GAMBLING ATTENTION AND RETAIL TRADING VOLUME

Anya Khanthavit*

Abstract

Retail investors pay limited attention to alternative gambling activities. More-attentive activities increase, whereas less-attentive activities decrease. However, attention is unobservable. Previous studies proxy gambling attention based on representative gambles, such as lotteries. These proxies incorporate general gambling and representative-gambling attention. Thus, previous studies have reported net effects. This study analyzes the effects of gambling attention on the trading of retail investors in the Stock Exchange of Thailand. Lotteries served as representative gambles. Gambling attention is decomposed into general gambling and lottery-specific components, enabling the study to separately estimate the effects of each component. Lotteries in Thailand offer fixed prizes. However, traditional proxies are not applicable. This study measures attention using the Google search volume index on a lucky-number query. The query is based on a superstitious belief that is unique to the Thai market. Using daily observations from August 6, 2008, to June 30, 2022, which totaled 3,388 observations, this study establishes that gambling attention has a net negative effect. When attention is decomposed, its general gambling and lottery-specific components exhibit positive and negative effects, respectively. Furthermore, the effect on the buying side was stronger than that on the selling side. During the COVID-19 pandemic, the lottery-specific effects became positive. Retail investors responded to lottery-specific attention through stock trading.

Keywords: gambling attention, gambling sentiment, trading volume

1. INTRODUCTION

Gambling involves betting or staking money for a potential higher return. Gambling is risky, and its expected gain is negative. Despite this, investors reveal their gambling preferences when they trade in stock markets. Dorn, Dorn, and Sengmueller (2015) and Gao and Lin (2015) found substitution effects between stock trading and lottery gambling in the United States and Taiwan, respectively, concluding that stock trading involved gambling.

Investors show a preference for lottery-like stocks whose expected returns are negative (Kumar, 2009). Markiewicz and Weber (2013) reported that the trading volume of the Polish market is driven by gambling rather than investment propensity. For the US market, based on self-reported data, the trading volume was found to be positively associated with problem gambling (Mosenhauer, Newall, & Walasek, 2021). Researchers, such as Barberis and Huang (2008), theoretically explain gambling preference using investors' appreciation of positively skewed returns.

Stock market speculation and trading represent high-risk stock buying and selling where the investor has hopes of turning a profit in a short time period (Arthur, Delfabbro, & Williams, 2015). Arthur, Williams, and Delfabbro (2016) acknowledged that speculation has some

* Dr. Anya Khanthavit is a Distinguished Professor of Finance and Banking at the Faculty of Commerce and Accountancy, Thammasat University, Bangkok, Thailand. He holds a Ph. D. in International Business and Finance from New York University's Leonard N. Stern School of Business. Email: akhantha@tu.ac.th

attributes similar to investment. Meanwhile, its other attributes are similar to gambling. Although it is conceptually intermediate between gambling and investment, speculation is considered as involvement in gambling.

Stock trading is not the only gambling option. Alternative examples include lottery gambling (Dorn et al., 2015; Gao & Lin, 2015), casino gaming (Tsai & Gu, 2006), and sports betting (Cox, Schwartz, & Van Ness, 2020). Human brains have limited cognitive processing capacity (Pashler & Johnston, 1998), and attention is a scarce cognitive resource (Kahneman, 1973). When investors are presented with competing gambling options, their limited processing capacity forces them to allocate attention to selective choices or to substitute attention to one choice for another (Peng & Xiong, 2006). Ruan and Zhang (2016) prove, in Kyle's (1985) market, that higher attention leads to higher trading intensity in contexts involving fully and limitedly attentive investors. Empirical findings support this prediction (Chen & Lo, 2019; Da, Engelberg, & Gao, 2011; Yang, Ma, Wang, & Wang, 2020).

If higher attention leads to higher attentive activities (Ruan & Zhang, 2016) while attention is limited, attention must be allocated (Kahneman, 1973; Pashler & Johnston, 1998). Consequently, higher attention on one gambling choice should result in lower activity in its competing choices. In the United States, Tsai and Gu (2006) reported that casino revenue in Atlantic City decreases when the stock market rises. Gao and Lin (2015) discovered an association between a low trading volume in the Taiwanese stock market and large lottery jackpots.

Using the generalized method of moments (GMM) regression, this study examines the relationship between gambling attention and retail trading volume in Thailand. The Stock Exchange of Thailand (SET), the largest stock exchange in Thailand, is one of the most important markets in the world. With a market capitalization of $592 billion, SET is the 24th largest stock market in the world and the 12th largest market in the Asia-Pacific region (World Federation of Exchanges, 2022). Retail investors dominate SET. From June 2002 to January 2007, the average share of retail trading volume was 50.25%. French (2017) found that retail investors are the only influential group in SET. This finding is consistent with the significant role played by retail investors in Barber, Odean, and Zhu (2008).

This study focuses on gambling attention. As attention cannot be observed, the study follows Da et al. (2011), whereby attention is proxied using Google's search volume index (SVI) on a gambling-related query. Compared to alternative proxies, such as extreme returns, trading volumes, and media coverage, SVIs are active proxies that directly reflect the attention of retail investors in a continuous and timely manner (Ding & Hou, 2015).

Thailand and the SET are among the most interesting countries and markets, respectively, for gambling research. Compared to the global prevalence rate of 26%, Thailand's gambling rate is 45.52% (Casino.org, 2021). Heavy gamblers account for 9.45% of the population (Komonpaisarn, 2020). Thai retail investors are Asian. According to Arthur et al. (2015), Asian investors are high-risk stock traders in Canada. Kumar, Nguyen, and Putniņš (2021) studied gambling activities in 38 countries, finding that stock-gambling activities are 3.5 times higher than traditional-gambling activities. Gambling-motivated trading in the Thai market accounts for 34.14%, which is the highest among the sample markets. China ranked second, with a share of 31.81 %.

More than 32 million Thai people play traditional gambling activities, such as lotteries, card and dice games, and sports betting (Center for Gambling Studies, 2022). Government and underground lotteries were the most popular gambling venues, and were ranked first and second, respectively. Therefore, this study chooses lottery gambling as a representative of gambling choices and an alternative to stock trading. Lottery gambling has served as a representative gambling activity in previous gambling-attention studies (Gao & Lin, 2015; Chen, Kumar, & Zhang, 2021).

Thailand's government lottery has fixed jackpot prizes, whereas underground lottery payouts rely on government lottery drawings. It is unlikely that the size of jackpot prizes or SVIs for general lottery-related queries are good proxies for lottery-gambling attention. This study recognizes the unique characteristics of gamblers in the Thai lottery. They employ superstitious beliefs in search of lucky numbers, using the internet or guidebooks (Pusaksrikit, Pongsakornrungsilp, Chinchanachokchai, & Crosby, 2018). High attention to lottery gambling should lead to lucky-number queries. In the Thai language, the term for *lucky number* is *เลขเด็ด* (*Lek̄h dĕd*). This study follows Khanthavit (2021) in using the SVI based on a query to proxy gambling activities.

Most studies that proxy investor attention using SVIs estimate their models using ordinary least squares (OLS) regression (Chen et al., 2021). This method provides biased estimates resulting from two endogeneity problems: omitted variables (OV) and errors in variables (EIV). For the OV problem, trading volumes are explained using various economic and behavioral factors. SVI is a behavioral factor. It is unlikely that the SVIs and control variables cover all significant factors.

SVI serves as the attention proxy. It contains errors that constitute EIV problems. Moreover, DeHann, Lawrence, and Litjens (2021) warned that 69% of SVIs on S&P 500-stock tickers were not from information-seeking investors; the case of gambling-attention SVIs is similar.

Endogeneity problems can be mitigated by an instrumental-variable (IV) regression (Greene, 2018). This study employs a GMM regression for the estimation. The GMM is an IV regression. Its estimators give consistent, asymptotically normal, and efficient estimates in the class of estimators that do not use any extra information besides that contained in the moment conditions (Hansen, 1982).

According to previous studies, the effects of gambling attention on trading volumes have not been consistent. For instance, they are negative in Gao and Lin (2015), but positive in Chen et al. (2021). It is noted that the attention measures are based on lottery gambling, although they are intended for general gambling. The measures bundle general gambling attention (common to stock trading and lottery playing) and lottery-specific attention (specific to lottery playing). These two components work in opposition to each other. General-gambling attention causes gambling sentiment (Mbanga, Darrat, & Park, 2019; Siering, 2013). As a result, investors' risk aversion decreases, and trading volumes rise (Chen et al., 2021). Meanwhile, lottery-specific attention is necessarily reallocated from elsewhere to lottery-playing (Kahneman, 1973; Pashler & Johnston, 1998). Higher lottery-specific attention raises lottery-playing activities and reduces stock trading activities (Ruan & Zhang, 2016). Positive or negative effects depend on the net effects of general gambling and lottery-specific components. This study decomposes the lucky-number SVI into general-gambling and lottery-specific components so that the positive and negative effects of general-gambling and lottery-specific attention can be unbundled and tested separately.

This study contributes to the literature in four main ways. First, the sample was new and interesting. Thailand's gambling prevalence rate is extremely high; SET, one of the world's largest markets, is dominated by retail investors, and gambling-motivated trades are high, even higher than those in the Chinese market. However, gambling-attention studies have never been conducted for SET. Second, the estimates are unbiased. Endogeneity problems are also present in attention studies. This study resolves the endogeneity problems and removes bias using GMM regressions. Third, this study is the first to unbundle a gambling-attention measure into general gambling and lottery-specific components. This technique enables the study to examine their separate roles in stock-trading activities. Fourth, the findings were insightful. The effect of general gambling attention is positive and significant, while that of lottery-specific attention is negative and significant. This finding supports the limited attention explanation for retail investors.

2. METHODOLOGY

2.1 Effect of Gambling Attention on Retail Trading Volume

The study follows Chen et al. (2021), relating trading volume linearly to gambling attention, as in Equation (1).

$$V_t = \beta_0 + \beta_1^A A_t + \varepsilon_t, \quad (1)$$

where the variables V_t and A_t are trading volume and gambling attention, respectively. Variable ε_t is the error term. β_0 is the intercept and β_1^A is the slope coefficient. If gambling attention has no effect, $\beta_1^A = 0$.

2.2 Decomposition of Gambling Attention

2.2.1 General-Gambling and Lottery-Specific Attention

Attention is unobservable. In practice, gambling-attention studies use attention measures based on a representative gamble, such as lotteries, as proxies. Although a lottery-based measure is intended for general gambling, it focuses more on the representative lottery. The measure bundles general-gambling and lottery-specific attention together. General-gambling attention positively affects trading volume (Chen et al., 2021), while a negative effect is expected for lottery-specific attention (Ruan & Zhang, 2016). The coefficient β_1^A reflects the net effect. It can be positive, negative, or zero depending on which attention dominates.

This study decomposes the attention variable A_t into the general-gambling component G_t and lottery-specific component L_t, such that:

$$A_t = G_t + L_t. \quad (2)$$

Equation (1) has been revised to Equation (3), allowing the effects of G_t and L_t to be analyzed separately.

$$V_t = \beta_0 + \beta_1^G G_t + \beta_1^L L_t + \varepsilon_t. \quad (3)$$

If the components have no effect, the coefficients β_1^G and β_1^L are insignificant. Significant effects predict a positive and significant β_1^G and a negative and significant β_1^L.

2.2.2 Decomposition Method

Retail trade is motivated by gambling and investment (Kumar et al., 2021). When retail investors search for stock market information, SVIs incorporate information on gambling and investment attention levels. Let M_t^i be the SVI on a stock market-related query i. M_t^i is decomposed into three components: general-gambling attention G_t, i-specific gambling attention g_t^i, and i-specific investment attention I_t^i.

$$M_t^i = G_t + \left(g_t^i + I_t^i\right). \quad (4)$$

In Equations (2) and (4), the general gambling component G_t is the common component. This study follows Zhang, Song, Li, and Liu (2021), using the first principal component of A_t and $M_t^{i \geq 2}$ to represent G_t. The lottery-specific component L_t is the residual of the regression of A_t on G_t.

2.3 Model Estimation

2.3.1 Instrumental-Variable Regressions

In Equations (1) and (3), the variables A_t, G_t, and L_t are measured with errors. Moreover, the explanatory variables for V_t are unlikely to be exhaustive. These factors create endogeneity problems. Traditional OLS regressions provide biased estimates of β_1^A, β_1^G, and β_1^L. Thus, these problems are corrected using instrumental GMM regressions (Greene, 2018).

2.3.2 Construction of Instrumental Variables

IVs must be informative, meaning that they must be able to explain the explanatory variables. They must also be valid as they are not correlated with the error term in the OLS regression equation. IV choices have been proposed in the literature (e.g. Durbin, 1954; Pal, 1980). This study used the simple method proposed by Durbin (1954) to construct IVs. $\boldsymbol{X}_t$ is the vector of explanatory variables at time t. The Durbin IVs are $\boldsymbol{Z}_t^D = \boldsymbol{X}_t * \boldsymbol{X}_t$, where $*$ denotes the Hadamard element-by-element matrix multiplication operator. Durbin (1954) pointed out that there is no single best IV. Alternative IVs are recommended for robustness checks.

2.4 Hypothesis Tests

In Equation (1), if gambling attention has a net effect on retail trading volume, the coefficient β_1^A is significant. The null hypothesis is $\beta_1^A = 0$. Equation (2) separates the effects into general-gambling and lottery-specific effects. The hypotheses for the non-significant effects are $\beta_1^G = 0$ and $\beta_1^L = 0$, respectively. *t*-tests were used for the hypothesis testing. The t statistic was computed from Newey and West's (1987) heteroskedasticity and autocorrelation consistent (HAC) standard deviation.

3. DATA

The data are daily. Although Google began reporting SVIs on January 1, 2004, this study chose August 6, 2008, as the first observation. Prior to this date, the SVI data is not reliable (Challet & Ayed, 2014). The sample ended on June 30, 2022, as the Thai government declared June 30, 2022, as the end of the pandemic stage for COVID-19 (Wipatayotin, 2022). The sample was comprised of 3,388 observations.

3.1 Search Volume Indexes

3.1.1 Gambling Attention

This study follows Da et al. (2011) in using Google SVIs to measure retail investors' attention. The SVIs were downloaded from https://trends.google.co.th/ trends/?geo=TH. For gambling attention, the search query is *เลขเด็ด* (*Lekh̄ dĕd*, meaning lucky number in Thai) was used. Two alternative queries—*เลขล็อค* (*Lekh̄ l̆xkh*) and *หวยเด็ด* (*H̄wy dĕd*)—have a meaning close to 'lucky numbers'. They were not considered for this measure because of their low popularity.

3.1.2 Stock-Market Attention

Stock-market attention was measured by three queries, consisting of *ตลาดหุ้น* (*Tlādh̄ûn*, meaning stock market or stock exchange), *ราคาหุ้น* (Rākhā h̄ûn, meaning stock price or share price), and *หุ้นไทย* (*H̄ûn thịy*, meaning Thai stocks), all of which relate to the core components of the Thai stock-market.

3.1.3 Variable Construction

The variables A_t and M_t^i were constructed from the SVIs for gambling and stock market attention, respectively. Let $W_t = A_t, M_t^i,$ and SVI_t^W be the corresponding SVI for W_t. W_t is the de-trended and de-seasonalized SVI_t^W. This trend is the logged time trend, following Khanthavit (2021) and Zhang, Shen, Zhang, and Xiong (2013). Seasonality includes the days of the week and months of the year, as in Nguyen and Pham (2018).

3.1.4 Variables for General-Gambling and Lottery-Specific Attention

G_t is the first principal component of the set of de-trended and de-seasonalized SVIs for gambling and stock market attention. The study regresses A_t on the G_t. The lottery-specific variable, L_t, is the regression residual. All attention variables were standardized using their averages and standard deviations.

3.2 Retail Trading Volume

Retail trading volume V_t is the aggregate of retail investors' buying and selling volume, scaled by market capitalization and multiplied by 10,000. This construction, like Chen and Lo (2019), provides the volume turnover. Trading volume and market capitalization data were obtained from the SET database.

3.3 Descriptive Statistics

Columns 2 and 3 of Table 1 report the descriptive statistics of the trading volume (V_t) and gambling attention (A_t) variables, respectively. These two variables are positively skewed, and fat tailed. The normality hypothesis was rejected by the Jarque-Bera statistic at the 99% confidence level. The variables are autocorrelated, while augmented Dickey-Fuller tests indicate that they are stationary variables.

Variable G_t—the first principal component—can explain 41.94% of the attention SVIs. The descriptive statistics of the variables G_t and L_t are reported in Columns 4 and 5, respectively. The behavior of G_t and L_t is similar to that of the attention variable, A_t.

The fact that the variables are stationary, non-normal, and autocorrelated, supports the use of GMM regressions and the HAC standard deviations. The GMM does not require normally distributed variables. Despite non-normality, the GMM estimators are consistent, asymptotically normal, and efficient. The HAC standard deviations are consistent even when the regression errors are autocorrelated or heteroskedastic.

4. EMPIRICAL RESULTS

4.1 Effect of Gambling Attention on Retail Trading Volume

This study estimates Equation (1) using OLS regression. The coefficient β_1^A is -1.7997 and is significant at the 99% confidence level. The estimate is biased if Equation (1) has endogeneity problems. This study estimates the artificial Hausman coefficient for Equation (1) (Hausman, 1978) to check for endogeneity problems. A non-significant coefficient indicates that no endogeneity problems exist. It was found that the coefficient was significant at the 99% confidence level. OLS coefficient β_1^A is biased.

Equation (1) was re-estimated using the GMM regression. The GMM coefficient β_1^A is unbiased. It equals -3.8149 and is significant at the 99% confidence level. These results are consistent with those reported by Dorn et al. (2015) and Gao and Lin (2015). Higher gambling attention reduces stock trading activities. This finding suggests a substitution effect between lottery gambling and stock trading.

Table 1 Descriptive Statistics

Statistic	Aggregate Retail Trading Volume	Gambling Attention	Components of Gambling Attention	
			General-Gambling	Lottery-Specific
Average	36.0625	0.0000	0.0000	0.0000
Standard Deviation	14.6598	1.0000	1.0000	1.0000
Skewness	1.2082	2.7080	-0.1673	1.5226
Excess Kurtosis	2.1242	8.2135	0.1452	3.4973
First-Order Autocorrelation	0.7980***	0.4349***	0.7254***	0.5291***
Jarque-Bera Statistic	1.46E+03***	1.37E+04***	18.7894***	3.04E+03***
Augmented Dickey-Fuller Statistic	-7.0391***	-5.2805***	-3.2675**	-4.7714***

Note: ** and *** denote significance at the 95% and 99% confidence levels, respectively.

4.2 Effects of General-Gambling and Lottery-Specific Attention

The attention effect β_1^A in Equation (1) is the net effect of positive general-gambling attention and negative lottery-specific attention. Equation (3) describes these different effects.

The artificial Hausman regression for Equation (3) suggests significant endogeneity problems. For this reason, the equation is estimated using the GMM regression method. The results are reported in Column 2 of Table 2. The coefficients for general gambling (β_1^G) and lottery-specific gambling (β_1^L) are 2.0645 and -1.2417, respectively. The results were significant at the 99% confidence level; they support the limited-attention explanation of retail investors' trading. General-gambling attention induces gambling sentiment and risk-seeking behavior, raising retail trading volumes. Retail investors with lottery-gambling pay more for lotteries and trade fewer stocks.

In Equation (3), the two attention components jointly explain 5.80% of the trading volume. For the explained portion, the general-gambling component had a majority share of 73.43 %, while the remaining 26.57% is from the lottery-specific component.

4.3 Informativeness and Validity of Instrumental Variables

For the regression of explanatory variables on the IVs, the degree of informativeness is measured by a high coefficient of determination (R^2). A low R^2 from the regression of error ε_t in Equations (1) and (3) on the IVs indicates valid IVs. For Equation (1), the informativeness and validity R^2s are 0.2816 and 0.0054, respectively. For Equation (3), the informativeness R^2 for the general-gambling IV and lottery-specific IV are 0.9869 and 0.5780, respectively. The validity R^2 is 0.0006. The R^2 statistics indicate that the Durbin IVs for Equations (1) and (3) are informative and valid.

5. DISCUSSION

5.1 Robustness Check

This study chose Durbin's (1954) IVs because of their simplicity. Although the informativeness and validity have been verified, alternative IVs are available. To check for robustness, Equation (3) was re-estimated by substituting Pal's (1980) IVs for Durbin's (1954) IVs. The Pal IVs are $\boldsymbol{Z}_t^P = \boldsymbol{X}_t * \boldsymbol{X}_t * \boldsymbol{X}_t - 3\boldsymbol{X}_t * \overline{\boldsymbol{X}}$, where vector $\overline{\boldsymbol{X}}$ is the vector average of the explanatory variables. Based on the Pal IVs, the coefficients β_1^G and β_1^L are 1.9657 and -1.1841, respectively. They are significant at the 99% confidence level. The results are robust to the alternative IV specifications. Durbin IVs were used in subsequent analyses.

5.2 Fun-and-Excitement *vs.* the Financial-Risk-Exposure Hypotheses

Gao and Lin (2015) propose competing hypotheses to describe retail investor trading induced by gambling attention. On the one hand, under the fun-and-excitement hypothesis, stock buying and selling offer investors the same degree of fun and. excitement. Thus, the effects of gambling attention on stock buying and selling should

Table 2 Effects of General-Gambling and Lottery-Specific Attention on Retail Trading Volume

Coefficient	Retail Trading Volume			
	Aggregate	Buying	Selling	Aggregate (COVID-19 Sub-sample)
General-Gambling β_1^G	2.0645***	1.1225***	0.9419***	1.5190*
Lottery-Specific β_1^L	-1.2417***	-0.6590***	-0.5827***	3.5176**

Note: *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

be the same. On the other hand, the financial-risk-exposure hypothesis explains that buying stocks and playing lotteries exposes investors to greater risk. Stock selling reduces exposure. This effect should be stronger for stock buying than for stock selling. Gao and Lin (2015) support the financial-risk-exposure hypothesis using Taiwanese market data.

This study estimates Equation (3) for the retail buying and selling volumes. The two variables are computed from retail buying and selling volumes divided by market capitalization and then scaled by 10,000. Let $\beta_{B,1}^{G}$ and $\beta_{B,1}^{L}$ ($\beta_{S,1}^{G}$ and $\beta_{S,1}^{L}$) be the coefficients of the buying (selling) volume. The fun-and-excitement hypothesis predicts that $\beta_{B,1}^{G} = \beta_{S,1}^{G}$ and $\beta_{B,1}^{L} = \beta_{S,1}^{L}$. However, if the financial-risk-exposure hypothesis is correct, $\beta_{B,1}^{G} > \beta_{S,1}^{G}$ and $\beta_{B,1}^{L} < \beta_{S,1}^{L}$. Columns 3 and 4 of Table 2 report the results. All the coefficients were significant at the 99% confidence level. The coefficients $\beta_{B,1}^{G}$ and $\beta_{S,1}^{G}$ equal 1.1225 and 0.9419, respectively, whereas the coefficients $\beta_{B,1}^{L}$ and $\beta_{S,1}^{L}$ are -0.6590 and -0.5827, respectively. These effects are stronger for buying than for selling volume. This test rejects the $\beta_{B,1}^{G} = \beta_{S,1}^{G}$ hypothesis at the 99% confidence level. Thus, the $\beta_{B,1}^{L} = \beta_{S,1}^{L}$ hypothesis cannot be rejected. Finally, the joint hypothesis of $\beta_{B,1}^{G} = \beta_{S,1}^{G}$ and $\beta_{B,1}^{L} = \beta_{S,1}^{L}$ is rejected at the 99% confidence level. These tests support the financial-risk-exposure hypothesis in the context of the Thai market.

5.3 Effects during the COVID-19 Period

The COVID-19 pandemic affected individuals' mental health, with many turning to gambling and gaming (Király et al., 2020). Chiah, Tian, and Zhong (2022) discovered rising retail trading volume in the Australian market during the COVID-19 period. This study examines the relationship between COVID-19 and retail investors' gambling attention in the Thai market. Equation (3) was estimated based on the sample from April 3, 2020, to June 30, 2022. In order to contain the spread of COVID-19, the Thai government imposed its first curfew on April 3, 2020 (Post Reporters, 2020), while the pandemic stage of COVID-19 ended in Thailand on June 30, 2022 (Wipatayotin, 2022).

The results for the COVID-19 sample are reported in Column 5 of Table 2. The coefficients β_1^G and β_1^L, equal 1.5190 and 3.5176, respectively. Moreover, they are significant at the 90% and 95% confidence levels, respectively. Coefficient β_1^L changes to a positive sign for the COVID-19 sample from a negative sign for the full sample. A significant change could be explained by the fact that during the COVID-19 period, retail investors avoided unnecessary outings. It is difficult for retail investors to reach government or underground lotteries. Lottery-specific attention is achieved through stock trading.

5.4 Preference for Lottery-Like Stocks

Retail investors reveal preferences for lottery-like stocks (Kumar, 2009). This study follows Kumar (2009) in describing lottery-like stocks based on high volatility and positive skewness. Equation (3) was modified to examine retail investors' preferences for lottery-like stocks, as in Equation (5).

$$\begin{aligned} V_t = {} & \beta_0 + \beta_1^G G_t + \beta_{SMA,1}^{G} SMA_t G_t \\ & + \beta_{SKEW,1}^{G} SKEW_t G_t + \beta_1^L L_t \\ & + \beta_{SMA,1}^{L} SMA_t L_t + \beta_{SKEW,1}^{L} SKEW_t L_t \\ & + \varepsilon_t, \end{aligned} \tag{5}$$

where SMA_t and $SKEW_t$ denote the standard deviation and skewness of stock returns on day t. The variable SMA_t was computed using Parkinson's (1980) formula. The study set the Variable $SKEW_t = \frac{R_t^3}{SMA_t^3}$. Variable R_t is the logged return on the SET index portfolio. The SET index is considered to be the main market index for Thailand. This study proxies for the expected cubed return for day t using R_t^3. The SET index data were obtained from the SET database.

If retail investors have preferences for lottery-like stocks, they will trade more stocks when their volatility or skewness increases. The coefficients $\beta^G_{SMA,1}$, $\beta^G_{SKEW,1}$, $\beta^L_{SMA,1}$, or $\beta^L_{SKEW,1}$ must be significant and positive. The coefficients for Equation (5) are reported in Column 2 of Table 3. The coefficients $\beta^G_{SMA,1}$ and $\beta^G_{SKEW,1}$ are positive and significant, while the coefficients $\beta^L_{SMA,1}$ and $\beta^L_{SKEW,1}$ are insignificant. Given the positive and significant $\beta^G_{SMA,1}$ and $\beta^G_{SKEW,1}$, this study concludes that Thai retail investors prefer lottery-like stocks.

5.5 Lottery-Drawing Day Seasonality

Lottery drawings are generally held on the first and sixteenth of each month. Chancharat, Paisarn, and Maporn (2019) report that Thai stock returns and volatility react positively to lottery-drawing events. The researchers described a lottery-drawing day as follows. "*It is not an official holiday for the stock market, but there is strong media attention and a carnival atmosphere on that day.*" Lottery-specific attention should be high during these days.

Drawing-day seasonality has not been tested for retail trading volume. This study proposes Equation (6) for testing.

$$V_t = \beta_0 + \beta^G_1 G_t + \beta^G_{D,1} D_t G_t + \beta^L_1 L_t + \beta^L_{D,1} D_t L_t + \varepsilon_t, \quad (6)$$

where D_t is the drawing day dummy variable. It is 1.00, if day t is the drawing day. Otherwise, it is 0.00. Lottery drawing dates were retrieved from the website (https://horoscope.thaiorc.com/lottery/stats/lotto-years20.php). Drawing day seasonality implies $\beta^G_{D,1}$ or $\beta^L_{D,1}$ is negative and significant.

The coefficients $\beta^G_{D,1}$ and $\beta^L_{D,1}$ are reported in Column 3 of Table 3. The coefficient $\beta^G_{D,1}$ is negative and significant at the 95% confidence level. Coefficient $\beta^L_{D,1}$ is not significant. It is therefore concluded that drawing-day seasonality exists in retail trading volumes.

5.6 Effects on Market Trading Volume and Returns

Retail investors can move to stock markets (Barber et al., 2008). In the Thai market, they are the most influential investor group (French, 2017). For example, Yang et al. (2020) found significant effects of attention on market volume and returns.

The effects of retail investors' attention on market volume V^M_t and returns R_t were tested by substituting these variables for V_t in Equation (3). The market volume is half the aggregate buying and selling volume of all investor groups divided by the market capitalization and multiplied by 10,000. The market return is the logged return on the SET index portfolio. Data on market volume and the SET index were retrieved from the SET database.

Table 3 Effects of Lottery-Like Stock Preferences and Lottery-Drawing Day Seasonality

Coefficient	Lottery-Like Stock Preferences	Lotter-Drawing Day Seasonality
General-Gambling β^G_1	-0.3933	0.2206***
Volatility-Preference $\beta^G_{SMA,1}$	4.2986**	N.A.
Skewness-Preference $\beta^G_{SKEW,1}$	0.4115**	N.A.
Lottery-Drawing Seasonality $\beta^G_{D,1}$	N.A.	-0.3294**
Lottery-Specific β^L_1	-0.8078	-0.1622***
Volatility-Preference $\beta^L_{SMA,1}$	-2.4223	N.A.
Skewness-Preference $\beta^L_{SKEW,1}$	0.2061	N.A.
Lottery-Drawing Seasonality $\beta^L_{D,1}$	N.A.	0.0383

Note: ** and *** denote significance at the 95% and 99% confidence levels, respectively, whereas N.A. = not applicable.

Table 4 Effects on Market Trading Volume and Returns

Coefficient	Market Trading Volume	Market Return
General-Gambling β_1^G	3.1342***	-0.0464*
Lottery-Specific β_1^L	-1.2728***	0.0015

Note: * and *** denote significance at the 90 and 99% confidence levels, respectively.

5.6.1 Market Trading Volume

Column 2 of Table 4 shows that the effects are consistent with those on retail trading volumes. The general-gambling coefficient β_1^G is positive and significant and the lottery-specific coefficient β_1^L is negative and significant. This finding supports the influence of retail investors on the Thai market.

5.6.2 Market Return

Column 3 of Table 4 reports the results. The effect of general gambling attention is negative and significant at the 90% confidence level, indicating that lottery-specific attention had no effect.

Previous studies have reported mixed results on the relationship between gambling attention and contemporaneous market returns. The relationship in Zhang et al. (2021) was positive, while Chen et al. (2021) found no such relationship. Siering (2013) reported a negative relationship. However, these results are for stock-market attention rather than stock-gambling attention. Stock-market and stock-gambling attention lead to investor sentiment (Mbanga et al., 2019). The negative β_1^G in this study is consistent with the findings of Siering (2013). This theory supports a sentiment explanation for a negative relationship. Trades induced by general-gambling attention originate from noise traders. These trades create noise trader risks and pressure the current price downward (De Long, Shleifer, Summers, & Waldmann, 1990). The market returns fall with greater attention.

6. CONCLUSION

Retail investors have limited attention. More attentive gambling increases and less attentive gambling decreases with high and low allocated attention, respectively. For this reason, general-gambling attention raises retail trading volumes, while specific-gambling attention reduces volume. This study decomposes gambling attention, represented by lottery gambling, into general-gambling and lottery-specific components. It estimates the effect of each component on retail trading volume on the Stock Exchange of Thailand. The general-gambling and lottery-specific effects were positive and negative, respectively. These results support the limited attention explanation.

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