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# Investor sentiment by psychological line index and stock return

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**C H R O N I C L E**

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**A B S T R A C T**

This article examines 57 companies listed on the Ho Chi Minh City Stock Exchange from January 1, 2015 to March 31, 2020, to check whether or not investors' sentiment impacts the return of these stocks. Investor's daily sentiment towards each stock was measured by the psychological line index. The results of the study using both regression methods, Fama-MacBeth and General Least Squares, show that the influence of investor sentiment to return stocks in the stock market was significant and could not be ignored. Besides, the psychological factor of investors, their trading behavior causing stock supply-demand imbalance were all important factors affecting stock return. The study also found that the effect of firm size on stock returns was more pronounced when both investor sentiment and behavior were used in research models. The finding from this study suggests that individual investors who trade stocks every day can use psychological line index, which is one of the groups of decision-making indicators.

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## 1. Introduction

Capital Asset Pricing Model of Sharpe (1964), Lintner (1965) and Mossin (1966) have been a basic theory of asset valuation in financial markets for a long time. However, traditional theories and empirical research results have shown that stock returns are not only affected by market risk, but are also affected by many other factors. Traditional financial theory states that stock returns can be affected by fundamental values of stocks such as cash flow per share (Hadi, 1998) or individual stock characteristics such as firm size. (Hu, Chen, Shao & Wang, 2019), not because of investors' irrational behavior. Even if market prices of financial assets do not accurately reflect value based on fundamentals, reasonable investors will help correct the market to a reasonable equilibrium. In addition to the fundamentals and corporate characteristics that influence stock returns, recent studies have suggested that investor sentiment plays an important role in determining stock returns (Ryu, Kim & Yang, 2017; Kim, Ryu & Yang, 2019; He, He & Wen, 2019). These studies are based on the view of behavioral finance in that investors' sentiment influences their economic decisions. Investors' irrational decisions can be systematic and create financial market anomalies. So far many studies provide evidence of non-financial factors that can affect the Vietnamese stock market such as foreign ownership (Vinh, 2015), geomagnetic field (Phuong, 2017), institutions (Phuong, 2020a), corruption (Phuong, 2020b, 2020c), but the number of studies using technical analysis tools to measure investor sentiment in this market is very small. In developed stock markets, many studies have used psychological line indexes to measure investor sentiment (Ryu et al., 2017; He et al. 2019; Kim et al. 2019; Shaik & Syed, 2019) but until now, there are no studies using this indicator to measure the psychology of

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investors in the stock market in Vietnam. Therefore, this article will measure investor sentiment according to the psychological line index and study how it affects the return of stocks on the stock market of Vietnam from January 1, 2015 to. March 31, 2020.

## 2. The proposed study

The article conducts research on 100 listed companies in the VN100 basket on the City Stock Exchange. Ho Chi Minh City-Vietnam from the beginning of 2015 to the end of March 2020. After eliminating listed companies with insufficient financial data, intermittent stock exchange data, companies that change stock exchanges, and those whose trading is canceled for a period of time, in this sample, there were 57 remaining companies. Financial data is calculated from the annual audit reports, semi-annual audit reports and quarterly financial statements of each company from Q1 2015 to Q4 2019. Daily transaction data of each company is collected from https://www.hsx.vn/ during the period from January 1, 2015 to March 31, 2020.

### *2.1 Research models*

Based on the research of Ryu et al. (2017) and Kim et al. (2019), this article builds a research model that examines the net impact when combining both investor sentiment and their transaction behavior to excess return on the stock market of Vietnam. The regression equation for this study takes the form:

$$R_{i,t} = \beta_0 + \beta_1 PLI_{i,t} + \beta_2 BSI_{i,t} + \beta_3 ComSize_{i,t-1} + \beta_4 CFS_{i,t-1} + e_{i,t}. \quad (1)$$

*($e_{i,t}$ is the remaining return of each share i at time t)*

The variables in Eq. (1) are calculated as follows:

- *Dependent variable* $R_{i,t}$ is excess return calculated by the difference between return of stock *i* and the risk-free asset rate. Return is calculated in logarithm of the share price of day *t* versus date *t*-1, using the 1-year government bond rate as the risk-free rate (Alsaifi et al., 2020; Nguyen et al., 2020).

Variables explained:

- *The variable PLI* - investor sentiment index: this article uses the psychological line index (PLI) of each individual stock to capture the sentiment and expectations of the market. Eq. (2) is used to calculate PLI.

$$PLI_{i,t} = 100 \times \sum_{k=0}^{11} \left( \frac{max(0, P_{i,t-k} - P_{i,t-1-k})}{P_{i,t-k} - P_{i,t-1-k}} \right) / 12 \quad (2)$$

In which: $P_{i,t}$ is the closing price of stock *i* on date *t*.
Psychological curve (PLI) is an indicator that compares the number of rising periods with the total number of periods. It reflects buying power in relation to selling power and ranges from 0 to 100. For a stock, when the indicator is above 50, the buyer is in control of the market and the general sentiment towards the stock is expected to increase. Similarly, when it is below 50, the sellers for the stock are dominant in the market and the overall sentiment is considered bearish. If the PSY moves along the 50 zone, it shows a balance between the buyers and the sellers and therefore the market is sideways (Murphy, 1999). This study uses 12-day PLI as in Ryu et al. (2017). Like most oscillating indicators, PLI has overbought and oversold levels. When its value is above 75, the share price is considered overbought. When the index is below 25, the share price is considered oversold.

- *The variable BSI*- investor behavior: Measuring the index of investors' buying and selling trade imbalance is built according to each individual stock through two steps. Step 1: Use the raw data about the buy and sell daily trading imbalances of each individual stock to calculate (BSV) according to formula (3a). If equation (3a) is positive, the stock is overbought by investors. If equation (3a) is negative, the stock is being oversold by investors. Step 2: Calculate the investor's buy and sell unbalance index (BSI) by taking the residual in Eq. (3b).

Calculate BS

$$BSV_{i,t} = \frac{BV_{i,t} - SV_{i,t}}{BV_{i,t} + SV_{i,t}}, \quad (3a)$$

where: $BV_{i,t}$ is the volume of total - buy transaction for stock *i* in day *t* by investors, *SVi*, *t* is the volume of total sale transaction of stock *i* in day *t* of investors. private.

Calculate BSI

$$BSI_{i,t} = \alpha_1 + \alpha_1 (Rm_t - Rf_t) + u_{i,t}, \quad (3b)$$

where, $Rm_t$ and $Rf_t$ are the return of the market and the risk-free rate at time *t*. To control the financial factors of each company, the article uses the financial data of these companies through two variables: *ComSize* and *CFS*.

- *The variable ComSize*- company size: is the market capitalization of each company. Company i's market capitalization on date t is calculated by the number of outstanding shares multiplied by its closing price on day *t*.

$$ComSize_{i,t-1} = P_{i,t-1} \times Average\ Outstanding\ Shares_{i,t-1} \quad (4)$$

- *Variable CFS* -Cash Flow per Share. CFS is calculated by the value of cash flow from operating activities after subtracting the preferred dividend of the stock divided by the average number of current outstanding shares.

$$CFS_{i,t-1} = \frac{\text{Operating Cash Flow}_{i,t-1} - \text{Preferred Dividends}_{i,t-1}}{\text{Common Shares Outstanding}_{i,t-1}} \quad (5)$$

Both ComSize and CFS variables take value 1 period behind the rest of the Eq. (1).
This article uses regression results from estimated models to find the psychological effect of investors' psychological line index on the return of stocks in Vietnam stock market. Five estimation models in this study were developed based on Eq. (1). Model (1) is the Eq. (1) with the coefficient $\beta_1 = 0$, this model does not measure the psychological impact of investors on the return of stocks. Models (2), (3), (4), (5) all have $\beta_1 \neq 0$ but the value of the PLI variable used in these models is not the same. Model (2) uses all of the PLI data calculated using Eq. (2). Model (2) shows the general psychological effect of investors on returning stocks in all trading stages. Model (3) uses the dummy variable PLI, PLI = 1 when the PLI value is less than 25, the remaining values, PLI = 0. Model (3) measures the impact of investors on low psychology and pessimism on stock returns. Similar to model (3), model (4) and (5) also use the dummy variable PLI to measure investor sentiment to return of stocks. The optimistic sentiment among investors when the stock price signals an increase, which occurs when the PLI is above 50, is shown in the model (4). Investors' euphoria when stock prices rise sharply, which occurs when the PLI is above 70, is shown in model (5).

### *2.2 Estimation method*

The article uses the Fama-MacBeth and General Least Squares estimation methods for tabular data of 57 companies listed on the Ho Chi Minh City Stock Exchange. Wald test performed with both estimation methods to remove unnecessary variables in research models. Studies using time series data on the stock market often have problems with correlation and variance change in research models. Compared with the estimation methods commonly used with tabular data such as Pooled Ordinary Least Squares, Fixed Effect Model and Random Effect Model, the technique using General Least Squares can overcome the variance and autocorrelation phenomena in the research models. In addition, this study used the Fama-MacBeth estimate with 57 companies over a period of more than 6 years. Compared with Ordinary Least Squares estimation, the Fama-MacBeth estimation technique, which processes time effects is more efficient and the standard errors of the parameters estimated in this way are less biased. This article uses standard errors according to Newey-West (Newey-West, 1987) in the Fama-MacBeth estimation technique to ensure that the tabular data is biased but to a very small extent.

## 3. Results of the study

Estimated results according to Fama-MacBeth and General Least Squares method for the five research models are presented in Table 1 and Table 2.

**Table 1**
Fama-MacBeth estimation results from the models

| Variable | FMB (1) | FMB (2) | FMB (3) | FMB (4) | FMB (5) |
|---|---|---|---|---|---|
| BSI | 1.0203*** | 0.9518*** | 0.9929*** | 0.9828*** | 0.9926*** |
| Comsize | -0.0044 | -0.0329*** | -0.0145** | -0.0232*** | -0.0072 |
| CFS | 0.0000*** | 0.0000*** | 0.0000*** | 0.0000*** | 0.0000*** |
| PLI_all | | 0.0240*** | | | |
| PLI_under25 | | | -0.5457*** | | |
| PLI_over50 | | | | 0.5710*** | |
| PLI_over75 | | | | | 0.5860*** |
| cons | 0.1043 | -0.0220 | 0.5315*** | 0.4621** | 0.1642 |
| N | 70563 | 70563 | 70563 | 70563 | 70563 |
| r2 | 0.0986 | 0.1512 | 0.1308 | 0.1372 | 0.1200 |
| adjr2 | 0.0651 | 0.1030 | 0.0814 | 0.0881 | 0.0700 |
| Wald test (F-test) | 195.66 | 410.20 | 284.59 | 343.09 | 173.96 |
| Prob > F | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

*Source: Author's calculations*

**Table 2**

Results of regression according to General Least Squares method from the models

| Variable | GLS (1) | GLS (2) | GLS (3) | GLS (4) | GLS (5) |
|---|---|---|---|---|---|
| BSI | 1.4732*** | 1.3659*** | 1.4142*** | 1.4021*** | 1.4523*** |
| Comsize | -0.0053 | -0.0404*** | -0.0211*** | -0.0283*** | -0.0110* |
| CFS | 0.0000*** | 0.0000 | 0.0000*** | 0.0000** | 0.0000*** |
| PLI_all | | 0.0274*** | | | |
| PLI_under25 | | | -0.6728*** | | |
| PLI_over50 | | | | 0.6688*** | |
| PLI_over75 | | | | | 1.0761*** |
| _cons | 0.1785 | 0.1049 | 0.7982*** | 0.6216*** | 0.3238* |
| N | 70563 | 70563 | 70563 | 70563 | 70563 |
| Wald test | 1967.48 | 4361.62 | 3089.91 | 3467.75 | 2350.73 |
| Prob > chi2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

*Source: Author's calculations*

Wald test results from Table 1 and Table 2 show that all regression models have P-value <0.05, thus rejecting the hypothesis that the regression coefficient of the variables in the research models is zero. In other words, the Wald test results from research models according to both General Least-Squares and Fama-MacBeth methods show that the variables included in the models are important and valuable variables in the research models.

In general, the estimation results between the Fama-MacBeth method (Table 1) and General Least Squares (Table 2) are quite similar in terms of the statistical significance of the regression coefficients in the research models. In other words, although the study uses different estimation methods, the regression results are quite similar. It has proven the robustness, effectiveness and reliability of the estimation results from the research models.

Model (1): Results from two estimation methods both show that when the psychological impact of investors is ignored, the company size has a negligible impact on the return of the stock. This is shown by the regression coefficient of the Comsize variable, which is not statistically significant for both estimation methods. In this model, stock returns are influenced by investor behavior and cash flow per share. Cash flow per share positively affects its return is reasonable and consistent with standard valuation theory. This result supports the results of Hadi (1998). The transaction imbalance between the stock's supply and demand has a positive effect on its own return. This result is explained by the investor's behavior in the research period of deviation from the demand side to the supply side, creating the driving force for the stock's price increase.

When quantifying the impact of investors' psychology in the research models, the level of explanation for stock returns in models 2, 3, 4, 5 is higher than that of model 1. This is expressed in R2 and adjR2 when comparing model 1 with the other four models. Of the five models, model (2) has the largest adjR2 coefficient. This result is quite reasonable because model (2) measures the impact of investors' sentiment according to many different levels of stock volatility. The 3, 4, and 5 models only measure investor sentiment in one of the many phases of the stock. This result supports the view of behavioral finance that the effect of investor sentiment on stock returns in Vietnam stock market is very significant and cannot be taken lightly. It supports the results of Ryu et al. (2017), Kim et al. (2019) and Kondoz et al. (2019).

When comparing the impact of the factors in the five models, it shows that the investor behavior factor due to the supply-demand imbalance has the strongest impact on the return of stocks compared to the rest. The investor's sentiment has the second strongest impact on the return of the stock in the 3,4,5 models. However, psychological factor only ranks third in terms of role in explaining return stocks in model 2. This result is logical because the effect of investor sentiment on returning a stock is more pronounced when the stock price is following a specific trend (up or down) - as shown in the 3, 4, 5 model. Model 2 shows investor sentiment in all phases (increase, decrease, sideways) of stocks. When investor sentiment is negative due to the stock price being oversold, it will negatively affect the return of the stock (Model 3). On the contrary, when investor sentiment is positive (model 4) and euphoria (model 5) will have a positive effect on the return of these stocks.

The regression results reveal something interesting about the effect of firm size on stock returns. When not measuring investor sentiment, return stock is not affected by firm size (model 1) but when psychology is used in the regression model its explanatory role to return stocks clearer. In other words, the measurement of investor sentiment helps to reveal more clearly the role of stock size in influencing their return. When a stock price is being dominated by investor sentiment and behavior, its return is also influenced by company size. In this situation company size will have a negative impact on the return of the stock.

## 4. Conclusions

This article has used two estimation methods, Fama-MacBeth and General Least Squares, for 57 companies listed on the Ho Chi Minh City Stock Exchange to find out the influence of the psychological factor of investors to return on the Vietnamese stock market. Based on the estimation results from five different research models by two different methods, this article has discovered that investor sentiment was the key factor in explaining stock returns. This is evident when comparing adjR2 of model (1) with the other four models. In particular, when both investor psychology and behavior were measured, the effect of company size on stock returns was more significant. The result from this study is useful for investors who trade at a daily frequency in the Vietnamese stock market. They can use the psychological line index as one of the groups of indicators to be consulted before making transaction decisions. Besides, the factor that represents the individual characteristics of each company is the cash flow per share is also the factor affecting the return of these shares.

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