TESTING AND MEASUREMENT OF ASYMMETRIC INFORMATION: EMPIRICAL EVIDENCE FROM COMPANIES LISTED ON THE HO CHI MINH CITY STOCK EXCHANGE

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ABSTRACT: *A failed market, or asymmetric information, is a well-known economic concept. This phenomenon can be witnessed in a variety of markets. However, the repercussions of information asymmetry are thought to be more substantial in the stock market. Because, in addition to measurable economic impact, knowledge asymmetry harms trust. The Vietnamese stock market has experienced several successes since its creation, yet it still has many restrictions typical of a young market. The numerous violations of the subjects on the market in recent years reflect those restrictions. Information issues, or more broadly, information asymmetry, are primarily responsible for these errors. The goal of this study was to analyze and assess the degree of information asymmetry in the Vietnamese stock market during a five-year period (2018 – 2022). The author tests the information asymmetry effect using GARCH models for VN-Index data and measures Adverse Selection Component (ASC) using the Glosten & Harris model for the 100 largest capitalization companies on the Ho Chi Minh City Stock Exchange (HOSE). The findings demonstrate information asymmetry, and the ASC value for the entire study period is 89.53%. This empirical finding serves as the foundation for formulating suitable policy recommendations for every market participant, aiding in the growth of a productive, equitable, open, and transparent Vietnamese stock market.*

Keywords: *Stock market, Asymmetric Information, Glosten & Harris model, ARCH/GARCH model.*

1. INTRODUCTION

The stock market in Vietnam was born late and officially began operations just over 22 years ago on July 28, 2000, not a very short time but also not too lengthy. Vietnam's stock market has made numerous milestones while carrying out its functions. The Vietnamese stock market, on the other hand, nevertheless exhibits many of the inherent limits and flaws of a market that is deemed rudimentary and fledgling. Individual investors bear the largest risks and losses, particularly those resulting from the mistakes of other market participants, although their vast number and significant contribution to trading volume. Individual investors' main risks in Vietnam's stock market in recent years have been primarily tied to information factors. One of the root issues to explore is the problem of information transparency, or the fact that actors have unequal amounts of information, often known as asymmetric information. The study's goal is to examine and measure the extent of asymmetric information in transactions on the Vietnamese stock exchange using adverse selection component. The author then develops suitable policy implications for each target group in order to reduce the impact of asymmetric information.

Akerlof (1970) was the first to investigate information asymmetry through an examination of the used automobile market. *Spence (1973)*, extending Akerlof's theory, investigates this problem in the labor market and proposes signaling to lessen information asymmetry in hiring. *Stiglitz (1975)* applies Spence's theory to offer a screening system for successfully grouping and paying workers. Later studies, such as *Glosten & Harris (1988)*, *George et al. (1991)*, *Kim & Ogden (1996)*, *Huang & Stoll (1997)*, sought to evaluate the degree of information asymmetry by using quantitative models. Then, in the study of *Van Ness et al. (2001)*, *Giouvris & Philippatos (2008)*, these models were tested with real stock market data. The concept of

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information asymmetry is a reasonably frequent research topic in domestic studies. The authors investigate information asymmetry in a variety of industries, including insurance, labor, and agricultural products, although the majority of their studies focus on information asymmetry in the stock market. *Hoang (2004)* was one of the first to propose utilizing a group of models with variable variance (ARCH/GARCH) to find information asymmetry effects. *Khang (2007)* and *Hoai & Khang (2008)* both focus on understanding econometric models used to quantify information asymmetry. *Thuan (2009)*, *Mo (2009)* and *Huyen (2011)* investigate the existing status and potential remedies to reduce information asymmetry in the Vietnamese stock market. *Dinh (2012)*, *Thom (2013)*, *Gam (2013)* and *Tu (2013)* study the determining variables and effects of information asymmetry on entities and the stock market. *Ngai et al. (2016)*, *Anh (2021)* and *Phan (2021)* presented and empirically evaluated a model for the degree of information asymmetry in the Ho Chi Minh City stock market.

In general, theoretical, qualitative, and quantitative research on the impacts of information asymmetry, particularly information asymmetry in the stock market, is fairly established. The authors described the existing situation, the elements that influence it, quantified the extent of information asymmetry, and provided methods to mitigate the impact. However, the majority of quantitative studies on information asymmetry merely perform, or test for, information asymmetry, or just assess information asymmetry using adverse selection component to develop models of influence variables. Furthermore, because stock trading data is updated daily, the scope of prior authors' research is frequently between 6 months and each year, which is sporadic owing to the magnitude of the data. As a result, the author employs stock trading data from 2018 to 2022 in this analysis. To assess the information asymmetry effect, GARCH models were applied to VN-Index data, and Glosten & Harris model were used to measure the adverse selection component for the group of 100 highest capitalization companies on HOSE.

2. THEORETICAL FRAMEWORK

2.1. Market Failure and Asymmetric Information

2.1.1. Market Failure

Efficient resource allocation is a critical need of every economy. The potential distribution is determined by the economy's technology and resources. Different people will have different opinions on efficiency and fairness; the common denominator is Pareto efficiency. For a given set of consumer preferences, resources, and technology, a Pareto optimal distribution would make some people wealthy if they did not have the capacity to migrate to a different distribution. without anyone becoming broke. When all markets are perfectly competitive, the supply-demand equilibrium will be Pareto efficient (Stiglitz & Rosengard, 2015).

Competitive equilibrium is an efficient state when there is no distortion. *Begg et al. (2014)* define "market failure" as circumstances in which market equilibrium is inefficient. These distortions prohibit the "invisible hand" from allocating resources efficiently. As a result, the causes of market failure include: imperfect competition, public goods, externalities, and information asymmetry. To overcome these flaws in the market system, today's modern economies are a hybrid of the "invisible hand" and the "visible hand". Operating the economy only through market mechanisms or state regulation is like to clapping with one hand (Samuelson, 1915).

2.1.2. Asymmetric in economics

Akerlof's "The market for lemons: Quality uncertainty and the market mechanism" in 1970 was the first to present the theory of information asymmetry. Asymmetric information occurs when one side in a market transaction has more and better information than the other. Disparities in information put pressure on businesses to distort transactions. Although the idea of information asymmetry has only been around since the 1970s, it was verified when three economists studying it, George Akerlof, Michael Spence, and Joseph Stiglitz, were awarded the Nobel Prize in Economics in 2015.

The asymmetric information model assumes that at least one party to the transaction has superior information than the other(s), or that one party can influence, respond, or demand terms that affect the initial transaction agreement while the other(s) cannot. According to Akerlof, information asymmetry will result in the establishment of a market with many "bad" items, while excellent ones will be excluded. The cash market manifests itself in a variety of markets, including labor, banking, real estate, insurance, securities, used furniture, and so on.

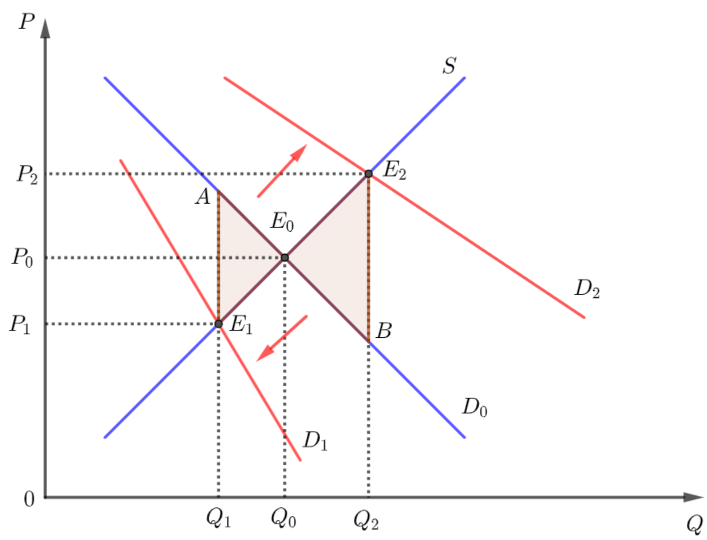

Figure 1. Economical effect of Asymmetric Information

Source: The author draws by Geogrebra

The economy is initially in equilibrium at point E_0 in Figure 1, with price P_0 and output Q_0. If an exchange rate influences the demand side, shifting the curve to the left, the new equilibrium point will be E_1. At E_1, the pricing is $P_1 < P_0$ and the output is $Q_1 < Q_0$. As a result of the old equilibrium, the total social residual loses the area of triangle E_0E_1A (a waste of time). Similarly, if asymmetric knowledge causes the demand curve to move to the right, the welfare loss would be E_0E_2B in a triangle analysis. To summarize, information asymmetry in both of these circumstances leads to society's poor use of consumption, resulting in a loss of profits to the economy.

Asymmetric information is a market failing those results in the following outcomes:

+ **Adverse Selection:** When participants in a transaction purposefully withhold information, purchasers lack accurate and complete knowledge and give a price willing to pay less than the true value of the items. As a result, vendors lose the incentive to produce high-quality goods and instead supply things of poor quality. As a result, low-quality items – "lemons" – pushed high-quality goods out of the market (Akerlof, 1970).

+ **Moral Hazard:** A situation that emerges after a transaction has concluded in which one party plans to conceal information that is difficult for the other party to control or will cost a lot of money to control. The fact that the party with the advantage of information no longer has the incentive to try or act as rationally as before the transaction occurs makes the less informed party fearful of their own risk of loss (Thom, 2013).

+ **Principle – Agent:** A client-agent dilemma occurs when one party (the principal) hires another (the representation) to accomplish one or more specific goals. Because the executor makes it impossible for the principle to enforce, evaluate, or support the work, the executor pursues a different aim than the principal. This is due to the interaction of both unfavorable selection and moral hazard (Nga, 2020).

2.2. Models for testing and measurement asymmetric information

2.2.1. Models to test information asymmetry effects

There has been a great deal of effort towards developing models with variable variance, beginning with Engle's ARCH (1982). *Engle (1982)* was the first to establish a theoretical foundation for risk modeling. ARCH (Autoregressive Conditional Heteroscedastic) is a variable variance autoregressive model. The model's central idea is that the variance of the residuals across time is proportional to the square of the residuals at earlier points in time. As a result, we will estimate both a mean equation and an equation of variance at the same time. Consider the following simple model: $Y = \alpha + \beta X_t + u_t$ with $[X_t]$ is the explanatory variable vector and $[\beta]$ is the regression coefficients vector. According to the premise of the least squares approach $u_t \sim N(0;\sigma^2)$. However, Engle permits the incorrect approach to vary in real time depending on its precision: $\sigma_t^2 = \lambda_0 + \lambda_1 u_{t-1}^2$. Bollerslev (1986) extended the ARCH model by including the conditional variance's lag variable in the variance equation, resulting in the Generalized Autoregressive Conditional Heteroscedastic (GARCH) model. The GARCH model's variance equation (1,1): $\sigma_t^2 = \lambda_0 + \lambda_1 u_{t-1}^2 + \delta_1 \sigma_{t-1}^2$ (Das, 2019). If the residual delay in the ARCH effect test is too large, it will undermine the reliability of the estimation findings by limiting the number of degrees of freedom in the model. Because this problem is difficult to solve for short time series, GARCH models are more widely utilized in risk forecasting (Hoai et al., 2009).

The ARCH/GARCH risk prediction models have been heavily modified from the original Engle and Bollerslev models. This group includes the exponential GARCH model (EGARCH), the mean GARCH model (GARCH-M), the threshold GARCH model (TGARCH), the power ARCH model (PARCH), and the integrated GARCH model (IGARCH). EGARCH and TGARCH are examples of asymmetric models used to investigate the asymmetric effect of shocks.

To overcome the GARCH model's limitation of being unable to distinguish between the effects of negative and positive shocks, as well as the requirement that the coefficient of the variance equation be non-negative, *Nelson (1991)* proposes the EGARCH model with the assumption that For random variables with an exponential distribution, the variance equation of EGARCH (1,1) is as follows:

$$\ln\left(\sigma_t^2\right) = \omega + \alpha\left(\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}}\right) + \beta \ln\left(\sigma_{t-1}^2\right) + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} \qquad (1)$$

The left-hand side of (3) is the natural logarithm of the conditional variance, suggesting that the leverage effect of the shocks is exponential rather than quadratic as in the original GARCH model, and that even if the parameters are negative, σ_t^2 will be positive (Tsay, 2005). If $\gamma \neq 0$ and $\gamma < 0$ indicate a negative shock that is stronger than a positive shock, then information asymmetry or information asymmetry exists.

With the assumption that shocks have asymmetric effects in mind, the TGARCH model includes a dummy variable into the variance equation that defines negative and positive shocks. TGARCH (1,1) has the following variance equation:

$$\sigma_t^2 = \omega + \alpha u_{t-1}^2 + \beta \sigma_{t-1}^2 + \gamma u_{t-1}^2 d_{t-1} \quad (2) \quad \text{with } d_t = \begin{cases} 1 & (u_t < 0) \\ 0 & (u_t > 0) \end{cases}.$$

A positive shock (or good news, for $u_t > 0$) and a negative shock (or terrible news, for $u_t < 0$) affect the conditional variance differently in the TGARCH model. The partial effect of the good news will be α, whereas the partial effect of the negative news will be $(\alpha + \gamma)$. If $\gamma \neq 0$ occurs, then the asymmetry effect exists, and $\gamma > 0$ demonstrates that negative news has a greater impact than good news (Rabemananjara & Zakoian, 1993; Zakoian, 1994).

2.2.2. Models for calculating adverse selection component

One of the effects of asymmetric information is adverse selection. We can quantify the degree of information asymmetry between investors for public companies by measuring the Adverse Selection Component (ASC). *Glosten & Harris (1988)*, *George, Kaul & Nimalendran (1991)*, *Lin, Sanger & Booth (1995)*, *Kim & Ogden (1996)*, *Huang & Stoll (1997)* are examples of popular econometric models for analyzing information asymmetry.

Glosten and Harris (1988) present one of the first trade indicator regression models for spread decomposition. The basic model is: $\Delta P_t = c_0 \Delta Q_t + c_1 \Delta Q_t V_t + z_0 Q_t + z_1 Q_t V_t + \varepsilon_t \quad (3)$. In there:

+ $\Delta P_t = P_t - P_{t-1}$: The difference in price between time t and time $t-1$;

+ $\Delta Q_t = Q_t - Q_{t-1}$: Q_t is the stock trading index at time t, If it's a sale, receive value -1; if it's a buy, gain value $+1$. However, there will be many continuous transactions in the same time period, making it impossible to determine Q_t. Thus, *Lee & Ready (1991)* identify:

$$Q_t = \begin{cases} +1 & (P_t > P_{t-1}) \\ -1 & (P_t < P_{t-1}) \\ Q_{t-1} & (P_t = P_{t-1}) \end{cases}$$

+ V_t: Trading volume at time ;

+ c_0, c_1, z_0, z_1: Regression coefficients of model (3);

Glosten & Harris argue that the change in transaction price consists of 3 factors: Order cost, storage cost $C = 2(c_0 + c_1 V_t)$, and reverse selection cost $Z = 2(z_0 + z_1 V_t)$. With $\overline{V}_t$ being the average trading volume, ASC is calculated as following formula:

$$ASC = \frac{\overline{Z}}{\overline{C} + \overline{Z}} = \frac{z_0 + z_1 \overline{V}_t}{(c_0 + c_1 \overline{V}_t) + (z_0 + z_1 \overline{V}_t)} \quad (4).$$

3. METHODOLOGY AND DATA

3.1. Research models

3.1.1. GARCH model for testing asymmetric information effect

Nelson (1991), *Glosten et al. (1993)*, *Rabemananjara & Zakoian (1993)* used the EGARCH, GARCH-M, and TARCH models to show that bad news has a bigger impact on price factors on the US stock market than positive news. *Engle & Ng (1993)* compare and confirm the existence of information asymmetry in the Japanese stock market using a variety of models with variable variance conditions. However, a recent study utilizing the VECH-GJR model on the Taiwan stock market by *Chen & Anh (2020)* found no evidence of information asymmetry.

A few authors in Vietnam investigated and investigated the information asymmetry problem in the stock market. *Hoang (2004)* investigates the GARCH effect on the profitability of the Vietnamese stock market from 2000 to 2003, demonstrating that negative news has a stronger, faster, and more direct influence than positive news. This outcome is consistent with similar research in developed markets. *Tien et al. (2017)*, *Anh (2021)* use data from the VN-Index to assess the asymmetry of news on the Vietnamese stock market using two models. The study then employs Akaike information criteria (AIC) and Bayesian information criteria (BIC) to select a superior model, concluding that there is an information asymmetry effect.

3.1.2. Glosten & Harris model for calculating adverse selection component

Glosten & Harris (1988), *George et al. (1991)*, *Lin et al. (1995)*, *Kim & Ogden (1996)*, *Huang & Stoll (1997)* are all regularly used models with reliable estimation results. However, data on the closing price and the volume of matching transactions per day can only be acquired under certain situations. For the Vietnamese stock market, the types of prices and indexes in the models, and are not responsive and difficult to determine. With the Glosten and Harris model, this might be considered the "original" model as the foundation for the study path, employing the ASC of the price gap to evaluate the extent of information asymmetry in the stock market. This model is widely used, as evidenced by the studies of *Van Ness et al. (2001)*, *Park (2008)*, and others. As a result, the author believes that using Glosten and Harris' approach to calculate ASC is appropriate with HOSE transactions. The coefficients c_0, c_1, z_0, z_1 of the (3) model is obtained using the standard least squares regression technique.

3.2. Dataset

The study tests the existence of the information asymmetry effect on the Vietnamese stock market by using a group of conditional variance models that change through the daily closing price of the market representative index (VN-Index). After testing whether there really exists information asymmetry on the empirical data, the author continues to measure the level of information asymmetry by determining the ASC model for the group of 100 largest capitalization stocks listed on HOSE (VN100). The research process can be summarized by the diagram in Figure 2.

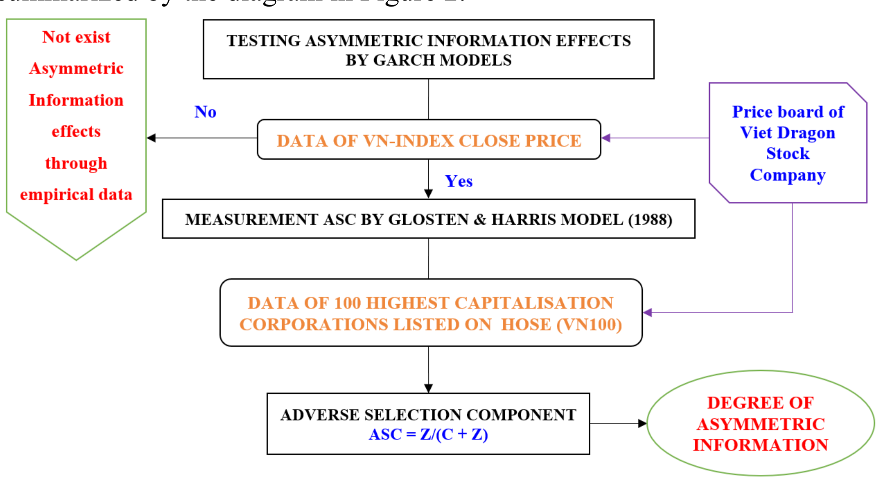

Figure 2. Research process of this paper

Source: The author draws by MS Word

3.2.1. VN-Index for testing by GARCH models

The study employs secondary data, specifically the daily closing price of the VN-Index, to reflect the Vietnamese stock market over a five-year period spanning January 1, 2018 to December 31, 2022. The sample with this data is a time series of days with 1,249 observations. The study calculates the GARCH model group for the profitability of equities traded in the market to assess the information asymmetry effect. The dependent variable is the percentage change in the VN-Index closing price: $R_t = \ln\left(\frac{P_t}{P_{t-1}}\right)$. In there: R_t is the rate of return of stocks on day t, P_t and P_{t-1} is respectively, is the closing price of VN-Index on day t and $t-1$.

3.2.2. VN100 for measurement by Glosten & Harris model

The author calculates the ASC for stocks in the VN100 basket after checking for the existence of an information asymmetry effect using the VN-Index. However, because of the nature of the business and the structure of capital and assets, the author does not calculate for stocks of banks, securities companies, and insurance companies (Van Ness et al., 2001). The total number of companies analyzed is 78/100 of the highest capitalisation corporations listed on the Ho Chi Minh Stock Exchange. The price used to determine the spread is the daily closing price (P_{it}) from January 1, 2018 to December 31, 2022. The total volume of matching transactions for the day (V_{it}) is referred to as volume. Because it is impossible to establish whether the trading volume is from a seller or a buyer, the transaction index is legitimate according to Lee and Ready's (1991) convention.

4. RESULTS AND DISCUSSION

4.1. Descriptive statistics

4.1.1. VN-Index data

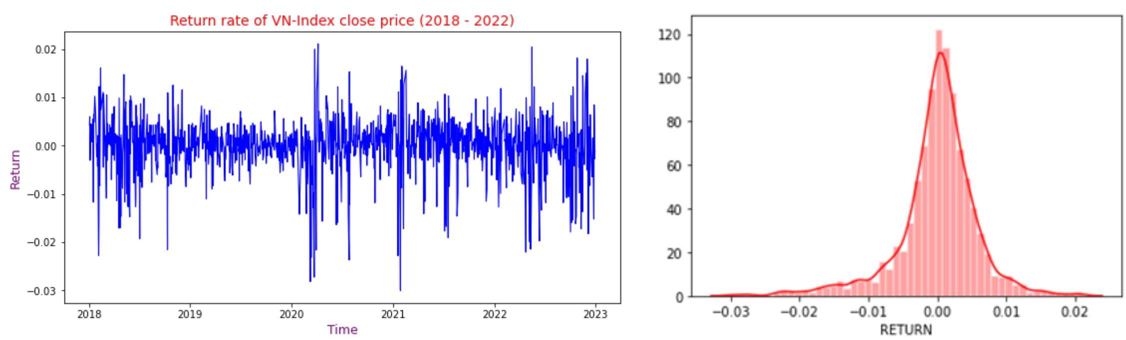

Figure 3. Descriptive statistics of VN-Index series

Source: The author draws by Python

The graph on the left in Figure 3 depicts the yield series of the VN-Index over a 5-year period, demonstrating that the range of returns is (– 0.03; 0.02). The special profit fluctuated extremely much in the first quarters of 2020 and 2021, whereas the subsequent periods, despite swings, had fairly constant profit that only fluctuated around an average of 0. Graph of frequency with the density function of returns in the figure to the right depicts a random distribution of returns, however when compared to the balanced bell shape and parameters with the same Jarque-Bera test result, the series of returns does not match the normal distribution.

4.1.2. VN100 data

Table 1. Descriptive statistics of variables in Glosten & Harris model

Variable	Mean	Medium	Minimum	Maximum	Standard Eror
P_{it}	36,426.64	24,228.80	2,575.60	289,000	33,879.99
V_{it}	2,394,031	856,700	0.0000	1.65×10^8	4,649,556
ΔP_{it}	0.0175	0.0000	– 104,900	92,500	5,211.5633

ΔQ_{it}	0.0002	0.0000	– 2.0000	2.0000	1.3938
$\Delta Q_{it}V_{it}$	– 319.5539	1730.0000	-1.65×10^{8}	1.66×10^{8}	7,185,475
Q_{it}	– 0.0068	0.0000	– 1.0000	1.0000	0.9688
$Q_{it}V_{it}$	250,081.5	0.0000	-1.29×10^{8}	1.65×10^{8}	5,159,617

The data on the VN100 companies is designed as a panel data set with 95,038 observations with a cross-section of 78 companies and a time series of days over 5 years. Among the variables observed are: P_{it}, V_{it}, ΔP_{it}, ΔQ_{it}, $\Delta Q_{it}V_{it}$, Q_{it}, $Q_{it}V_{it}$. Table 1 contains basic descriptive information regarding the variables. In addition to the dummy variable, all variables used to estimate the regression model by Glosten and Harris include random values ranging from negative to positive, indicating the daily increase and fall in stock prices. The price differential can reach 92,500 points on some days, but it can also fall dramatically from the previous day to 104,900 points.

4.2. Result of testing asymmetric information effect

Table 2. Unit root test

Variable	Augmented Dickey-Fuller		Phillips-Perron	
	t-stat	p-value	Adj. t-stat	p-value
R_t	– 33.1199	0.0000	– 33.3158	0.0000

The results in Table 2 show that both the ADF and PP tests produce statistical values with p-value = 0.0000 << 0.01, indicating that hypothesis H_0 is rejected and the VN-Index yield series is stationary at base-order of lag. The author then estimates a simple linear regression model with only constant variables to get residual series. The ARCH effect is tested using this residual series.

Table 3. ARCH effect test

ARCH-LM test			
F-stat	32.5980	p-value	0.0000
Regression with $RESID^2$			
	Coef.	t-stat	p-value
C	1.8×10^{-5}	6.9996	0.0000
$RESID^2(-1)$	0.1433	5.0431	0.0000
$RESID^2(-2)$	0.1444	5.0840	0.0000
$RESID^2(-3)$	0.1424	5.0114	0.0000
$RESID^2(-4)$	0.0349	1.2282	0.2196

If the data cannot reject the hypothesis H_0 that the coefficients in the autoregressive model of variance are all zero, then there is no ARCH effect. When H_0 is refused, there is an ARCH effect. Table 3 shows that the original hypothesis is rejected and that the series of squared residuals has an ARCH effect on the third delay. As a result, the data guarantees two input conditions for the estimate of two models, EGARCH and TGARCH.

Table 4. Estimation result of EGARCH and TGARCH model

EGARCH (1,1)		TGARCH (1,1)	
Variable	**Coef.**	**Variable**	**Coef.**
C	8.9×10^{-6}	C	7.8×10^{-6}
Variance Equation			
ω	– 0.8788***	ω	2.3×10^{-6}***
α	0.2202***	α	0.0305**
β	0.9317***	β	0.8069***
γ	– 0.1091***	γ	0.1578***

Note: *p < 0.1. **p < 0.05. ***p < 0.01.

Based on the γ coefficient, the EGARCH and TGARCH models show that there is an information asymmetry in Vietnam's stock market using VN-Index data from 2018 to 2022, with a significance of 1%.

4.3. Result of measurement Adverse Selection Component

The ASC findings for each ticker from 2018 to 2022 are derived by regressing the OLS for each ticker's data to determine the coefficients c_0, c_1, z_0, z_1, then determining the average trading volume and applying the formula (4). The author must compute ASC for each stock separately in order to have a selective foundation when computing ASC for the full sample. Because the calculation results are significant only when 0 < ASC < 1 is used, stocks with ASC > 1 or ASC < 0 must be removed before calculating the overall ASC for the sample; otherwise, the overall ASC result can be very high or very tiny (Khang, 2007). Results in Appendix show that five equities, including FPT, PDR, PTB, TMS, and VSH, have an ASC greater than one. If these 5 stocks are excluded, the sample will be 73/78 businesses (more than 93% of the sample); still ensure to estimate the model and calculate the ASC.

For each stock, the process of determining ASC for each year or the entire period of 2018 – 2022 is similar. We additionally compute the corresponding average trade volume for that time period, employing a pooled regression model (Pooled OLS) to get the required coefficients. *Brennan & Subrahmanyam (1995)*, *Van Ness et al. (2001)*, *Clarke & Shastri (2001)* construct the ASC without taking into account the statistical significance of the regression coefficients, instead focusing on the event 0 ASC 1. As a result, the author did not take into account or examine the statistical significance of these coefficients.

Table 5. Estimation result of ASC for each year and the period 2018 – 2022

Year	$\overline{V_t}$	c_0	c_1	z_0	z_1	ASC
2018	1.462.565	304.6894	0.0000	2.080.2470	– 0.0001	87.18%
2019	997.474	167.7902	0.0000	1.359.4320	– 0.0001	89.92%
2020	2.177.432	300.3171	0.0000	1.680.8020	0.0000	86.52%
2021	4.093.325	207.8906	0.0000	2.449.8650	0.0000	93.05%
2022	3.548.838	296.4724	0.0000	3.216.2580	0.0000	88.11%
2018 – 2022	2.477.925	224.8042	0.0000	2.098.6050	0.0000	89.53%

In the case of categorized samples, the year with the highest ASC (93.05%) is 2021 while the year with the lowest ASC (86.52%) is 2020. ASC = 89.53% over the entire 5-year period from 2018 to 2022.

4.4. Discussion

Table 6. Result of estimation ASC in some papers

PAPER	MARKET	PERIOD	ASC
Glosten & Harris (1988)	250 companies listed on NYSE	01.12.1981 – 31.12.1983	1.13%
Van Ness et al. (2001)	856 companies listed on NYSE	04.1999 – 06.1999	38.9%
Park (2008)	ETFs on NASDAQ	10.2005 – 12.2005	20%
Hoai & Khang (2008)	104 companies listed on HOSE	02.01.2007 – 28.12.2007	89.66%
Tu (2013)	112 companies listed on HOSE	03.01.2021 – 28.12.2012	72.75%
Ngai et al. (2016)	Companies listed on HOSE	01.12.2012 – 31.05.2013	77%
Phan (2021)	174 companies listed on HOSE	2009	89.2%
		2010	78.5%
		2011	79.1%
		2012	77.9%
		2013	79%
		2014	63.3%
		2015	72.2%
This paper (2023)	78 highest capitalisation companies listed on HOSE	2018	87.18%
		2019	89.92%
		2020	86.52%
		2021	93.05%
		2022	88.11%
		2018 – 2022	89.53%

Table 6 summarizes the research that used the Glosten & Harris model to determine the ASC. ASC was found to be less than 40% in all studies of the US stock market from 1981 to 2005. The ASC for Vietnamese stock market (HOSE) research is nearly always greater than 70%, indicating a large level of information asymmetry. This empirical conclusion accurately represents the challenge of information openness in a young stock market like Vietnam, where mistakes still occur often. The ASC value has increased significantly over the last five years when compared to earlier times, and it's near 90% or even more than 93% in 2021. The results of the author's ASC calculation accurately portray the market condition from 2018 to 2022, including the existing situation and a sequence of infractions. The ASC value of 89.53% for all five years indicates that the potential of reverse selection in a transaction on the Vietnamese stock exchange is quite high, indicating a significant degree of information asymmetry while the study's sample size is small. This is based on the stock code of the Ho Chi Minh Stock Exchange's top 100 companies. This figure highlights the need for Vietnamese investors, listed businesses, policymakers, and related organizations to take more active actions to remove asymmetric information and increase market transparency.

5. CONCLUSION

The paper has been investigated using experimental data, with the results indicating the presence of information asymmetry and a level based on an ASC value of 89.53% over the period 2018 – 2022. To reduce the impact of information asymmetry, synchronized improvements and coordination from all market parties are required. Investors, issuers, securities firms, and state management agencies are key players.

For investors: Before the authorities can protect them, investors must first protect themselves. Second, in order to efficiently manage their investment portfolio, investors must constantly increase their expertise and learn from experience. Third, instead of relying on information conduits from other organizations, investors should actively collect and learn information. Finally, when participating in investments, investors must follow the State's standards on transparency and honesty.

For listed companies:

(i) Recognize and fully adhere to information disclosure regulations.

(ii) Making information available to the public in a timely and accurate manner.

(iii) Fair competition with an honest accounting and internal audit system.

(iv) Closely examine and oversee leaders to limit the problem of Principle – Agent.

For stock companies:

Firstly, stock companies must rigorously adhere to the terms of the law, which requires a thorough understanding of the principles of securities information.

Secondly, stock companies foster an open and honest company culture.

Thirdly, stock companies assemble a team of skilled and accountable employees.

Fourthly, stock companies broaden their customer information channels.

Fifthly, stock companies is continuing to upgrade current equipment.

For the State Securities Commission:

+ The State Securities Commission must conduct regular checks on the ability of enterprises and the audit department, as well as aggressively enforce violations and negative indicators.

+ The State Securities Commission should create a unified legal document on investor protection based on standardizing regulations on stock market management and development in accordance with International Organization of Securities Commissions (IOSCO) recommendations.

+ The State Securities Commission may explore increasing its role and broadening its authority to investigate and manage major violations of stock market matters.

For Stock Exchanges:

+ The procedure by which listed firms provide information should be altered. In fact, because the publicized information is concentrated on this agency, information leakage occurs frequently. As a result, corporations can post information on their mass media system, and the Stock Exchange merely needs to confirm that information.

+ Not only the State Securities Commission but also Stock Exchange can use market surveillance technologies. The supervisory process will be more effective when the Stock Exchange becomes the first supervisory body, lowering pressure on the State Securities Commission and enhancing the Stock Exchange's duty.

+ The Stock Exchange should better coordinate with the media spot anomalous material quickly, open up communication lines, and encourage investor feedback. Because there is a lot of information regarding stock market misbehavior that neither the Stock Exchange nor the State Securities Commission can identify, but due to this media power.

Despite tremendous attempts, the paper contains certain flaws due to restricted time and independent research capacity. First, due to data constraints, the topic can only measure the ASC value using each

Glosten & Harris model. Second, the issue not only tests and measures the level of asymmetric information via the ASC value, but also investigates what circumstances influence this change in value. Third, because it does not cover the entire market, the data size is constrained; when compared to the original studies of Glosten & Harris or Van Ness (2001), the number of observations is still tiny. To address the aforementioned inadequacies and restrictions, the author will assess ASC using multiple models the next time when the database of transaction statistics is changed and the information is released more thoroughly. Furthermore, the author will broaden the group of research stocks to include companies listed on the Hanoi Stock Exchange in order to better understand the factors influencing the level of adverse selection as well as asymmetric information of the Vietnamese stock market.

6. APPENDIX

Appendix E. Results of ASC for each company

ID	ASC	MÃ	ASC	ID	ASC	ID	ASC
AAA	84.12%	DXG	86.82%	KOS	91.65%	SAM	96.19%
AGG	95.98%	DXS	85.32%	MSN	92.49%	SBT	87.92%
ANV	88.51%	FPT	101.53%	MWG	90.60%	SCR	86.35%
ASM	89.04%	FRT	85.63%	NKG	85.78%	SCS	87.53%
BCG	87.86%	GAS	78.80%	NLG	84.96%	SJS	89.11%
BCM	92.31%	GEG	93.34%	NT2	84.83%	SZC	94.69%
BMP	78.77%	GEX	87.00%	NVL	83.74%	TCH	86.69%
BWE	89.12%	GMD	92.46%	PAN	85.28%	TMS	105.19%
CII	83.40%	GVR	92.52%	PC1	89.01%	VCG	90.79%
CMG	97.52%	HBC	87.42%	PDR	104.76%	VGC	89.21%
CRE	93.21%	HDG	80.18%	PHR	91.89%	VHC	87.01%
CTD	83.75%	HNG	94.47%	PLX	91.10%	VHM	98.25%
CTR	86.93%	HPG	94.82%	PNJ	93.72%	VIC	96.02%
DBC	94.55%	HPX	92.39%	POW	89.11%	VJC	83.71%
DCM	83.15%	HSG	87.39%	PPC	89.59%	VNM	92.23%
DGC	94.75%	HT1	89.07%	PTB	106.05%	VPI	96.53%
DGW	94.09%	IMP	88.69%	PVD	88.57%	VRE	92.50%
DHC	85.29%	KBC	89.93%	PVT	87.51%	VSH	107.03%
DIG	79.87%	KDC	78.07%	REE	99.63%		
DPM	90.13%	KDH	89.76%	SAB	82.63%		

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