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Providing a behavioral model for measuring the stock price bubble in the capital market

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ABSTRACT

The existence of price bubbles in different markets, and in general the bubble in price levels is one of the new theories in the field of macroeconomics. Basic patterns do not explain much about the causes of bubbles. For this reason, experts in the framework of theories related to behavioral sciences tried to explain the causes related to the formation of this component. Some in the market believe that they have more mental ability than others and can take advantage of the opportunity and transfer all the losses caused by this situation to others by predicting the time of price reduction. The term bubble is more commonly used in financial markets when rising public expectations of future price increases will cause temporary price increases in the present. Therefore, the main purpose of this study is to provide a behavioral model for measuring the stock price bubble in the capital market. The method of the present study is descriptive-correlational and the statistical population of the study consisted of all companies active in the stock market in the period 2012 to 2020 due to the systematic elimination, 143 companies were selected as a sample. We used logistic regression with Eviews to test the hypotheses. Behavioral factors identified include speculative behavior, behavioral irrationality, investor heterogeneity, and market expectations. The results showed that behavioral irrationality has a positive effect on the stock price bubble. Investor heterogeneity also showed a positive effect on the price bubble. On the other hand, market expectations and speculative behavior also had a positive effect on the stock price bubble. Therefore, it can be said that behavioral factors can have a positive effect on the formation of stock price bubbles. Therefore, the identified pattern has the necessary performance from a behavioral point of view.

Keywords: stock price bubble, behavioral factors, speculative behavior, behavioral irrationality, investor heterogeneity and market expectations

1. Introduction

Interpreting short-term changes in asset prices in the context of efficient and rational markets remains a challenge. Many experimental studies have shown that stock prices show a kind of "extreme volatility" means that these prices change somewhat their interpretation is not possible due to changes in basic elements such as dividends. It is necessary to achieve efficiency in the capital market that fluctuations in the market are caused logically and based on fundamental factors. If the stock price has changed due to irrational factors and has very sharp fluctuations, the attractiveness of this investment option has decreased drastically and as a result we will see the outflow of capital from this market. Bubbles are the most complex disorder gripping capital markets Which causes the stock market to lose its function for optimal use of resources and pricing (Abbasi et al.,2018).

The bubble diverts savings to their optimal allocation in asset markets. For this reason, at the macro level, diversion of savings disrupts investment efficiency and the economy as a whole. Many researchers in the field of financial-behavioral studies have done a lot of research on the existence of this phenomenon. Recent research has shown that the traditional root patterns of the unit are weak in identifying explosive behaviors, especially in long periods (Sadeghi Sharif et al., 2017).On the other hand, we can say about the effect of the price bubble, an increase in stock prices will attract investors. Not all investors will want to study the inherent characteristics of the stock, And for these people, the price increase in itself is reason enough to invest. Additional investment, in turn, leads to price drift, so the positive feedback loop is complete. Like all dynamic systems, financial markets have variable equilibrium, referred to as price volatility. However, self-equilibrium (negative feedback) usually occurs: When prices rise, People are often eager to sell and few people are willing to buy. This limits the oscillation. However, when positive feedback is given, the market, like other positive feedback systems, is experiencing an imbalance. This is seen in financial bubbles where asset prices rise rapidly above economic value, and then fall rapidly. Of course, not to mention that Investment managers, like managers of mutual funds, protect in parts because of the similar performance of their counterparts. Taking a conservative stance when bubbling leads to poor performance for peers. This causes customers to go elsewhere and investment managers suffer compensation losses (Ramezani and Bagheri, 2017).Bubble phenomenon is a term that is frequently used in financial markets. In general, there is no agreement in the literature on the definition of a bubble and the causes of its occurrence. Bubbles are also difficult to detect due to the invisible intrinsic market value. Price fluctuations are part of the nature of the market, but sometimes these fluctuations are out of their normal form and give way to unbridled ascents (bubbles) and sudden falls (crises) and inflict irreparable blows on the stock market. An asset price bubble is a deviation of an asset price from its underlying value. Given that many financial crises follow the bursting of the financial asset bubble, Investigation of bubble behaviors in these markets and initial diagnosis is important to prevent adverse economic consequences (Asadi et al.,2019).

In recent years, stock prices on the Tehran Stock Exchange have been bubbled several times. Part of the Tehran Stock Exchange price bubble is due to emotional shocks. Accurate measurement and stability of the effect of emotional shocks on the stock price bubble is of particular importance. Behavioral economics is an aspect of economics that tries to understand and analyze markets and economic factors with a scientific method in the field of psychology and using variables related to emotions and society. Behavioral economics therefore defines the price bubble based on the behavior and actions of traders in a market. According to Robert Schiller, the price bubble is caused by the irrational thinking and decision of people to buy a type of product at high prices and their belief in making a profit from that product at higher levels. In this case, the vast majority of actors are optimistic about the flight of prices and minimize the risk of falling. And therefore the possibility of bubble formation is ignored. Schiller believes that the reason for such irrational behavior in traders is following the corridor-leadership model. In which a natural or legal person realizes the benefit of an acceptable economic activist through speculation in the financial market and imitates his behavior for profit. A good example of this is during the US mortgage crisis. When banks and credit institutions realized the high profitability of housing facilities, in imitation of each other and in more and more competition with each other and with little regard for

credit risk, they proceeded to provide facilities to applicants for housing. This imitation and competition in the first stage led to an increase in demand in the housing market and subsequently to a significant increase in prices. At a time when banks were confident of the hassle-free profitability of housing facilities, households were persuaded that they could become homeowners without relying on their personal assets, so households turned to financial and credit institutions to escape the scourge and receive the facility. They became housewives. It was not long before this behavior of bankers, housing consultants and households led to the formation of a price bubble under the influence of speculation. Robert Schiller describes irrational euphoria in a book of the same title as the main cause of the speculation bubble and describes it as a situation. Where the announcement of high prices makes the actors excited, something that causes psychological transmission from person to person. Behavioral economics therefore sees the bubble as a social pandemic associated with a lack of information transparency in which the prevalence of euphoria is causing prices to rise and in the first stage, it affects investor's doubts about the true value of assets due to jealousy and competition, they continue to invest more and make irrational decisions. At the same time, it should be noted that behavioral economics has done enough to define the bubble problem but it has not been very successful in defining irrational behavior and explaining how rational a behavior is, and it has its weaknesses. Financial markets, especially the capital market, are one of the most important tools for equipping and allocating financial resources any disruption in these markets in the optimal allocation of these resources creates serious problems.

One of these gaps is the price bubble. The basis of the price bubble is based on reaction which you do to increase prices. Rising prices lead to increased investor enthusiasm, increased demand and consequently a consecutive increase in prices and increase investors' expectations for higher returns in the future. But the uptrend can never be sustained and when price increases come to an end, so does growing demand ascending feedback gives way to descending feedback. (Basis of price bubble formation in the stock market) (Kamran Rad, ۲۰۱۷). Behavioral sciences are among the applied sciences it has entered the sciences in the form of a specialized field called psychology. The basic infrastructure of this knowledge is human and inherent complexities, behaviors and characteristics that must be understood in a scientific framework called psychology. Behavioral finance refers to the study of the effect of psychology on market behavior. Behavioral finance attempts to demonstrate the use of psychological decision-making processes in identifying and predicting financial markets. Most previous asset validation studies have focused on the behavioral response of investors. Such studies proved Changes in investor behavior can change the pricing and performance of assets and the behavioral response of investors was introduced as a significant factor in the pricing process in the market (Rezaei and Elmi, 2018). Therefore, according to market research, this issue is important that capital markets must have the necessary efficiency to attract investors and provide financial resources and, consequently, the optimal allocation of resources for their greater returns. In order for the capital market to achieve this efficiency, it is necessary to create fluctuations in the market logically and based on fundamental factors. In the presence of bubbles in the stock market, the valuation of companies' stocks is not based on their actual performance. And prices as an indicator cannot show their performance. The emergence of bubbles indicates abnormally sharp fluctuations in stock market indices. This causes severe losses to market participants. In addition, identifying and understanding bubbles and finding bubble cycles in the market. Investors looking for long-term profits, Get out of the trend of unusual increases or decreases. It is also important for macro-level actors to identify and understand explosive (very severe) bubbles; because after such bubbles, there are always financial crises and then recession. In general, one of the ways to detect inefficiency and irrational behaviors from the perspective of financial-behavioral proponents in asset markets is to identify bubble cycles. Therefore, in line with the above, the main purpose of this study is to provide a behavioral model for measuring the stock price bubble in the capital market.

Theoretical Framework

Behavioral finance is studying people's interpretation of information to make informed investment decisions. In other words, behavioral finance studies the effect of psychological processes on decision making. In addition, behavioral tax can be considered as a model

for studying financial markets using the studied models. Such models ignore the two main and limiting hypotheses of the expected utility maximization model and complete rationality. Behavioral finance has two main pillars. One limitation in arbitration is this that rational investors cannot easily take advantage of arbitrage opportunities. Because it requires accepting some risks. Second, this psychology is for studying the behavior and judgment of investors and the mistakes made by individuals. Therefore, investors do not always behave rationally (Friedman and Kamir, 2016).

The well-known theory of efficient markets states that changes in stock prices are the result of changes in expectations due to new information about the underlying factors (factors) that are available to investors. In other words, in an efficient market, the price (value) of financial assets changes in response to the expected change in the sum of discounted cash flows from the asset. Now, if the price trend is not reflected in changes in fundamental factors (dividends and discount rates), other factors should be sought to justify it. The term "bubble" in financial science generally refers to a situation the price of an asset is significantly higher than the price and the underlying value of that asset. Over the course of a bubble, prices for a financial asset or group of financial assets swell significantly(Abbasi et al.,2018).Shows records of theoretical models in finance that speculation could lead to price overruns and price bubbles. We provide evidence that, in fact, potential individual behaviors are exorbitant in (experimental) asset markets (Johnson et al., 2019)The concept that the word bubble comes to mind. It mainly includes economic concepts which stems from sharp fluctuations in prices in the financial markets; In other words, the deviation of the asset price from its long-term equilibrium price is called a bubble. In fact, when the price of an asset or service differs from its intended price in the future, the bubble issue arises. A bubble is a part of the price of an asset that cannot be defined by the principles set out in the basic patterns. The financial bubble will occur when the price of an asset, such as stocks or real estate, rises suddenly, for irrational reasons (from the fundamentalists' point of view). And then fall (Sadeghi Sharif et al., 2017).

The existence of a bubble causes a difference between the price of an asset and its underlying value. The price bubble is a fluctuation in the price of an asset that cannot be explained by its fundamentals. The bubble can also be seen as a rapid increase in asset prices in a continuous process. In general, thinkers and proponents of the new financial theory attribute the bubble to the inefficiency of the market and the formation of false expectations due to insufficient and vague information or the incorrect use of valuation patterns; Whereas financial-behavioral theorists cite psychological and psychological factors of the market as the main cause of the price bubble; In other words, modern financial theorists consider the bubble as a result of spontaneity of expectations and financial-behavioral theorists consider it as a result of herd-like behavior (Hume and Brittung, 2012).

Fama (1970) addresses two very important assumptions: 1) Investors behave rationally in their market decisions. 2) Investors buy and sell securities based on the latest information and news and they have enough wisdom to determine the fairness of securities prices. Investors do not meet the hypothesis of complete rationality and have poor ability to interpret information and trade at will. Widespread chases lead to the impact of market sentiment on stock prices and stock prices rise to the point where it goes beyond its core level. This creates a price bubble, and when the bubble collects to a certain point, it bursts. And then stock prices fall rapidly, and it causes heavy losses for investors if the bubble is not controlled in time, it will gradually expand and explode, which will affect the financial security of the country and create a series of negative effects. Therefore, preventing and neutralizing capital market risks, preventing the display of risks between sectors and ensuring that the main result of preventing systematic risk is important to maintain the stability of the capital market and the market. When traders become aware of herd behavior in the market, they raise prices further and attract more investors to buy. By pouring more funds into the market, the effect of the herd and buying behavior becomes more intense. Therefore, these investors are very vulnerable to foreign information and always change their main investment strategy and can shape expectations through imitation and mutual learning. This leads to herd behavior (Lee, 2016).

The discrepancy between the efficient market hypothesis and reality encourages deeper insights into psychology as an important factor in financial theory. The efficient market theory hypothesis holds that investors, while competing for big profits, they set fair prices. An efficient market is related to the theory of

reasonable expectations, including the evaluation of all property information. However, if there are many irrational investors and their financial behavior is not related and their transactions invalidate each other and affect prices, the impact of irrational investors on the market is raised. If investors are irrational, their financial decisions determine prices, although it does not change the value of financial assets. As a result, sensible investors can sell stocks higher than the appraised price or buy their undervalued assets. So they make a profit, until the price of an asset converges with its value (Rezaei and Elmi, 2018). In the case of behavioral errors in the capital market, we may have a graphical description of their mechanism which is pendulum simulators that are constantly optimistic among investors (that prices are unreasonably rising) and pessimistic investors (where security prices fall unnecessarily) Optimistic investors, like confident investors, are more likely to make risky investments. They make irrational transactions and their irrational reactions can lead to abnormal returns and trading volume which significantly affects judgment and decision-making and thus changes investor behavior. Investors' mood or mental state when making decisions can affect their preferences, risk assessment and rational claims, and ultimately their investment decisions. Therefore, financial decisions should vary according to the investor's circumstances (Opera and Tansiso, 2014).

Because the decisions of mood investors are positively related to market sentiment, Increased market interest leads to more buy orders and the morale of other investors increases again. Rising conditions are forcing other investors to consider their signals positive and increase their investment in the market. In this process of positive feedback, the price is constantly rising and deviating from its core value eventually creates a bubble (Li, 2012)..In emerging markets, the presence of factors such as lack of information, lack of timely and accurate information about a particular company and the impact of macroeconomic and political factors on financial markets, has led investors to focus on the behavior of other investors. And so the formation of the herd behavior of investors has led to behavioral bias Which can be the source of various anomalies such as bubbles and falling prices, the formation of market fluctuations and ultimately inefficiency in the market and the impact on stocks (Jokara et al., 2018).In fact, it determines the dynamic interaction between disruptive traders and price arbitrage. The effect of emotional behavior on investor judgment is intuitively inferred from future earnings growth. When emotions are high, investors become more optimistic and stock analysts publish more trademarks. Hence, higher sentiment is thought to increase the expected revenue growth for investors. Emotions can also affect expected rates of return through their effects on projected risks and risk pricing. During a period of high sentiment, investors tend to underestimate potential risks (Zhu & Niu, 2016).

Balkilaret al. (2016) assessed the presence and age of bubbles in the South African stock market. This study introduced a nonlinear model using an experimental model of bubble formation in asset prices and using multiple bubbles entering the model. The results showed that there were several bubbles in the market. Jones (2017) Review of Asset Bubbles: Reflections on the Institutional Investment Era showed that miscalculated prices are increasingly reflecting institutional friction - benchmarks, motivational pressures and organizational design - in the institutional investment industry which is growing rapidly. These effects may make the bubble "logical", Buffa et al. (2014) claim that index information can be generated in both directions - where low-value assets become cheaper and assets become more expensive - upward distortions are possible. Adverse phenomena such as financial market uncertainty, fear of depositors, banking management and financial credit all stem from factors such as bubbles in financial markets. However, rising asset prices are not always the cause of the bubble. There are several reasons for this phenomenon. The first reason is that the increase in risk leads to a change in the base price of the guaranteed asset within the reasonable expectations (Madjumerd et al., 2017).

Another reason is the factors that may cause a permanent deviation from the equilibrium path. large movements in asset prices can be explained by variable time. Sandra (2020) in examining stock markets, market crashes and market bubbles stated that repeated bubbles and market crashes have confused financial professionals. Important economic theories such as the efficient market hypothesis show that, logically, incorrect pricing of assets traded in stock markets should not occur. However, such factors cause the behavior of individual stock market players.

Yashushi et al. (2020) showed that traders tend to hold bubble assets for longer. As a result, they expand the bubble in the market with symmetric and asymmetric information. Zheng and Chiu (2020) showed that the artificial stock market can accurately simulate the real situation of the market and when the number of passive investors in the market is small,

Or the number of major investors is small, or the number of emotional investors is large, Stock bubbles tend to occur and stock prices deviate from their value Lance (2019) showed that asset price dynamics may well include a bubble component and the explosive price behavior of the bubble price can still be matched by the rational behavior among investors. Yao and Gang (2018) examined the relationship between the stock bubble and investor sentiment. They showed that the stock bubble has a positive relationship with investor sentiment and the ratio of income to market price. Meanwhile, the stock bubble has a negative correlation with the volume of market transactions and the market turnover rate. On the other hand, it calculates the core value of stocks using the residual income model and found that there are many bubbles among the mentioned companies. Aitmar and Mittal (2017) tested the bubble in stock markets with an irregular distribution. They showed that this problem could be avoided by using the test on the stock value bubble by using the ratio of book value to market value. Behavioral finance theory attributes stock bubbles to cognitive bias that leads to group thinking and herd behavior. Bubbles exist not only in real-world markets, with their inherent uncertainty and noise, but also in highly predictable experimental markets. Some economists have suggested a monetary policy regime that targets low and stable inflation. Can increase the likelihood of asset price bubbles, because the stability associated with inflation targeting can lead to over-optimism about the future of new technology profits. Other economists think that an inflation targeting regime reduces the likelihood of asset price bubbles. But improper monetary policy in that regime can contribute to the bubble (Burrio & White, 2004).

These assumptions are based on evidence that asset price fluctuations in recent business cycles have been greater than in previous business cycles. Despite the success of many countries in achieving low inflation, there have been, so the hypotheses of the present study were formulated as follows:

1) Behavioral irrationality dose effective in measuring the stock price bubble in portfolio management with a behavioral approach.
2) Speculative behavior is effective in measuring stock price bubbles in portfolio management with a behavioral approach.
3) Heterogeneity of investors dose effective in measuring the stock price bubble in portfolio management with a behavioral approach.
4) Market expectations affect the measurement of stock price bubbles in portfolio management with a behavioral approach.

Research method

The research method is a descriptive correlation in terms of nature and content of a research which will be done post-event to discover the correlation between variables. The present study is an applied research in terms of the type of research work and in terms of purpose which uses factual information and various statistical methods to refute or disprove hypotheses, and falls within the realm of positive theory. Doing this research is in the framework of deductive-inductive reasoning. This means that the theoretical foundations and background of the research are through library studies, articles and sites in the form of deductive and collecting information to confirm or reject the hypotheses in the form of inductive. The information used in this research will be library which is collected by referring to scientific books, prestigious domestic and foreign journals and using the Internet. Also, the required information will be collected through stock exchanges and software available in the market, such as Reheard Novin.

And if necessary, the stock exchange site will be used. Companies listed on the Tehran Stock Exchange have been selected as the statistical population. In addition, the time period of this research is between the years 2012 to 2020. To determine the sample, the systematic removal method is used. Therefore, in this study, companies from the statistical community will be accepted that:

1) The end of their fiscal year is March 20;
2) To be present in the stock exchange from 2012 to 2020.
3) The company does not have a change of fiscal year between 2012 and 2020.
4) The required information is available.

Due to the above restrictions, 143 companies were selected as the final sample. Exiew software was used to measure the collected data and Eviews statistical software was used to analyze the data. In addition to testing the hypotheses, we use the regression method.

Research models and variables

Dependent variable: Price bubble (P)

Dassis and Lee (2018) noted that scalability is very important for economic bubbles.Because the structure reduces the dependence between price and model parameters. In this case, the price bubble is calculated based on the following formula:

$$P_t = \sum_{j=1}^{\infty} \frac{E_t(d_{t+j})}{(1+r)^j} + b_t$$

Where dt is the dividend, Pt is the stock price at time t, and E is the expected value based on the valuable and valid information available at time t. If the rate t is constant throughout the period, the equilibrium price is obtained and bt indicates the random bubble value that triggers this condition. Which is calculated for the years under review. If there is a bubble, it gets the number 1 and otherwise it gets the number 0.

$$\log\big(p(y=1)\big) = log\left[\frac{p(y=1)}{1-p(y=1)}\right]$$

If p = 1 there is a possibility of no bubble (y = 0) Then the probability p = 0 will be the probability of being a bubble (y = 1). If Xi is a set of variables affecting bubbling, In this case, the probability of being a bubble is as follows:

$$p_i = E(\{y=1|X_i\}) = \frac{1}{1+e^{-(B_1 B_2 X_i)}}$$

Independent variables:

Speculative Behavior (DP): To measure this variable, real cash dividends in a previous period are used.

Market Expectations (PE): The P / E ratio is used to measure market expectations and to calculate it, the current price of the company in the market is divided by the net income of the company (Ansari Samani and Nazari, 2016).

Behavioral irrationality (BI): Ahmed and Duelman (2013) model have been used to calculate the behavioral irrationality of corporate investment costs. This model divides tangible fixed assets by the sum of the company's total assets. Then the middle of the results obtained all the companies. Accordingly, compare the ratio of investment costs with the median obtained among all companies And if the number obtained is greater than the middle, Indicates irrational behavior in that company and takes the number one And if it is less than the middle, it takes the number zero and indicates irrational behavior in that company (Ahmad and Duelman, 2013).

Investor Heterogeneity (IH): Investor heterogeneity is the average random turnover of stocks in the current financial year minus the average turnover of stocks in the previous year. The average random turnover of stocks is obtained by dividing the monthly trading volume of stocks by the total number of stocks issued during the month (Ahmadi et al., 1398).

Company Size (SIZE): The natural logarithm of assets is used to measure company size.

Financial Leverage (LEV): In this study, the ratio of total debt to total assets is used as an indicator of financial leverage.

Growth opportunity (market value to book value (Grow) book value to market value of the company for year t

$$Grow = \frac{MV}{B}$$

Return on Assets (ROA): Equivalent to net profit divided by total assets

Regression model (logit regression)

$$BU_t = \beta_1 + \beta_2 DP_{it} + \beta_3 PE_{it} + \beta_4 BI_{it} + \beta_5 DT_{it}$$

Inferential results

Descriptive Statistics

In descriptive analysis, the researcher describes the collected data using descriptive statistics tables and indicators such as central indicators and dispersion. This contributes a lot to the transparency and explanation of the researcher's data. Descriptive analysis of the data is presented in Figure (1).As seen in Figure (1).

Figure (1): Descriptive analysis results related to quantitative research data

Standard deviation	the smallest	the largest	mean	observations	Symbol of variables	Variable
0.107	0.019	0.500	0.078	1144	(DP)	Speculative behavior
0.039	0.004	0.597	0.355	1144	(PE)	Market expectations
0.616	0.029	0.734	0.663	1144	*(BI)*	Behavioral irrationality
0.209	0.00	1.000	0.493	1144	(IH)	Heterogeneity of investors
1.595	9.267	19.149	14.104	1144	*SIZE*	size of the company
0.344	0.044	0.864	0.626	1144	*LEV*	Financial Leverage
1.966	0.304	3.801	1.270	1144	*G*	company's growth
0.180	-1.038	2.284	0.106	1144	*ROA*	Asset return rate

Figure (2): Results of frequency analysis of qualitative research variables

Percentage	Frequency	measurement	the mark	observations	Variable name
37.29	427	Price bubbles (1)	*BU*	١١٤٤	Price bubble
62.71	717	Bubble Free (0)			

Assessing the reliability (meaning) of research variables at the level of companies

Reliability of variables means that the mean and variance of variables are constant over time and the covariance of variables between different years. The application of conventional econometric methods in model estimation is based on the assumption that model variables are stable. If the pattern variables are unstable or have a single root, In this case, the usual t and F tests will not be valid. To evaluate the reliability of the variables, single root tests such as Lin, Levin and Chou tests were used. The results of the reliability of research variables at the level of companies in general are presented in Figure (2). Levin, Lin and Chou tests were used to determine the reliability of research variables. The results of this test indicate that the variables were at a stable level during the research period. Because the probability value for the test was less than 5%.Reliability means that the mean and variance of variables have been constant over time and the covariance of variables has been constant between different years. In other words, all research variables are meaningful and therefore there is no need to examine the long-term meaning of the variables.

Being two-way means that a random event occurred in two possible situations. Logistic regression can be seen as a special case of general linear model and linear regression. The logistic regression model is based on linear regression based on completely different assumptions (about the relationship between dependent and independent variables).An important difference between the two models can be seen in the two features of logistic regression. The first conditional distribution X / Y is a Bernoulli distribution instead of a Gaussian distribution because it is a binary dependent variable. The second is the probabilistic prediction values, which are limited between zeros and ones and are obtained by means of a logistic distribution function. And logistic regression predicts output probability.

Table (٢): Mana test of research variables

Probability of statistics of Levin, Lin and Cho	Statistics of Levin, Lin and Chou	Symbol of variables	Variable
0.00	-11.42	**(DP)**	Speculative behavior
0.00	-187.12	**(PE)**	Market expectations
0.00	-24.41	*(BI)*	Behavioral irrationality
0.00	-14.19	**(IH)**	Heterogeneity of investors
0.00	-48.013	*SIZE*	size of the company
0.00	-57.908	*LEV*	Financial Leverage
0.00	-2969.27	*G*	company's growth
0.00	-59.250	*ROA*	Asset return rate

In many cases, the dependent variable (y) takes the values 0 and 1 which indicates the choice of two options: Y = 0 does not select the desired subject and Y = 1 indicates its selection. For such cases, the following probability model can be introduced:

Vector $X_i' = [1, X_{2i} ... X_{ki}]$ is a set of factors on which the probability of Y occur depends. β also shows the coefficients related to the impact. What is the relationship between explanatory variables (X_i s) and decision variables (Y_i) Depends on the shape of the function $F(X_i, \beta)$, which may be linear or nonlinear.

The hypothesis to be tested is as follows:

Behavioral irrationality dose effective in measuring the stock price bubble in portfolio management with a behavioral approach.

Figure (3): Results of the first hypothesis

The significance level	Statistics of z	Coefficient value	Variable name	
0. 000	-5.49	-6.31	C	Constant
0.023	2.26	1.26	BI	Behavioral irrationality
0.00	4.65	0.34	SIZE	Size
0.44	0.77	0.33	LEV	Financial Leverage
0.301	1.03	0.008	G	Growth
0.962	0.04	0.03	ROA	Asset return rate
McFadden Rsquared=0.23	LR statistic=24.66		Prob(LR statistic=-0.00001	

H0: Behavioral irrationality dose not effective in measuring the stock price bubble in portfolio management with a behavioral approach.

H1: Behavioral irrationality dose effective in measuring the stock price bubble in portfolio management with a behavioral approach.

In this model, the dependent variable is the stock price bubble and as the results show considering the significance level of 5% behavioral irrationality, there is a positive and significant effect on the stock price bubble.Also, McFadden R2, LR or Chi-square and ProbLR statistics indicate the significance and appropriateness of all regression coefficients. Also, McFadden R2, LR or Chi-square and ProbLR statistics indicate the significance and appropriateness of all regression coefficients. Also, R2 McFadden (0.23), LR or chi-square (24.66) and ProbLR indicate that all regression coefficients are significant (0.000).LR statistic is significant at the level of less than 5%. This indicates the overall significance of the regression model fitted to the 95% confidence level. Coefficient of determination is a measure that describes the strength of the relationship between the independent variable and the dependent variable; In fact, the value of these coefficients determines what percentage of the changes in the dependent variable is explained by the independent variable. In logistic regression analysis, McFadden's coefficient of determination plays almost the same role as the coefficient of determination.

According to the McFadden determination coefficient of the fitted model, which is a dependent variable of the stock price bubble it can be claimed that about 23% of the changes in behavioral irrationality are explained by model variables. According to Figure (3), the level of significance between the two variables is equal to 0.023, this value is smaller than the level of significance considered in the present study (5%); Therefore, at the 95% confidence level, the null hypothesis that behavioral irrationality has no effect on the stock price bubble is rejected and the original hypothesis is confirmed. Behavioral bubble models generally assume that real investors, as ignorant and irrational people, follow the trend and cause a bubble and this is while legal investors, as informants, by adopting the reverse strategy, behave against the trend (Mehrabanpour et al., 2017).So what is the benchmark for such behavior? Or how an analyst can remain neutral in his or her assessment and questions like these are major criticisms which justifies the bubble from the point of view of behavioral economics. Herd behavior has a significant magnifying effect on stock market bubbles. Rational mentality and the rules that investors have set for themselves to be rational, if faced with future prospects, it will fall. Increasing investor confidence and the constant increase in prices shape the optimistic feeling of the market and cause more herd behavior and bubbles (Liu et al., 2014).

According to the results of the table, the hypothesis test model is significant and there is also a direct and significant relationship between independent and dependent variables. As a result, the first hypothesis is confirmed. Behavioral irrationality has a positive and significant coefficient less than ۰,۰۵, so it can be said that behavioral irrationality is effective in measuring stock price bubble in portfolio management with a behavioral approach. Behavioral

irrationality of investors leads to stock price bubble and increase Bubbles are in the portfolio.

Convenience of regression model test

In order to compare the estimated probability values with the actual values, two tests are used, both of which have similar hypotheses.

H0: Our model has enough estimation power

H1: Our model does not have enough estimation power

Here, the Hosmer- Lemeshow and Andrews tests are used. The results are shown in Figure (4):

Figure (4): The result of Hosmer- Lemeshow and Andrews test

H-L Statistic	36.47	Prob. Chi-Sq(8) 0.43
Andrews Statistic	43.84	Prob. Chi-Sq(10) 0.43

One of the tests used to properly fit binary selection models is the test Hasmer - Lemshu. In this test, the overall significance of regression coefficients is examined by comparing the predicted and actual values of the dependent variable in different groups. If the difference between the actual and predicted values of the dependent variable is large, it indicates a poor fit of the model. Given that the significant value of the Hasmer statistic is greater than 0.05, this value indicates the adequacy of the data for the fit of the model. .Given the significance level of 0.05%, H-hypothesis zero is not rejected. This means that our model is a good model and there is no difference between real values and estimates.Given the significance level of 0.05%, H-Hypothesis Zero is not rejected. This means that our model is a good model and there is no difference between real values and estimates.

1. The second hypothesis states:

Speculative behavior is effective in measuring stock price bubbles in portfolio management with a behavioral approach.

H0: Speculative behavior dose not effective in measuring stock price bubbles in portfolio management with a behavioral approach

H1: Speculative behavior dose effective in measuring stock price bubbles in portfolio management with a behavioral approach

As the results show considering the level of significance of 5% between the behaviors of speculation on the stock price bubble, there is a positive and significant effect. Also, McFadden R2, LR or Chi-square and ProbLR statistics indicate the significance and appropriateness of all regression coefficients. Also, McFadden R2, LR or Chi-square and ProbLR statistics indicate the significance and appropriateness of all regression coefficients. Also, R2 McFadden (0.23), LR or chi-square (28.75) and ProbLR indicate that all regression coefficients are significant (0.000). LR statistic is significant at the level of less than 5%. This indicates the overall significance of the regression model fitted to the 95% confidence level. Given the McFadden coefficient of determination of the fitted model, which is a dependent variable of the stock price bubble, it can be claimed that about 23% of the changes in the stock price bubble are explained by the model variables. According to Figure (5), the level of significance between the two variables is equal to 0.069, this value is higher than the level of significance considered in the present study (5%); therefore, at the 95% confidence level, the null hypothesis that speculative behavior has no effect on the stock price bubble is confirmed and the original hypothesis is rejected. Based on self-attribution bias is a cognitive bias and it is completely recorded in psychology. This allows people to more likely to evaluate signals that support their beliefs. While ignoring conflicting signals as noise. Theoretical models that explain bubble phenomena through biased self-attribution state that the bubble bursts when the positive sentiment about high prices is reversed. Like feedback-based business models, biased self-attribution theories can explain positive and negative bubbles. Bubbles are likely to arise in the price of valuable assets (Lance, 2019).

According to the results of the table, the hypothesis test model is significant and there is also a direct and significant relationship between independent and dependent variables. As a result, the first hypothesis is confirmed. Speculative behavior has a positive and significant coefficient less than ۰,۰۵, so it can be said that speculative behavior is effective in measuring the stock price bubble in portfolio management with a behavioral approach. Increasing the stock bubble in the portfolio has a positive role.

Figure (5): Results of the second hypothesis test

(%5) Significance level	Statistics of z	Coefficient value	Variable name	
0/00	-4.88	-5.15	C	Constant
0.69	2.70	1.34	DP	Speculative behavior
0.000	4.44	0.30	SIZE	size of the company
0.0343	0.94	0.36	LEV	Financial Leverage
0.279	1.08	0.007	G	company's growth
0.171	-1.36	-0.098	ROA	Return on assets
McFadden Rsquared=0.23	LR statistic=28.75		Prob(LR statistic)-0.00	

Figure (6): The result of Hassmer and Andrews-model test

H-L Statistic	8.96	Prob. Chi-Sq(8)	0.34
Andrews Statistic	11.45	Prob. Chi-Sq(10)	0.32

One of the tests used to properly fit binary selection models is the test Hasmer - Lemshu. In this test, the overall significance of regression coefficients is examined by comparing the predicted and actual values of the dependent variable in different groups. If the difference between the actual and predicted values of the dependent variable is large, it indicates a poor fit of the model. Given that the significant value of the Hasmer statistic is greater than 0.05, this value indicates the adequacy of the data for the fit of the model. .Given the significance level of 0.05%, H-hypothesis zero is not rejected. This means that our model is a good model and there is no difference between real values and estimates. Given the significance level of 0.05%, H-hypothesis zero is not rejected this means that our model is a good model and there is no difference between real values and estimates.

The third hypothesis states: Investor heterogeneity is effective in measuring the stock price bubble in portfolio management with a behavioral approach.

H0: Heterogeneity of investors dose not effective in measuring the stock price bubble in portfolio management with a behavioral approach.

H1: Heterogeneity of investors dose effective in measuring the stock price bubble in portfolio management with a behavioral approach.

Figure (7): Test results of the third hypothesis

(%5) Significance level	Statistics of z	Coefficient value	Variable name	
0.002	2.855	0.158	C	Constant
0.002	-٤,٣٧٢	0.122	IH	Investor heterogeneity
0.426	1.050	0.004	SIZE	size of the company
0.002	-2.142	-0.020	LEV	Financial Leverage
0.724	0.391	3.76	G	company's growth
0.054	-1.991	0.048	ROA	Return on assets
McFadden Rsquared=0.37	LR statistic=17.73		Prob(LR statistic)-0/00	

As the results show, considering the significant level of 5% of investor heterogeneity, there is a positive and significant effect on the stock price bubble. Also, R2 McFadden, LR or Chi-square and ProbLR statistics indicate the significance and appropriateness of all regression coefficients. Also, McFadden R2, LR or Chi-square and ProbLR statistics indicate the significance and appropriateness of all regression coefficients. Also, R2 McFadden (0.37), LR or chi-square (17.73) and ProbLR indicate that all regression coefficients are significant (0.000). LR statistic is significant at the level of less than 5%.This indicates the overall significance of the regression model fitted to the 95% confidence level. Considering the McFadden coefficient of determination of the fitted model, which is a dependent variable of the stock price bubble, it can be claimed that about 37% of the changes in the stock price bubble are explained by the model variables. According to Figure (7), the level of significance between the two variables is equal to

0.002, which is smaller than the level of significance considered in the present study (5%); therefore, at the 95% confidence level, the null hypothesis that investor heterogeneity does not affect the stock price bubble is rejected and the original hypothesis is confirmed.

According to the results of the table, the hypothesis test model is significant and there is also a direct and significant relationship between independent and dependent variables. As a result, the first hypothesis is confirmed. Heterogeneity of investors has a negative and significant coefficient less than ۰,۰۵, so it can be said that heterogeneity of investors in measuring the price bubble of stocks in portfolio management with a behavioral approach. With the explanation that heterogeneity of investors reduces the price bubble Stocks are in the portfolio.

Some researchers believe that emotions, beliefs, and mental states influence decision-making and judgment, and thus change the behavior of investors. The psychological state of an investor can influence his decisions about choosing priorities, risk assessment, reasoning views, and finally, it can influence investment decisions. Therefore, economic decisions will be different based on the different mental state of the investors the dominant pattern in financial theory is based on the maximum expected profitability and risk-taking. While empirical studies of the real world have made many criticisms in recent years of modern financial theory and human rational assumptions. In a more practical scenario, studies by psychologists show that human beings behave differently from what modern financial theories have suggested about rational human beings. Other financial studies, including the scientific study of securities price behavior, have shown that there are inconsistencies in efficient market realities and assumptions. The behavior of investors in the stock market influences the decision-making, allocation of monetary resources, pricing and evaluation of the company's return. Ambiguous conditions and cognitive errors rooted in human psychology, Helps investors make mistakes in shaping their expectations and as a result leads to certain behaviors when investing in financial markets (Judge et al., 2020).

Given the significance level of 0.05%, the H-Hypothesis Zero is not rejected, meaning that our model is a good model and there is no difference between actual values and estimates.The fourth hypothesis states: Market expectations are effective in measuring the stock price bubble in portfolio management with a behavioral approach.Given the significance level of 0.05%, the H-Hypothesis Zero is not rejected, meaning that our model is a good model and there is no difference between actual values and estimates.

The fourth hypothesis states: Market expectations are effective in measuring the stock price bubble in portfolio management with a behavioral approach.

H0: Market expectations dose not affect the measurement of stock price bubbles in portfolio management with a behavioral approach

H1: Market expectations dose affect the measurement of stock price bubbles in portfolio management with a behavioral approach

Figure (8): The result of Hassmer and Andrews-model test

H-L Statistic	7.71	Prob. Chi-Sq(8)	0.21
Andrews Statistic	9.64	Prob. Chi-Sq(10)	0.19

(٪۵) Significance level	Statistics of z	Coefficient value	Variable name	
0.5726	0.564	1.4293	C	Constant
0.0000	1.966	0.6113	PE	Market expectations
0.2919	1.0539	0.1943	SIZE	size of the company
0.4510	-0.753	-0.7159	LEV	Financial Leverage
0.8265	-0.2191	-0.0174	G	company's growth
0.9647	-0.0442	-0.0276	ROA	Return on assets
۰,۳۱۷McFadden Rsquared=	۳,۳۲۸LR statistic=		۰,۰۰۰Prob(LR statistic)=	

As the results show, considering the significant level of 5% of market expectations, there is a positive and significant effect on the stock price bubble. Also, McFadden R2, LR or Chi-square and ProbLR statistics indicate the significance and appropriateness of all regression coefficients. Also, McFadden R2, LR or Chi-square and ProbLR statistics indicate the significance and appropriateness of all regression coefficients. Also, R2 McFadden (0.317), LR or chi-square statistic (3.328) and ProbLR indicate the significance (0.000) and appropriateness of all regression coefficients.LR statistic is significant at the level of less than 5%. This indicates the overall significance of the regression model fitted to the 95% confidence level. Given the McFadden coefficient of determination of the fitted model, which is a dependent variable of the stock price bubble, it can be claimed that about 31% of the changes in the stock price bubble are explained by the model variables. According to Figure (9), the level of significance between the two variables is equal to 0.000,This value is smaller than the level of significance considered in the present study (5%);Therefore, at the 95% confidence level, the null hypothesis that market expectations do not affect the stock price bubble is rejected and the original hypothesis is confirmed. From a theoretical point of view, behavioral economics is an aspect of economics which tries to understand and analyze markets and economic factors with a scientific method in the field of psychology and by using variables related to emotions and society.

According to the results of the table, the hypothesis test model is significant and there is also a direct and significant relationship between independent and dependent variables. As a result, the first hypothesis is confirmed. Market expectations have a positive and significant coefficient of less than ۰,۰۵, so it can be said that market expectations are effective in measuring the stock price bubble in portfolio management with a behavioral approach. And causes a stock price bubble.Behavioral economics therefore defines the price bubble based on the behavior and actions of traders in a market. According to Robert Schiller, the price bubble is caused by the irrational thinking and decision of people to buy a type of product at high prices and their belief in making a profit from that product at higher levels. In this case, the vast majority of actors are optimistic about the flight of prices and minimize the risk of falling. And therefore the possibility of bubble formation is ignored. Schiller believes that the reason for such irrational behavior in traders is following the corridor-leadership model. In which a natural or legal person realizes the benefit of an acceptable economic activist through speculation in the financial market and imitates his behavior for profit. A good example of this is during the US mortgage crisis. When banks and credit institutions realized the high profitability of lending, they imitated each other and competed more and more with each other and with little regard for credit risk, they proceeded to provide facilities to applicants. This imitation and competition in the first stage led to an increase in demand and subsequently to a significant increase in prices.

One of the tests used to properly fit binary selection models is the test Hasmer - Lemshu. In this test, the overall significance of regression coefficients is examined by comparing the predicted and actual values of the dependent variable in different groups. If the difference between the actual and predicted values of the dependent variable is large, it indicates a poor fit of the model. Given that the significant value of the Hasmer statistic is greater than 0.05, this value indicates the adequacy of the data for the fit of the model. .Given the significance level of 0.05%, H-hypothesis zero is not rejected. This means that our model is a good model and there is no difference between real values and estimates.

Figure (10): The result of Hassmer and Andrews-model test

H-L Statistic 8.381	Prob. Chi-Sq(8) 0.097
Andrews Statistic13.564	Prob. Chi-Sq(10) 0.093

Discussion and conclusion

Experimental evidence has repeatedly shown that logical bubble models are not consistently able to explain the price level of an observable asset. Thus, recent theoretical models of bubbles, common behavioral bubble models, try assuming a current value model in which all investors are perfectly reasonable, they can better prepare the data. By combining psychological insights, they try to provide better explanations for bubble and other return

phenomena. Bubbles associated with behavioral models are often referred to as irrational bubbles. Therefore, behavioral bubble models are sometimes called irrational bubble models. The bubble model is based on the difference with this fact that different investors have different beliefs about the core value of an asset. For this reason, these models are also known as heterogeneous belief models. Behavioral bubble models are characterized by this fact that rational and complex traders interact with irrational traders. When these irrational market participants' trade, they face psychological prejudices. Business feedback models, biased self-attribution, and a combination of conservative biases are examples of models. They rely on psychological bias to explain parts of the bubble (Lance, 2019).Disagreement-based models, sometimes known as heterogeneous belief models or different opinion models. In these models, investors have heterogeneous beliefs about asset valuation. This means that investors have unusual previous beliefs or psychological biases. As a result, anomalous property market phenomena such as asset price bubbles may occur (Brunmeier, 2008).Accordingly, the main purpose of this study was to provide a behavioral model for measuring stock price bubbles. According to the results, the four dimensions of irrational behavior, investor heterogeneity, market expectations and speculative behavior had a positive effect on the price bubble. According to the identified behavioral factors, the general model will be as follows.

$$BU_t = 0.158 + 1.34DP_{it} + 0.611PE_{it} + 1.26BI_{it} + 0.122DT_{it}$$

Therefore, considering that four behavioral items were included and examined in the presented model so, in the general interpretation of the model, it can be stated that the behavior of speculation with a coefficient of 1.34 has the highest impact on the formation of the price bubble. And behavioral irrationality with a coefficient of 1.26 is in the second priority. According to the findings and the value of the model coefficient, the heterogeneity of investors among the identified behavioral factors showed the least impact with a coefficient of 0.122 in the formation of the price bubble. The results of the present study with the results of Balchillar et al., 2016; Sandra, 2020, Lance, 2019, Yao and Gang, 2018, Soheili et al., ۲۰۲۰ and Majomard et al., 2017. From a theoretical point of view, behavioral bubble models based on feedback transactions are based on the fact that an asset experiences an initial price increase in response to good news. This price increase is observed by a group of traders, called feedback traders who buy the asset according to past price movements and not based on current asset valuation. This raises prices. Further price increases attract additional feedback, their demand for assets increases prices even more. In some cases, this behavior leads to prices that it goes beyond the basics. In short, feedback traders reinforce past price movements rather than focusing on the basics. Feedback-based business models abandon complete rationality and allow unreasonable pricing. Potential investors may expect securities traders to buy securities at even higher prices later, expecting positive feedback. Contribute to price movements (Lance, 2019). The third subset of behavioral bubble models that distinguish us (Lance, 2019).. Jang and Kunk (2019)Estimate the probability of maximum negative returns (falls) of certain stocks as a potential pre-pricing criterion and shares with a high probability of falling gross income returned. They also concluded that institutional investors, who anticipate the possibility of stock falling by weight, they have skills in scheduling bubbles and falling normal stocks. the fourth category describes bubble behavioral models using exploratory bias and conservatism. Exploratory bias of representation and conservatism are cognitive biases that are widely recorded in the psychological literature. And is used when judging the probability of an event occurring under uncertainty. The theory is that investors trust the agency to make decisions. However, it can lead to misjudgment, which means that investors overreact to strong news or attract too much attention. On the other hand, this means that investors do not react to normal and inattentive signals .Behavioral bubble models try build their hypotheses based on documented evidence in psychology In other words, based on behavioral financial knowledge, factors such as accounting information and macroeconomic variables are no longer expected to affect stock returns. But a variety of behavioral variables can also affect stock prices and returns. Therefore, bubbles are observable economic phenomena which are typically considered economic cycles which is characterized by rapid expansion followed by contraction. Bubbles are usually accompanied by a sharp rise in prices, followed by a

fall. According to rational expectation theory, if market participants buy a wide range of assets simply waiting to be able to sell at a higher price, Market prices will be much higher than core values and it creates speculative bubbles. Bubbles are described as a dramatic rise in prices, with the initial increase that creates the expectation of further increase and attracts new buyers in a way commonly referred to as irrational liveliness.Price bubbles may exist for a while that prices are driven by arbitrary and self-fulfilling prophecy elements. Excessive price fluctuations and bubbles may have significant negative effects among market participants and impose problems such as inflationary pressure and negative growth pressure (Chi View et al., 2020).If price bubbles are detected, price dynamics do not indicate efficient market performance. Distorted price signals have significant destructive consequences and risk management strategies. Which greatly exacerbates the instability and uncertainty of investors. In addition, excessive price shifts due to speculation may provoke excessive hoarding behaviors and lead to misallocation of resources. Which significantly reduces the efficiency of market allocation (Irandoost, 2017). Finally, once the bubbles burst, a lack of price adjustment can severely upset the trade balance and expose market participants to serious welfare losses (Liu et al., 2017). Stock markets are complex systems whose main social function is to aggregate ideas and guide them to the future of investments. Investing in stock markets is characterized by uncertain decisions. Therefore, considering the possibility of bubble behavior in influencing the real allocation in the economy, tracking the evolution of price bubbles is of great importance and impact for policymakers. Utilizing important policy implications in communicating appropriate global institutional arrangements to prevent market failure has become a high priority (Chi View et al., 2020).Therefore, behavioral variables such as investor herd behavior, investors' emotional inclinations, overconfidence between managers and investors, and other investor behavioral biases are expected to affect the performance and returns they produce. Therefore, corporate behavioral variables (managers' overconfidence) and extra-corporate behavioral variables, such as two variables of investors' emotional inclination and investors' herd behavior, are expected to affect stock returns (Jokara et al., 2018). there are four types of bubbles in financial markets:1) Rational bubbles: It is a situation in which stock prices deviate from the fundamental values without calling the behavior of investors irrational. In rational bubbles, investors are fully aware of the higher value of the stock market, but again Remain in the market; because they believe that the bubble is likely to grow again. 2) Intrinsic bubbles: Intrinsic bubble is a bubble that is caused by fundamental factors, so that with the growth and improvement of fundamental factors and the publication of news related to that bubble also grows. One of the main characteristics of the intrinsic bubble is that its lifespan is much longer than the rational bubble. Another characteristic of the inherent bubble is a sharp reaction to news related to fundamental factors.3) Behavioral bubbles: Behavioral bubbles are bubbles that are caused by psychological factors;A state of intoxication and joy that surrounds people And shapes public opinion. Group thinking also contributes to this factor.4) Information bubbles: If the price does not reflect all the information (lack of information aggregation) then prices move away from the underlying value and an information bubble is created (Sandra, 2020). In an efficient market, stock prices on the stock exchange are determined by the intersection of supply and demand. And there is no specific rule for determining stock price behavior. However there are several important factors that drive stock prices to move up or down. If the stock market is functioning properly, Price deviations will occur and stock fluctuations will be out of the ordinary As a result, sudden falls and unbridled ascents occur. In fact, the presence of a bubble in the share price affects the price of other assets.

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