyses are used for testing the hypotheses of the research.

Determination of an Appropriate Model for Regression Estimation:
Chaw Test

Results from F-test for regression models used in this study are shown in <Table 1>.

<Table 1> Descriptive Statistics

	N	Mean	Minimum	Maximum	Std. Deviation
Investment	470	3.251	2.321	4.658	0.325
GEROW	470	5.417	4.325	6.020	0.652
CASH	470	2.854	1.487	3.201	0.124
ROA	470	1.258	0.258	2.014	0.325
LEV	470	4.650	3.654	5.654	0.258
SIZE	470	5.325	4.658	6.320	0.123
TCA	470	4.870	3.258	5.870	0.214
CFO	470	2.325	2.021	3.148	0.147
AQ	470	1.324	0.124	2.321	0.325
SPREAD	470	3.451	2.789	4.874	0.365
EQ	470	0.254	0.147	0.984	0.146
LD	470	0.365	0.190	0.874	0.102

<Table 2> Chaw Test for Regression Models

Regression Models	F Statistic	p-value Significance	Test Results
Model 1-for testing 1st And-2nd hypotheses	68.547	0.000	Null hypothesis is rejected

For Model 1 used to test the first and second hypotheses, considering the significance of Chaw's test results, null hypothesis (which says that using pool model is more appropriate) is rejected. In other words, due to existing singular or group effects, panel data method should be used for regression estimation. In the following section, results of Hausman test to determine whether the panel data is random effect or fixed effect are described. In other words, since there are no singular or group effects, pool data method should be used for regression estimation so that there is no need to perform Hausman test.

Hausman Test

After constants are determined (not to be the same for different years), there is a need to find an appropriate method (fixed effects or random effects) for regression estimation purposes. In this article, Hausman test was used to test the null hypothesis, that is, random effect estimation is consistent against alternative hypothesis, arguing that random effect estimation is inconsistent. The results from Hausman test for Model 1 used to test the first and second hypotheses are presented in <Table 3>. The Hausman test output shows that statistic for the said model equals to 111.254, which is significant at 5 per cent level, and leads to the disapproval of null hypothesis; thus, considering this result, panel data with fixed effects was used for the estimation of Model 1 to test the first and second hypotheses.

<Table 3> Hausman Test Results

Regression Models	Statistics	p-value	Test Results
Model 1-for testing 1st And-2nd hypotheses	111.254	0.000	Null hypothesis is rejected

Testing Classic Assumptions for Regression Estimation

Before the estimation of any regression model, the classic assumptions behind the linear regression models were tested. These tests and their results are discussed in the next section. Normality of Independent Variable Distribution the Kolmogorov–Smirnov test was used to determine whether the distribution of independent variables was normal, results of which are presented in <Table 4>. Since the significance level calculated in the Kolmogorov–Smirnov test is more than 5 per cent (0.596), as presented in <Table 4>, null hypothesis for this test is rejected and, therefore, we can conclude that the distribution of SPREAD (independent variable) is normal.

<Table 4> One-Sample Kolmogorov–Smirnov Test Results

Dependent Variable	p-value	Test Results
underinvestment	0.321	Distribution is normal

Residuals' Autocorrelation

The Durbin–Watson statistic was used to test the presence of autocorrelation in the residuals. This statistic is generally used to test the following hypotheses in this

respect:

$H_0 =$ There is no significant autocorrelation in the residuals
$H_1 =$ There is a significant autocorrelation in the residuals

If the Durbin–Watson statistic is between 1.5 and 2.5, then the null hypothesis (no autocorrelation between residuals) is accepted; else, the alternative hypothesis is accepted. Durbin–Watson statistic, R-square, and adjusted R-square for both the models used in this article are shown in <Table 5>.

<Table 5> Testing Autocorrelation between Residuals

Regression Models	R-square	Adjusted R-Square	Durbin-Watson
Model 1-for testing 1st And-2nd hypotheses	0.481	0.421	1.958

As shown in <Table 5>, Durbin–Watson statistic for both the models is between 1.5 and 2.5. Therefore, the null hypothesis, that there is no significant autocorrelation in the residuals, is accepted. After testing the classic assumptions for regression models, the results from the estimation of the regression models and the test of the main research hypotheses are discussed in the following section.

Testing Research Hypotheses

The results of estimation of regression Model 1 used to test the first and second hypotheses are presented in <Table 6>. As shown in <Table 6>, F-statistic for Model 1 is 9.265 that prove that goodness of fit for this model is of appropriate level. Also, estimated R-square and adjusted R-square for Model 1 are 48.1 per cent and 42.1 per cent, respectively. Based on this, therefore, it can be concluded that explanatory variables used in the regression Model 1 can explain only 48.1 per cent of the changes in underinvestment.

<Table 6> Regression Estimation Results for Model 1

Variables	Multiplier	Standardized Beta	t-statistic	Significance
Constant	β_0	5.124	3.001	0.005
AQ	β_1	-5.241	-2.745	0.015
Sp	β_2	-2.587	-3.114	0.000
LD	β_3	4.557	2.014	0.042
EQ	β_4	3.781	2.212	0.016
R-square: 0.481		F-statistic: 9.265		
Adjusted R-Square: 0.421		P-value: 0.000		
		Durbin–Watson: 1.958		

It should be noted that the positive (negative) sign of figures presented in Standardized Beta column shows the direct (reverse) impact of each variable on information asymmetry of the sample firms.

<H1> There is a significant relation between accrual quality (AQ) and underinvestment.

As shown in <Table 6>, accrual quality is significant at 5 per cent (sig. = 0.015); also, the absolute value of T-student statistic for this variable is -2.745, which proves that it is significant at 5 per cent level. Therefore, at 95 per cent level of confidence, the first research hypothesis that there is a significant relation between accrual quality and underinvestment is accepted.

<H2> There is a significant relation between spread and underinvestment.

As shown in <Table 6>, spread is significant at 5 per cent (sig. = 0.000); also, the absolute value of t-student statistic for this variable is -3.114, which proves that it is significant at 5 per cent level. Therefore, at 95 per cent level of confidence, the second research hypothesis, that there is a significant relation between spread and underinvestment, is accepted.

Fuzzy regression

Simple Linear Regression defined based on probability distribution, is always confronted with some limitations due to the hypotheses inflexibility. Also, the statistical regression models are used only when the observations' distribution is done based on a statistical model. But, the fuzzy regression models, in addition to their flexibility in adaptation to natural conditions, are an efficient instrument for demonstrating the effects of those variables with the same features. Time fuzzy regression is used when the variables or the observations are imprecise and vague, and when the relationship between variables is imprecise, as well as when the hypotheses' accuracy is uncertain (in small samples). However, in many cases, one or more hypotheses may be rejected or due to the sample size the hypothesis cannot be supported. In such cases, the common models do not have the required reliability and performance. The next alternative method is fuzzy regression. This kind of regression can be used when the variables or the relevant observations are imprecise and vague; also when the relationship between the variables is imprecise; or when the hypotheses are not certainly true (particularly, when the sample is small). The current study employs the fuzzy regression with fuzzy coefficients to examine the model.

The regression model:

$$UI = \alpha_0 + \alpha_1 AQ + \alpha_2 Sp + \alpha_3 LD + \theta_i$$

Assuming that:

$$y = UI,\ x_1 = AQ,\ x_2 = Sp,\ x_3 = LD,\ x_4 = EQ$$

, And $\alpha_1 = (\alpha_i, s_i),\ i = 0,\ 1,\ \cdots, 4$

The objective function is expressed as follows:

$$z = 2 \times 80 s_0 + 2 s_1 \sum_{j=1}^{80} |x_{2j}| + 2 s_2 \sum_{j=1}^{80} |x_{2j}| + 2 s_3 \sum_{j=1}^{80} |x_{2j}| + 2 s_4 \sum_{j=1}^{80} |x_{2j}|$$

Two constraints are defined for each observation with a total of 416 constraints. For instance, the first two constraints are as follows:

$$(1-h) s_0 + (1-h) s_1 |0.3| + (1-h) s_2 |89| + (1-h) s_3 |88|$$

$$+ (1-h) s_4 |0.5| + -a_0 + a_1 |0.3| + a_2 |89| + a_3 |88| + a_4 |0.5| \geq -0.07$$

Minimizing the objective function (z) with respect to the 416 constraints as well as $s_0 \geq 0$ for $i = 0,\ 1,\ \cdots, 4$ and $a_1 = 0,\ 1,\ \cdots, 4$ is a problem in linear programming that is solved by Lingo software. Solving the problem for leads to the data provided in <Table 5>.

<Table 7> Estimating the objective function based on different membership degrees

h	s_0	z
0.1	0.39	79
0.2	0.43	89
0.3	0.49	103
0.4	0.57	119
0.5	0.24	142
0.6	0.86	179
0.7	1.14	232
0.8	1.8	355
0.9	3.5	710

Considering the Table 7, we will have the following calculations for all the h values:

$$s_0 = s_1 = s_2 = s_3 = s_4 = 0$$

$$a_0 = 0.17,\ a_1 = 0.21,\ a_2 = 0.008,\ a_3 = 0.11,\ a_4 = 0$$

By replacing the coefficients obtained in the regression model, for certain values of independent variables the output is fuzzy and in the form of symmetric triangular fuzzy numbers. Therefore, we solve the output using Center of Area (COA) in MATLAB. Finally, the MSE of the model can be obtained by comparing the estimated model with real values. In this case, the final regression model is the one with the lowest MSE. The output of MATLAB is provided in <Table 7>.

<Table 8> Estimating the objective function based on real value

h	a_0	MSE
0.1	0.171	0.0320
0.2	0.182	0.0313
0.3	0.172	0.0318
0.4	0.173	0.0320
0.5	0.180	0.0318
0.6	0.172	0.0317
0.7	0.164	0.0315
0.8	0.162	0.0316
0.9	0.08	0.0318

Considering the **<Table 8>**, the lowest MSE occurs when h=0.09.

Therefore, the fuzzy regression model is:

$$\tilde{y} = 0.17 + 0.21 x_1 + 0.008 x_2 + 0.11 x_3 + 0 x_4$$

Defuzzification gives the following model

$$y = 0.008 + 0.21 x_1 + 0.008 x_2 + 0.11 x_3 + 0 x_4$$

5. Discussion and Conclusion

The present research examined the relationship between four variables (AQ, SP, LD, and EQ) and underinvestment of the firms listed in Tehran Stock Exchange. The results of multivariate regression accepted two the hypotheses of the Research. The results of multiple linear regression analysis show that: There is a significant relation between accrual quality (AQ) and underinvestment. There is a significant relation between spread and underinvestment. The results show that information asymmetry is the main factor in the creation underinvestment. There is a positive impact of accounting information quality and information asymmetry on underinvestment. The results of this current research will be able to inform accounting researchers and theoreticians in connecting real world facts with hypotheses in terms of accounting information quality, information asymmetry, and underinvestment. The limitations of this study are related to the lack of classified data in the database of TSE. Therefore, the researchers were forced to use the audited reports of the firms and data collection became a very time consuming process.

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