

# Modeling of the real earning management resulted from investment activities

Esmail Shakib Shiran<sup>a</sup>, Mehdi Moradzadeh Fard<sup>a,\*</sup>, Bahman Bani Mahd<sup>a</sup>, Elham al sadat Hashemizadeh<sup>b</sup>

<sup>a</sup>Department of Accounting, Karaj Branch, Islamic Azad University, Karaj, Iran

<sup>b</sup>Department of Mathematics, Karaj Branch, Islamic Azad University, Karaj, Iran

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## Abstract

Selling fixed assets when the current operating income is decreasing is essential for managing real earnings among companies. Therefore, this study aimed to design a model for realizing tangible fixed asset sales revenue and investments to address the real earning in the Tehran Stock Exchange. This inductive and correlational-analytical study was conducted on 138 companies listed on the Tehran Stock Exchange from 2010 to 2018, of which 1242 samples were selected using the systematic elimination method. First, the model of Gunny (49) and the proposed model were tested after passing the necessary assumptions and in a statistical sample, and the proposed model showed a better fit. In the second step, the remaining values of the two models were tested as real earning management with several other variables in a new model. The results showed both models' reasonable explanatory power and a weak relationship with some variables.

Keywords: Purchase of fixed assets, Purchase of long-term investment, Cash flow from investing activities  
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## 1 Introduction

The recent scandals of large global companies such as Enron, Satyam, and Toshiba have shaken investors' confidence in the quality of financial reporting. Earning management is the cornerstone of these scandals [19].

The net earning of companies is the result of applying accounting methods and estimates. Managers are given a considerable choice in determining earnings in different periods, especially in the accrual accounting system, and the possibility of earning management is available for them. Managers have significant control over the timing of recognition of some income and expense items under this accounting system.

For this reason, investors also care about the quality of financial reporting, especially the quality of earnings, when not manipulated by an opportunistic approach. The factors involved in determining the quality of financial reporting include endogenous and exogenous factors. The major weakness of many empirical studies on the quality of financial reporting is ignoring the endogenous nature of the decision about the quality of financial reporting. Earning management is one of the internal factors affecting the quality of financial reporting [26]. Earning management is

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\*Corresponding author

Email addresses: [shakibshiran@yahoo.com](mailto:shakibshiran@yahoo.com) (Esmail Shakib Shiran), [moradzadehfard@kiaiu.ac.ir](mailto:moradzadehfard@kiaiu.ac.ir) (Mehdi Moradzadeh Fard), [b\\_banimahd@yahoo.com](mailto:b_banimahd@yahoo.com) (Bahman Bani Mahd), [hashemizadeh@kiaiu.ac.ir](mailto:hashemizadeh@kiaiu.ac.ir) (Elham al sadat Hashemizadeh)

divided into two categories: earning management based on accruals and earning management based on real activities. In real earning management, managers perform actions associated with cash inflows and outflows.

REM (Real Earnings Management) hides the company's real performance and undermines the usefulness of accounting numbers as an evaluation and monitoring tool. As a result, the risk of information increases, and the quality of information decreases [31].

[13] investigated the different dimensions of real earning management and, while modifying and improving them, presented real earning management in the form of four models as follows.

1. Reducing research and development costs to increase income
2. Decreasing general, administrative, and sales expenses to increase income
3. Realizing the time of income from the sale of tangible fixed assets and investments
4. Reducing the cost of goods sold by increasing production.

[15] also presented three models for real earning management.

First model: manipulation of real activities to increase sales revenue;

Second model: manipulation of real activities to reduce the cost of goods sold;

Third, the manipulation of real activities to reduce discretionary costs (operating costs).

In Roychowdhury's triple model, there was no discussion about selling tangible fixed assets and non-current investments.

This study aimed to evaluate the ability of Gunny's model [9] to upgrade and realize the real earning management resulting from the timing of the sale of fixed assets and investments with more accuracy and by accounting standards and theories.

This research is necessary because the investment activities sector has been considered and examined in much less research and in a limited way, despite its central role and contribution to real earning management. Studies inside Iran also confirm the use of real earning management by company managers. [21], [16], and [22] explained the necessity of conducting more comprehensive research and identifying new tools for realizing real-earning management to increase the quality of financial reporting. This study aimed to expand the theoretical foundations of real earnings through investment activities by providing a new model for measuring real earning management through investment activities and comparing it with the measurement model of real earning management through investment activities provided by [9].

## 2 Theoretical foundations

REM occurs when managers change the timing or structure of an investment or financing operation to affect the output of the accounting system. Such output is not necessarily harmful and opportunistic because managers often use REM activities to optimize and efficiently use scarce resources [31].

Researchers usually consider one of the two frameworks of efficiency theory and opportunism theory as REM logic.

The efficiency perspective (information perspective) with signaling theory suggests that firms with strong financial performance use REM reduce information asymmetry in the capital market and to signal future economic growth. REM is a costly strategy, and managers use these activities when the positive benefits of transmitting information to capital markets outweigh its negative impact [11].

The opportunistic view based on the agency theory shows that managers deviate from normal business activities to provide false information to the users of financial statements. Therefore, the goal of achieving financial reporting objectives is deliberately diverted from normal activities to achieve private interests [15].

Accordingly, REM creates information asymmetry and agency problems through adverse selection and moral hazard. Adverse selection is exacerbated when managers can access real information about firm value while investors do not. The information asymmetry caused by REM creates a negative selection problem between managers and capital providers. Moral hazards occur when management cannot monitor the agent's behavior and assess whether the agent is acting to maximize the company's value.

Most studies have shown that managers use REM, especially after the Sarbanes Oxley (SOX) legislation was passed, to increase earnings and thus support the opportunistic theory [4, 18, 15].

Real earning management is created by changing the timing of activities or the structure of transactions [5]. In the meantime, earning management through asset sale timing is essential. [3] showed managers manipulate the company's earning level by selling fixed assets and investments to prevent earning reduction and debt covenant violations.

[14] investigated the use of income from the sale of assets by Japanese managers for earning management. In this study, companies increase (decrease) earnings by selling fixed assets and marketable bonds when current operating income falls short (rises) of managers' forecasts. The basis of earning management is the timing of the sale of assets and the execution method. Assets are held at historical cost and sold at current or market prices when sold. Earnings and losses from sales are realized in the period of sale. This gain or loss allows managers to influence reported earnings by timing asset sales [25].

### 3 Research background

[31] conducted a comprehensive review of REM systematic literature, including theoretical framework, criteria development, determinants, and its implications in an international context, and categorized them into financial, audit, and governance reports.

The change was investigated in real earning management by industry. Real earning management among companies listed on the Egyptian Stock Exchange from 2012 to 2020 was studied in seven industries, and the results showed a significant difference between real earning management practices.

[12] explored the effect of board characteristics and real earnings management on performance and showed a negligible impact on the company's efficiency. In addition, more independent directors and more presence decrease the company's efficiency. This study suggested that having more female managers can increase firm performance despite the company's earnings management practices.

[6] investigated the relationship between accrual-based real earnings management and companies' investment cost. The results indicated a negative relationship between accrual-based real earning management and the investment cost of companies. The rate of return on assets affected real-earning management.

[7] examined the role of managerial ability in earnings management through real activities during the financial crisis. The results showed that managers with less ability use more real activities for income management. Management ability and financial crisis negatively affected real earning management.

[8] stated that the concepts of real earning management are included in the auditor's assessment of the selective risk related to clients' economic status and lead to increased audit costs. The increase in income from real earning management was directly related to the current and future audit fees, except for the abnormal decrease in general administrative and selling expenses. Evidence was provided according to which real earning management activities that increase income significantly impacted audit pricing behavior, which was done by matching selective risk along with the audit structure with the audit fee.

The connection of companies was assessed to real earning management, strong incentives to manage accruals, and their ability to manage accruals limited by higher-quality auditors. For example, audit industry expertise in a city and audit fees are associated with higher levels of real earnings management in firms that seek to meet earnings criteria and firms that issue seasoned equities. This paper acknowledges that higher-quality accountants limit accrual earnings management. As a result, companies engage in potential smoothing even more than real earning management. The extended audit tenure was associated with more excellent real earnings management, which could indicate the benefits of requiring firm audit rotation.

[10] in Australia did not find evidence of earnings management in the year of CEO change and the year after the change but reported negative earnings management in the year of change in cases of simultaneous CEO and chairman of the board change.

[23] investigated the effect of board characteristics on the relationship between ownership structure and earning classification change to emphasize the previous research about earning management more on accrual earning management and real earning management. Recently, a third tool called reclassification for earnings management has gained attention. In addition, the role of ownership structure, which is argued to have a significant impact on earnings management, should not be ignored. The features of the board of directors are also taken into consideration due to the importance of the supervisory role of the board of directors in the company and its effect on the efficiency of the supervisory mechanisms in the present study. Therefore, this study aimed to examine the impact of the board of directors' characteristics on the relationship between the ownership structure and the change in earning classification. The results showed a negative and significant relationship between institutional shareholders and the change in earning

classification, and the size of the board of directors strengthens this relationship. However, the independence of the board of directors does not affect this relationship. Moreover, there is a positive and significant relationship between government owners and a change in earning classification. While the independence of the board of directors weakens the size of the board of directors does not affect the mentioned relationship.

[27] evaluated the effect of CEO power on accrual-based earnings management and real earning management. The study aimed to investigate the impact of the CEO's power on accrual-based earnings management and real earning management in companies listed on the Tehran Stock Exchange. Three criteria, including abnormal discretionary cost, abnormal production cost, and abnormal operating cash flows, were used to determine the amount of real earnings management. For this purpose, the data from 108 companies were analyzed between 2010 and 2019. The regression model of the research was examined and tested using the combined data method with the integrated approach and the panel data method with the fixed effects approach. The results showed that the CEO's power negatively affects accrual-based earning management. CEO power negatively and significantly affected real earning management (abnormal discretionary cost, abnormal production cost, and abnormal operating cash flows). Therefore, powerful managers have more independence and a more significant supervisory role over the board of directors, which reduces the violation of the beneficiaries' rights and the cost of representation. As a result, the reduction of the agency cost reduces information asymmetry and reduces the lack of transparency of financial information, and as a result, reduces earning management.

([1] and [10]) studied the effect of accrual and real earning management on the company value of companies listed on the Tehran Stock Exchange. Accrued earnings management positively and significantly impacted firm value from free cash flow through discretionary accruals, real earnings management, abnormal production costs, and abnormal operating cash flows. No significant relationship between real earnings management through abnormal discretionary expenses and firm value from free cash flow was observed. While the impact of accrual earnings management on firm value due to economic value added was negative and significant, through discretionary accruals and real earnings management, through abnormal production costs and abnormal operating cash flows. Real earning management through abnormal discretionary expenses positively and significantly affected the company's value due to economic added value. The research results showed that earning management affects the value of companies. This effect was positive in some cases and negative in others and showed that the manipulation of discretionary accruals and real activities on the value of companies have different effects that can seriously endanger stakeholders' interests.

[22] examined the effect of management capabilities on the relationship between real earning management and future company performance using the Roychowdhury model and data from 107 companies from seven industries (2006-12). Based on this study, there was a negative relationship between real earnings management and company performance, and management abilities did not reduce this negative relationship.

## 4 Research methodology

This applied, and correlational research was conducted based on Gunny's [13] model, which examined the results of four types of real earning management and improved them in 2010, which were:

1. Reducing research and development costs to increase income
2. Decreasing general, administrative, and sales expenses to increase income
3. Realizing the time of income from the sale of tangible fixed assets and investments
4. Reducing the cost of goods sold by increasing production.

The model related to the realizing time of income from the sale of tangible fixed assets and investments is as follows.

$$\frac{GainA_t}{A_{t-1}} = \alpha_0 + \alpha_1 \frac{1}{A_{t-1}} + \beta_1 MV_t + \beta_2 Q_t + \beta_3 \frac{INT_t}{A_{t-1}} + \beta_4 \frac{ASales_t}{A_{t-1}} + \beta_5 \frac{ASales_t}{A_{t-1}} + \epsilon_t^{Asset} \quad (1)$$

AGAIN: earning from selling assets (positive earnings and negative losses)

ASALES: selling non-current assets

ISALES: Sale of non-current investments

MCAP (MV): natural logarithm of the market value of equity (of market capitalization)–controls for company size

TOBINSQ (Q): A criterion of market opportunities (Tobin's Q) is calculated as the total market value of equity, preferred stock, long-term liabilities, and short-term liabilities divided by total assets.

(INTFUNDS) INT: Internal funds – as the sum of earnings before unexpected items,  $R\infty D$  and depreciation (represents

the extent to which the company relies on external financing for cash investment projects)

$A(t - 1)$ : Total company assets in the previous year.

If the earning is negative, it is multiplied by (-1) to create uniform relations between ASALES and ISALES.

Asset sales gain is expected to increase with company size, the market value of equity, available cash, non-current assets, and investment sales. A positive residual value from the above estimate is consistent with increased REM (Real Earnings Management). This accrual model directly measures the real earning management resulting from the sale of assets and non-current investments. However, this model can be done more accurately by deducting the purchase of assets and non-current investments from the relevant sales to determine earning management. Experimental results are consistent with the significant negative impact of all four types of real earning management activities on operational performance. This research considers the third case of the four types of real earning management (Realizing time of income from the sale of tangible fixed assets and investments). [15] also presented three models for real earning management.

First model: manipulation of real activities to increase sales revenue

$$CFO_t = \beta_0 + \beta_1 SALES_t + \beta_2 \Delta SALES_t + \epsilon_t \quad (2)$$

Second model: Real activities to change the cost of goods sold

$$GGS_t = \beta_0 + \beta_1 SALES_t + \beta_2 \Delta SALES_t + \beta_3 \Delta SALES_{t+1} + \epsilon_t \quad (3)$$

Third model: real activities for changes in operational costs (general administrative and sales)

$$DISE_t = \beta_0 + \beta_1 SALES_t + \epsilon_t \quad (4)$$

CFO: Cash flow from operating activities

CGS: Cost of goods sold

DISE: Disaggregation—Income Statement Expenses

SALES: Sales revenue

$\Delta SALES$ : Sales changes

Manipulation of activities in the first model is done through accelerating sales time, incredible sales of excess production with increased price discounts, or very lenient credit terms.

In the second model, the goods were produced in excess, or the workers' wage rate and working hours were reduced to reduce the cost of goods sold. Finally, the manipulation of the activities of the third model is based on the reduction of discretionary expenses from the operating expenses department to improve the profit margin. Most manipulation of actual activities is related to manipulating research and development expenses to reduce the reported costs. Roychowdhury used Dechau et al.'s model (38) to measure the normal level of cash flow from operations (CFO), discretionary costs, and production costs for each company year to measure the variables. Deviation from the normal level is called abnormal operating cash flow, abnormal discretionary costs, and abnormal production costs. None of these models are related to selling tangible fixed assets and investments. The above triple model did not discuss selling tangible fixed assets and non-current investments.

## New model

It is possible to develop the Roychowdhury and Gunny model to manage the real profit in selling tangible fixed assets and investments, optimize their model, and present a new model. First, the normal profit level from the sale of fixed assets and investments was calculated by presenting a model based on Gunny's model [9] and Roychowdhury's model [15]. The Gunny model considers the normal level of profit from the sale of fixed and investment assets to be related to their sales amount, and the remaining values of the model are the abnormal level of profit from the sale of assets. Roychowdhury also (in the section on operating activities) related net operating cash flow to sales and sales changes and considered the remaining values as abnormal levels. In the new model and under normal operating conditions, non-current assets are sold to buy new non-current assets. In this case, the profit from the sale of assets is normal. However, when these assets are sold, and no purchase is made to replace them, the situation is considered abnormal, and the corresponding profit from the sale is created at an abnormal level. In other words, the abnormal level of the profit model was defined as sales that were not made in line with the repurchase of assets.

Since the abnormal level of the Gunny and Roychowdhury models is compatible with real earning management and is considered real earning management, the abnormal level of asset sale profit in the new relationship was also consistent with real earning management. In other words, real earning management is associated with changes in the timing or structure of real activities. Therefore, abnormal levels of business unit activities should be identified with changes in the timing or structure of real activities. The basis of the discussed relationship is based on the fact that according to Iran's Standard 2, investment activities (asset sales) take place to maintain current operations, expand the volume of operations, and limit the volume of operations. The research limitations in the statistical sample section include the third case of limiting the volume of operations. The argument was that the sale of fixed assets and investments not in line with the purchase of new assets were made in abnormal conditions. An attempt has been made to extend the real earning management in tangible fixed asset sales and investments to investment activities by developing the Roychowdhury [15] model.

$$CFI_{it} = \alpha_1 + \alpha_2 CE_t + \alpha_3 \Delta CE_t + \alpha_4 PL_t + \alpha_5 \Delta PL_t + \alpha_5 1/A_{t-1} + \alpha_5 OI + \epsilon_t \quad (5)$$

CFI: Cash Flow from Investing Activities

CE: Purchase of fixed assets

$\Delta CE_t$ : Acquire fixed assets of the current year minus the previous year

PL: Purchase of long-term investment

$\Delta PL_t$ : Purchase of long-term investment of the current year minus the previous year

OI: Operating income

$A_{t-1}$ : total assets of the company at the beginning of the year

$t$ : Studied year

[17] showed that adding the return on assets variable to the model to control companies' financial performance increases the models' efficiency because companies differ in performance. The operating profit was replaced by net profit in the following relationship while using this variable.

Adding  $1/A_{t-1}$  variable to the relationship was performed using [17]. In this study, adding this variable to the models reduces the heterogeneity of the variance of the error values and improves the model's predictability. In addition, the model variables are divided by the sum of the assets at the beginning of the year so that the error values of the numerical model are not enlarged and the assumptions of homogeneity and normality of the error values are not violated.

If the net cash flow from investment activities is positive, it means that the inflow of cash is more than the outflow of cash (sales are more than purchases), and this difference is due to abnormal conditions.

When the CFI is negative, it means that cash outflow is more than cash inflow (purchases are more than sales), abnormal conditions do not prevail, and the claim of earning management is ruled out. Therefore, in this case, the remaining value is zero.

A significant percentage of the study's companies lacked long-term investment information. Of 1240 observations, 1106 cases of long-term investment sales have reported zero, and 847 cases of total long-term investment purchase observations have recorded zero. On the other hand, in other companies that reported investment activities, only "profit from the sale of operational investments" was reported separately, and "profit from the sale of long-term investments" was not reported under an independent heading.

Since the long-term investment buying and selling variable could affect the validity of the relationships in the model and lead to false results, it was not used in the model.

The normal level was determined using the new model (Equation 5) and the Gunny model (Equation 1). The abnormal level values of both models were examined as Real Earnings Management (REM), or R for short, with the future performance variables of companies (with two measures of operating cash flows and future operating profit), the financial performance of companies (with two criteria of price-to-profit ratio and sales growth), type of ownership, tenure of the CEO, change of CEO management, the overconfidence of the manager, restatement of financial statements, bonus of the manager, accrual earning management, real estate inflation index, and organizational hierarchy of the group. Equation 6 was used in this regard:

$$R_{it} = \beta_{0it} + \beta_{1it} CFO + \beta_{2it} OI + \beta_{3it} OWN + \beta_{4it} LEV + \beta_{5it} SGR + \beta_{6it} P/E + \beta_{7it} CCEO + \beta_{8it} CEOP + \beta_{9it} OVC + \beta_{10it} RFS + \beta_{11it} BON + \beta_{12it} DA + \beta_{13it} HII + \beta_{14it} OHG + e_{it} \quad (6)$$

Table 1: Model variables

$R_1$	The first criterion of earnings management at the industry level each year
$R_{1ALL}$	The first criterion of earnings management in the industry
$R_2$	The second criterion of earnings management at the industry level each year
$R_{2ALL}$	The second criterion of earnings management in the industry
CFO	Cash flow from Operating activities
OI	Operating income
OWN	Type of ownership
LEV	Leverage ratio
SGR	Sales growth rate
P/E	Price-to-earning ratio
CCEO	Change of CEO
CEOP	CEO period
OVC	Overconfidence of the manager
RFS	Restatement of Financial Statements
BON	Manager bonus
DA	discretionary accruals
HII	Housing inflation index
OHG	Organizational hierarchy of the group
I	Industry
T	Year

## Method

Since this research seeks to explain a new relationship by adjusting the relationships between variables, it can be placed in basic research. The type of research argument in the first part, which includes formulating a new relationship, will be a comparative approach. In the second part of the research, the model test has an inductive approach, and from the perspective of the time dimension, it is considered longitudinal research. This applied, analytical, and correlational uses hypothesis testing and focused on identifying important factors affecting a phenomenon.

## Population

The companies listed in Tehran Stock Exchange were selected, of which the following were selected using systematic elimination:

1. The company's financial year should end at the end of March 20 every year.
2. The company has not changed the financial year during the period under review.
3. The companies under investigation should not be investment, holding, and financial intermediary companies.
4. The information and data of the companies should be available.
5. The company's shares have been continuously traded in the Tehran Stock Exchange, and there has not been a suspension of trading for more than three months in the case of the said shares.
6. The company should not try to limit the volume of its activity.

According to the above conditions, 138 companies were selected.

## 5 Definition of variables and their calculation

### Real Earnings Management (REM):

The Gunny and new models are used from the non-normal level (residual/error values).

### Cash flow from operating activities (CFO):

The cash flow statement of the companies will be used from the operating activities section [26].

### INT Available Cash:

Earnings before discontinued operations, R&D, and depreciation [9] and [8]

**MV:**

Natural logarithm of equity market value [9] and [8].

Tobin's Q is the total market value of equity, preferred shares, and long-term and short-term debt [9] and [8].

**Type of ownership (OWN):**

The type of ownership of companies is divided into two types: private and public, which is a virtual variable, and code 1 is used for public and code 0 for private companies.

Companies with more than 50% of their capital owned by the government or 50% of their shares belonging to government companies are considered government companies.

**Price to earnings ratio (P/E):**

$$\frac{P}{E} = \frac{\text{Trading price per share}}{\text{Earning per share}} \quad (7)$$

**Sale Grow:**

The percentage of sales changes in the current year compared to the previous year [29, 13].

$$SGR_t = \frac{S_t - S_{t-1}}{S_{t-1}} \quad (8)$$

**CEO period (CEOP):**

The number of years the CEO was present in a company [24, 28, 2, 23],

**Change CEO (CCEO):**

As a virtual variable, if the company has changed its management in the desired year, the value of one will be considered; otherwise, the value will be zero [28, 24].

**Overconfidence of the manager:**

The overinvestment index is used as a criterion of overconfidence. For this purpose, the following model is used.

$$TAG_{i,t+1} = \beta_0 + \beta_1 SG_{it} + \epsilon_{it} \quad (9)$$

TAG: Total asset growth of the current year compared to the previous year in each company

SG: Sales growth this year compared to the previous year in each company

Error-values: index of investment in assets/ manager's overconfidence

The overconfidence variable is a virtual variable that is considered one if the residual of the above regression model is positive and zero otherwise (26).

**The severity of financial statement renewal:**

$$\text{The severity of financial statement renewal} = \ln \left| \frac{\text{Annual adjustments}}{\text{Earning of the last year}} \right| \quad (10)$$

If the intensity of renewal is essential, the value is one and, otherwise, zero. Representation is considered significant if its intensity exceeds 5% [12].



**Housing inflation index:**

The inflation index in the real estate sector will be obtained from the website of the Iranian Statistics Center or Central Bank.

**Accrual Earnings Management**

: The adjusted Jones model will calculate discretionary accruals [18, 31].

**Organizational hierarchy of the group:**

It is a virtual variable that identifies the sale of assets between the subsidiary and the leading company. If it is a subsidiary company, the number is 1; if not, it is 0 [20].

**Inferential statistics:**

Hardy’s mean test was used to detect the mean of research variables. The results show that the significance level of all variables is less than 5%, indicating that the variables are meaningful.

Jarek’s test was used to check the normality of the research variables. The significance level of all variables was less than 5%, which did not have a normal distribution. According to the central limit theorem, the number of observations is more than 30, and other classical regression assumptions are maintained. Therefore, the normality of the variables or disturbance components can be ignored.

**F-Limmer test and Hausman’s test:**

The results of the data arrangement test are according to Tables 2 and 3.

Table 2: F-Limmer (Chow) test results

Model name	Test statistics	Significance level	Result
First model The first criterion of earning management ( $R_1$ )	1.3511	0.0067	Panel data
Second model The second criterion of earning management ( $R_2$ )	1.1250	0.1670	Pool data
Third model The first criterion of earning management ( $R_{1ALL}$ )	0.3921	1	Pool data Fourth model
The second criterion of earning management ( $R_{2ALL}$ )	0.4804	1	Pool data

According to Table 2, the significance level of F Limmer’s test in all research models (except in the first model, ”the first criterion of earning management”) was more than 5%. Therefore, the consolidated pool data approach is accepted against the tabular panel data approach.

Table 3: Hausman test results

Model name	Test statistics	Significance level	Result
First model The first criterion of earning management ( $R_1$ )	18.7686	0.1305	Random effects of width from the origin
Second model The second criterion of earning management ( $R_2$ )	Considering that the significance level of the mentioned models in the F Limmer’s test in the previous table is more than 5%, there is no need to run the Hausman test.		
Third model The first criterion of earning management ( $R_{1ALL}$ )			
Fourth model The third criterion of earning management ( $R_{2ALL}$ )			

According to Table 3, the significance level of the test in the first model is more than 5%. Therefore, the random effects of the width from the origin are accepted in contrast to the fixed effects.

Breusch Pagan Godfrey's test was used to check the homogeneity of the variance of the disturbance sentences. The results revealed that the significance level of Breusch Pagan Godfrey's test was less than 5% in all models and indicated the heterogeneity of variance in the disturbance sentences. This problem was solved in the final estimation of the models by weighting the data through the GLS command.

The significance level of the Breusch-Godfrey test was less than 5% in all models except the first model (the first criterion of earning management) and indicated the existence of serial autocorrelation. This problem was fixed by using the Auto Correlation command in the software.

## 6 Hypothesis test

### 6.1 Research hypothesis

In this section, 14 hypotheses were formulated, and the variables used in these hypotheses were selected from internal research on real earning management, or variables that can be justified based on the theoretical foundations of this relationship were used.

#### Hypothesis 1:

H0: There is no significant relationship between real earning management through investment activities and sales growth.

H1: There is a significant relationship between real earning management through investment activities and sales growth.

#### Hypothesis 2:

H0: There is no significant relationship between real earnings management through investment activities and the price-to-earnings ratio ( $P/E$ ).

H1: There is a significant relationship between real earnings management through investment activities and the price-to-earnings ratio ( $P/E$ ).

#### Hypothesis 3:

H0: There is no significant relationship between real earnings management through investment activities and future operating cash flows.

H1: There is a significant relationship between real earnings management through investment activities and future operating cash flows.

#### Hypothesis 4:

H0: There is no significant relationship between real earning management through investment activities and future operating profit.

H1: There is a significant relationship between real earning management through investment activities and future operating profit.

#### Hypothesis 5:

H0: There is no significant relationship between real earning management through investment activities and type of ownership.

H1: There is a significant relationship between real earning management through investment activities and type of ownership.

**Hypothesis 6:**

H0: There is no significant relationship between real earning management through investment activities and the debt (leverage) ratio.

H1: There is a significant relationship between real earning management through investment activities and debt ratio.

**Hypothesis 7:**

H0: There is no significant relationship between real earning management through investment activities and agent management change.

H1: There is a significant relationship between real earning management through investment activities and agent management change.

**Hypothesis 8:**

H0: There is no significant relationship between real earning management through investment activities and the CEO period.

H1: There is a significant relationship between real earnings management through investment activities and the CEO period.

**Hypothesis 9:**

H0: There is no significant relationship between real earning management through investment activities and manager overconfidence.

H1: There is a significant relationship between real earning management through investment activities and manager overconfidence.

**Hypothesis 10:**

H0: There is no significant relationship between real earning management through investment activities and restatement of financial statements.

H1: There is a significant relationship between real earning management through investment activities and restatement of financial statements.

**Hypothesis 11:**

H0: There is no significant relationship between real earning management through investment activities and manager's bonus.

H1: There is a significant relationship between real earning management through investment activities and manager's bonus.

**Hypothesis 12:**

H0: There is no significant relationship between real earning management through investment activities and housing inflation index.

H1: There is a significant relationship between real earning management through investment activities and housing inflation index.

**Hypothesis 13:**

H0: There is no significant relationship between real earning management through investment activities and accrual earning management.

H1: There is a significant relationship between real earning management through investment activities and accrual earning management.

### Hypothesis 14:

H0: There is no significant relationship between real earning management through investment activities and organizational hierarchy of the group.

H1: There is a significant relationship between real earning management through investment activities and organizational hierarchy of the group.

## 6.2 Model estimation

Only one hypothesis is analyzed in each model estimation for brevity

Table 4: The final estimate of the first regression model - the first criterion of earning management ( $R_1$ )

Variables	Coefficients	Standard deviation coefficients	of t statistic	Significance level	Collinearity
Manager's bonus	-0.0480	0.0329	-1.4546	0.1460	1.1439
Operating cash flow	0.0085	0.0071	1.1948	0.2324	4.5641
Operating earnings	-0.0064	0.0074	-0.8632	0.3882	5.3948
debt (leverage) ratio	-0.0002	0.0014	-0.1446	0.8850	1.4950
Sales growth	-0.0008	0.0004	-2.2182	0.0267	1.2320
Price-to-profit ratio	0.000000537	0.000000346	1.5525	0.1208	1.0261
Change of agent management	0.00000366	0.0004	0.0900	0.9283	1.5413
CEO period	-0.00000385	0.00000425	-0.9067	0.3647	1.5425
Overconfidence of the manager	0.0011	0.0007	1.6299	0.1034	1.2597
Restatement of Financial Statements	0.0004	0.0010	0.4207	0.6740	1.0135
discretionary accruals	0.0059	0.0063	0.9384	0.3482	3.8161
Housing inflation index	-0.0033	0.0028	-1.1808	0.2379	1.1218
Organizational hierarchy of the group	-0.0003	0.0002	-1.7011	0.0892	1.0477
Intercept	-0.00000269	0.0009	-0.0293	0.9766	
Other information statistics					
The adjusted coefficient of determination	0.0029				
Fisher's statistic - significance level	1.2812		0.2173		
Durbin-Watson	2.2361				

Fisher's statistic has a significance level of more than 5%. Therefore, the fitted model has insufficient validity, and it is impossible to comment on other variables.

The significance level of Fisher's statistic was less than 5%. Therefore, the model has sufficient validity. The adjusted coefficient of determination equals 0.0208, indicating that the independent and control variables in the model could explain 0.0208 of the changes in the dependent variable. In addition, the Durbin-Watson statistic is between 1.5 and 2.5, showing the lack of first-order autocorrelation in the model. The manager's overconfidence variable has a significance level of less than 5%, and it can be said that the manager's overconfidence is related to real earning management.

The significance level of Fisher's statistic was less than 5%. Therefore, the model has sufficient validity. The adjusted coefficient of determination equals 0.0555, indicating that the independent and control variables in the model could explain 0.0555 of the changes in the dependent variable. In addition, the Durbin-Watson statistic is between 1.5 and 2.5, showing the lack of first-order autocorrelation in the model. The manager's overconfidence variable (OVC) has a significance level of less than 5%, and it can be said that the manager's overconfidence is related to real earning management.

Table 5: The final estimate of the third regression model - the second criterion of earning management ( $R_2$ )

Variables	Coefficients	Standard deviation of coefficients	t statistic	Significance level	Collinearity
Manager's bonus	-0.5795	0.8951	-0.6474	0.5175	1.1439
Operating cash flow	-0.0638	0.0206	-3.0930	0.0020	4.5641
Operating earnings	0.0360	0.0213	1.6894	0.0914	5.3948
debt (leverage) ratio	-0.0113	0.0070	-1.6105	0.1075	1.4950
Sales growth	-0.0034	0.0034	-1.0217	0.3071	1.2320
Price-to-profit ratio	-0.000000206	0.00000120	-0.1710	0.8642	1.0261
Change of agent management	0.0008	0.0036	0.2203	0.8256	1.5413
CEO period	0.0001	0.0005	0.3385	0.7350	1.5425
Overconfidence of the manager	-0.0089	0.0029	-3.0526	0.0023	1.2597
Restatement of Financial Statements	-0.0024	0.0058	-0.4270	0.6694	1.0135
discretionary accruals	-0.0026	0.0156	-0.1664	0.8678	3.8161
Housing inflation index	0.0212	0.0307	0.6897	0.4905	1.1218
Organizational hierarchy of the group	0.0011	0.0025	0.4707	0.6379	1.0477
Intercept	0.0086	0.0068	1.2653	0.2060	
Other information statistics	-0.0409	0.0286	-1.4305	0.1528	
Adjusted coefficient of determination					
Fisher's statistic - significance level			0.0208		
Durbin-Watson	2.8883		0.0002		
Manager's bonus			1.9957		

Table 6: The final estimate of the third regression model - the first criterion of earning management ( $R_{1ALL}$ )

Variables	Coefficients	Standard deviation of coefficients	t statistic	Significance level	Collinearity
Manager's bonus	-0.0279	0.3317	-0.0841	0.9329	1.1439
Operating cash flow	0.0119	0.0076	1.5616	0.1186	4.5641
Operating earnings	-0.0133	0.0078	-1.7032	0.0888	5.3948
debt (leverage) ratio	-0.0038	0.0025	-1.5178	0.1293	1.4950
Sales growth	-0.0019	0.0013	-1.4571	0.1453	1.2320
Price-to-profit ratio	0.000000193	0.000000473	0.4086	0.6829	1.0261
Change of agent management	0.0019	0.0014	1.3018	0.1932	1.5413
CEO period	-0.0001	0.0001	-0.6546	0.5128	1.5425
Overconfidence of the manager	0.0025	0.0011	2.2137	0.0270	1.2597
Restatement of Financial Statements	-0.0012	0.0023	-0.5249	0.5997	1.0135
discretionary accruals	0.0106	0.0057	1.8302	0.0675	3.8161
Housing inflation index	-0.0167	0.0121	-1.3835	0.1667	1.1218
Organizational hierarchy of the group	-0.0012	0.0008	-1.3552	0.1756	1.0477
Intercept	0.0042	0.0025	1.6817	0.0929	
First order autoregressive	-0.2331	0.0280	-8.3026	0.0000	
Other information statistics					
Adjusted coefficient of determination	0.0555				
Fisher's statistic - significance level	6.2080		0.00000		
Durbin-Watson	2.0291				

The reward variable has a significance level of more than 5%. Therefore, it can be said that managers' remuneration does not affect real earnings management.

## 7 The first appendix (estimation of models related to real earning management)

The data of the models based on the calculation of error values are arranged to measure the real earning management separately for each industry and based on the cross-sectional structure.

In this section, real earnings management (with two different models) was estimated once at the level of each industry in each year ( $R_1$  and  $R_2$ ). The results (90 models from 9 industries over ten years) were stored in EViews due to the large volume, and the extracted error values were included in descriptive statistics Table 3. In addition, these two models have been fitted as combined data at the industry\*year level ( $R_{2AL}$ ,  $R_{1AL}$ ), and the result of the two models is presented as follows.

Table 7: The final estimate of the fourth regression model - the third criterion of earning management ( $R_{2ALL}$ )

Variables	Coefficients	Standard deviation of coefficients	t statistic	Significance level	Collinearity
Manager's bonus	-1.5863	1.2551	-1.2638	0.2065	1.1439
Operating cash flow	-0.0686	0.0289	-2.3699	0.0179	4.5641
Operating earnings	0.0464	0.0299	1.5502	0.1213	5.3948
debt (leverage) ratio	-0.0013	0.0098	-0.1331	0.8941	1.4950
Sales growth	-0.0044	0.0048	-0.9188	0.3583	1.2320
Price-to-profit ratio	-0.00000495	0.00000171	-2.8986	0.0038	1.0261
Change of agent management	0.0043	0.0052	0.8256	0.4092	1.5413
CEO period	0.0008	0.0007	1.0858	0.2778	1.5425
Overconfidence of the manager	-0.0128	0.0041	-3.081	0.0021	1.2597
Restatement of Financial Statements	0.0025	0.0082	0.3058	0.7598	1.0135
discretionary accruals	0.0057	0.0220	0.2604	0.7946	3.8161
Housing inflation index	0.0429	0.0435	0.9863	0.3242	1.1218
Organizational hierarchy of the group	-0.0037	0.0035	-1.0724	0.2837	1.0477
Intercept	0.0021	0.0095	0.2294	0.8186	
First order autoregressive	-0.0707	0.0290	-2.4330	0.0151	
Other information statistics					
Adjusted coefficient of determination	0.0239				
Fisher's statistic - significance level	3.1725		0.0000		
Durbin-Watson	1.9830				

Table 8: The final estimate of the regression model related to the first criterion of real earning management ( $R_{1ALL}$ )

Variables	Coefficients	Standard deviation of coefficients	t statistic	Significance level	Collinearity
Operational earning	431.113	468.957	0.919	0.358	1.465
The natural logarithm of the market value of equity	0.002	0.002	1.369	0.171	1.681
Tobin's Q, as the total market value of equity, preferred stock, long-term debt, and short-term debt	0.001	0.001	1.311	0.189	1.412
Available cash	-0.013	0.006	-1.993	0.046	1.323
Sale of fixed assets	0.742	0.028	25.811	0.000	1.026
Long-term investment sale	-0.030	0.049	-0.613	0.539	1.001
Intercept	-0.016	0.011	-1.448	0.147	
Other information statistics					
Adjusted coefficient of determination	0.396				
Fisher's statistic - significance level	6.693		0.000		

Tables 1–9 are related to the final estimation of the regression models related to real earning management. In the following, the information criteria of all three models are presented to compare the fit of these models.

The second model has the highest coefficient of determination. Therefore, it has more power in fitting. The information values of Akeik, Schwartz, and Hannan Quinn are also lower in the second model than in the first model. The lower these three criteria are, the better the model's fit. The fitting power of the second earning management model is better than the first model.

## 8 The second appendix (factor analysis)

Estimating the real earning management model is more accurate at the level of each industry and in each year. Therefore, the errors related to the estimates at the level of each industry and year in both models are transformed

Table 9: The final estimate of the regression model related to the second criterion of real earning management (R2ALL) ( $R_{2ALL}$ )

Variables	Coefficients	Standard deviation of coefficients	t statistic	Significance level	Collinearity
CE	-0.894	0.052	-17.097	0.000	1.040
DCE	-0.011	0.012	-0.916	0.359	1.019
PL	0.286	0.119	2.403	0.016	2.122
DPL	0.298	0.091	3.256	0.001	2.086
OI	-0.085	0.019	-4.362	0.000	1.042
1/A	2769.929	1234.841	2.243	0.025	1.009
Intercept	0.005	0.004	1.417	0.156	
Other information statistics					
Adjusted coefficient of determination	0.410				
-Fisher's statistic significance level	7.036		0.000		

Table 10: Estimation of the research model

Model name	Akaike	Schwartz	Hannan Quinn	The coefficient of determination
First model	-2.891	-2.862	-2.880	0.396
Second model	-2.889	-2.856	-2.877	0.41

into a comprehensive criterion of real earning management by the method of exploratory factor analysis with the help of STATA software version 15. Similar to this work was conducted differently by [21].

### 8.1 Factor extraction

The factor extraction stage aims to obtain the underlying structures that cause changes in the observed variables. STATA software first selects combinations of variables whose correlations show the highest amount of observed total variance. This set makes factor 1 and factor 2 the variables with the highest contribution in explaining the remaining variance. This method continues for the third, fourth, and subsequent factors until the number of extracted factors equals the number of variables. The correlation of each variable with each factor is called factor loading. The variance explained by each factor is equal to the square of its factor loadings, called Eigen Value.

Table 11: Eigenvalues for each of the factors (real earning management criteria)

Factors	Eigenvalues
First factor	1.463
Second factor	-0.156

The researcher is not interested in all the extracted factors, and a factor with a higher eigenvalue should be selected. The purpose of factor analysis is to explain the desired phenomena with fewer primary variables. First, the goal is to determine the number of factors kept in the analysis. Factors that have formal or theoretical validity should be kept. Before the rotation process, the meaning of each factor cannot be well understood, and mathematical criteria such as Kaiser's criterion or the Schrei-Kettle test are used to keep the factors. The first factor has the highest eigenvalue, which is selected as a comprehensive criterion of real earning management, and the correlation of this measure with earning management criteria are listed below.

Table 12: Correlation between earnings management measures with the first factor

Variable	name First factor
Errors of the first model of earning management	0.855
Errors of the second model of earning management	0.055

Table 12 presents s that the error of the first model and the second model of earning management have a high correlation of 80% with the extracted factor. This factor is considered a comprehensive criterion of real earning management, and the model has been re-fitted.

Considering that the bonus variable has a significance level of more than 5%, managers' bonus does not affect real earning management.

Table 13: The final estimate of the regression model with the comprehensive criterion of real earning management

Variables	Coefficients	The standard deviation of coefficients	t statistic	Significance level	Collinearity
Manager's bonus	0.578	2.503	0.230	0.817	1.143
Operating cash flow	0.462	0.124	3.705	0.000	4.564
Operating earnings	-0.222	0.137	-1.618	0.105	5.394
debt (leverage) ratio	0.105	0.047	2.241	0.025	1.495
Sales growth	-0.025	0.023	-1.101	0.270	1.232
Price-to-profit ratio	0.0002	0.000081	2.571	0.010	1.026
Change of agent management	0.004	0.012	-0.310	0.756	1.541
CEO period	0.001	0.002	-0.513	0.608	1.542
Overconfidence of the manager	0.022	0.007	2.966	0.003	1.259
Restatement of Financial Statements	-0.016	0.020	-0.800	0.423	1.013
discretionary accruals	0.324	0.093	3.490	0.000	3.816
Housing inflation index	-0.303	0.083	-3.647	0.000	1.121
Organizational hierarchy of the group	0.029	0.039	0.743	0.457	1.047
Intercept	-0.090	0.51	-1.743	0.081	
First order autoregressive	-0.161	0.040	-4.033	0.000	
<b>Other information statistics</b>					
The adjusted coefficient of determination	0.105				
Fisher's statistic - significance level	1.857		0.000		
Durbin-Watson	2.005				
F-Limmer	1.477(0.000)				
Hausmann	23.199(0.039)				
Variance heterogeneity	1.761(0.044)				
Serial autocorrelation	3.318(0.036)				

## 9 Discussion and conclusion

When the current operating income is lower than expected, selling fixed assets is one of the most accessible methods of profit correction and real-earning management among companies. Therefore, this research only focuses on real earning management through the sale of fixed assets.

The comparison of the proposed model with Gunny's model in Appendix 1 shows that the proposed model can be considered as a tool and criterion for measuring earning management using the sale of fixed assets, it has a higher coefficient of determination, which can perform better in the stock exchange. The arrangement of the data of each industry in each year has a more normal distribution compared to the arrangement of the data of industry\*year with smaller standard deviation and skewness values as well as the mean and median close to each other.

The results were consistent with those of [31, 19, 9, 30] and [11]. The lack of a relationship between future performance and earnings management is not consistent with the research of [14]. Iran's environmental conditions differ from other countries, leading to different results. Real earning management in the Tehran Stock Exchange member companies does not result from the contract cost approach. Earning and other accounting statistics specified in the contracts are not effective for earning management.

Future studies can evaluate each of the criteria of real earning management (abnormal discretionary expenses, changes in the time of sale of assets, and abnormal operating cash flow) as one of the components in the proposed model. Comparing the proposed model with the Roychowdhury model is another suggestion that can provide an accurate and better evaluation of the new model, considering the similarity of both models in the use of cash flows.



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