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Presenting the model of investment anomalies' measurement based on management efficiency

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Abstract

This article aims to explain how determining a company's efficiency may explain investment anomalies. Investment anomalies point to a negative relation between company growth, adjusted rate of return, and future risk. When companies grow with plenty of investments, the market assumes this growth is positive news, but if the companies do not have the required skills for financing, the prices shall be lowered. The findings show that NSI, dAA, and IA anomalies are concentrated in companies with low returns. Furthermore, there is strong evidence that there is a strong relation between Manager-based efficiency and NSI anomaly and there is limited evidence that shows NOA efficiency plays a role in NSI, IA and NOA anomalies.

Keywords: net stock issuance (NSI), dynamic asset allocation (dAA), investment on assets (IA)
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1 Introduction

In the 20th century, capital market development is of most fundamental concerns of most countries in economy. The root of this concern and endeavours of investors is trying to minimize the investment risks and maximize its return. One of the usual concerns of the researchers is finding a proper model to make a comprehensive connection between theory and what happened. The relation between risk and return is one of the most prominent topics in this field. It is expected the more risk, the more return but the empirical evidence doesn't show this matter and this relation has remained a mystery. The beginning of many modelling to explain this relation is capital asset pricing. This model is based on a set of certain premises and in the form of an equation and says the only factor which is gained from covariance between asset return and market set return is the risk and it is possible for diversification of this risk [14]. The exceptions or anomalies are the events and incidents which could not be explained with prevailing theory. About the stock market, the anomalies are faced in efficient market theory so that in case of having predetermined patterns, it is provided the conditions for a stock transaction strategy with surplus interns (more than a certain risk) [11]. Hence, in asset pricing models based on portfolio modern theory, there will be no bonus for the risks which are not originally systematic and the expected return is just linked to systematic risk. However, the mentioned model doesn't explain

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all stock returns and their changes and this matter, while facilitating researchers to submit more efficient models, has been based for researchers to review effective factors on return. In this matter and from the '70s, the endeavours were accelerated and then the anomalies' literature was formed [14].

Hence, this article reviews the role of managerial efficiency and company in asset pricing. The main key to reviewing the role of a company's capability as a behavioural pricing source in investment anomaly is that we could discrepant legal investments of master companies from overinvestment of inexperienced and fresh companies. Macro-investment just resulted in poor stock function for fresh companies. They are most likely going to overinvestment or incorrect administration of resources and consequently, they will fail in achieving their functional expectations. In master companies, there is no poor function after growth. The more efficient the company, the more successful in investment and the less probability that the market punishes that company for macro-investment which results in the following hypothesis: Investment anomalies are concentrated in low-efficient companies. Hence, by presenting evidence based on excited markets and the failure of investors in processing required information related to investment, this article reviews the role of the company's efficiency in cross-sectional changes of anomaly to enhance the understanding of the main reason for investment anomaly.

2 Investment anomaly

The word anomaly means deviation from common rules [23] and in the financial field it means a pattern in average return on stock which is inconsistent with common models in asset pricing literature [5]. The market anomalies are the result of empirical research which are inconsistent with asset pricing theory [20]. On this basis, many variables such as size, financial leverage, the ratio of book value to market value, total assets, number of issued stocks, etc. were introduced. The process of identifying anomalies was such accelerating that some researchers simulated the status of studies in this field and introduced anomalies to a zoo of anomalies. In this situation, some researchers such as Harvey et al. [12], Cederburg et al. [5], Hou et al. [13] and Avellaneda et al. [1] engaged in identifying anomalies and the necessity of their control. The scepticism made by the mentioned researchers about anomalies caused the topic of anomalies to be re-considered by researchers. In this matter, some researchers know the methodology of recognizing anomalies and applied statistical methods as probable bias factors in the results [5, 12, 13]. Also, the studies in the Tehran Stock Exchange about the anomalies have sometimes presented conflicting results which shall be discussed in the research part. For these reasons, in this research, by applying advanced techniques in determining management and company efficiency, a new procedure in determining anomalies in the company's level and not in accounting anomalies portfolio which has been seen in the Tehran Stock Exchange.

In this matter, the researcher while trying to recognize the behaviour of stock price, intends to explain the changes in return and effective factors on it. These endeavours while resulting in the emergence of an efficient market hypothesis, have also helped the emergence of models to predict stock return. In this environment, several asset pricing models such as Fama's [9] 3-factor model [19]. The asset pricing model was introduced by Sharpe [21] and Lintner [17] for the first time. However this model was the beginning of remarkable progress in determining the expected rate of return, but its empirical efficiency was gradually doubted. Fama and French [10] completed the capital asset pricing model by adding some variables. However, through two decades, the increasing evidence showed that even the effective model of Fama and French [8] could not explain many of the cross-sectional patterns of return on stock from which the most prominent sample is the momentum effect. The momentum means choosing an investment strategy along to market trend, i.e. for a portfolio, the winner stock should be purchased and looser stock should be sold as it is given that stock return is like the past. Recently, Chen et al. [6] have presented Q theory based on two factors, i.e. investment and profitability. They severally tested their model in such methods as Fama and French [10] against anomalies of the capital market and compared its function with Fama and French's three-factor model [16]. Nevertheless, this model is and shall not be capable of explaining all changes in stock return and the return rate itself like the other presented models and this makes researchers review the effective factors on the return rate. In this matter and from the '70s, the endeavours were accelerated and then the anomalies' literature was formed [19]. The investment anomalies point to a negative relation between the company's investment and the future return rate on the stock. This anomaly is a well-known and stable phenomenon in the stock market.

This research reviews four investment variables which are known for predicting future stock return cross-section: Net Stock Issuance (NSI); Dynamic Asset Allocation (dAA), Investment on Assets (IA) and Net Operational Assets (NOA). NSI Increasing which is measured by several adjusted stocks is a strong negative predictor for the cross-sectional rate of return. Special issuers have larger investments in proportion to non-issuers, so the effect of NIS has a close relation to the company's investment. The relation between issuing stocks and the rate of return has been also documented in the market level [15].

3 Research model

$$\text{Efficiency} = c + \beta_1 CUM_t^i + \beta_2 ROA_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 Growth_{it} + \beta_6 ocf_{it} + \varepsilon_{it}$$

whereas;

Efficiency = Company's efficiency

Cum = Investment anomaly

ROA = Return on Asset

Size = Company's size

Lev = Financial leverage

Growth = Growth

ocf = Operational Cash Flow

E = Model error level

Dependent Variable: The dependent variable is the company's efficiency which is calculated by Data Envelopment Analysis (DEA). In this research, the company efficiency measurement by DEA has been taken from Demerjian et al. [7]. The efficiency and inefficiency of each determinant unit depend on the function of that unit in switching inputs to outputs compared with other units in a particular field. This method makes an efficient border for companies ranging between zero and one. The companies with an efficiency level of 1 are so effective companies and the companies with an efficiency level of less than 1 are below of efficiency edge and should reach to efficiency edge by decreasing expenses and increasing incomes [7].

For the company's output, we apply the variable of the company's sales and for input, we use fixed assets, intangible assets, cost of goods sold and expenses. The equation (3.1) and pattern (3.2) have been used for measuring company's efficiency:

$$\max_{y}^{\theta} = \frac{Sales_{it}}{V_1 COGS_{it} + V_2 SG\&A_{it} + V_3 PPE_{it} + V_4 OTHER\ INTAN_{it}} \tag{3.1}$$

whereas;

Sales: Income from selling for company i in year t

COGS: Cost of Goods Sold

SG & A: Sale, General and Administrative Costs

PPE: Property, Plant and Equipment

Other intan: Intangible assets

MAX: Company's Efficiency

The company's efficiency is affected by two factors: the the Company's certain features and the manager's capabilities. The following pattern shows this relation in which after omitting company's certain features, the remaining is the manager's capabilities.

$$FE = \beta_0 + \beta_1 In(TA) + \beta_2 MS + \beta_3 PFC + \beta_4 In(Age) + \beta_5 FCI + \varepsilon \tag{3.2}$$

whereas;

FE: company's efficiency by Data Envelopment Analysis (DEA) method

TA: Total Assets

MS: Market Share: Sale rate at the end of t year divide to total industry's sale at the end of t year

PFC: Positive Free Cash Flows: If a company has positive cash flows, 1, otherwise 0. In this research, the Lehn and Poulsen's index was used to measure free cash flows:

$$\text{Free Cash Flows} = \text{operating profit} + \text{depreciation–income tax–interest rate–dividend}$$

Age: Number of active years of the company from establishment

FCI: Foreign Currency and Dummy variables. If the company exports, the value is 1, otherwise it considers zero.

Independent variable:

Here, investment anomalies on company's efficiency are the independent variable. To measure this variable, it shall be used 4 investment variables which negatively predict the average future return on stocks.

- NSI: is Net Stock Issuance which is calculated as the logarithm of change present in split-issued stocks.

  Split stocks are calculated as issued stocks (SHROUT) multiple split stock factor (CFACSHR).

- dAA: Dynamic Asset Allocation which is calculated as a change percent in total assets from the year t-1 to year t-2.

- IA: Investment on Assets, in fixed assets and inventories which is calculated as changes in gross assets, Property, Plant and Equipment (PP&E) plus changes in inventories (investment) divided by total assets of previous year (TA). Changes in PP&E show long-term investment and changes in IVT show short-term investments.

- NOA: it is total assets which are scaled as NOA and calculated through total assets of the previous year.

  NOA is Net Operational Assets which is calculated as a difference between operational assets (OA) and operational liabilities (OL).

Control Variable

All variables could not be studied concurrently, so researchers control some variables or neutralize them. These variables are control variables [4].

Here, the control variables are:

ROA: means profitability which is a control variable and equal to the ratio of net profit to total assets

SIZE: means the size of the company which is a control variable and equal to the natural logarithm of total sales income

LEV: means financial leverage which is a control variable and equal to the ratio of total liabilities to total assets

GROWTH: means growth which is equal to the ratio of stock market value to total shareholders' equity

OCF: means operational cash flows and is equal to the ratio of net operational cash flows to total assets [15].

4 Methodology

Because of the extensive volume of the statistical population and some incongruities between members of the society, the following conditions were applied to choose the statistical sample. The conditions are:

1. The stocks of the company have been transacted in the stock exchange during research years.
2. The ending date of the fiscal year was 20 March. Furthermore, those companies which have changed in the fiscal year have been omitted from the samples.
3. These companies had no operation stop or changes in the financial period.
4. The considered companies were not been investment companies.

Table 1: Number of Samples

Number of accepted companies in stock exchange	472
Investment companies, financial intermediaries, banks, insurance companies	(55)
Companies with fiscal years ending another date than March 20	(145)
Had no continuous activity during the research period and their transactions in stock exchange had an idle period of more than 4 months	(117)
There was no information about variables	(21)
Final samples	134

4.1 Panel data method

Nowadays, panel data in terms of advantages in regards to cross-sectional and time series data, are increasingly used in economic research. Panel data is a set of data by which the observations have been reviewed by many cross-sectional variables (N) which are mostly selected randomly during a certain period (T). In this matter, $N \times T$ of statistical data is called panel data or cross-sectional-time series data. In the analysis of cross-sectional data, a certain cross-section such as a company is considered and the relevant variables are reviewed for all N sections and T periods. This method is called panel data as includes both aspects of time series data and cross-sectional data. The panel data models review group effects, temporal effects or both effects together.

Considering that it could be used different models in the estimation of regression models with panel data, this is the usual question that which model is more proper and which model should be chosen to analyze data. The truth is contrary to the first sight, it is not simple to choose a proper model. Mundlak [18], Wallace and Hussain [22] have supported fixed effects model and Balestra and Nerlove [2] have been proponents of random effects model [3].

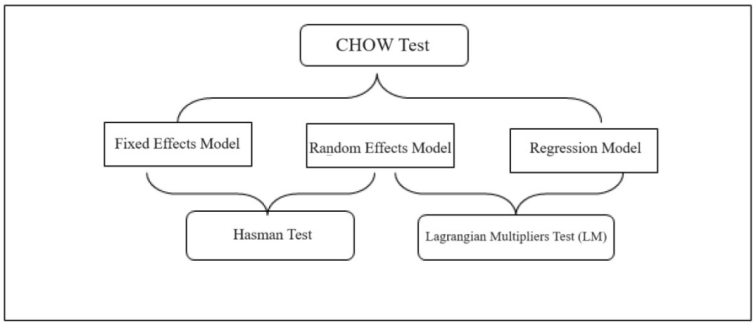

Figure 1: Required tests for choosing proper model

5 Findings

The results of Reliability Tests for Pattern Variables:

To correct estimations in time series, we should first ensure the reliability of these variables during the time. Being careless about this important thing could result to incorrect results about critical variables of the model and false regression. So, in this research first, the Levin-Lin-Chu test was applied to test the reliabilities of variables. The results are summarized in table 2.

Table 2: The results of augmented Dickey-Fuller test in pattern's variables level

Variable	**Levin, Lin and Chu t statistic**	
	Critical Value	Significance Level
	-12.5034	0.0000
	-10.9536	0.0000
	-11.8380	0.0000
	-14.3415	0.0000
	-5.34267	0.0000
	-15.8802	0.0000
	-15.4894	0.0000

According to the significance level of this test which is 0.0 for all variables and less than 0.05, we could say that the research variables have sufficient reliability. So, all the variables are I(0) and there is no need to differencing.

5.1 Results from cointegration test

As per the model of this research, there is a significant relation between actual value added and independent variables. If this hypothesis is regarded as true, there should be a significant and long-term relation between the variables of this model. To investigate, it has been used Kao cointegration test between model values. The value of the T statistic in the Kao test was -3.28 and P_Value was 0.0 which confirms the cointegration at the confidence level of 95. Hence, the results of this review show the long-term equivalence relation between the actual value-added variable and the independent variables of the model.

Table 3: The results of Kao Test for Pattern's Variables

Prob.	t-Statistic	
	-3.284601	ADF
0.0005	1.907588	Residual variance
	1.351692	HAC variance

5.2 Model estimation

As per the formerly resulted model and based on the research hypothesis, by using the panel data method in steady state and the procedure of fixed effects by applying least squares regression (generalized) the model was estimated as fixed effects in cross-sections:

- The results of model estimation by using the procedure of fixed effects in sections and applying least squares regression are shown in table 4.

Table 4: The results of model estimation in fixed effects state in sections and applying least squares method

Dependent Variable				
Variables	**Coefficient**	**Standard Deviation**	**T Statistic**	**P_Value**
C	-1.580141	0.451949	-3.496278	0.0006
	0.358154	0.097971	3.655728	0.0003
	1.067050	0.107075	9.965476	0.0000
	-0.336207	0.118588	-2.835080	0.0051
	3.967409	0.437341	9.071660	0.0000
	0.317243	0.028110	11.28579	0.0000
R-squared		0.953425	Mean dependent var	9.304605
Adjusted R-squared		0.944418	S.D. dependent var	6.864517
S.E. of regression		1.366384	Sum squared resid	337.9278
F-statistic		105.8623	Durbin-Watson stat	2.419870
Prob(F-statistic)		0.000000		

Also, by the regression coefficient table, it is seen that the value is 0.95 and generalized value has been estimated at 0.94 which shows the high explanatory of the model. As per F statistics which is 105.86 and the p-value of this statistics which is 0.00, we could say the whole model is significant in terms of statistics. In addition, Durbin-Watson statistics also show that the above model is not autocorrelated.

6 Discussion and conclusion

The origin of the investment anomaly has remained unclear. This study, by reviewing the role of the company's efficiency in the continuous poor function of stocks related to NSI, dAA, IA and NOA, assesses the hypothesis of incorrect pricing. This research has reviewed this simple evidence that over-investment shall not result in good, especially if the market cannot fully process the negative information of unfavored growth in the first place. The measurement of the company's efficiency is used to distinct legitimate growth from over-growth.

This study uses three efficiency standards such as two advanced standards which have been developed by Demerjian et.al [7]. These standards are not complete as they consist of anomalies resulting from measurement errors in inputs and some accounting variables, so they are limited to achieving a full spectrum of the company's skills. However, Demerjian's standards are the most updated standards which have fewer anomalies comparing former proxies. This article is the first one to use these standards to assess incorrect pricing logic for investment anomalies.

This article concluded that there is a relation between predicting a company's investment return and a company's efficiency level; inefficient investment companies act more poorly compared to companies with less investment and similar inefficient levels, though efficient investment companies do not necessarily have more poor function compared companies with less investment and similar inefficient level. In summary, investment anomalies are concentrated in inefficient companies. Especially, asset growth NSI and IA anomalies are seen in companies with general inefficiency. There is strong evidence that net issuance is driven by companies with managerial inefficiency and there is limited evidence that NOA efficiency potentially explains the IA, NSI and NOA anomalies.

This research presents several contents for financial affairs and investment management. First, the companies should be equipped to effectively manage resources while investing and offering value to shareholders. The company's

skill is so matter, that for an effective enterprise strategy, it should equalise the growth with the capability to maintain that growth.

Second, companies should hire and maintain managers who are capable of effectively exploiting the company's resources, especially if it is expected to issue new stocks for development. Unskillful managers shall most likely go beyond the company's growth optimized level, allocate the resources wrongly and deduct the wealth of shareholders. Eventually, investors should be concerned about those companies with great investment and fast growth. The investors are recommended to research if this growth comes from illegitimate investment or over-investment by inefficient companies or managers.

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