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Does volatility mediate the impact of analyst recommendations on herding in Malaysian stock market?[1]

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Abstract: This study examines the mediating role of volatility on the relationship between analyst recommendations and herding in the Malaysian stock market by using data from 2010 to 2020. Volatility is measured by realized volatility and the Parkinson estimator. The empirical evidence suggests that herding exists and realized volatility intervenes in the direct relationship between analyst recommendations and herding. The release of analyst recommendations causes realized volatility to fluctuate and investors are triggered by the volatility, which in turn follow the crowd to herd. Nonetheless, the Parkinson estimator is found to be insignificant, which infers that investors have anchor bias and rely on previous day stock prices to trade and herd. This paper provides an alternative explanation to the direct relationship and enhances the study of information-based herding. It contributes to academicians, practitioners, investors and policymakers to understand the herding of investors in responding to the arrival of new information.

Keywords: behavioural finance, herding, analyst recommendation, volatility, stock market.

JEL codes: D53, E70, G40.

Introduction

In the market, the investors' behaviours are unpredictable and often driven by multiple factors (Shi, Zheng, Guo, Jin, & Huang, 2020). According to the efficient market hypothesis, investors will react whenever there is an arrival of new information transmitted into the markets. Nonetheless, what has triggered the investors to react to the new information and affect their investment decision is worthy of discovery.

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One example where information starts to be available in the market is the release of analyst recommendations. Analyst recommendation is the investment suggestion provided by analysts to hold a significant position in a stock covered (Firth, Lin, Liu, & Xuan, 2013). It is the suggestions made by the institutional analysts who analyse the fundamentals of companies using valuation models to provide targeted prices and guide investors in making an investment decision. Chan and Hameed (2006) argue that sophisticated analyst recommendations lead to more firm-specific and market-wide information that allows investors to respond. Nevertheless, the arrival of new information may cause investors to be exposed to herd mentality.

Herding is a form of convergent social behaviour that can be broadly defined as an alignment of thoughts or behaviours of individuals in a group through local interaction and without centralized coordination (Raafat, Chater, & Frith, 2009). In a stock market, it is the behaviour that manifests itself in the often irrational and psychological behaviour of investors. In academic studies, the existence of herding has been documented among investors and professionals (Loang & Zamri, 2020).

It is widely believed that investors' reactions to the arrival of new information can cause herding. Jegadeesh and Kim (2010) examine the impact of analysts' revised recommendations on market reaction and they find that investors tend to herd when there is a major revised recommendation that moves away from consensus. Nonetheless, the explanation of the direct relationship between analyst recommendations and herding can be a neat and clean thought.

One potential aspect that has been quite overlooked in academic research is the role of volatility in explaining analyst recommendations and herding. Corbet, Dowling and Cummins (2015) argue that the release of a sell recommendation can cause an increase in volatility while the buy recommendation is negatively correlated to volatility. On the other hand, Blasco, Corredor and Ferreruela (2012) discover that volatility has a direct impact on the existence of herding due to information asymmetric, which drives uninformed investors to follow the market trend. These studies show that volatility can be a potential variable to mediate the relationship between analyst recommendations and herding because volatility is found to be correlated to analyst recommendation and herding.

Triggered by the above findings, this paper aims to examine the existence of herding and the impact of volatility as a mediator variable on the relationship between analyst recommendations and herding. The result may provide an alternative explanation to the direct relationship between analyst recommendations and herding and explore the often-overlooked volatility as a crucial factor in causing herding.

This study could assist academicians, investors, and practitioners to obtain an improved understanding of the existence of herding and behaviour of investors. Investors may not be triggered by the arrival of new information but fluctuation in volatility may lead to herding. The results will enable policymakers and regulators to target herding stocks by identifying idiosyncratic volatility and halt investors from blindly following the decisions of other investors, which can lead to a market crash. This paper creates awareness among analysts as their released information may cause investors to herd in markets. Furthermore, the results contribute to the field of behavioural finance more specifically on herding. It provides an alternative explanation to the direct relationship between analyst recommendation and herding through examining the mediating role of volatility. This study validates information-based herding as one of the root causes of herding that is caused by the arrival of information.

The remainder of the paper is organized as follows: Section 1 discusses the previous literature related to herding, analyst recommendation and volatility. Section 2 outlines the methodology to examine the mediating role of volatility. Section 3 presents the results. Lastly, the conclusion provides the conclusion, implications, limitations and recommendations for future studies.

1. Literature review

1.1. Herd behaviour and information-based herding

The studies of herding are not new to the field of behavioural finance because it is one of the market anomalies that are found to be associated with financial crisis. Chang, McAleer and Wang (2020) examine the existence of herding during the period of SARS and COVID-19. They show that herding exists with the emergence of COVID-19. They argue that most investors tend to make unwise investment decisions by selling off their stocks in a crisis. These studies show that herding can be associated with financial crisis but study herding under market stress is still limited.

Information-based herding was first found by the study of Bikhchandani, Hirshleifer and Welch (1992) in which they discovered that human behaviour could be explained by informational cascades. Information-based herding can be generally caused in two different ways: abandonment of a person's private information (Eyster & Rabin, 2010) and lack of information (Economou, Hassapis, & Philippas, 2018). In the study of Xu (2019), he examines the Chinese stock market and shows that the B-share market has a stronger tendency to herding. He argues that herding exists when numerous investors choose to ignore their private information and mimic the market movement.

On the other hand, Wang and Huang (2019) examine the impact of information transparency on the existence of herding. They show that herding is prevalent in the Taiwan stock market especially on stocks with a low level of transparency. They argue that investors are unable to analyse the stocks with limited transparency. These studies have explained the potential causes of herding but the impact of analyst recommendation and volatility should not be overlooked as these variables are found to be correlated with herding. The arguments of previous studies inspired this study to conduct research to examine the existence of herding, herding under market stress and the determinants of herding.

1.2. Analyst recommendation and herding

Previous studies on the relationship between analyst recommendation and herding can be broadly categorized into two different schools of thought. The first group of previous studies focuses on examining the impact of analyst recommendation on herding but fails to consider volatility as a potential variable. The second group of such studies has controlled volatility as a control variable but volatility is still found to be correlated to herding

Chiang and Lin (2019) examine the impact of analyst recommendation on herding with the moderating effect of market sentiment. Their result shows that analysts and investors tend to herd and achieve consensus with the emergence of new recommendations. This result is comparable to the study of Frijns and Huynh (2018) in which they argue that analyst recommendations increase the tendency of herding. These studies show that analyst recommendation is correlated to herding yet volatility is not controlled and overlooked.

For the second group of previous studies, volatility is controlled for but volatility is still found to be significant to herding. Lien, Hung and Chen (2020) consider multiple factors that can be correlated to herding in examining the relationship between analyst recommendation, herding and stock return. The result shows that volatility as a control variable is correlated to herding. Previous studies show that analyst recommendation can be a cause of herding but volatility is often discovered to be correlated to herding. Hence, there is a need to examine the mediating role of volatility because volatility is also found to be correlated to analyst recommendation.

1.3. Role of volatility

Volatility is the movement rate of stock prices within a specific time embedding information about risk adjustments made by the equity investors. However, volatility is often overlooked in academic research especially in the studies related to analyst recommendation and herding.

There are studies that relate volatility to herding. Chen (2016) examines the relationship between herding and volatility is examined and he argues that the existence of herding causes a higher level of volatility especially during a period of financial crisis. Nonetheless, a contradictory view is presented in the study of Shams and Golbabaei (2020). They examine the occurrence of herding in different stages of volatility such as low, high and extreme volatility but no signal of herding is detected.

Volatility is also found to be related to analyst recommendations. Su, Zhang and Hudson (2020) investigate the time-varying performance of UK analyst recommendation revision and they argue that analyst recommendation can increase the level of volatility if the recommendation is positive. Nevertheless, a contradictory result is presented in the study of Medovikov (2019) in which he investigates whether stock analysts can predict market risk and volatility. He argues that the relationship between analyst recommendation and volatility is not linear and analysts can predict the volatility to some extent for the best-rated stocks only.

For the Malaysian market, studies on the relationship between volatility, analyst recommendations and herding are limited. Prior studies such as Thaker, Mohamad, Kamil and Duasa (2018) have examined a few issues related to analyst recommendation, herding and volatility in Malaysia but limited studies have emphasized the potential role of volatility in mediating the relationship of analyst recommendation and herding. Hence, it was the motivation to fill the gap that is often ignored in academic study.

From the review of previous studies be volatility is often overlooked even though it has the potential to act as a mediator variable to intermediator in the relationship between analyst recommendation and herding. This is because volatility is also found to be related to analyst recommendation and herding. There is a need to conduct a study to examine in-depth the role of volatility in mediating the relationship between analyst recommendations and herding. Figure 1 shows the relationship between analyst recommendation (independent variable), volatility (mediator variable) and herding (dependent variable) with firm size and volume acting as control variables This paper proposes the following conceptual framework (see Figure 1) based on the mediation model as documented in the study of O'Laughlin, Martin and Ferrer (2018).

To the best of the authors' knowledge, the conceptual framework depicted in Figure 1 is new to the academic field and volatility is the only variable that

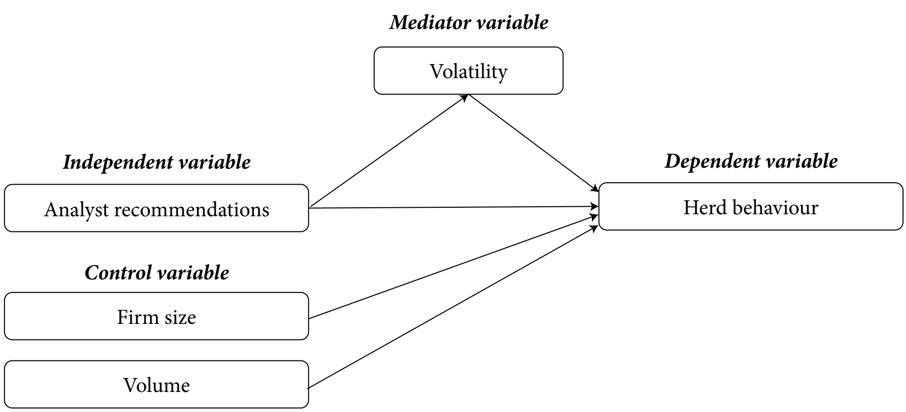

Figure 1. Conceptual framework
Source: Own work.

is found to be correlated to analyst recommendations and herd behaviour. Therefore, volatility is acting as a mediator variable.

2. Data and methods

Target prices are obtained from Standard and Poor's (S&P) Capital IQ Platform. This database provides aggregate target prices realized by various analyst firms such as the Public Investment Bank Berhad, AmInvestment Bank Berhad, Affin Hwang Capital, Hong Leong Investment Limited Berhad, etc. The analyst recommendation is measured as shown in the Equation (1) to determine the expected return of target price and justify analyst recommendation (Bradshaw, 2002):

$$DAR_{i,t} = P_{i,t} - TP_{i,t} \tag{1}$$

Where, $DAR_{i,t}$ is the dispersion of analyst recommendation of stock i at time t, $P_{i,t}$ is the price of stock i at time t, $TP_{i,t}$ is the average target price as released by analysts of stock i at time t. This is because the target price is merely an expected price provided by analysts and it is limited in providing a meaningful message. Equation (1) allows to measure the dispersion between the stock and the average target price. Positive (Negative) AR indicates a sell (buy) signal because the current stock price is higher (lower) than the expected price and it shows that analysts predict the stock price to decrease (increase) in near future.

One of the most common methods in measuring volatility is using realized volatility. Realized volatility is measured using the variance of discrete returns measured at numerous intervals. Koopman, Jungbacker and Hol (2005) argue that realized volatility is the most convincing model that can produce far more accurate volatility forecasts compared to the other models. It is a better approach compared to standard deviation because standard deviation calculates the variation of a set of data while realized volatility measures the fluctuation based on historical returns. Therefore, realized volatility to measure volatility is adopted. In accordance with Blasco and others (2012), the realized volatility can be measured as:

$$r_{i,t} = P_{i,t} - P_{i,t-1} \tag{2}$$

$$RV_{i,t} = \sqrt{\frac{\sum_{i=1}^{N} r_{i,t}^2}{N}} \tag{3}$$

Where $r_{i,t}$ refers to the return of stock i at time t, $P_{i,t}$ refers to the ending price of stock i at time t and $P_{i,t-1}$ refers to the previous day ending price of stock i at time t and $RV_{i,t}$ refers to realized volatility of stock i at time t. This simple tool of volatility measurement determines whether volatility mediates the relationship between analyst recommendation and herd behaviour.

Another approach to measuring volatility is the Parkinson estimator. Parkinson (1980) creates the estimator to capture intraday volatility by using maximum and minimum daily stock prices. Meanwhile, the realized volatility utilises the stock prices from the previous day. Parkinson's estimator is given as:

$$\sigma_P = \frac{1}{2\sqrt{In2}}\sqrt{\frac{1}{n}\sum_{t=1}^{n} P_{i,t}^{\;2}} \tag{4}$$

Where $P_{i,t} = In\frac{H_{i,t}}{L_{i,t}}$ and $H_{i,t}$ is the maximum price of stock i at time t and $L_{i,t}$ is the minimum price of stock i at time t. The Parkinson estimator and realized volatility examine the behaviour of investors relying on which types of volatility to herd.

A few control variables are included. They are firm size and volume because these variables have been widely proven to be correlated to herding in previous studies. For control variables, this paper adopts the market capitalization measurements as advocated in the studies of Amel-Zadeh (2011) as shown below:

$$FS_{i,t} = Q_{i,t} \cdot P_{i,t} \tag{5}$$

Where $FS_{i,t}$ refers to the firm size of stock i at time t, $Q_{i,t}$ refers to the total number of outstanding shares of stock i at time t and $P_{i,t}$ refers to share price of stock i at time t. The firm size can be measured in a natural logarithm if the variable is found to be skewed. On the other hand, the total amount of shares traded is measured to represent volume as a control variable. The measurement is written below:

$$Vol_{i,t} = Buy_{i,t} + Sell_{i,t} \tag{6}$$

Where $Vol_{i,t}$ refers to the total volume of stock i at time t, $Buy_{i,t}$ refers to the total number of "buy" shares of stock i at time t and $Sell_{i,t}$ refers to the total number of "sell" shares of stock i at time t. Volume can be measured in a natural logarithm to reduce skew.

The dependent variable is herd behaviour. One of the most popular methods to examine herding is using the coefficient of the squared term of market return (Y_3) in Cross-Sectional Absolute Deviation ("CASD"), which is proposed by Chiang and Zheng (2010). CSAD is a herding approach that is used to detect the existence of herding of individual stocks towards the market. The formula of CSAD is shown as below:

$$CSAD_{i,t} = \frac{1}{N}\sum_{i=1}^{N}\left|R_{i,t} - R_{m,t}\right| \tag{7}$$

Where CSAD is the cross-sectional absolute deviation of stock *i* at time *t*, $R_{i,t}$ is the stock return of stock *i* at time *t* and $R_{m,t}$ is the market return (linear). The formula calculates the return of each stock and minus the market return to determine the dispersion of corresponding returns. By determining the return of each stock, it allows to find out the deviation between stock return and market return.

The CSAD regression is further expanded to the following in order to detect the existence of herding:

$$CSAD_{i,t} = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 R^2_{m,t} + \varepsilon_t \tag{8}$$

Whereby $|Rm, t|$ is the absolute term of market return at time t; $R^2_{m,t}$ is the squared term of market return at time t (non-linear) and ε is the error term. Furthermore, changes in the market index (FTSE Bursa Malaysia KLCI) acts as a proxy to measure the market return. The squared market return (in Equation 7) is introduced in the regression to capture the non-linear relationship. The coefficient of the squared term of market return (γ_3) in CSAD regression is used to detect the existence of herd behaviour. If herd behaviour exists, the coefficient of γ_3 (in Equation 7) should be a negative value. When herd behaviour exists, the dispersion between stock return and market return is expected to decrease or increase considerably less than proportional to the market return. This is because investors herd to the market trends and follow the investment decision of other investors.

In determining the mediating impact of volatility on the relationship between analyst recommendation and herd behaviour, the regression equation as proposed by O'Laughlin and others (2018) is adopted. They argue that the mediation effect is valid if the independent variable (analyst recommendation) is found to be significant to the mediator variable (volatility) and the mediator variable is shown to affect the dependent variable (herding). This is because volatility intervenes in the direct relationship between analyst recommendation and herding. Hence, analyst recommendation will be significant to volatility and volatility will be significant to herding due to the mediation effect of volatility.

Panel data regression is the primary regression model used to analyse the mediating effect of volatility because it allows an analysis of data that consists of cross-sectional and time series. There are three steps in examining the mediating effect of volatility. Firstly, the relationship between analyst recommendation and herding is given as:

$$CSAD_{i,t} = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 R^2_{m,t} + y_4 DAR_{i,t} + y_5 \ln(FS_{i,t}) + \\ + y_6 \ln(Vol_{i,t}) + \varepsilon_t \tag{9}$$

The second step of regression includes the impact of analyst recommendation on volatility and the regression is written as follow:

$$V_{i,t} = \alpha_i + \beta_1 DAR_{i,t} + \varepsilon_t \tag{10}$$

Where $V_{i,t}$ refers to the realized volatility and Parkinson estimator of stock i at time t. The last step is to examine the mediating role of volatility, with the regression below:

$$CSAD_{i,t} = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 \left|R_{m,t}\right| + \gamma_3 R^2_{m,t} + y_4 DAR_{i,t} + y_5 \ln(FS_{i,t}) + \\ + y_6 \ln(Vol_{i,t}) + y_7 V_{i,t} + \varepsilon_t \tag{11}$$

If volatility can mediate the relationship between analyst recommendation and herd behaviour, the impact of analyst recommendation will be greatly reduced or insignificant to herd behaviour.

The research timeframe is from 2010 to 2020 to outline the latest market available data and analyst recommendations. For sampling, the public companies listed in Main Market before 1st January 2010 and remains its listing status as of 31st December 2020 are selected. Besides shares, REITs, Exchange Traded Funds and Warrants are not included in samples due to differences such as securities. Daily data of target price, stock price, market return, volume and outstanding shares are collected from S&P Capital IQ Platform, Bloomberg and Bursa Malaysia Official websites.

A total number of 690 listed companies are selected with a USD 297billion market capitalization, which is over 83% of Bursa Malaysia's total market capitalization as of October 2021.

Table 1. Descriptive statistics

Variable	Mean	Median	Maximum	Minimum	Std. dev.	Skewness	Kurtosis
Dependent variable							
Herd behaviour	2.56	2.14	26.69	0.33	1.66	3.20	27.96
Mediator variable							
Realized volatility	0.14	0.10	1.30	0.00	0.15	2.05	9.18
Parkinson estimator	1.88	1.55	6.77	0.00	1.03	1.37	5.61
Independent variable							
Analyst recommendation	0.39	0.22	14.12	−4.14	1.02	5.50	58.55
Control variables							
Firm size	1.64	0.17	107.68	0.01	7.25	8.69	92.05
Volume	3.12	0.50	205.15	0.00	9.36	9.08	129.10

Source: Own calculation using EViews 10.

Table 1 summarizes the descriptive statistics of all variables with mean, median, maximum, minimum standard deviation, skewness and kurtosis for further interpretation. Table 1 shows that the Parkinson estimator has higher dispersion with a standard deviation value of 1.03 compare to realized volatility. It indicates that intraday trading is more intense because the maximum and minimum stock prices are captured in the Parkinson estimator. The negative value of the dispersion of analyst recommendation indicates that the target price as advocated by analysts exceeds the current stock price. This is because it is the norm that analysts use to evaluate the stock performances based on the fundamentals and prospects of companies. It is a "buy" signal to investors as the analysts expect the company to perform well and an increase in the stock price in the near future. On the other hand, a positive value of analyst recommendation shows that the current stock is priced higher than the target price, which indicates a "sell" signal to investors.

3. Empirical evidence

Panel data regression requires the Hausman test to determine the choice between the random-effects model and the fixed effects model. The null hypothesis of the Hausman test indicates that a random effect is appropriate for the panel data regression. Using EViews 10, the results of the Hausman test indicate that fixed effects shall be applied as the p-value is found to be lower than 0.05 and that the null hypothesis is rejected.

Variance Inflation Factor (VIF) is employed to detect the existence of multicollinearity. The result of VIF shows that volatility (VIF = 1.33); analyst recommendations (VIF = 1.21); firm size (VIF = 1.07) and volume (VIF = 1.38). Nonetheless, none of the variables have more than five values and it indicates that multicollinearity is not detected.

The Modified Wald and White tests are used to detect the existence of heteroscedasticity and also the Wooldridge test to examine the existence of serial correlation. The results show that the p-value is equal to 0.00 for the Modified Wald, White and Wooldridge tests and the null hypothesis is rejected. There is a need to rectify heteroscedasticity and serial correlation in the regression model.

Table 2 shows the three steps in examining the mediating effect of volatility. The first step—Panel (A)—is to examine the impact of analyst recommendation (independent variable) on herding (dependent variable) to indicate the direct relationship based on Equation (9). The second step—Panel (B1) and (B2)—is to investigate the impact of analyst recommendation (independent variable) on volatility (moderator variable) based on Equation (10). Panel (B1) represents the realized volatility while Panel (B2) adopts the Parkinson estimator. The third step—Panel (C)—is to validate the mediating role of volatility (moderator variable) in the relationship between analyst recommendations (independent variable) and herding (dependent variable) based on Equation (11). If volatility is shown to be mediating the relationship, analyst recommendation shall be reduced or insignificant in the third step as volatility takes over the direct relationship.

Panel (A) of Table 2 shows that analyst recommendation is significant to herding at five percent. It indicates that the dispersion between stock price and target price can cause investors to herd with a coefficient value of 0.06. The negative value of the coefficient squared market return shows that herding exists. This result is comparable to the study of Brown, Wei and Wermers (2014) in which they discovered that mutual fund managers tend to herd around the analyst recommendations.

Panel (B1) and (B2) of Table 2 examine the relationship between analyst recommendation and volatility. The result demonstrates that analyst recommendation is significant to realized volatility and the Parkinson estimator at 5%. This result is consistent with the study of Corbet and others (2015) as they argue that analyst recommendations can affect volatility in the Greek market. This evidence shows that analyst recommendation is significantly correlated to volatility. Nevertheless, these results cannot justify the role of volatility in mediating the relationship between analyst recommendation and herding. Hence, the last step of the mediation model is to include all variables in a panel data regression to test for the mediating effect of volatility.

The result of the panel data regression with the correction of heteroscedasticity and serial correlation is shown in Panel (C) of Table 2 to examine the impact of volatility on the relationship between analyst recommendations and herding. The result indicates that realized volatility is significant to herding at the level of one percent while analyst recommendation is found to be insignificant. The value of adjusted R^2 is 0.68 indicates that other factors affect herding. Although analyst recommendation was found to be significantly correlated to herding in Panel (A) of Table 2, the impact of analyst recommendation has become insignificant when realized volatility acts as a mediator variable. It shows that realized volatility intervenes in the relationship between analyst recommendation and herding and the direct relationship between analyst recommendation and herding no longer holds. This finding indicates the role of volatility in mediating the relationship between analyst recommendation and herding.

One of the possible explanations is that investors are triggered by the fluctuation of volatility to herd on the market. Analyst recommendation is one of the sources of information that is released to investors. Nonetheless, the investors may not immediately make a new investment decision by solely receiving the recommendations of analysts. Typically, investors will observe the market movement before deciding whether want to buy or sell a specific stock. If the investors notice that the volatility of a specific stock has fluctuated, the investors will re-evaluate their portfolio and respond to the new information. This explanation is consistent with the study of Prasad, Bakry and Varua (2020) in which they argue that information released to the market can explain the changes in volatility and Xu, Jiang, Chan and Wu (2017) show that analyst recommendations can cause herding in the market.

Furthermore, the Parkinson estimator is found to be insignificant to herding in Panel (C) of Table 2. It shows that investors only rely on the realized volatility, which utilizes the previous day's stock price as a benchmark to trade. The investors are not sensitive to the maximum and minimum daily prices to herd. The result is inconsistent with Blasco and others (2012) in which they argue that investors focus on intraday volatility to herd. One of the reasons is that investors have anchor bias and they tend to herd based on previous performance of the stocks.

Besides, the analyst recommendation is found to be negatively correlated to herding. It indicates that herding is stronger when the dispersion between stock price and the target price is smaller. With the arrival of new information, investors may herd if the target price is close to the current stock price. On the contrary, investors may not herd when analyst recommendations are far from consensus. This result supports the argument of Brown and others (2014) in explaining the existence of herding around the consensus.

Moreover, volatility is found to be positively correlated to herding and it shows that a higher level of volatility can cause a higher level of herding tendency. This result is consistent with the study of Blasco and others (2012) in which they argue that volatility is a critical factor to measure the existence of herding as it represents a higher level of market stress. Investors will not be triggered by the low level of volatility because it shows that the information released may not be accepted and responded to by most investors on the receipt of new information.

Firm size and trading volume are the control variables. Nonetheless, the result of Panel (C) shows that volume is found to be significant to herding and the firm size is insignificant to herding. Both control variables are negatively correlated to herding. It indicates that herding tends to exist in stocks with lower trading volumes. One of the possible reasons is that lower trading volume indicates that there is no new information or the information on the stocks may not be sufficient to trigger investors to trade. Therefore, most investors tend to follow the market trend and crowd to trade resulting in a higher herding tendency when the volume of the stocks is low.

Conclusions

The objective of this study is to determine the mediating role of volatility on the relationship of analyst recommendation and herding by using data ranging from 2010 to 2020. Two different types of volatility measurements are employed, which are realized volatility and the Parkinson estimator. Realized vol-

Table 2. Relationship between analyst recommendation, volatility and herding

Panel (A). Analyst recommendation → herding						
Variables	Coefficient	Standard error	t-Statistic	p-value	R^2	Adjusted R^2
Constant	1.81	0.27	9.02	0.07***	0.73	0.65
Independent variable						
Market return	0.27	0.01	14.16	0.03**		
Absolute market return	0.23	0.13	1.77	0.08		
Squared market return	–0.07	0.01	–2.48	0.02**		
Analyst recommendation	–0.06	0.06	2.86	0.03**		
Control variables						
Firm size	–0.07	0.06	–0.71	0.48		
Volume	–1.22	0.11	–12.01	0.04**		
Panel (B1). Analyst recommendation → realized volatility						
Variables	Coefficient	Standard error	t-Statistic	p-value	R^2	Adjusted R^2
Constant	0.88	0.00	11.46	0.00*	0.53	0.37
Independent variable						
Analyst recommendation	–0.12	0.07	16.50	0.05**		
Panel (B2). Analyst recommendation → Parkinson volatility						
Variables	Coefficient	Standard error	t-Statistic	p-value	R^2	Adjusted R^2
Constant	0.25	0.03	5.33	0.00*	0.39	0.21
Independent variable						
Analyst recommendation	0.48	0.84	9.72	0.04**		

Panel (C). Analyst Recommendation → Volatility → Herding						
Variables	Coefficient	Standard error	*t*-Statistic	*p*-value	R^2	Adjusted R^2
Constant	1.17	0.23	3.07	0.09***	0.77	0.68
Mediator variable						
Realized volatility	1.54	0.15	15.56	0.00*		
Parkinson estimator	0.33	0.75	0.52	1.03		
Independent variable						
Market return	0.21	0.01	14.27	0.00*		
Absolute market return	0.37	0.19	2.88	0.00*		
Squared market return	–0.07	0.01	–3.44	0.00*		
Analyst recommendation	–0.02	0.02	–0.77	0.59		
Control variables						
Firm size	–0.05	0.06	–1.34	0.18		
Volume	–1.35	0.22	–12.40	0.00*		

Note: ***, **, * represent the coefficient significant at the level of 10%, 5% and 1%. Panel (A) examines the impact of analyst recommendation (independent variable) on herding (dependent variable). Panel (B1) and Panel (B2) examine the impact of analyst recommendation (independent variable) on volatility (moderator variable). Panel (C) examines the mediating role of volatility (moderator variable) to intervene in the relationship between analyst recommendation (independent variable) and herding (dependent variable).

Source: Own calculation using EViews 10.

atility captures the historical stock prices while the Parkinson estimator utilizes the maximum and minimum daily stock prices. The empirical evidence shows that herding exists in the Malaysian stock market and realized volatility intervenes in the relationship between analyst recommendation and herding. Nonetheless, Parkinson's volatility is found to be insignificant as a mediator variable. It shows that realized volatility intervenes in the direct relationship between analyst recommendation and herding and it indicates that the release of analyst recommendation can cause the fluctuation of volatility and subsequently cause herding.

When new information arrives, investors may not immediately respond to the new information and change their initial investment decision. In most circumstances, investors will observe the reaction of other investors. If there are investors who react to the new information and cause the volatility to fluctuate then the rest of the investors will follow the crowd to trade, which turns into herding. This result is consistent with the studies of Prasad and others (2020) and Xu and others (2017) and provides an alternative explanation to the direct relationship between analyst recommendation and herding by outlining the role of volatility in mediating the relationship. Furthermore, the insignificant value of the Parkinson's estimator indicates that investors have anchor bias to trade and herd based on the previous day's stock prices as a benchmark. Therefore, the daily extreme volatility cannot mediate the relationship between analyst recommendation and herding.

Apart from that, the result shows that analyst recommendation is negatively correlated to herding. It means that investors herd when the target prices as suggested by analysts are close to the consensus prices. Otherwise, the investors may not herd if the new target prices are unreasonable with huge differences from other target prices. Besides, realized volatility is found to be positively correlated to herding. It indicates that an increase in volatility can cause the investors to herd more strongly. This is because investors may panic to trade when there is a high level of fluctuation, which represents higher risk and uncertainty.

This study could assist academicians, investors, and practitioners to understand the determinants of herding. As documented in previous studies, analyst recommendation is one of the root causes of herding but this paper begs to differ and shows that volatility mediates the relationship between analyst recommendation and herding. It shows that investors are not directly triggered by the release of analyst information. It sheds light on the understanding of the behaviour of investors. Moreover, the results can assist policymakers and regulators to identify the stocks that may exhibit herding. This is because realized volatility is shown to be the mediator variable that can cause herding and thus, policymakers and regulators should implement stricter rules and regulations to oversee the idiosyncratic volatility that appears in markets.

For conceptual implication, the results here provide an alternative explanation to the often overlooked area in academic study. The direct relationship between analyst recommendation and herding can be too good to be true to expect the investors to herd with the arrival of new information. It enhances the field of behavioural finance more specifically on herding to understand the mediating effect of volatility to cause herding among investors. Additionally, the results validate the arguments of information-based herding as one of the root causes of herding. There is no doubt that investors may herd with the arrival of new information but this paper shows that investors are triggered by the volatility caused by the information and subsequently to herd in the market. It also enhances the study of information-based herding.

As a limitation, herding regression cannot determine whether domestic, foreign, individual or institutional investors herd more strongly in the Malaysian stock market due to data limitation. This is because different types of investors may react differently in markets due to self-interest. As a recommendation, future studies may focus on the impact of analyst recommendation before, during and after the COVID-19 to understand the behaviour of investors in responding to a pandemic. Quantile regression of herding can also be adapted to detect the existence of herding in different quantiles. The herding tendency between small stocks and large stocks also can be determined.

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