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Have hashtags and cashtags caused a slight reaction to stock returns in financial statements? Has the information content of the financial statements been lost? Case study: S & P500 companies

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Abstract

The present study examines the effect of conventional hashtags & cashtags at social networks on the stock returns of S&P500 companies. In the first step, by creating an optimization portfolio that consists of S&P 500 companies (Fundamental analysis) abnormal stock returns have been tested. (similar to the 1989 study, Jane A. OU and Stephen H. Penman). Then, in the second step of the research, the effect of reduction free float of companies on abnormal stock returns has been tested. Next, the reduction of the explanatory power of EPS and BV information content as representatives of financial statements (income statement and balance sheet) on stock returns has been tested, and finally, in the fourth step, the effect of conventional hashtags & cashtags in social networks at the site Stocktwits.com has been tested. The findings of this research showed that: although Jane A. OU and Stephen H. Penman 1989 rejected the hypothesis of a semi-strong efficient market in the companies surveyed, at this study and of course in the S & P500 companies, the hypothesis of a semi-strong efficient market was confirmed. The effect of declining free float has led to abnormal returns on the S & P500 companies. The explanatory power of EPS and BV information content on stock returns have diminished over time, which has been due to the hashtags & cashtags content of financial statements on social networks. In other words, news about the status of companies is rapidly affecting stock returns through virtual networks.

Keywords: Hashtag, cashtag, abnormal stock returns, free float, information content

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1. Introduction

Stock prices fluctuate through the publication of financial statements, the publication of interim financial statements or the transmission of good and bad news by managers in the news, newspapers and magazines or the political situation of industry, country, world, etc.

Information content in accounting is one of the topics that is currently doing a lot of research for you, and each of your research acknowledges in some way, and there are financial forms available for information. The background of the earnings information model is revealed in the research of Ball and Brown [1], which tests the relationship between accounting earnings and stock returns. In fact, information about a variable accounting is listed to benefit from the operation of that variable in the decision-making process for using financial information. In the regression model of Ball and Brown [1], the relationship and explainability of stock return by accounting profit have been measured. In the regression model of Feltham and Olson [7], the relationship and the explainability make the stock trading with the book value stock of equity whose brand is the balance sheet and Earning Per Share that exists if the profit and loss form is used.

Examining the information of accounting variables and specific Earning per share (EPS) and the book value of equity (BV), which are referred to as the representatives of the profit and loss statement and balance sheet of the company, are among the topics that are paid. If it's helpful in answering this fundamental question, could companies influence profit or loss (earnings per share), or the balance sheet (free stock value of your rights), or both?

The low explanatory coefficient, which is sometimes misunderstood in the stock market and mineral market research of variables, has been broken and has raised doubts about other variables that are available in the market. These variables over a wide range of economic levels such as inflation rate, long-term bank interest rate, increasing liquidity growth and exchange rate (for example in [5], appropriate economic level: type of ownership and shareholders, profitability, investment, etc. are wide, which has been studied in several cases.

The low rate of explanation of stock returns by accounting profits and the criticisms levelled at it provided a basis for the development of research on other accounting variables. Instead of focusing only on the benefits of accounting and its information materials, the path of accounting research has been built on accruals and how they are calculated and optional and non-optional as a teacher.

To explain the low coefficient of marketing distributed by accounting variables, intellectuals argue that because the financial statements are published annually or because there is material in the idea and shareholders are not waiting for the financial statements to be published and need to gain from other channels. Similarly, the number of financial statements published in a year increases (for example, quarterly financial statements), as well as material information, improves.

A hashtag is a prefix symbol and one of the big data tags that, if you want to make it simple, is a tag that is used to categorize and share posts and comments on a specific topic globally and beyond the circle and friends list. A hashtag is exactly the kind of tag that is created on the social networks Facebook, Twitter, Google Plus, Instagram, etc. for various topics if at any time you have to have a set of information on specific topics. A hashtag can be a regular word, an abbreviation, a term, a combination of numbers and letters, or a phrase.

The expansion of social networks and the use of hashtags in these networks, especially in accounting research and the use of the hashtag along with a stock symbol and the dissemination of information about a specific stock symbol, increase (decrease) floating stocks and consequently decrease (Increase) the return of that share in the stock market, which was sometimes unusual, and it is also referred to as the bubble. A bubble that, if you are right, will invite you in the future in the eyes of shareholders, will leave the ads.

The amount of stock control that exists in the capital of investors to trade in the stock market and can be traded without any restrictions. Collecting your share of stock by a certain person through advertising on social networks in the form of a special symbol hashtag in the company, will increase the return on your stock, and if this trend continues, you should continue to use this type of stock to buy, it is a symbol that sometimes there is no other type of foundation or special substance and it causes you to increase your shares by using a specific or a specific group and at the first opportunity Increase such stocks at very high prices to new shareholders. Your research has also been done to examine your shareholding by marketing and creating bubbles, which has been confirmed, by reducing the amount of energy transfer, in other words, this increase will cause an abnormal increase (bubble) later.

If the cumulative correction of abnormal stock returns, in the long run, tends to zero, it can observe such behavior that is interpreted as a bubble in stock returns. In other words, by examining the stock returns of a particular company and observing an abnormal return, if the power changes strongly, it is an experimental abnormality towards zero desire to show such behavior that if it already exists and in the pre-bubble period Floating absorption is meaningful if you find and after the formation of the bubble increases to a certain extent a decrease in floating stock if you can interpret the performance of eight on social networks. The bigger the bubble, the more it exchanges, and the more it hurts the shareholders, who enter the price peak and get bigger.

If the red flags trend is shown to be due to the unfavorable situation of the company, in this case, it may cause an experimental abnormal opening in the long run to zero, which is created if this is released, because, in the absence of buoyancy, you can use the hashtag function on the network.

2. Theoretical foundations and research background

There are two hypotheses about earnings forecasting: one is that earnings changes are unpredictable and follow a random walk process; in contrast, based on the theory of reasonable expectations, investors use a broader body of information to forecast earnings. Therefore, the profit is predictable.

Penman and Ohlson [13] examined the role of the equity return rate (BROR) in predicting earnings changes, arguing that increasing the predictive data set should make it possible to disprove the random patrol hypothesis of earnings forecasts. They argued that the wide variation in P/E ratios were due to expectations of corporate profits in the coming years. The market predicts profits based on a wide range of data, of which financial statements can also be a part. Using the logit model, they tested the empirical relationship between earnings per share changes (dependent variable) and book rate of return (independent variable). The results showed the ability to explain the book efficiency rate and relatively better performance of the fitted model compared to the random patrol model. Freeman et al. Were the first researchers to formally reject the random patrol hypothesis when the dependent variable is the accounting rate of return.

Stock valuation techniques are usually divided into two categories: fundamental analysis and technical analysis.

3. Fundamental analysis:

It is the evaluation of information in financial statements, industry reports and economic agents, in order to determine the intrinsic value of the company.

Analysts are trying to predict future stock price changes by examining factors related to stock market values. These factors fall into one of three categories:

1- Company conditions: such as incomes, financial strength, products, management and labour relations, financial leverage.

2- Industry conditions: such as degree of stability and existing competitive conditions, the competitive advantage of the industry.

3- Economic and market conditions: such as economic cycles and fiscal and monetary policies.

Most financial institutions use the fundamental method in investing. Common stock valuation techniques in this method are:

1- Cash flow discount models: In this method, by calculating the current value of cash profit, operating and free cash flows of companies, the value of companies' shares is finally determined. Examples include Free Cash Flow (FCF), Operating Cash Flow (OCF), Present Value of Cash Profits, Gordon Models, EVE, etc.

2- Relative evaluation methods: In this method, ratios such as P/E, P/CF, P/BV, P/S are used. In the mentioned ratios, P is the price, E is the earnings per share, CF is the cash flow, BV is the book value of the assets and S is the sales of the company.

3- Technical analysis: The technical analyst focuses on predicting (when) values change. Technical analysts believe that changes in the relationship between supply and demand in investments, which occur as a result of stable trends for any particular stock or the market as a whole, can be identified and predicted. More importantly, technical analysts believe that investors with similar conditions encounter what happened in the past and behave in a predictable way. In other words, history repeats itself.

3.1. New securities portfolio theory

Market efficiency: This means that in a developed securities market, the price of assets (and in particular securities (such as stocks and bonds)) is properly reflected through the balance between risk and potential return on the same securities. In an efficient market, new information is quickly transferred to the market, and as a result, stock prices are determined according to the new information.

Portfolio managers are responsible for creating the best possible set of investments based on the wishes and circumstances of each investor. Investors who have adopted the new portfolio theory believe that they are not market rivals, so they hold a variety of securities to bring their returns equal to the average market return.

3.2. Investing experts generally suggest a three-step approach to the portfolio management process

1- Learning the basic principles of finance: Without learning the basic principles of finance, you cannot form an effective portfolio. Two key concepts in the financial literature, simply put, are: The value of one rial today is more than the value of one rial tomorrow A safe rial is more valuable than an uncertain rial.

2- Creating a portfolio: You should get acquainted with the elements and concepts (capital market theory) and learn the mathematical relationships used in portfolio theory. You need to be familiar with the concepts of risk and return and diversification.

3- Portfolio management and protection: A plan should be designed to update the portfolio and always modify the objectives of the portfolio. Also, portfolio managers should be familiar with the principles of pricing and derivatives pricing. They should also learn how to evaluate portfolio performance.

3.3. Capital market efficiency concepts

1- Operational efficiency: refers to the acceleration and speed of operations in the market that the higher the speed, the easier the entry and exit of investors. Of course, operational efficiency requires that transaction costs be kept to a minimum and asset liquidity be high.

2- Allocating efficiency: The market is efficient when the community capital (resources) is allocated to high-yield projects.

3- Information efficiency (pricing): Discussions such as whether securities are priced correctly in the market? Are the intrinsic value and the market value of the securities equal? Obviously, if intrinsic value and market value are equal, the market is information-efficient. In such a case, the job market is when the market reacts immediately when a news item is published.

In general, if the market is efficient, investors will be more willing because they are confident that they will not be fooled. Prerequisites for creating an efficient market:

1- Competitive market should prevail: it means that there are a large number of applicants and suppliers. To balance prices. If there is no competitive environment, the market is affected by influential people

2- There should be financial experts in the market: there should be people who constantly determine the intrinsic value of stocks.

3- Everyone should have access to information and it is better that the information is free.

4- Lack of tax obstacles, duties and fees

5- Rational behavior of individuals: less risk should be preferred to more risk. Higher returns should be preferred to lower returns.

3.4. Efficient market news behavior

In an efficient market, prices are extremely sensitive to news. Prices in this market are unpredictable and have a random steps.

In an efficient market, the price reflects all the information. And it is assumed that prices also show intrinsic value. However, in order to evaluate the efficiency of the market and keep the market in this continuous state, it is necessary for experts to determine intrinsic values.

Ou and Penman [12] analyzed financial statements and used large financial ratios to calculate a summary measure (Pr) that predicted future earnings changes. They fitted the model to about 1,780 companies from 1973 to 1981. Then, by forming a portfolio of stocks of companies that had voted to hold these stocks for the long term as a result of financial ratio analysis (for two years 1981 to 1983), they reached an average return of about 12.5% higher than the market return, even after adjusting the size effect. Again, this return was about 7% higher than the market return. Eventually, they concluded that not all of the information in the financial statements was used in the market and that the market price often deviated from core values and only slowly and intermittently shifted to intrinsic value. These findings were inconsistent with the efficient market hypothesis.

There is a lot of evidence presented by academics and researchers in the capital markets of different countries of the world, which shows that people's conversations and relationships on social networks are influential in changing stock prices and people's decisions. This is especially true when publishing negative economic news (when traditional models have not been properly analyzed solely

on the basis of financial variables). Information and analysis shared on social networks play a vital role in strengthening the efficiency of the capital market. In fact, social media is a huge database of the behavior of people in the community on a particular issue such as the capital market. On the other hand, regulators, publishers and companies active in the capital market also use social networks to disseminate their information. Therefore, two important issues in this category can be examined: first, the analysis of the relationship and the positive and negative effects of social networks on the capital market, and second, providing regulatory and regulatory solutions to improve efficiency and reduce the risk of using these communication channels.

In the behavioral finance literature, the study of the effects of social networks on the stock market is a relatively new topic. However, some researchers have examined the relationship between the stock market and social media. For example, Wysocki in [20] analyzed the messages posted on Yahoo Messenger related to the stock market, showing the relationship between the number of messages and changes in stock returns the next day, while Tumarkin and Whitelaw in [18] showed that the number of messages posted on the RagingBull.com does not predict the stock return the next day. Similarly, although Sprenger et al. [17] did not report a relationship between the number of Twitter messages and stock returns, they did examine the relationship between the number of messages and the number of trades in their study.

Explaining the relationship between messages posted on social media and the number of stock trades, Bordino et al. [3] also show that movements in the Yahoo search engine in relation to a stock can lead to the same stock trading activities. Be. Finally, Oliveira et al. [11] stated that the number of news releases on StockTwits.com can improve the forecast of exchanges, and thus show the effect of social networks on the stock market. In general, these studies have sought to prove the hypothesis of the existence or non-existence of a significant relationship between the indicators of participation in social networks and the stock market.

One example of a specialized social network in the field of capital markets is the US stock market social network called Stock Tweets, which was launched in 2008. The network has a separate infrastructure from Twitter and publishes only stock market-related posts. In this network environment, people publish their opinions, analyzes and news based on the company logo. This social network is compatible with the platform of other social networks, and users of other social networks also have access to its content. Much of the world's academic research shows that virtual networks have a significant impact on index forecasting and stock price changes, as they are more effective than conventional networks.

In the study of Pineiro-Chousa et al. [14] while examining the activities of investors in social networks, its impact on the Chicago Board Options Exchange Market through the Volatility Index and using logit models and comparative qualitative analysis of the fsQCA fuzzy package was measured and analyzed. Has done. The results of Logit model estimation show that the emotions expressed in social networks have affected the stock market, while the results of the fuzzy package model prove the importance of information and description of investment characteristics to explain the effects of social networks on the stock market. in this research, the stock tweet microblog platform has been used as the main source of social networks in comparison with other networks such as Twitter or Facebook. The reason for using stock tweets is that the users of this platform include a financial community, and on the other hand, all shared messages are accessible through the network's website. In this study, the dependent variable of the model, risk deviation, is selected, which shows the daily deviations of the Weeks index. The independent variables of the model are daily emotions, daily experience, duration of daily review and follow-up, and the number of followers. The results show that none of the independent variables except time-dependent variables affects the behavior of technical and experienced investors, while the feeling derived from social networks has the greatest

effect on the behavior of non-technical and novice investors among other variables. The results of the analysis of the fsQCA model also show that different combinations of different variables affect the stock market, while these effects vary depending on the type of investor. In the case of non-technical investors, experience and personal feeling are the two main explanatory variables, and observations have shown that these types of investors can play an important role in preventing increased market risk, even if pessimistic market conditions are shown. Finally, the results of the models prove the impact of social networks on the stock market, which also has the effect of market risk deviations. This study shows that the feeling caused by shared messages is an important factor in explaining the relationship between social networks and the stock market.

In another study, Reed [15] measured consumer sentiment through information obtained from Twitter, showing the effect of these sentiments on stock prices. In this study, the author used the S&P 500 and Dow Jones stock market indices. The author collects information about tweets in three categories: unemployment, economy and taxes, then analyzes the content of each tweet using lexical technique and creates a list of lexical words for each category, and then a list of words in each search tweet. Using this analysis, the researcher can determine which economic indicators people in the community have reacted to the most. Next, by identifying the set of tweets for each category, the effect of mass movement and speculative population behavior on the stock market is determined. Next, the author uses the Granger causality analysis model to answer the question of whether changes in the severity of public behavior are correlated with changes in the stock market. Research has shown that Twitter can affect the stock market in two ways. First, the direct effect that investors see as a prelude to a decline in capital market returns when they see an increase in societal trends related to the economy, unemployment, and political change. Therefore, the investor who sells his stake in the result is a further drop in stock market prices, which is likely to encourage other investors to sell their stocks. The second and indirect effect of social media on the stock market is when the media uses Twitter to cover the daily news of the world. In this case, the media covers more economic debates and reports to the public, the rest of the investors see this method of information as a reduction in stock market returns. As a result, people sell their stocks to avoid losses, which in turn reduces stock prices further.

In another study, Bernardo et al. [2] explained and predicted stock prices using Twitter data. Bayesian classifier and two causality regressions (stock market and Twitter emotions as two dependent variables of the model) are used in the model of this research. The author explains the relationship between daily information taken from Twitter and daily stock prices and concludes that, first, the relationship between Twitter and the stock market in causal models depends on the time of Twitter data collection. Second, Granger causality analysis has shown that Twitter data is effective in predicting the stock prices of some companies, and for others, this information is not able to predict. Also, for companies whose stock prices are predictable, for some companies, there is a slight delay between the message release time and the stock price change (eg Microsoft) and for others a relatively long time (eg LinkedIn). Third, the results show that in companies with a large number of tweets, there is a weaker relationship between the two variables in the model, and fourthly, the return of the relationship between Twitter and the stock price, in the case of British Petroleum, has shown that changes Twitter sentiment is predictable using the company's stock price.

In an empirical study by Fiala et al., [6], the effect of users' economic sentiment on the stock returns of two large companies, Apple and Microsoft, was investigated. The authors used text mining methods published about the shares of the two companies to analyze the positive and negative messages of Twitter. As a result, they have used the number of positive and negative messages identified to find the causal relationship between the level of emotion and the stock price of these companies. In this study, Granger causality tests were used to find the causality relationship. The

test results show a two-way relationship between risk and the number of news items published via Twitter messages.

To examine the relationship between social networks and the stock market in developing countries, Guo et al. [9] used the shared messages of a specialized social network in China(Xueqiu) to examine the relationship between investors' feelings and their investment decisions. The author has used the symmetric optimal path method to analyze the dynamic relationship between the stock market and investors' feelings. The results show that emotion-based information in this social network does not always determine the stock price in the market, and only when certain stocks are of interest to investors, this information can be used to predict stock prices.

Ruiz et al. [16] by examining the relationship between volume and stock prices of a number of companies with their shared messages on social networks, have found a strong relationship between trading volume and the number of messages.

To examine stock price changes using floating stock manipulation, Robin Greenwood [8] studied a group of Japanese companies that changed their floating stock between 0.1 and 99.9% over a period of one to three months. The results showed that: a) when floating stocks are limited, prices rise and when floating stocks rise, prices fall, and b) returns are partially dependent on declining floating stocks.

In a study entitled " What Determines Chinese Stock Returns? " conducted in the Chinese stock market, Wang and Xu [19] sought to find factors that affect stock returns. By conducting research, they were able to provide a three-factor model affecting the stock rate of return, which includes market factor, size and floating stock. This model can justify 90% change in the return of a portfolio, which shows a 10% improvement compared to using a simple market model.

In a study entitled "Free Float and Market Liquidity" conducted on the Hong Kong Stock Exchange, Kaluk Chan et al. [4] examined the relationship between floating stocks and market liquidity after government intervention in the Hong Kong stock market and concluded that the Government intervention in the Hong Kong stock market reduces floating stocks and, as a result, reduces the volume of small stock transactions and increases stagnant liquidity in the market.

4. theories

Hypothesis 1: The S & P500 market is semi-robust. (You can not average higher returns than market returns).

Hypothesis 2: Decreasing the floating stock of companies leads to abnormal stock returns.

Hypothesis 3: The information content of EPS and BV as indicators of financial statements (profit and loss statement and balance sheet) has decreased over time.

Hypothesis 4: Corporate stock returns are affected by the number of hashtag publications and republishing's used on social networks.

Hypothesis 5: Hashtags used on social networks can explain abnormal changes in stock returns.

Hypothesis 6: The number of hashtags published and republished leads to a bubble in stock prices.

4.1. Research method and statistical population

Research in terms of purpose: applied, in terms of nature: original (first hand), in terms of data: quantitative, in terms of methodology: correlational research (linear multivariate regression and logit), in terms of time: retrospective and in terms of duration: is time.

The data collection method includes information contained in the financial statements of sample companies for 8 years (2009-2016), regression model fitting period (estimation) for each company and 1 year forecast period (2017) and preparation of a portfolio of shares that they had a cut-off point (Pr) greater than 0.6 in the logistic regression model and its maintenance for 2 years ended on 31/03/2020. The volume of trades, the number of shares bought and the number of shares sold on the New York Stock Exchange were extracted from information sites (www.investing.com - www.nasdaq.com - www.teletrader.com) as well as the number of tweets and likes retrieved from www.stocktwits.com.

5. Research model and its variables

The dependent variable:

Return (R): is a set of benefits that are awarded to a share over a period of time. Returns can be defined as the rewards that an investor earns for investing over a period of time.

$$R_t = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_{17} X_{17} + \varepsilon$$

Logit is a conditional probability model that determines which group each observation belongs to based on the value of the observed independent variables.

$$P_{it+1} = [1 + \exp(-\theta X_{it})]^{-1}$$

That :

P_{it+1}: Estimating the probability of increasing the return of company i in year $t+1$

θ: Indicates the weight or estimated coefficient of independent variables

X_{it} :Indicates accounting ratios (independent variables) for company i in year t

exp: represents the exponential function

If the probability value is higher than the cut-off point of 0.6, it means that the company's stock return will grow, and if the probability value is less than the cut-off point of 0.4, it means that the company's stock return will not grow.

The research was conducted in the following steps:

step one:

According to his and Penman 1989 and Daharan and Buff Kane 2008 research, the effect of independent variables (17 financial ratios and 7 red flag criteria) on the stock returns of each of the sample companies was tested. The research period was as follows in 2 stages:

1- Model fitting period (estimation): The model of each company is fitted through the financial statements of 2009 to 2016, which are published three months after the end of each fiscal year.

2- Forecast period: Based on the fitted model of each company (in the years 2009 to 2016), when the financial statements of 2017 of each company are published (3 months after the end of the fiscal year) if the probability value of the logistics model is more than the point The cut was 0.6 The share was retained and the share was sold if the probability value of the logistic model was less than the cut point 0.4.

The number of shares held in a portfolio for a period of 24 months after the publication of the financial statements for 2017 (ie from three months after the end of the fiscal year 2017 to three months after the fiscal year 2019) is prepared and the return of this portfolio with Market returns will be compared. As a result, if the return on the prepared portfolio is higher than the market return, it is concluded that the items in the financial statements are useful and this usefulness can predict the future. At the same time, proving such a thing leads to the conclusion that the market is not efficient at a semi-strong level.

The table below shows the stocks of companies whose summary size (Pr) based on 17 ratios (OP) or 7 ratios (DB) was less than 0.4. (If the value of Pr is less than 0.4, it means selling stocks (no maintenance) and if the value of Pr is more than 0.6, it means buying stocks (holding).

NO.	Company symbol	Company name	Summary size (pr)		conflict
			DB	OP	
1	BKR	Baker Hughes A	0.34	0	
2	CMCSA	Comcast	0.215	0.496	
3	VIAC	ViacomCBS	0.153	0.099	
4	AMT	American Tower	0.024	0.654	*
5	BA	Boeing	0.354	0	
6	FITB	Fifth Third	0.29	0.633	*
7	IP	International Paper	0.282	0.573	
8	IPG	IPG	0.376	0.417	
9	LNC	Lincoln National	0.35	0.59	
10	BLK	BlackRock	0.269	0	
11	EXR	Extra Space Storage	0.244	0	
12	R	Ryder System	0.983	0.132	*
13	RIG	Transocean	0	0.33	
14	RL	Ralph Lauren A	0	0.254	
15	CMA	Comerica	0	0.231	
16	ETN	Eaton	0	0.383	
17	LOW	Lowe's	0	0.285	
18	SPG	Simon Property	0.44	0.348	
19	VNO	Vornado	0	0.367	
20	RCL	Oracle	0	0.312	
21	DISCA	Discovery A	0	0.352	
22	DLR	Digital	0	0.335	

The growth rate of the index in the period 01/04/2018 to 31/03/2020 (maintenance or sales period) was +3.89%.

* In cases where there was a conflict between 17 financial ratios OP and 7 ratios DB. The return of AMT symbol was +49.36% and the return of FITB symbol was −57.30% and the return of R symbol was −83.9%.

The return on the portfolio consisting of stocks traded by OP or DB votes is −27.57%.

The table below shows the stocks of companies whose summary size (Pr) was greater than 0.6 based on 17 OP ratios or 7 DB ratios. (If the value of Pr is more than 0.6, it means buying stocks (holding) and if the value of Pr is less than 0.4, it means selling stocks (not holding)

The growth rate of the index in the period 01/04/2018 to 31/03/2020 (maintenance or sales period) was +3.89%.

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NO.	Company symbol	Company name	Summary size (pr)		conflict
			DB	OP	
1	ADSK	Autodesk	0.727	0.874	
2	AMGN	Amgen	0.726	0.5	
3	AMZN	Amazon	0.601	0	
4	C	Citigroup	0.669	0.63	
5	COF	Capital One Financial	0.76	0.521	
6	GIS	General Mills	0.601	0.533	
7	HIG	Hartford	0.993	0	
8	ISRG	Intuitive Surgical	0.716	0	
9	MCHP	Microchip	0.601	0	
10	MSI	Motorola	0.66	0.637	
11	NEE	NextEra Energy	0.601	0	
12	R	Ryder System	0.983	0.132	*
13	ROP	Roper Technologies	0.677	0	
14	GL	Torchmark	0.604	0.569	
15	WAT	Waters	0.7	0	
16	WHR	Whirlpool	0.689	0.555	
17	XRX	Xerox	0.619	0.557	
18	ANSS	ANSYS	0.663	0	
19	KSU	Kansas City Southern	0.771	0	
20	PKG	Packaging America	0.633	0.56	
21	WYND	Wyndham	0.906	0	
22	ADBE	Adobe	0	0.609	
23	AEP	American Electric Power	0	0.637	
24	AMT	American Tower	0.024	0.654	*
25	BAC	Bank of America	0	0.616	
26	BBBY	Bed Bath&Beyond	0	1	
27	CHK	Chesapeake Energy	0	0.972	
28	EA	Electronic Arts	0	0.636	
29	EFX	Equifax	0	0.601	
30	FITB	Fifth Third	0.29	0.633	*
31	GE	General Electric	0	0.604	
32	HOG	Harley-Davidson	0.557	0.618	
33	JCI	Johnson Controls	0.432	0.73	
34	SNA	Snap-On	0	0.823	
35	T	AT&T	0	0.699	

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NO.	Company symbol	Company name	Summary size (pr)		conflict
			DB	OP	
36	ZION	Zions	0.493	0.664	
37	ABMD	ABIOMED	0.53	0.683	
38	ALGN	Align	0	0.955	
39	BWA	BorgWarner	0	0.987	
40	IT	Gartner	0	0.922	
41	NFLX	Netflix	0	0.609	
42	OKE	ONEOK	0	0.627	
43	URI	United Rentals	0.484	0.895	
44	CE	Celanese	0	0.661	
45	DD	Dupont	0.57	0.863	

The return on the portfolio consisting of shares held by the OP or DB Voting is -7.04%.

Therefore, the first hypothesis of the research is confirmed. (You can not average higher returns than market returns)

Step two:

The return of the total stock index (market return) for a period of 24 months from 01/04/2018 to 31/03/2020 is calculated and the sample companies if they have a return of more than two standard deviations from the market return (abnormal return) or have a return. There are less than two standard deviations from market returns (abnormal returns) in the remaining sample and the rest are omitted. Companies that had a return of more than two standard deviations from the market return in the first group of companies surveyed (companies with much more growth than the market) and companies that had a return of less than two standard deviations from the market return In the second group, the surveyed companies (companies with much less growth than the market) are divided. Market return in the period under review was $+3.89\%$, the standard deviation of market return was 7.24%. Therefore, returns of more than 18.37% and less than -10.59% are classified as abnormal returns.

For both groups of companies, the following relationship is fitted to ensure that the increase in stock returns or the decrease in stock returns was due to a decrease in floating stocks.

$$CAR_t = \beta_0 + \beta_1 FF_t + \epsilon$$

CAR_t= accumulated stock returns in the period under review

FF_t= floating share rate

In this model, the average stock traded in the 20 days before the trading day is considered as the amount of floating stock (FF) of that day, which is divided by the total number of shares of the company.

If the correlation coefficient between CAR (stock accumulated return in the period under review) and FF (floating stock rate) was more than negative 20% or more than positive 20%. The hashtag of the company symbol on the site WWW.StockTwits.com has been examined and the effect of the large number of contents discussed on the site page (including tweets (Like) and Like (Reply) (Reply) (Reply)) in the following model will be examined.

$$Ret_t = \beta_0 + \beta_1 Ret_{t-1} + \beta_2 Twits_{t-1} + \beta_3 Like_{t-1} \beta_4 Reply_{t-1} + \epsilon$$

In this model, $Twits_{t-1}$, $Like_{t-1}$, $Reply_{t-1}$ are the average daily deviation values from the, which are calculated as follows.

$$\frac{1}{n}\sum_{i=1}^{n}(x_i - m(X))$$

Dependent Variable: RET_T
Method: Panel Least Squares
Date: 04/29/21 Time: 09:32
Sample: 1/01/2018 5/19/2019
Periods included: 504
Cross-sections included: 331
Total panel (unbalanced) observations: 166701

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000548	6.58E-05	8.336318	0.0000
RET_{t-1}	0.007228	0.002408	3.002392	0.0027
$TWITS_{t-1}$	-7.71E-06	1.76E-06	-4.378684	0.0000
$LIKE_{t-1}$	4.15E-06	1.14E-06	3.629229	0.0003
$REPLY_{t-1}$	9.47E-07	2.83E-07	3.344737	0.0008
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.200267	Mean dependent var		0.000556
Adjusted R-squared	0.198662	S.D. dependent var		0.029972
S.E. of regression	0.026830	Akaike info criterion		-4.396579
Sum squared resid	119.7590	Schwarz criterion		-4.376435
Log likelihood	366792.1	Hannan-Quinn criter.		-4.390603
F-statistic	124.7334	Durbin-Watson stat		2.000243
Prob(F-statistic)	0.000000			

Dependent Variable: RET_t
Method: Panel Least Squares
Date: 04/29/21 Time: 09:34
Sample: 1/01/2018 5/19/2019
Periods included: 504
Cross-sections included: 331
Total panel (unbalanced) observations: 166701

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000548	6.58E-05	8.328227	0.0000
RET_{t-1}	0.007663	0.002405	3.186402	0.0014
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.200141	Mean dependent var		0.000556
Adjusted R-squared	0.198550	S.D. dependent var		0.029972
S.E. of regression	0.026832	Akaike info criterion		-4.396458

Sum squared resid	119.7779	Schwarz criterion	-4.376494
Log likelihood	366778.9	Hannan-Quinn criter.	-4.390535
F-statistic	125.7670	Durbin-Watson stat	2.000326
Prob(F-statistic)	0.000000		

As can be seen in the Eviews output tables, the addition of Twits, Like and Reply to the model has resulted in an improved adjustment coefficient.

The table below shows the symbol of companies that the correlation coefficient between CAR and FF was more than negative 20% and also tweets (Like) or Like (reply) (Reply) were significant in the model.

The table below shows the symbol of companies that the correlation coefficient between CAR and FF was more than positive 20% and also tweets (Like) or Like (reply) (Reply) in the model is significant.

symbol	Company name	Correlation coefficient	accumulated returns	Twit / like / reply
CTSH	Cognizant A	-0.2383	-43.67	Twits & Like & Reply
XLNX	Xilinx	-0.2502	73.93	Twits & Like & Reply
RE	Everest	-0.2834	-19.61	Reply
ACN	Accenture	-0.2863	34.83	Twits & Like
INTC	Intel	-0.3577	19.89	Twits & Like & Reply
ORLY	O'Reilly Automotive	-0.3916	30.69	Twits
FISV	Fiserv	-0.4026	38.91	Like
CTL	CenturyLink	-0.4657	-34.58	Reply
SWN	Southwestern Energy	-0.4667	-54.18	Like
MDLZ	Mondelez	-0.4747	24.76	Twits & Like & Reply
LOW	Lowe's	-0.4795	35.32	Reply
HBI	Hanesbrands	-0.4938	-71.33	Reply
CCL	Carnival Corp	-0.5196	-60.6	Twits
ADBE	Adobe	-0.5266	59.11	Twits
WMB	Williams	-0.5536	-38.16	Twits & Like
SCHW	Charles Schwab	-0.5681	-29.4	Twits & Like
IBM	IBM	-0.5723	-23.43	Twits & Like
PM	Philip Morris	-0.6079	-23.24	Like
KEY	KeyCorp	-0.6267	-42.84	Like
HST	Host Hotels Resorts	-0.65	-41.83	Like & Reply
MRO	Marathon Oil	-0.7416	-118.3	Reply
DAL	Delta Air Lines	-0.7621	-45.52	Twits & Like & Reply
NBL	Noble Energy	-0.8386	-113.14	Twits & Like
XOM	Exxon Mobil	-0.8644	-58.42	Twits & Reply

The table below shows the symbol of the companies that the correlation coefficient between CAR and FF was more than positive 20% and also tweets (Like) or Like (Reply) (Reply) were significant in the model.

symbol	Company name	Correlation coefficient	accumulated returns	Twit / like / reply
PRU	Prudential Financial	0.2007	-51.38	Like
COF	Capital One Financial	0.2047	-47.2	Reply
TDC	Teradata	0.2086	-57.9	Twits & Like & Reply
PLD	Prologis	0.2218	33.89	Like
PXD	Pioneer Natural	0.2231	-59.24	Reply
LEG	Leggett&Platt	0.226	-35.62	Twits
HRL	Hormel Foods	0.2382	35.73	Twits
TMO	Thermo Fisher Scientific	0.244	39.46	Like & Reply
NDAQ	Nasdaq Inc	0.278	18.86	Twits
JBHT	JB Hunt	0.2829	-13.78	Reply
RCL	Royal Caribbean Cruises	0.2977	-95.03	Twits & Reply
SPG	Simon Property	0.3042	-82.2	Like & Reply
URBN	Urban Outfitters	0.3078	40.81	Like & Reply
LNC	Lincoln National	0.3152	-71.26	Twits
IRM	Iron Mountain	0.3328	-22.58	Reply
CHD	Church&Dwight	0.376	31.65	Like
ADP	ADP	0.3876	28.13	Twits
BXP	Boston Properties	0.4078	-19.83	Like & Reply
STT	State Street	0.5166	-46.73	Like
TRV	Travelers	0.5185	-23.46	Twits
MTB	M&T Bank	0.5453	-46.87	Like
WEC	WEC Energy	0.5594	42.47	Reply
LH	Laboratory America	0.6096	-12.08	Like
DGX	Quest Diagnostics	0.7075	-14	Like
AOS	AO Smith	0.7433	-43.63	Reply

Therefore:

The second hypothesis of the research (decrease and increase of companies' floating stocks lead to abnormal stock returns) is confirmed.

The fourth research hypothesis (companies' stock returns are affected by the number of hashtag publications and republishing used in social networks) is confirmed.

The fifth research hypothesis (hashtags and cashtags used in social networks can explain abnormal changes in stock returns) is confirmed.

Hypothesis 6 (the number of hashtags published and republished leads to a stock price bubble) is confirmed.

Final step:

The most important model for the relevance of financial statement information is presented by Olson and Feltham (1995). This information includes earnings per share and book value of equity per share. The model of Olson and Feltham is as follows:

$$R_t = \alpha_0 + \beta_1 BV_t + \beta_2 EPS_t + \epsilon$$

In this model, EPS_t represents earnings per share in the fiscal year (net profit divided by the number of shares), BV_t represents the book value of equity for each share in the fiscal year (sum of

total equity reported in the balance sheet except preferred stock divided by the number of shares) and R_t represent returns Stocks in the fiscal year. Stock returns are calculated based on the stock value at the end of July next year.

The following table shows the results of the regression model for the years 2009 to 2017 in S & P500 companies.

Table 1: the results of Olsen and Flatham model in S&P 500

Probability of statistic F	Statistic F Regression model	Durbin–Watson statistic	Probability of statistic t	statistic T Independent variable 2	Probability of statistic t	statistic t Independent variable 1	R^2 justified	Regression model	year
0.000	8.533	1.967	0.5322	0.625	0.0079	-2.669	0.032	$Ret_t = 0.667 - 0.001EPS_i + 0.00005BV_i \epsilon$	2009
0.000	35.826	2.015	0.0015	-3.189	0.0000	4.882	0.134	$Ret_i = 0.294 - 0.014EPS_i + 0.00044BV_i \epsilon$	2010
0.000	28.839	2.082	0.0054	-2.797	0.0000	4.207	0.11	$Ret_t = 0.09 - 0.009EPS_i + 0.00027BV_i \epsilon$	2011
0.000	66.796	2.138	0.0145	2.453	0.1697	-1.375	0.226	$Ret_t = 0.198 - 0.003EPS_i + 0.00012BV_i \epsilon$	2012
0.000	64.823	2.112	0.0000	4.27	0.4622	0.736	0.221	$Ret_t = 0.245 - 0.003EPS_i + 0.00033BV_i \epsilon$	2013
0.000	46.512	1.96	0.1968	-1.292	0.0000	4.622	0.168	$Ret_t = 0.129 - 0.008EPS_i + 0.0001BV_i \epsilon$	2014
0.217	1.533	2.064	0.1142	1.582	0.3706	0.896	0.002	$Ret_t = 0.039 - 0.0002EPS_i + 0.00028BV_i \epsilon$	2015
0.008	4.851	1.781	0.0028	3.005	0.1305	1.514	0.016	$Ret_t = 0.144 - 0.0005EPS_i + 0.00025BV_i \epsilon$	2016
0.000	20.996	1.977	0.0000	5.929	0.0000	-4.607	0.081	$Ret_t - = 0.329 - 0.039EPS_i + 0.00704BV_i \epsilon$	2017

The results of the F-Limer test in Table 2 indicate that the null hypothesis is not rejected and

Table 2: Results of F-Limer test to determine the panel or polishing method

Test Statistic	Significance level	Degree of freedom	result
0.1409	1.077	(449,3598)	Pold data

there is no heterogeneity between sections at the 5% level. In fact, it indicates the appropriateness of the solid data method for estimating the model.

Regarding the intensity of the relationship between earnings per share (EPS) and book value (BV) with the market price of the stock, the parent test is used as follows

Table 3: Parent test results to determine the intensity of the relationship between earnings per share and book value with stock returns

year	Significance level	Degree of freedom	result
2009	0.0000	1	261.7065
2010	0.0000	1	271.5045
2011	0.0000	1	47.805
2012	0.0000	1	132.169
2013	0.0000	1	155.594
2014	0.0000	1	103.37
2015	0.2520	1	1.3124
2016	0.0000	1	67.8577
2017	0.2226	1	1.4876

Since the statistical probability χ^2 of the parent test in 2009, 2010, 2011, 2012, 2013, 2014 and 2016 is less than 5%, so the coefficients β_1, β_2 for EPS and BV in the model are not statistically equal and Since the probability of parent test χ^2 statistics in 2015 and 2017 is calculated to be more than 5%, so the coefficients and EPS and BV in the model are statistically equal, respectively.

As shown in Table 1, the $\mathbf{R}^2$ adjusted trend has decreased during the years 2009 to 2017, therefore:

Hypothesis 3: The information content of EPS and BV as indicators of financial statements (profit and loss statement and balance sheet) has decreased over time.

6. Conclusion

Fluctuations in the stock prices of companies are due to the publication of financial statements, the publication of interim financial statements or the transmission of good and bad news by managers in news circles, newspapers and magazines, or the political situation of industry, country, world, etc.

Examining the information content of accounting variables, in particular EPS, and the book value of equity (BV), which are referred to as the representatives of corporate income statements and balance sheets, are among the topics to be addressed. It can be useful in answering this fundamental question: Are corporate stock prices affected by profit and loss statements (earnings per share), balance sheet (book value of equity), or both?

The low explanatory coefficient that has sometimes been obtained in stock returns to research and information content of variables has raised doubts about other variables that affect stock returns. These variables range from macroeconomic levels such as inflation, long-term bank interest rates, liquidity growth rates, and exchange rates (for example, in [5] regression model) to microeconomic levels such as ownership. And shareholders, profitability, investment, etc. are wide, which have been widely discussed in numerous studies.

The low rate of explanation of stock returns by accounting profits and the criticisms levelled against it, paved the way for the expansion of research on other accounting variables. Instead of focusing solely on accounting profit and its information content, the path of accounting research turned to accruals and how they are calculated and optional and non-optional.

To explain the low explanatory coefficient of stock returns by accounting variables, thinkers argue that because financial statements are published annually, they have little information content and shareholders do not wait for the financial statements to be published and get the information they need. Gain other channels. And if the number of financial statements published in a year increases (for example, quarterly financial statements), the information content also improves.

The spread of social networks and the use of hashtags in these networks, especially in accounting research and the use of the hashtag symbol next to a stock exchange symbol and the publication of information about that particular stock exchange symbol leads to an increase (decrease) in floating stocks and consequently a decrease (Increase) The return of that share in the stock market, which is sometimes unusual and is also referred to as a bubble. A bubble that, if true, would have consequences for some shareholders in the future if it burst.

The present study investigates the effect of conventional hashtags and cashtags on social networks on the stock returns of S & P500 companies. In the first step, similar to the 1989 study, he and Penman sought to test for abnormal stock returns (fundamentals) by forming an optimal portfolio of S&P 500 companies. After that, the research in the second step sought to test the effect of decreasing floating stock of companies on abnormal stock returns. In the third step, the study examined the reduction of the explanatory power of EPS and BV information content as representatives of financial statements (profit and loss statement and balance sheet) on stock returns, and finally, in the fourth step, the study examined the effect of conventional hashtags and cashtags on networks. Social on the Stocktwits site was examined on stock returns.

The findings of this study showed:

1- Although he and Penman 1989 rejected the hypothesis of an efficient market in a semi-strong state in their research companies, but in this study and in S & P500 companies, the hypothesis of an efficient market in a semi-strong state was confirmed.

2- The effect of declining floating stocks has led to abnormal returns on S&P 500 companies.

3- The explanatory power of EPS and BV information content on stock returns has decreased over time, which has been due to the hashtags and cashtags of traditional financial statements on social networks. In other words, news about the status of companies is rapidly affecting stock returns through social networks.

References

[1] R. Ball and P. Brown, *An empirical evaluation of accounting income numbers*, J. Account. Res. (1968) 159–178.
[2] I. Bernardo, R. Henriques and V. Lobo, *Social market: Stock market and twitter correlation*, Int. Conf. Intell. Decision Technol. (2017) 341–356.
[3] I. Bordino, S. Battiston, G. Caldarelli, M. Cristelli, A. Ukkonen and I. Weber, *Web search queries can predict stock market volumes*, PLoS One 7 (2012) 40014.
[4] K. Chan, Y.C. Chan and W.-M. Fong, *Free Float and Market Liquidity: Evidence From Hong Kong Government's Intervention*, Department of Finance, Hong Kong University of Scinces and Technology, 2002.
[5] N.-F. Chen, R. Roll and S.A. Ross, *Economic forces and the stock market*, J. Bus. (1986) 383–403.
[6] V. Fiala, S. Kapounek and O. Veselý, *Impact of social media on the stock market: Evidence from tweets*, Eur. J. Bus. Sci. Technol. 1 (2015) 24–35.

[7] G.A. Feltham and J. A. Ohlson, *Valuation and clean surplus accounting for operating and financial activities*, Contemp. Account. Res. 11 (1995) 689-–732.
[8] R.M. Greenwood, *Float Manipulation and Stock Prices*, Division of Research, Harvard Business School, 2006.
[9] K. Guo, Y. Sun and X. Qian, *Can investor sentiment be used to predict the stock price? Dynamic analysis based on China stock market*, Phys. A: Statist. Mech. Appl. 469 (2017) 390–396.
[10] J.A. Ohlson, *Earnings, book values, and dividends in equity valuation*, Contemp. Account. Res. 11 (1995) 661–687.
[11] N. Oliveira, P. Cortez and N. Areal, *On the predictability of stock market behavior using stocktwits sentiment and posting volume*, Portuguese Conf. Artific. Intell. (2013) 355–365.
[12] J.A. Ou and S.H. Penman, *Financial statement analysis and the prediction of stock returns*, J. Account. Econ. 11 (1989) 295–329.
[13] S.H. Penman and J.A. Ohlson, *Book rate-of-return and prediction of earnings changes: An empirical investigation*, J. Account. Res. 20(2) (1982).
[14] J. Piñeiro-Chousa, M. Vizcaíno-González and A. M. Pérez-Pico, *Influence of social media over the stock market*, Psych. Market. 34 (2017) 101–108.
[15] M. Reed, *A study of social network effects on the stock market*, J. Behav. Finance 17 (2016) 342–351.
[16] E. J. Ruiz, V. Hristidis, C. Castillo, A. Gionis and A. Jaimes, *Correlating financial time series with micro-blogging activity*, Proc. Fifth ACM Int. Conf. Web Search Data Min. (2012) 513–522.
[17] T.O. Sprenger, A. Tumasjan, P.G. Sandner and I.M. Welpe, *Tweets and trades: The information content of stock microblogs*, Eur. Financ. Manag. 20 (2014) 926–957.
[18] R. Tumarkin and R.F. Whitelaw, *News or noise? Internet postings and stock prices*, Financ. Anal. J. 57 (2001) 41–51.
[19] F. Wang and Y. Xu, *What determines Chinese stock returns?*, Financ. Anal. J. 60 (2004) 65–77.
[20] P. D. Wysocki, *Cheap Talk on the Web: The Determinants of Postings on Stock Message Boards*, University of Michigan Business School Working Paper, 1998.