



Correlation Analysis Between Accounting Information and Daily Twitter's Happiness Sentiment on Stock Return

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Abstract. The main goal of financial reporting is to provide relevant information for estimating business value. This study has two purposes. The first purpose is to analyze the causal relationship between accounting information and stock returns. The second one is to analyze the causal relationship between daily happiness sentiment on twitter and stock returns. The research data was obtained from the financial statements of LQ45 companies throughout the period from 2011 to 2021 and collected daily happiness sentiment data from Twitter at <https://hedometer.org>. The analytical technique used in this study is the Granger Causality Analysis technique. The results show that Earnings per Share (EPS) can predict future Stock Return so that EPS as a fundamental factor is still relevant in making investment decisions and Daily Happiness Sentiment on Twitter can be a new proxy in predicting stock returns in the future. This research is important as representative research in developing countries with a new proxy for online investor sentiment.

Keywords: Earning per Share · Online Investor Sentiment · Stock Market · Granger Causality

1 Introduction

Accounting plays an important role in the concept of creating and transmitting corporate wealth. Making good investor decisions depends on getting the right information. The main goal of financial reporting is to provide relevant information for estimating business value. Accounting information can take the form of debt values, equity and earnings, and relevant investors and other accounting parties use the financial statements and disclosures to assess the company's risks when making investment decisions.

Beaver (1968) suggests that accounting profit is associated with the price of securities or indirectly states that Earning per Share (EPS) is an indicator that is very much cared for by investors in making investment decisions [1]. Several studies show that the relationship between accounting information and price / returns declines over time. Their view contradicts research by other researchers who argue that the relationship between accounting information and price / returns does not diminish over time [2–5].

The stock market is one of the most important parts of today's financial markets. Stock market forecasting has received a lot of attention in both academician and practitioner. One of the key questions is whether investor sentiment predicts stock returns. But that's not all. Because today we cannot ignore the investor sentiment factor in regard. Recently, López-Cabarcos et al. (2017) construct a proxy for investor sentiment from social media and show that they all have predictability for stock returns [6].

Zhang et al. (2018) suggest that Daily Happiness Sentiment Twitter (DHS) impacts differently through the geographic location [7]. One of the studies related to cross-country studies and DHS is Zhang et al. (2016) which investigated the relationship between Twitter happiness and stock returns of listed Chinese companies [8]. Since now, the impact of Daily Happiness Sentiment Twitter on stock market returns is limited in the literature. Furthermore, we are not aware of any study that compares the estimated power of social networks (Twitter) and happiness at the level of developing countries like Indonesia, according to the Director General of IT and Postal Equipment Resources (SDPP) of the Ministry of Communications and Information Technology, Budi Setiawan. Indonesia is growing fast in the world, including Indonesia, reaching the third place in Asia for the number of internet users. There are 44.6 million Facebook users and 19.5 million Twitter users in Indonesia. Indonesia is the fifth largest country with Twitter users, after the UK and other major countries [9].

This study will use the financial Behavior Theory by Slovic, (1972) suggesting psychological aspects of investment and stockbrokers [10]. Nofsinger, (2001) defines behavioral finance as studying how humans behave in a financial decision [11]. In particular, study how psychology affects financial decisions, companies, and financial markets. The two concepts described clearly state that behavioral finance is an approach that explains how humans make investments that are influenced by psychological factors.

The novelty of this research is first, we analyze the fundamental factor, namely accounting information, and non-fundamental, the sentiment of Twitter happiness which will affect the prediction of stock returns in the future. Second, we propose a new proxy for measuring investor sentiment using Twitter's daily happiness sentiment. Third, in contrast to previous research, mainly from the US, China, and Singapore stock markets, our focus is on one of the largest Twitter users and represents a developing country's stock market, namely the Indonesian stock market.

The first purpose of this study is to analyze the causal relationship between accounting information and stock returns and the second one is the causal relationship between daily happiness sentiment twitter and stock returns.

1.1 Financial Behavior Theory

Investment analysis using psychology and finance is called behavioral finance. Shfrin, (2003) defines behavioral finance as the study of how psychological phenomena influence financial behavior [12] (Fig. 1).

Conceptual Framework and Hypothesis Development:

This study was conducted to provide an overview of how fundamental factors such as accounting information and non-fundamental, such as the sentiment of daily happiness on Twitter with the correlation of stock returns on the Indonesian stock exchange.

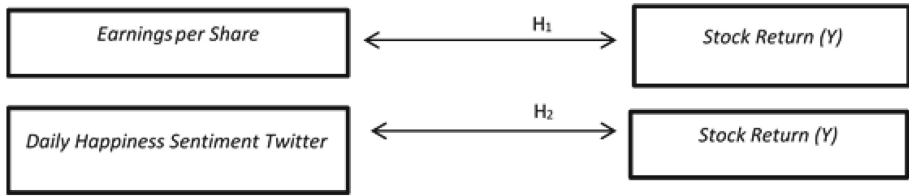


Fig. 1. Conceptual Framework

1.2 Correlation between Accounting Information and Stock Return

The relevance of accounting information to investor decisions has been mentioned in many studies, Miller et al. (2014) The study shows that the income variable is the most important explanatory in the stock price valuation model, other research Dimitropoulos & Asteriou, (2009) they studied the Greek stock market from 1992 to 2001 and concluded that stock returns were related to EPS, but not to ROI or ROE [13, 14]. In Vietnam, several authors have investigated the relationship between accounting information and stock prices, such as: Hai et al. (2015), who documented a strong relationship in the domestic market between 2012 and 2016 [15]. Based on this description, the hypothesis in this study is as follows:

H1: Accounting Information has a positive correlation with Stock Return.

In financial behavior theory, financial behavior is an approach that explains how people invest or manage finances, which is influenced by psychological factors. Until 1970, the efficient market hypothesis (EMH) dominated financial theory. EMH stipulates that stock prices must reflect fundamental values based on reasonable and representative agents. A new theory has since emerged that suggests that investor sentiment can also affect future prices. The non-fundamental factor is called investor sentiment.

One of the non-fundamental factor is investor sentiment. The stock market is one of the most important parts of today's financial markets. Stock market predictions have attracted a lot of attention from both academia and business. One of the important questions is whether investor sentiment predicts stock returns, but that does not stop there because nowadays we cannot ignore the factor of investor sentiment in this regard. Recently, López-Cabarcos et al. (2017) construct a proxy for investor sentiment from social media and show that they all have predictability for stock returns [6]. Based on this description, the hypothesis in this study is as follows:

H2: Daily Happiness Sentiment on Twitter has a positive correlation with Stock Return.

2 Methodology

Data was obtained through non-participant observation, namely by processing data on the company's financial statements LQ45 throughout the period 2011 to 2021 from www.idx.co.id and www.yahoo.finance.com, which is in the form of accounting and financial data regarding matters related to this research as well as retrieving Twitter happiness sentiment data at <https://hedonometer.org>. The analytical technique used in

Table 1. Results Test ADF Using non- intercept on Level

Variable	ADF t-statistics	Mc Kinnon Critical Value 10%	Prob	Information
Stock Return	-4.703437	-1.601144	0.0003	Stationary
Earnings Per Share	-1.746336	-1.601144	0.0770	Stationary
Twitter Happiness Sentiment	-0.071232	-1.601144	0.6347	Not Stationary

Source: Results Processed Data Eviews

this study is quantitative data analysis with Granger Causality Analysis technique, the data in this study was carried out using the Eviews 12 application.

The Granger causality test model in this study is as follows:

$$EPS_t = \sum_{t=i}^m a_i EPS_{t-i} + \sum_{t=i}^m \beta_i SR_{t-i} + \varepsilon_t \tag{1}$$

$$SR_t = \sum_{t=i}^m a_i SR_{t-i} + \sum_{t=i}^m \beta_i EPS_{t-i} + \varepsilon_t \tag{2}$$

$$DHS_t = \sum_{t=i}^m a_i DHS_{t-i} + \sum_{t=i}^m \beta_i SR_{t-i} + \varepsilon_t \tag{3}$$

$$SR_t = \sum_{t=i}^m a_i SR_{t-i} + \sum_{t=i}^m \beta_i EPS_{t-i} + \varepsilon_t \tag{4}$$

where:

EPS = Earnings Per Share.

SR = Stock Return.

DHS = Daily Happiness Sentiment Twitter.

ε_t = Confounding variable.

α, β = Variable coefficient.

3 Result and Discussion

3.1 Stationarity Test (Hypothesis Testing)

From Table 1 above could is known that for all variables used in this study there are two stationary variables and 1 other variable not stationary on level levels. On test the all variable must stationary. Thing they could is known on each variable, namely:

- a. Stock Return variable on non-intercept model testing at the level shows that scores Augmented Dickey-Fuller (ADF) t-stats bigger from McKinnon Critical Value 10 percent (in this study used 0.1), which is $-4.703437 > -1.601144$. That is, H_0 is rejected and H_1 is accepted or with say other, data stationary.

Table 2. Results Test ADF Using non- intercept on the First Difference Level

Variable	ADF t-statistics	Mc Kinnon Critical Value 10 percent	Prob	Information
Stock Return	-4.354826	-1.599088	0.0009	Stationary
Earnings Per Share	-4.291723	-1.600140	0.0008	Stationary
Twitter Happiness Sentiment	-1.889793	-1.59909	0.0603	Stationary

Source: Results Processed Data Eviews

Table 3. Co-Integration Test Results (Johansen Co-Integration Test) Unrestricted Co-Integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.1 Critical Value	Prob.**
None *	0.997903	77.90629	21.77716	0.0000
At most 1 *	0.848185	22.40095	10.47457	0.0008
At most 2 *	0.453327	5.435141	2.976163	0.0234

The trace test indicates 2 cointegrating eqn(s) at the 0.1 level.

* denotes rejection of the hypothesis at the 0.1 level.

**MacKinnon-Haug-Michelis (1999) p-values.

Source: Results Processed Data Eviews.

- b. Earnings Per Share variable on non-intercept model testing at the level shows that scores ADF t-stats bigger from McKinnon Critical Value 10 percent (in this study used 0.1), which is $-1.746336 > -1.601144$. That is, H_0 is rejected and H_1 is accepted or with say other, data stationary.
- c. Daily Happiness Sentiment on twitter Variable on non-intercept model testing at the level shows that scores ADF t-stats smaller from McKinnon Critical Value 10 percent (in this study used 0.1), which is $-0.071232 < -1.601144$. That is, H_1 is rejected and H_0 is accepted, or with say otherwise, the data is not stationary.

Two variables have stationary data, namely Stock Return and Earning Per Share, while one other variable has data that is not stationary which is Twitter Happiness Sentiment. In the test, all of the variable data must be stationary, therefore will differentiation is carried out data on the level first difference.

From Table 2 on could is known that for all variables used in this study there are two stationary variables and 1 other variable not stationary on level levels. On test the all variable must stationary. Thing could is known on each variable, namely (Table 3):

- a. Stock Return variable on non-intercept model testing at the level shows that scores Augmented Dickey-Fuller (ADF) t-stats bigger from McKinnon Critical Value 10 percent (in this study used 0.1), which is $-4.354826 > -1.599088$. That is, H_0 is rejected and H_1 is accepted or with say other, data stationary.

- b. Earnings Per Share variable on non-intercept model testing at the level shows that scores ADF t-stats bigger from McKinnon Critical Value 10 percent (in this study used 0.1), which is $-4.291723 > -1.600140$. That is, H_0 is rejected and H_1 is accepted or with say other, data stationary.
- c. Daily Happiness Sentiment on Twitter Variable on non-intercept model testing at the level shows that scores ADF t-stats bigger from McKinnon Critical Value 10 percent (in this study used 0.1), which is $-1.889793 > -1.59909$. That is, H_0 is rejected and H_1 is accepted or with say other, data stationary.

From testing on, all variable has Fulfill requirements stationery of the ADF test data where the Augmented Dickey-Fuller (ADF) t-statistic is bigger than the value of McKinnon Critical Value 10 percent at the first difference level. Because all the data variable is stationary at the first difference level, it can be done step next in Granger Causality Test.

3.2 Co-integration Test (Hypothesis Testing)

From the table above, it can be seen that the test level is 10% (0.1), and there are two variable ranks related to Co-Integration. This can be proven from the trace value statistics 77.90629, 22.40095, and 5.435141 are greater than the critical value of 0.1, namely 21.77716, 10.47457, and 2.976163 which means, the variables used have a relationship in the long run (Co-Integration) with each other. Therefore, Granger Causality Test study could be used. On Step next conducted test Granger Causality Test.

3.3 Granger Causality Test (Hypothesis Testing)

Test Causality Granger used for knowing connection because consequence from each variable independent to variable dependent. Causality here is a statistical framework. Test level used in the test causality granger this, that is level trust 0.1 (10%). Results causality granger is shown in Table 4 as follows:

Table 4. Test Causality (Granger Causality Test)

H 0	Lag 1	
	F-Statistics	Prob
SR does not Granger Cause EPS	0.57419	0.4733
EPS does not Granger Cause SR	6.43133	0.0389
SR does not Granger Cause DHS	1.05596	0.3383
DHS does not Granger Cause SR	5.13126	0.0579

From the table, it can be seen the direction of the relationship between the variables through causality test (granger causality test). Whether or not there is a relationship can be seen from score probability from each testing causality which is then compared with alpha 0.1. Thing they could is known on each variable, that is:

First, H1 states the Granger test between the Stock Return (SR) variables and EPS shows that SR does not affect EPS, while EPS has an effect on SR at alpha 0.1. Therefore no occur connection causality between EPS and SR. However, there is a one-way relationship.

Second, H2 states the Granger test between the Stock Return (SR) variables and DHS showed that SR did not affect DHS, while DHS affected SR at alpha 0.1. Therefore no occur connection causality between DHS and SR. However, there is a one-way relationship.

Based on the results of the causality test of the earning per share (X1) and the daily happiness sentiment of Twitter (X2) on the stock return variable (Y).

From the tests in the table above, it can be seen as follows:

a. H 1: Earning per Share (X1) on Stock Return (Y)

From the table above, it is known that the earning per share variable has a positive correlation with stock return has a value of 0.0389 below the standard value of 0.1. Thus, the first hypothesis is accepted.

b. H 2: Daily Happiness Sentiment on Twitter (X2) on Stock Return (Y)

From the table above, it is known that the daily happiness sentiment Twitter variable has a positive correlation with stock return has a value of 0.0579 below the standard value of 0.1. Thus, the second hypothesis is accepted

Granger Causality Analysis between Earning per Share and Stock Return. Based on testing which has been conducted Among Earning per Share (EPS) and Stock Return only have a connection in one direction (unidirectional causality). Stock Return no takes effect by positive significant to EPS while EPS has a significant effect positive significant to Stock Returns. Ball & Brown, (2013) in their research assessed that accounting information, especially EPS, was positively correlated with stock returns, this study was conducted on a global scale [17]. So it can be concluded that Earning per Share can predict Stock Return in the future so EPS as a fundamental factor is still very relevant in making investment decisions.

This Granger Causality test shows that there is a strong short-term relationship between Earnings per Share and Stock Returns in the short-term. And the Co-Integration test through the Johansen Co-Integration test shows that the Earning per Share variable is cointegrated with stock returns, which means it has a long term.

Granger Causality Analysis between Twitter's Daily Happiness Sentiment and Stock Return. Based on testing conducted between Daily Happiness Sentiment on Twitter (DHS) and Stock Return only have a connection in one direction (unidirectional causality). Stock Return no takes effect by positive significant on DHS while DHS significantly influences positive significant to Stock Returns.

De Long et al. (1990) provide a popular theoretical model in which two types of investors can represent the economy [18]. Essentially, rational investors analyze available

information by core values and can distinguish between useful and useless information. In contrast, irrational investors are generally inexperienced agents who lack experience and need trading knowledge to analyze the information.

The Co-Integration test through the Johansen Co-Integration test shows that the DHS variable is cointegrated, which means that the DHS variable has a long-term relationship with stock returns. Meanwhile, the Granger causality test shows that DHS has a significant effect on positive significant to Stock returns in the short term.

4 Conclusion

Based on the results of hypothesis testing and discussion of the effect of earnings per share and daily happiness sentiment on Twitter on stock returns, the following conclusions can be drawn:

- a. Accounting information has a positive effect on stock returns. This Granger causality test shows a strong short-term relationship between Earnings per Share and Stock Returns in the short term. And the Co-Integration test through the Johansen Co-Integration test shows that the Earning per Share variable is cointegrated with stock returns, which means it has a long term. That is, the greater the value of earnings per share of a company, it can predict future stock returns.
- b. Daily Happiness Sentiment on Twitter has a positive effect on stock returns. The Co-Integration test through the Johansen Co-Integration test shows that the Daily Happiness Sentiment Twitter variable is cointegrated, which means that the Daily Happiness Sentiment Twitter variable has a long-term relationship with stock returns. Meanwhile, the Granger causality test shows that Twitter's Daily Happiness Sentiment has a significant effect on positive significant to Stock returns in the short term. The happier the individual, the more likely it will be followed by forecasting high stock returns. So it can be said that investors make investments based on emotional decisions.

The results of this study can have implications for researchers, namely the expansion of the theoretical framework on Financial Behavior Theory shows that individuals cannot be separated from rational and irrational considerations in this study showing Earnings per Share (EPS) can predict Stock Return in the future so that EPS as a rational factor is still very relevant in decision making. Investment decisions. Daily Happiness Sentiment Twitter can be a new non-fundamental proxy for predicting stock returns in the future. This research is important as representative research in developing countries with a new proxy for online investor sentiment.

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