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Testing the rational expectations hypotheses on accounting numbers in Tehran stock exchange

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Abstract

The purpose of this paper is to test the persistence and pricing of earnings, CFO and accruals using Iranian data. In response to arguments concerning omitted variables in the Mishkin (1983) test, it seeks to explore asymmetric effects by incorporating omitted variable capturing firm size, firm growth, sales and its variations and net operating assets into forecasting and pricing equations. The results indicate that, 1) CFO is more persistent than ACC, 2) excluding omitted variables, stock market price earnings and its components irrationally and 3) including omitted variables, stock market price earnings and its components irrationally, too.

Keywords: Rational expectation hypothesis, earnings, operation cash flows, accruals, Mishkin test

Introduction

In the some works on financial-statement analysis, researchers are very interested in how current (or past) earnings (or earnings components) aid in forecasting future earnings or cash flows, both of which are central inputs in accounting-valuation models.

Prior research has often termed the abnormal accruals (resulted from accruals models such as the Jonse (1991) model and subsequently modified version of this model) as "discretionary accruals" and used these items as proxies for managerial discretion (e.g.Jones 1991; Subramanyam 1996; Erikson and Wang 1999). However, Healy (1996) and Bernard and Skinner (1996) point out that the residuals from accruals models capture not only managerial discretion but also unusual normal accruals and unintentional misstatements. Because of this measurement error in residuals of accruals models, it is difficult to determine whether the market overprice that portion of discretionary accruals of earnings management are the portion arising from the unusual business environment.

Sloan (1996) investigates the market pricing of total accruals and finds that the market fails to appreciate fully the lower persistence of the accrual component of earnings and thus, overprices total accruals. Collins and Hribar (2000a) also find that the market overprices total accruals. Sloan (1996) and Collins and Hribar (2000a) do not examine whether the overpricing is due to discretionary accruals, non-discretionary accruals, or both.

Subramaniam (1996) reports that the discretionary accruals are positively related to future profitability but this relationship does not necessarily mean that the market rationally prices these accruals with respect to their association with future profitability, such as earnings.

Managers have chosen positive abnormal accruals to increase earnings before IPOs and SEOs. They also find that the market overprices these abnormal accruals(Rangan, 1998; Toeh, Welch, Wong, 1998a, 1998b) find that. These studies have not examined whether the market misprice abnormal accruals.

However, Xie (2001) examines the market price of the Jones (1991) model estimated abnormal accruals to test whether stock prices rationally reflect the one-year-ahead earnings' implications of these accruals. Using the Mishkin (1983) and Hedge-portfolio test methods Sloan (1996) employs, he finds that the market overestimates the persistence of abnormal accruals and consequently, overprices these accruals.

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Dopuch, Seethamraju, and Xu (2005) investigate the differential persistence of accruals between profit firms and loss firms. They find that accrued earnings are more persistent for profit firms than for loss firms and that only in profit firms accrued earnings are overpriced, while in loss firms accrued earnings are underpriced, albeit insignificantly.

In this paper, to divide total accruals to normal and abnormal accruals, we employ a piecewise linear version of accrual models. First, earnings are divided into operating cash flows and total accruals. Second, using a piecewise linear version of McNichols' (2002) modification of Dechow and Dichev's(2002) model, total accruals are divided into non-discretionary (normal) accruals and discretionary (abnormal) accruals to test whether stock prices rationally reflect the one-year-ahead earnings' implications of these accruals.

The Mishkin (1983) test provides a statistical comparison between (1) a measure of the market's pricing of abnormal accruals (i.e., the market's *valuation coefficient* on abnormal accruals) and (2) a measure of abnormal accruals' ability to predict one-year-ahead earnings (i.e., the *forecasting coefficient* of these accruals). Mishkin (1983) indicated that if the market's valuation coefficient on abnormal accruals is significantly larger than the forecasting coefficient of these accruals for one-year-ahead earnings, the market overprices abnormal accruals. Mishkin (1983) suggested that if the valuation coefficient is significantly smaller than the forecasting coefficient, markets under price abnormal accruals. Since the forecasting coefficient is a measure of the persistence of abnormal accruals (Freeman et al. 1982; Sloan 1996), Xie (2001) attributes any market mispricing of abnormal accruals to the market's failure to assess the persistence of these accruals.

Although the MT has been widely used in accounting, certain aspects of the MT do not appear to be completely understood by accounting researchers, and the likely outcome is that incorrect inferences have been drawn from prior research. While the econometric properties of the ordinary least squares (OLS) -based methods used in accounting have been extensively studied (see, e.g., Bernard, 1987; Christie, 1990), little evidence (if any) exists on the specification of the MT as it is applied in accounting. One aspect of the MT that has been misunderstood by accounting researchers is whether or not omitting variables from the forecasting equation bias tests of market efficiency.

In general, accounting researchers have misunderstood the Mishkin which was referring to tests of market efficiency; however, there are any specific variables in the forecasting equation. More precisely, one can test whether the market is efficient with respect to earnings forecasts even if there are omitted variables. However, one cannot test whether the market is efficient with respect to specific variables in the forecasting equation (e.g., accruals). If the variables omitted from the forecasting equation, there are not priced rationally. Thus, they also correlate with the variables of interest in the forecasting equation (e.g., accruals). That is, based on the MT, one can reject efficiency (at least with respect to the assumed equilibrium model of returns) even if the forecasting equation has omitted variables, but one cannot draw inferences about which accounting variable or variables are the source of the inefficiency.

In this research, we survey whether or notthe omitted variables (current stock return, sales and its variations, and net operating assets) affect inferences drawn from the Mishkin test in listed firms in Tehran Stock Exchange (TSE).

Methodology

Research design

Hypothesis Development

To survey whether or not the omitted variables (current stock return, sales and its variations, and net operating assets) affect inferences drawn from the Mishkin test, research hypotheses are as follows:

HYP1: The persistence of the CFO is greater than that of accruals.

HYP2: Excluding omitted variables, the stock market is not efficient on earnings' information.

HYP3: Excluding omitted variables, the stock market is not efficient on the CFO's information.

HYP4: Excluding omitted variables, the stock market is not efficient on accrual information.

HYP5: Including omitted variables, the stock market is efficient on earnings' information.

HYP6: Including omitted variables, the stock market is efficient on the CFO's information.

HYP7: Including omitted variables, the stock market is efficient on accrual information.

Applied regression models for the hypothesis test are represented in the next sections.

Sample selection and data collection

We use the 2010 version of Tadbirpardaz (the Iranian database of Tehran Stock Exchange) annual data files (includes 444 firms, 3248 firm-years) and sample all firms in Tehran Stock Exchange between 2002 and

2008 with 20 March fiscal year end with sufficient data available to calculate the variables for every firm-year. In some cases whereby the required data are incomplete we use the manual archive in the TSE's library.

We eliminate banks and financial institutions from the sample (13 firms, 75 firm-years). To eliminate the effect of outliers, we winsorize the 1% and 99% percentile imposing all the data-availability requirements yield 2,283 firm-years over the period 2002-2008, including 18 industries and 307 individual firms. This is the full sample that we use for testing research hypotheses. We apply the pooled approach to model estimations.

Variable measurement

To test the HYP1, the following model is applied:

$$Earnings_{t+1} = \alpha_0 + \alpha_1 CFO_t + \alpha_2 Accruals_t + \varepsilon_{t+1} \quad (1)$$

Therefore, to test the HYP2 – HYP7, this paper employs the Mishkin(1983) approach (hereafter the Mishkin test). Specifically, to test the HYP2, this paper estimates the following simultaneous regression system:

$$Earnings_{t+1} = \alpha_0 + \alpha_1 Earnings_t + \varepsilon_{t+1}$$
$$Ret_{t+1} = \beta\left(Earnings_{t+1} - \alpha_0^* - \alpha_1^* Earnings_t \right) + \varepsilon_{t+1} \quad (2)$$

Where, Ret_{t+1} is the buy-and-hold return over a 12-month period ending 20 March of each year. To test the HYP3 and HYP4, we estimate the following simultaneous regression system:

$$Earnings_{t+1} = \alpha_0 + \alpha_1 CFO_t + \alpha_2 Accruals_t + \varepsilon_{t+1}$$
$$Ret_{t+1} = \beta(Earnings_{t+1} - \alpha_0^* - \alpha_1^* CFO_t -$$
$$- \alpha_2^* Accruals_t \big) + \varepsilon_{t+1} \quad (3)$$

Now, omitted variables are added to previous simultaneous regression systems. For instance, to test the HYP5, this paper estimates the following simultaneous regression system:

$$Earnings_{t+1} = \alpha_0 + \alpha_1 Earnings_t + a_2 Ret_t + a_3 Sale_t + a_4 \Delta Sale_t + a_5 NOA_t + \sum \gamma_k \left(P/B \right)_{Quintile_t} + \sum \gamma_k Size\_Quintile_t + \varepsilon_{t+1}$$

$$Ret_{t+1} = \beta \left(\begin{array}{c} Earnings_{t+1} - a_0^* - a_1^* Earnings_t - a_2^* Ret_t - a_3^* Sale_t - a_4^* \Delta Sale_t - a_5^* NOA_t \\ - \sum \gamma_k^* \left(P/B \right)\_Quintile_t - \sum \gamma_k^* Size\_Quintile_t \end{array} \right) + \varepsilon_{t+1} \quad (4)$$

Where, *Sale* (Δ *Sale*) is sales revenue (change in sales revenue) and are not operating assets. In this system, we control the size and growth (the ratio of the stock price on stock book value) effects, by including the size and P/B Quintiles binary variables.

Finally, to test two last hypotheses, the following simultaneous regression system is estimated:

$$Earnings_{t+1} = \alpha_0 + \alpha_1 OCF_t + \alpha_2 Accruals_t + a_3 Ret_t + a_4 Sale_t + a_5 \Delta Sale_t + a_6 NOA_t + \sum \gamma_k \left(P/B \right)_{Quintile t} + \sum \gamma_k Size\_Quintile_t + \varepsilon_{t+1}$$

$$Ret_{t+1} = \beta \left(\begin{array}{c} Earnings_{t+1} - a_0^* - a_1^* OCF_t - a_2^* Accruals_t - a_3^* Ret_t - a_4^* Sale_t - a_5^* \Delta Sale_t - a_6^* NOA_t \\ - \sum \gamma_k^* \left(P/B \right)\_Quintile_t - \sum \gamma_k^* Size\_Quintile_t \end{array} \right) + \varepsilon_{t+1} \quad (5)$$

In each of simultaneous regression systems, the first equation is *forecasting* equation that estimates the forecasting coefficients (a_s) of earnings components (and control variables) for predicting one-year-ahead earnings. The second equation is *valuation* equation that estimates the valuation coefficients (a^*_s) that the market assigns to earnings components (and control variables).

This paper estimates simultaneous regression systems jointly using an iterative generalized nonlinear least squares estimation procedure, proceeding in two stages. In the first stage, this paper jointly estimates simultaneous regression systems without imposing any constraints on a_s and a^*_s. To test whether the valuation coefficients (a^*_s)are significantly different from their counterpart forecasting coefficients (a_s) obtained in the first stage, this paper estimates systems equations jointly in the second stage after imposing the rational pricing constraints,($a_j = a_j^*$, j = 1,2, and/or 3).

Mishkin shows that the following likelihood ratio statistic is asymptotically χ^2 *(j)* distributed under the null hypothesis that the market rationally prices one or more earnings components with respect to their associations with one-year-ahead earnings:

$$LR = 2N\ln(SSR^c/SSR^u) \quad (6)$$

Where j is the number of rational pricing constraints imposed; N is the number of sample observations; Ln is the natural logarithm operator; SSR^c is the sum of squared residuals from the constrained regressions in the second stage; and SSR^u is the sum of squared residuals from the unconstrained regressions in the first stage. This paper rejects the rational pricing of one or more earnings components (i.e., $a_j = a_j^*$, j = 1, 2, and/or 3) if the above likelihood ratio statistic is sufficiently large.

Results

Descriptive statistics

Descriptive statistics are presented in Table 1. The mean (median) of earnings is 0.18 (0.19). The mean (median) of $Earnings_{t+1}$ is 0.16 (0.18). The mean (median) of ret is 0.23 (0.06). The mean (median) of RET_{t+1} is 0.23 (0.06). The mean (median) of CFO is 0.10 (0.10). The mean (median) of ACC is 0.08 (0.05).The mean (median) of SALE is 1.77 (1.21). The mean (median) of ΔSALE is 0.28 (0.14).The mean (median) of NOA is 1.99 (1.41). The mean (median) of P/B is 3.00 (2.01). The mean (median) of SIZE is 12.92 (12.82).

The maximum (minimum) of earning is 2.02 (-1.00). The maximum (minimum) of $Earnings_{t+1}$ is 1.37 (-1.99). The maximum (minimum) of ret is 4.70 (-0.79). The maximum (minimum) of $RETt_{+1}$ is 4.52 (-0.79). The maximum (minimum) of CFO is 1.67 (-2.00). The maximum (minimum) of ACC is 2.37 (-1.52). The maximum (minimum) of SALE is 15.98 (0.06). The maximum (minimum) of ΔSALE is 6.44 (-3.90). The maximum (minimum) of NOA is 22.62 (0.09). The maximum (minimum) of P/B is 22.04 (-2.91). The maximum (minimum) of SIZE is 17.11 (9.56). Standard deviation of variables is presented in the last column of Table 1.

Table 1. Descriptive statistics

Variable	Mean	Median	Max.	Min.	Std. Dev
$Earnings_t$	0.18	0.16	2.02	-1.00	0.19
$Earnings_{t+1}$	0.16	0.16	1.37	-1.99	0.24
RET_t	0.23	0.06	4.70	-0.79	0.67
RET_{t+1}	0.23	0.06	4.52	-0.79	0.66
CFO	0.10	0.10	1.67	-2.00	0.30
ACC	0.08	0.05	2.37	-1.52	0.32
SALE	1.77	1.21	15.98	0.06	1.76
ΔSALE	0.28	0.14	6.44	-3.90	0.81
NOA	1.99	1.41	22.62	0.09	1.97
P/B	3.00	2.01	22.04	-2.91	2.99
SIZE	12.92	12.82	17.11	9.56	1.37

This table reports the descriptive statistics of all variables.

Earnings: Net income

RET: Stock annual return

CFO: Cash from operations

ACC: Accruals that are earnings minus CFO

SALE: Sales revenue

ΔSALE: Changes in sales revenue

NOA: Net operating assets

P/B: The ratio of the stock market price of stock book value

SIZE: Natural logarithm of stock market price

Pearson correlation coefficients

Pearson correlation coefficients are presented in Table 2. The results indicate that $Earnings_t$ is significantly correlated to $Earnings_{t+1}$ (0.45), RET_t (0.46), RET_{t+1} (0.11), CFO (0.23), ACC (0.37), SALE (0.33), ΔSALE (0.30), NOA (0.17), P/B (-0.12) and SIZE (0.12). Also, $Earnings_{t+1}$ is significantly correlated to RET_{t+1} (0.35), CFO (0.22), ACC (0.06), ΔSALE (0.14), NOA (-0.10), P/B (-0.13) and SIZE (0.07).

Table 2.Correlation coefficient

Variable	$Earnings_t$	$Earnings_{t+1}$	RET_t	RET_{t+1}	CFO	ACC	SALE	ΔSALE	NOA	P/B
$Earnings_{t+1}$	**0.45**	1								
RET_t	**0.46**	0.01	1							
RET_{t+1}	**0.11**	**0.35**	-0.05	1						
CFO	**0.23**	**0.22**	**0.06**	**0.16**	1					
ACC	**0.37**	**0.06**	**0.21**	**-0.09**	**-0.82**	1				
SALE	**0.33**	0.04	**0.27**	**0.10**	-0.05	0.25	1			
ΔSALE	**0.30**	**0.14**	**0.23**	**0.06**	0.01	0.17	0.59	1		
NOA	**0.17**	**-0.10**	**0.19**	**0.07**	**-0.12**	0.21	0.74	**0.34**	1	
P/B	**-0.12**	**-0.13**	**0.24**	**-0.08**	-0.04	-0.03	-0.27	**-0.06**	**-0.32**	1
SIZE	**0.12**	**0.07**	-0.01	-0.02	0.01	**0.06**	-0.01	0.03	**0.14**	**-0.08**

Significant correlation coefficients are presented in bold.

In Table 2, other significant correlation coefficients are presented in bold format.

Test of HYP1

In order to test the HYP1, regression model (1) is estimated and the regression results are presented in Table 3.

Table 3. Regression results of model (1)

Variables	Coefficient	T-Statistic	P-Value
Intercept	0.05	17.15	0.00
CFO	0.63	37.80	0.00
ACC	0.54	27.14	0.00
Adjusted R^2	46.59%		
F-Stat. (P-Value)	645.96 (0.00)		
HYP1: $a_1 > a_2$	55.69 (0.00)		

The results indicate that intercept (0.05), CFO (0.63) and ACC (0.54) are significantly related to one-year-ahead earnings. The result of the Wald test (55.69) shows that the coefficient of the CFO is significantly greater than that of the ACC. In other word, the persistence of the CFO is greater than ACC. Thus, the first research hypothesis is not rejected.

Test of HYP2

Panel A of Table 4 reports the coefficient estimates of forecasting and valuation equations of the system (2) and panel B show the Mishkin (1983) test results.

The results of the Mishkin test (19.61) indicate that the coefficient of earnings in forecasting (0.53) and valuation (0.05) equations are significantly different from each other. This indicates excluding omitted variables, and stock market price earnings information irrationally. Thus, the HYP2 is not rejected.

Table 4. Nonlinear generalized least squares estimation (the Mishkin test) of the market pricing of earnings to implicate one-year-ahead earnings (exclude omitted variables)

Panel A. Market price of earnings with respect to their implication for one-year-ahead earnings

Forecasting coefficient			Valuation coefficient		
Parameter	Estimate	Asymptotic Std. Error	Parameter	Estimate	Asymptotic Std. Error
(α_1) $Earnings_t$	0.53	18.47	(α_1^*) $Earnings_t$	0.05	0.64

Panel B. Tests of rational pricing of earnings

Null hypotheses	Likelihood ratio statistic	P-value
$\alpha_1 = \alpha_1^*$	19.61	0.00

Test of HYP3 and HYP4

Panel A of Table 5 reports the coefficient estimates of forecasting and valuation equations of the system (3) and panel B show the Mishkin (1983) test results. The results of the Mishkin test (32.80) indicate that the coefficient of CFO in forecasting (0.55) and valuation (-0.22) equations are significantly different from each other. This indicates that, excluding omitted variables, stock market price CFO information, irrationally. Thus, the HYP3 is not rejected. Also, the results of the Mishkin test (15.87) indicate that the coefficient of ACC in forecasting (0.46) and valuation (0.02) equations are significantly different from each other.This indicates that, excluding omitted variables, stock market price ACC information, irrationally. Therefore, the HYP4 is not rejected, too.

Table 5. Nonlinear generalized least squares estimation (the Mishkin test) of the market pricing of earnings components with respect to their implications for one-year-ahead earnings (exclude omitted variables)

Panel A. Market price of earnings components with respect to their implication for one-year-ahead earnings

Forecasting coefficient			Valuation coefficient		
Parameter	**Estimate**	**Asymptotic Std. Error**	**Parameter**	**Estimate**	**Asymptotic Std. Error**
(α_1) CFO	0.55	17.90	(α_1^*) CFO	-0.22	-1.66
(α_2) ACC	0.46	16.56	(α_2^*) ACC	0.02	0.23

Panel B. Tests of rational pricing of earnings components

Null hypotheses	Likelihood ratio statistic	P-value
$\alpha_1 = \alpha_1^*$	32.80	0.00
$\alpha_2 = \alpha_2^*$	15.87	0.00

In two next sections, we add omitted variables in system equations and again estimate them.

Test of HYP5

Including omitted variables, panel A of Table 6 reports the coefficient estimates of forecasting and valuation equations of the system (4) and panel B show the Mishkin (1983) test results.

The results of the Mishkin test (13.65) indicate that the coefficient of earnings in forecasting (0.57) and valuation (0.16) equations are significantly different from each other. This indicates that, including omitted variables, stock market irrationally price earnings information again. Thus the HYP5 is rejected.

Table 6.Nonlinear generalized least squares estimation (the Mishkin test) of the market pricing of earnings with respect to their implications for one-year-ahead earnings(include omitted variables)

Panel A. Market pricing of earnings with respect to their implication for one-year-ahead earnings

Forecasting coefficient			Valuation coefficient		
Parameter	**Estimate**	**Asymptotic Std. Error**	**Parameter**	**Estimate**	**Asymptotic Std. Error**
(α_1) $Earnings_t$	0.57	16.73	(α_1^*) $Earnings_t$	0.16	1.54

Panel B. Tests of rational pricing of earnings

Null hypotheses	Likelihood ratio statistic	P-value
$\alpha_1 = \alpha_1^*$	13.65	0.00

Test of HYP6 and HYP7

Including omitted variables, panel A of Table 7 reports the coefficient estimates of forecasting and valuation equations of the system (5) and panel B show the Mishkin (1983) test results.

The results of the Mishkin test (22.48) indicate that the coefficient of CFO in forecasting (0.64) and valuation (0.01) equations are significantly different from each other. This indicates that omitted variables, and stock market price CFO information are included irrationally too. Thus, the HYP6 is rejected. Also, the results of the Mishkin test (5.93) indicate that the coefficient of ACC in forecasting (0.57) and valuation (0.28) equations are significantly different from each other. This indicates that, including omitted variables, stock market price ACC information, irrationally. Therefore, the HYP7 is rejected, too.

Table 7.Nonlinear generalized least squares estimation (the Mishkin test) of the market pricing of earnings components with respect to their implications for one-year-ahead earnings (include omitted variables)

Panel A. Market pricing of earnings components with respect to their implication for one-year-ahead earnings

Forecasting coefficient			Valuation coefficient		
Parameter	**Estimate**	**Asymptotic Std. Error**	**Parameter**	**Estimate**	**Asymptotic Std. Error**
(α_1) CFO	0.64	16.78	(α_1^*) CFO	0.01	0.09
(α_2) ACC	0.57	15.64	(α_2^*) ACC	0.28	2.51

Panel B. Tests of rational pricing of earnings components

Null hypotheses	Likelihood ratio statistic	P-value
$\alpha_1 = \alpha_1^*$	22.48	0.00
$\alpha_2 = \alpha_2^*$	5.93	0.01

Discussion and Conclusions

In this paper, we study the persistence and pricing of earnings and its components excluding and including the omitted variables (firm size, firm growth, sales and its variations and net operating assets). The results indicate even in conditions that omitted variables are rationally priced by stock market; including mentioned omitted variables do not change the results of Mishkin test significantly. This result is not compatible to Anderson et.al (2009).

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