





# “The bidirectional relationship between investor sentiment and Tobin’s Q: An ARDL analysis of the Vietnamese stock market”

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# THE BIDIRECTIONAL RELATIONSHIP BETWEEN INVESTOR SENTIMENT AND TOBIN'S Q: AN ARDL ANALYSIS OF THE VIETNAMESE STOCK MARKET

## Abstract

Investor sentiment plays a crucial role in shaping firm valuation dynamics within emerging markets, where its bidirectional relationship with Tobin's Q remains a largely uncharted territory. This is especially relevant in contexts like Vietnam, where the dominance of retail investors and the prevalence of herd behavior significantly heighten market volatility, creating unique challenges for understanding market mechanisms. This study delves into the mutual interplay between investor sentiment and Tobin's Q among companies listed on the Vietnamese stock market, aiming to uncover the intricate connections that influence valuation processes. The study employs the Autoregressive Distributed Lag (ARDL) model, a robust econometric approach, to analyze an extensive dataset comprising 410 firms from the Ho Chi Minh City Stock Exchange (HOSE) and Hanoi Stock Exchange (HNX) over the period spanning 2015 to 2023. The findings unveil a multifaceted dynamic: in the short term, investor sentiment negatively affects Tobin's Q, suggesting that excessive market optimism often leads to overvaluation, followed by necessary corrections. In contrast, over the long term, sentiment positively affects Tobin's Q, indicating that sustained positive perceptions can substantially enhance firm valuation. Furthermore, Tobin's Q demonstrates a positive short-term influence on sentiment, reflecting how improved valuations bolster investor confidence, although this influence fades in the long run. Granger causality tests reinforce the presence of a reciprocal short-term relationship between these variables. These insights underscore the critical influence of sentiment on firm valuation within Vietnam's emerging market, providing valuable guidance for investors and policymakers to better manage and mitigate the risks associated with sentiment-driven market fluctuations.

## Keywords

sentiment, Tobin's Q, bidirectionality, relationship, econometrics, management, valuation, behavior

## JEL Classification

G41, G12, C32, G15

## INTRODUCTION

Investor sentiment plays a pivotal role in shaping financial markets, influencing investor behavior and, consequently, market valuations. In emerging markets like Vietnam, where retail investors dominate and exhibit limited financial literacy, sentiment-driven behaviors, such as herd behavior and rumor-based decision-making, often lead to heightened market volatility and investment risk. These characteristics underscore the critical need to understand how investor sentiment impacts firm valuation, particularly through metrics like Tobin's Q, which reflects a firm's intrinsic value and growth prospects. Moreover, the potential for firm valuation to, in turn, influence investor sentiment creates a complex feedback loop that remains underexplored. Investigating this bidirectional relationship is essential for unraveling the intricate dynamics of emerging stock markets, where traditional assumptions of market efficiency may not fully apply.



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Despite the acknowledged importance of investor sentiment, its direct effect on firm value, as proxied by Tobin's Q, has received limited attention, particularly in the context of emerging markets. Existing studies have largely focused on unidirectional effects, examining how sentiment influences stock returns or market volatility, often in developed market settings. However, the possibility of reverse causality – where firm valuation signals future economic conditions and subsequently shapes investor sentiment – remains under-theorized and empirically unsubstantiated. This gap is particularly pronounced in emerging markets like Vietnam, where information asymmetry, herd behavior, and the dominance of retail investors amplify the influence of sentiment on market outcomes. Understanding this bidirectional relationship is not only crucial for advancing behavioral finance theory in contexts where efficient market assumptions are challenged but also for practical applications. Insights from such an investigation can help investors develop more effective strategies to navigate sentiment-driven volatility and enable market regulators in Vietnam to formulate policies that mitigate excessive market fluctuations. This study addresses this scientific gap by examining the reciprocal dynamics between investor sentiment and Tobin's Q in the Vietnamese stock market, shedding light on a critical yet underexplored aspect of emerging market finance.

## 1. LITERATURE REVIEW AND HYPOTHESES

The incorporation of psychological dimensions into financial theory has emerged as a vital area of study, enriching the understanding of market behaviors beyond traditional economic models. This review synthesizes existing research on measuring investor sentiment and its linkages with financial indicators, laying the groundwork for exploring the bidirectional relationship with Tobin's Q in an emerging market context.

Various methodologies have been developed to quantify investor sentiment, drawing from mar-

ket-based indicators, direct market activities, and performance metrics. Here is a summary table of the methods used to measure investor sentiment in previous studies (Table 1).

The interplay between sentiment and financial indicators has been widely examined, particularly regarding stock prices, returns, and market volatility. Table 2 presents the main research findings of previous studies on these relationships.

In conclusion, the literature provides a solid theoretical base for understanding sentiment measurement and its financial implications, yet it falls short in addressing the reciprocal relationship

**Table 1.** Summary of studies on measuring investor sentiment

Category	Study (Year)	Key Findings and Contributions
Market-based Sentiment Measurement	Malkiel (1977)	Linked net mutual fund flows (small-cap stocks) to sentiment; inflows reflect confidence in growth potential.
	Lee et al. (1991)	Linked higher closed-end fund (CEF) discounts to pessimistic sentiment, lower discounts to optimism; CEF discount as sentiment indicator.
	Ritter (1991)	Proposed first-day IPO return as sentiment indicator; excessive optimism leads to a higher first-day trading price.
	Chen et al. (1993)	Investigated CEF discount patterns using data mining; highlighted limitations of conventional financial models in explaining discounts.
	Qiu and Welch (2004)	Included institutional investors and market frictions in CEF discount analysis; price variations driven by retail and institutional investors.
	Baker and Wurgler (2004)	Found an inverse relationship between dividend payouts and sentiment; high sentiment leads to lower dividends, low sentiment to higher dividends.
	Baker and Wurgler (2006)	Positive sentiment drives mutual fund inflows (small-cap stocks), leading to abnormal growth; fund flows as a sentiment indicator.
	Baker and Wurgler (2007)	Suggested firms time IPOs during positive sentiment ("window of opportunity"); number of IPOs as a sentiment signal.

**Table 1 (cont.).** Summary of studies on measuring investor sentiment

Category	Study (Year)	Key Findings and Contributions
Direct Market Activity	Baker and Stein (2004)	High liquidity reflects irrational sentiment; linked to overpricing/underpricing due to short-selling restrictions.
	Baker and Wurgler (2000)	Stock issuance timing reflects sentiment; low returns signal pessimism, affecting issuance decisions.
	Brodie (1940), Barber (1994)	Odd-lot sales as a contrarian sentiment indicator; high sales signal buying opportunities for professionals.
	Wang et al. (2006)	Put-Call Ratio (PCR) predicts market returns; high PCR signals declines, low PCR signals growth.
	Kumar and Lee (2006)	Buy-Sell Imbalance reflects investor psychology; predicts asset returns as a sentiment indicator.
Market Performance Measures	Solt and Statman (1988)	Cognitive biases lead to price distortions; discount sentiment indices reflect investor sentiment.
	Wang et al. (2006)	ARMS Index (TRIN) assesses market mood via advancing/declining stock ratio and volume; reflects market strength.
	Baker and Wurgler (2007)	VIX captures investor mood; high VIX indicates pessimism, low VIX indicates optimism.
Mixed Investor Sentiment	Baker and Wurgler (2007)	Developed sentiment index using principal component analysis (dividend premium, CEF, IPOs, etc.); widely used in research.
Survey Methods	American Association of Individual Investors. (1987), Verma (2008), Brown (2004)	American Association of Individual Investors survey captured investor reactions to market fluctuations over 6 months.
	Investors Intelligence (1963)	Surveyed 100+ financial advisors; assessed optimism/pessimism in bull/bear markets.
	Sentix (2001), Bormann (2013), Heiden et al. (2013)	Weekly survey of 5,000+ investors across 14 markets; contrarian indicator for market trends and reversals.

**Table 2.** Summary of studies on investor sentiment and its impacts

Topic	Study (Year)	Key Findings
Effect on Stock Prices and Returns	Baker & Wurgler (2006, 2007)	Excessive optimism leads to overvaluation, short-term profits, but inverse long-term returns; impacts market-wide.
	Yu et al. (2017)	Positive sentiment increases short-term returns, but long-term corrections occur; causes asset value fluctuations.
	Grigaliūnienė, Ž., & Cibulskienė(2010)	Inverse relationship between sentiment and returns in Scandinavian markets; causes market volatility.
	Verma & Verma (2007)	Positive sentiment drives short-term price growth, high returns in India, especially for high-growth stocks.
	Li et al. (2021)	Bidirectional relationship: optimistic sentiment raises prices/returns; strong returns boost optimism.
	Al-Nasseri et al. (2021)	Bidirectional interaction: positive sentiment increases short-term returns; strong returns enhance optimism.
	Ugurly-Yildirim et al. (2021)	Monetary policy uncertainty negatively impacts sentiment; sentiment and returns have a bidirectional relationship.
Effect on Market Volatility	Giray (2012)	Media sentiment (WSJ columns) influences stock prices and trading volumes, driven by past returns/volumes.
	Brown & Cliff (2004)	Investor optimism increases short-term volatility; peak sentiment signals higher price adjustments.
	Chen et al. (2013)	Sentiment shifts affect VIX; optimism to pessimism causes sharp volatility spikes due to uncertainty.
	Whaley (2000)	VIX ("investor fear gauge") spikes during instability; negative sentiment drives rising volatility.
	Baker & Wurgler (2006)	Optimistic sentiment impacts the volatility of hard-to-value stocks (small-cap, growth stocks).
Connection with Macroeconomic Variables	Qiu & Welch (2004)	Sentiment indicators predict volatility, explain market cycles, and reflect changes in risk tolerance.
	Lemmon & Portniaguina (2006)	Consumer confidence impacts stock returns, especially during volatility; linked to GDP.
	Chen et al. (2011)	Optimistic sentiment leads to positive reactions to good news, ignoring bad news; pessimistic sentiment increases sensitivity to negative news.
	Tetlock (2007)	Negative media tone causes short-term stock price declines; media mediates sentiment-market relationship.
	De Long et al. (1990)	Irrational (noise) traders cause abnormal price fluctuations, indirectly affecting sentiment-macroeconomic relationships.

with Tobin's Q in emerging contexts like Vietnam. This gap underscores the need for further investigation, with the objective of this study being to analyze the bidirectional influence between investor sentiment and Tobin's Q within the Vietnamese stock market, employing advanced econometric techniques to fill this research void. To achieve this objective, the study seeks to address the following key questions:

(1) How is investor sentiment constructed in the Vietnamese stock market? (2) Is there a bidirectional interaction between investor sentiment and Tobin's Q?

The following hypotheses are proposed:

*H<sub>1</sub>: There is a significant short-term effect of investor sentiment on Tobin's Q in the Vietnamese stock market.*

*H<sub>2</sub>: There is a significant long-term effect of investor sentiment on Tobin's Q in the Vietnamese stock market.*

*H<sub>3</sub>: There is a significant short-term effect of Tobin's Q on investor sentiment in the Vietnamese stock market.*

*H<sub>4</sub>: There is a significant bidirectional relationship between investor sentiment and Tobin's Q in the Vietnamese stock market.*

## 2. METHODOLOGY

The study sample comprises 410 companies listed on Vietnam's HOSE and HNX exchanges, spanning various industries, sizes, and operational histories, with data from 2015–2023 sourced from fi-

ancial statements and daily trading records. Due to the absence of official sentiment data in Vietnam, where retail investors dominate and exhibit herding biases (Nguyen & Truong, 2021), a sentiment index is constructed to explore its bidirectional relationship with Tobin's Q. Following Baker and Wurgler (2006), this study adopts market-based proxies, widely used for their robustness (Chen et al., 2013; Huang et al., 2015), tailored to Vietnam's context. The closed-end fund discount (CEFD) is excluded due to its absence and ETF data scarcity, aligning with emerging market studies (Chen et al., 2013). Share turnover is omitted due to distortions from high-frequency trading and electronic platforms (Vuong & Suzuki, 2022), replaced by the advance-decline ratio (ADR) from FiiinGroup, which reflects market breadth and sentiment shifts (Brown & Cliff, 2004; Fosback, 1976). A high ADR indicates positive sentiment, while a low ADR signals negativity, effectively capturing short-term fluctuations amid Vietnamese herding behavior. First-day IPO returns (RIPO) are excluded due to limited data and disclosure, substituted by the number of IPOs (NIPO) to reflect similar sentiment trends.

In this study, Principal Component Analysis (PCA) was used. This method reduces data from a high-dimensional space to a lower-dimensional space, simplifying the data while retaining its essential information. Furthermore, PCA helps eliminate less important or noisy variables by focusing on the principal components with higher variance, thus improving the accuracy of the analytical models (Johnson & Wichern, 2002). For time series data, this method provides more efficient explanations (Garthwaite et al., 2002).

The indicators used to form the investor sentiment index are described in Table 3.

**Table 3.** Components of investor sentiment

Variables	Acronym	Measurement	Data source
Dividend premium	DP	$= \log \left[ \left( \frac{\text{Maret value}}{\text{Book value}} \right)_{\text{payers}} - \left( \frac{\text{Maret value}}{\text{Book value}} \right)_{\text{nonpayers}} \right]$	Baker và Wurgler (2006)
Equity Issues Over Total New Issues	EI	$= \frac{\text{The share of equity issues}}{\text{Total equity and debt issues}}$	Baker và Wurgler (2006)
The advance-decline ratio	AD	$= \frac{\text{The number of advancing shares}}{\text{The number of declining shares}}$	Fosback, N. G. (1976)
IPO volume	IPO	<i>The total number of IPOs during the period</i>	Baker và Wurgler (2006)

Tobin's Q represents the market value of a firm's assets relative to their replacement cost. This index is determined based on the market value of the firm's assets and the market value of its debt and equity (Ross et al., 2014).

$$\begin{aligned} & \text{Tobin's } Q \\ &= \frac{\text{Market value of firm's assets}}{\text{Replacement cost of firm's assets}}, \end{aligned} \quad (1)$$

where *Market value of firm's assets* = Market value of equity + Market value of debt, *Replacement cost of firm's assets* = Book value of equity + Book value of debt.

This study adopts a multi-step econometric approach to rigorously analyze the relationship between investor sentiment and Tobin's Q, ensuring the robustness of the findings. Initially, a cross-sectional dependence test is conducted to address potential interdependencies among the units, as conventional unit root tests like Levin, Lin, & Chu (LLC) and Im, Pesaran, & Shin (IPS) assume cross-sectional independence (Garthwaite et al., 2002). Pesaran's test, proposed by M. Hashem Pesaran, is applied to detect such dependence in the panel data; if no cross-sectional correlation is found, traditional unit root tests are used, but if dependence is confirmed, second-generation tests such as Pesaran's CADF and CIPS are employed to account for this issue (Garthwaite et al., 2002). Unit root testing is used to ensure stationarity, a critical assumption in economic models, as non-stationarity can lead to biased or unstable regression results, thereby requiring careful examination of Tobin's Q and investor sentiment over the study period (Garthwaite et al., 2002). To examine both short-term and long-term relationships between these variables, the Autoregressive Distributed Lag (ARDL) approach, proposed by Pesaran and Shin (1995), is selected as the most suitable method given the sample of 410 companies from 2015 to 2023 and the mixed integration orders of the variables, which combine stationary and non-stationary series (Garthwaite et al., 2002). This comprehensive methodology ensures accurate estimation of the dynamic interactions between sentiment and firm valuation.

The general form of the ARDL model for two variables is as follows:

$$\begin{aligned} \text{Tobin's } Q_{i,t} &= \alpha_i + \sum_{p=1}^p \gamma_p \text{Tobin's } Q_{i,t-p} \\ &+ \sum_{q=0}^q \beta_q \text{Sent}_{i,t-q} + \mu_i + \varepsilon_{i,t}, \end{aligned} \quad (2)$$

where *Tobin's*  $Q_{i,t}$  – the value of Tobin's Q for entity  $i$  at time  $t$ , *Sent* $_{i,t}$  – the value of sentiment for entity  $i$  at time  $t$ ,  $\alpha_i$  – the constant specific to each entity,  $\gamma_p$  – the coefficient of the lags of the Tobin's Q variable, where  $p$  represents the number of lag periods,  $\beta_q$  – the coefficient of the lags of the Sentiment variable, where  $q$  represents the number of lag periods,  $\mu_i$  – the fixed or random error component between entities,  $\varepsilon_{i,t}$  – the random error for entity  $i$  at time  $t$ .

$$\begin{aligned} \text{Sent}_{i,t} &= \alpha_i + \sum_{n=1}^n \gamma_n \text{Sent}_{i,t-n} \\ &+ \sum_{m=0}^m \beta_m \text{Tobin's } Q_{i,t-m} + \mu_i + \varepsilon_{i,t}, \end{aligned} \quad (3)$$

where *Tobin's*  $Q_{i,t}$  – the value of Tobin's Q for entity  $i$  at time  $t$ , *Sent* $_{i,t}$  – the value of sentiment for entity  $i$  at time  $t$ ,  $\alpha_i$  – the constant specific to each entity,  $\gamma_n$  – the coefficients of the lags of the Sent variable, with  $n$  representing the number of lag degrees,  $\beta_m$  – the coefficients of the lags of the Tobin's Q variable, with  $m$  representing the number of lag degrees,  $\mu_i$  – the fixed or random error component across entities,  $\varepsilon_{i,t}$  – the random error term for entity  $i$  at time  $t$ .

According to Pesaran and Shin (1995), the ARDL method consists of three steps as follows: The first step involves testing for a cointegration relationship between the variables using the bound testing approach. The second step involves estimating the coefficients of the long-term relationships identified in the first step. The third step is to estimate the coefficients for the short-term dynamics.

Additionally, the Granger Causality test (Granger, 1969) is used in this study to determine whether the Tobin's Q variable can help predict the future value of the Sentiment variable, or vice versa, by examining the lags of each variable. This method tests whether changes in Tobin's Q (or Sentiment) at a previous time provide useful information for predicting changes in Sentiment (or Tobin's Q) at subsequent time periods. Specifically, this test

helps determine whether one variable “Granger causes” the other, meaning that one variable can predict the changes of the other in the future, with the assumption that the past dependence of a variable can provide information to forecast the other variable.

### 3. RESULTS

To construct the investor sentiment index, Principal Component Analysis (PCA) is employed to reduce the dimensionality of the characteristic vectors. Table 4 describes the four proxies used to construct the sentiment indices. There is a positive correlation between Dividend Premium and the Advance-Decline Ratio, as well as between Equity Issues Over Total New Issues and the Advance-Decline Ratio. There is a negative correlation between Dividend Premium and Equity Issues Over Total New Issues, Dividend Premium and IPO Volume, IPO Volume and Equity Issues Over Total New Issues, between the Advance-Decline Ratio and IPO Volume.

Table 4 provides descriptive statistics for the four components and the correlations between the components of the sentiment variable for the entire sample of 410 listed companies on the HOSE

and HNX exchanges from 2015 to 2023. The descriptive statistics are presented in Panel A. The Pearson correlation coefficients between the components are shown in Panel B.

According to Garthwaite et al. (2002), based on the Kaiser criterion, among the components, those with an Eigenvalue greater than 1 should be selected, as they contribute significantly to explaining the variance in the data. Based on the Scree Plot, Garthwaite (2002) suggests retaining the principal components before the curve begins to “flatten” (often referred to as the “elbow” point). Components beyond this point typically contribute little to the variance and can be discarded.

Table 5 presents the results of the Principal Component Analysis (PCA), while Figure 1 displays the corresponding Scree Plot. The first component (COMP1) has an Eigenvalue of 1.27171, accounting for 31.79% of the total variance, and the second component (COMP2) has an Eigenvalue of 1.01529, explaining 25.38%, resulting in a cumulative variance of 57.18%. The third component (COMP3) has an Eigenvalue of 0.986596, slightly below the Kaiser criterion, and explains 24.66%, while the fourth component (COMP4) has an Eigenvalue of 0.726402, contributing 18.16%. The Scree Plot clearly indicates an elbow after COMP2,

**Table 4.** Descriptive statistics and correlations of sentiment components

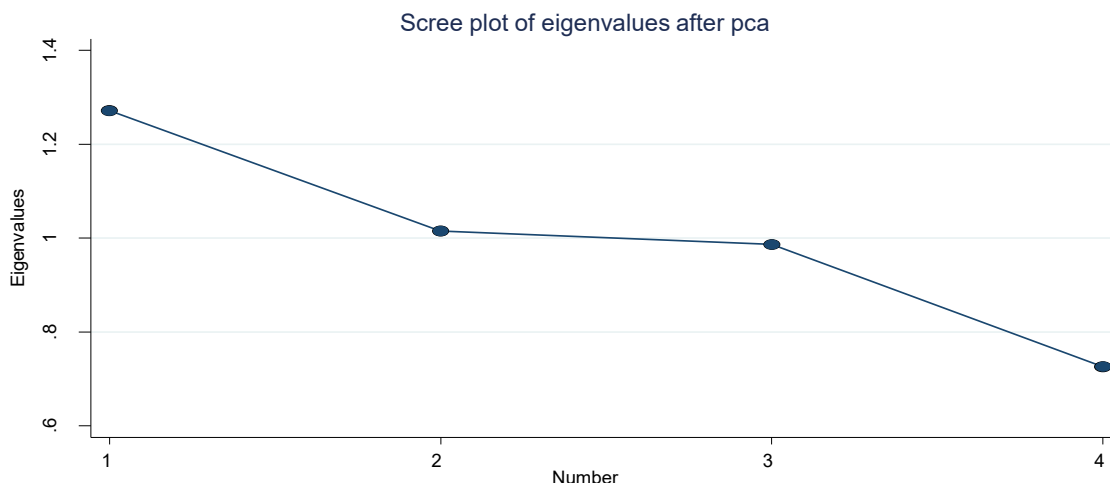
Panel A. Descriptive statistics					
Variable name	Obs	Mean	Std. Dev.	Min	Max
DP	3,690	0.575	1.388	-1.689	3.859
EI	3,690	-0.003	18.275	-783.506	354.780
AD	3,690	1.148	0.144	0.982	1.327
IPO	3,690	31,200,000	112,000,000	500,000	1,900,000,000

Panel B. Pearson correlation coefficients				
Variables	Dividend premium	Equity Issues Over Total New Issues	The advance-decline ratio	IPO volume
Dividend premium	1.000			
Equity Issues Over Total New Issues	-0.012	1.000		
The advance-decline ratio	0.272	0.022	1.000	
IPOvolume	-0.000	-0.014	-0.000	1.000

**Table 5.** PCA analysis results of the sentiment variable components

Component	Eigenvalue	Difference	Proportion	Cumulative
Com1	1.272	0.256	0.318	0.318
Com2	1.015	0.029	0.254	0.572
Com3	0.987	0.260	0.247	0.818
Com4	0.726		0.182	1.000



**Figure 1.** Scree plot of eigenvalue after principal component

where the Eigenvalues fall below 1, and the additional variance explained significantly declines (from 25.38% for COMP2 to 24.66% for COMP3). Although the Eigenvalue for COMP3 is close to 1, its influence is primarily driven by IPO data (as shown in Table 5), which may reflect specific regulatory or market conditions rather than a broad measure of investor sentiment in Vietnam. Retaining COMP1 and COMP2, which together account for 57.18% of the variance, is adequate for representing the sentiment index, aligning with the approach of Baker and Wurgler (2006), who typically retain components that explain more than 50% of the variance.

**Table 6.** Loadings (eigenvectors) of each proxy on the principal components

Proxy	COMP1	COMP2	COMP3
DP	0.7060	-0.0572	-0.0566
EI	0.0269	0.7270	0.6805
AD	0.7077	0.0281	0.0321
IPO	-0.0014	-0.6836	0.7298

According to Table 6, COMP1 exhibits strong loadings on AD (0.7077) and DP (0.7060), reflecting short-term market sentiment driven by the advance-decline ratio (which serves as a proxy for herd behavior and speculative actions in Vietnam) and the dividend premium (indicating a preference for dividend-paying stocks during periods of market downturn). The loadings for EI (0.0269) and IPO (-0.0014) are minimal, suggesting their limited contribution to this component. COMP2, on the other hand, shows a significant loading on EI (0.7270), capturing long-term sentiment tied to cor-

porate equity issuance decisions in optimistic market conditions, and a notable negative loading on IPO (-0.6836), implying that periods of heightened equity issuance may coincide with fewer IPOs, potentially due to market saturation or regulatory limitations in Vietnam. The loadings of DP (-0.0572) and AD (0.0281) in COMP2 are relatively low. The substantial loadings of AD and DP in COMP1 align with their role in capturing short-term investor sentiment, while EI in COMP2 reflects longer-term market optimism, in line with the findings of Baker and Wurgler (2006). Despite COMP3 showing a significant loading on IPO (0.7298), its Eigenvalue below 1 and its emphasis on IPO activity – which could be influenced by regulatory factors rather than pure investor sentiment – justify its exclusion. The sentiment index is constructed as a weighted sum of COMP1 and COMP2, with weights proportional to their respective explained variances (31.79% and 25.38%, respectively, out of the total 57.18% explained by these two components). Specifically, the index is computed as:

$$Sentiment\ Index = 0.556 \cdot COMP1 + 0.444 \cdot COMP2. \tag{4}$$

The weights are calculated based on the share of total explained variance attributed to each component ( $0.556 = 31.79/57.18$ ,  $0.444 = 25.38/57.18$ ). The index is then standardized to have a mean of zero and a standard deviation of one, where positive values represent optimistic sentiment and negative values indicate pessimistic sentiment. This sentiment index is subsequently utilized in the ARDL models to explore its relationship with Tobin's Q.

**Table 7.** Descriptive statistics and correlations of Tobin's Q and investor sentiment

Panel C: Descriptive Statistics (Average Values for the Period 2015–2023)						Panel D: Correlation between Tobin's Q and Sent	
Variable	Obs	Mean	Std. Dev	Min	Max	Tobin's Q	Sent
TobinsQ	3,690	1.197	0.878	0.150	16.844	1.000	
Sent	3,690	-0.000	0.411	-11.079	5.301	0.050*	1.000

Panel E: Descriptive Statistics (Annual Average Values)									
Variables		Sentiment				Tobin's Q			
Year	Obs	Mean	Std. Dev	Min	Max	Mean	Std. Dev	Min	Max
2015	410	-0.219	0.539	-11.079	0.368	1.085	0.657	0.228	9.267
2016	410	-0.262	0.077	-0.999	0.390	1.267	1.294	0.299	16.844
2017	410	-0.354	0.427	-7.973	0.608	1.260	1.011	0.207	15.035
2018	410	-0.222	0.137	-0.399	2.228	1.193	0.863	0.183	11.486
2019	410	-0.362	0.041	-0.855	-0.002	1.131	0.725	0.150	8.777
2020	410	0.236	0.043	-0.096	0.646	1.091	0.650	0.152	8.015
2021	410	0.399	0.053	-0.040	0.980	1.306	0.847	0.486	13.099
2022	410	0.386	0.257	-0.953	5.301	1.299	0.912	0.432	10.657
2023	410	0.397	0.097	-0.895	1.797	1.139	0.721	0.277	9.166

Table 7 provides descriptive statistics for the values of Tobin's Q and Sentiment for the entire sample of 410 listed companies on the HOSE and HNX exchanges from 2015 to 2023. The average statistics for the period 2015-2023 are presented in Panel C. The Pearson correlation coefficients between the two variables are shown in Panel D.

Table 7 presents the descriptive statistics for all the variables. The average value of Tobin's Q during this period is 1.197, with a large standard deviation of 0.878. The minimum and maximum values of Tobin's Q are 0.150 and 16.844, respectively.

The average value of the Sentiment variable is -0.000, with a standard deviation of 0.411. The values of Sentiment range from -11.079 to 5.300.

The descriptive statistics for each year show significant fluctuations in both Tobin's Q and investor sentiment over the five-year period. Notably, the Sentiment variable had a negative average value from 2015 to 2019, but from 2020 onwards, the value of this variable shifted to a positive value. This shift indicates a reversal in investor sentiment during this period.

**Table 8.** Analysis of panel unit root

Variables	CIPS(at level) Intercept	CIPS(1 <sup>st</sup> different) Intercept	CIPS (at level) Intercept and trend	CIPS (1 <sup>st</sup> different) Intercept and trend
Tobin's Q	-2.779	-3.072***	-3.343***	1.700
Sent	-3.332 ***	-3.025***	-3.221**	1.700

Note: CIPS is the Pesaran unit root test that accounts for cross-sectional dependence. \*\* and \*\*\* significance levels at 5% and 1%, respectively.

According to the correlation coefficients in Table 5, Panel D, there is a statistically significant positive relationship between Tobin's Q and Sentiment for the sample.

Pesaran's test, proposed by M. Hashem Pesaran, is a method for testing cross-sectional dependence in panel data. A common reality is that when cross-sectional units are not entirely independent of each other, they could be affected by common factors or systemic shocks. Pesaran's test tests the null hypothesis that there is no cross-sectional dependence in the data. The results of Pesaran's test for cross-sectional dependence show that the P-value < 0.05, indicating the existence of cross-sectional dependence among the units.

The results of the cross-sectional dependence test reveal the existence of cross-sectional dependence among the units in the data. Therefore, the assumptions in the first-generation unit root test are violated. To ensure unbiased estimates and increase the accuracy of the tests, we proceed with second-generation unit root testing to reduce bias (Pesaran, 2007).

The test results in Table 8 show that the variable sent is stationary at level, while Tobin's Q is stationary at its first difference in the no-trend scenario. In contrast, both variables are stationary at level in the trend scenario. Thus, the use of the panel ARDL model estimation is suitable in this context. Table 8 presents the results of the Pesaran unit root test in both trend and no-trend scenarios for the variables in the research model

The cointegration test results for the panel data analysis demonstrate the importance of modeling long-term sustainable effects to avoid biased outcomes, a principle supported by prior methodologies (Pedroni, 1999; Pesaran et al., 2001). In this study, the Westerlund test is employed to evaluate the presence of a cointegration relationship between investor sentiment and Tobin's Q, revealing a p-value below 0.05, which confirms a significant long-term equilibrium between the two variables.

Table 9 presents the findings from the Panel Autoregressive Distributed Lag (ARDL) model, which investigates the effect of sentiment on Tobin's Q within the Vietnamese stock market. The model is estimated using three different methods: Pooled Mean Group (PMG), Mean Group (MG), and Dynamic Fixed Effects (DFE). To determine the most suitable method, the Hausman test is employed. The test outcomes (PMG vs. MG:  $p = 0.829$ ; MG vs. DFE:  $p = 0.999$ ; DFE vs. PMG:  $p = 0.036$ ) suggest that DFE is the preferred model over PMG ( $p < 0.05$ ), as it accommodates firm-specific heterogeneity while ensuring the consistency of long-term estimates. Consequently, we concentrate on interpreting the DFE results, although the insights from PMG and MG align in terms of directionality.

In the short run, the DFE estimates reveal that Tobin's Q is significantly positively impacted by its lagged value ( $\Delta \text{Tobin's Q} = 0.111$ ,  $p < 0.01$ ). This persistence in firm valuation suggests that market forces and pricing tendencies display inertia, likely driven by momentum in stock prices and stable growth forecasts within the Vietnamese market. In Vietnam, where retail investors predominate and frequently engage in herd behavior (Nguyen & Truong, 2021), a high Tobin's Q in the preceding period may reinforce optimistic investor perceptions, thus sustaining valuation trends.

The investor sentiment index (Sent), derived from four components using Principal Component Analysis (PCA), demonstrates a significant negative correlation with Tobin's Q in the short term (coefficient =  $-0.067$ ,  $p < 0.01$ ). This result implies that a surge in investor sentiment leads to a temporary drop in firm valuation, driven by the interaction among the sentiment index components. Firstly, a high equity issuance ratio reflects investor optimism but increases the share count, thereby diluting the per-share value and exerting downward pressure on stock prices, which in turn reduces Tobin's Q (Baker & Wurgler, 2006). In Vietnam, where information asymmetry is widespread (Nguyen et al., 2021), equity issuance might also signal that managers perceive stock prices to have peaked, thereby undermining investor confidence in future growth. Secondly, the advance-decline ratio captures short-term market optimism or speculative sentiment. In Vietnam, retail investors frequently fuel price hikes through herding behavior (Nguyen & Truong, 2021), but when these price increases are not supported by long-term fundamentals, Tobin's Q declines as the market value no longer aligns with the replacement cost. Thirdly, a high volume of IPOs reflects market enthusiasm, but in Vietnam, where IPO activity is

**Table 9.** Panel ARDL estimation results for Equation (1)

Variables	PMG		MG		DFE	
	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error correlation		-0.870***		-1.528 ***		-0.796***
$\Delta$ Tobin's Q		0.310***		0.5110 ***		0.111***
Sent	0.141***	-0.102***	0.084	-0.240***	.0897***	-0.067***
Constant		0.979***		1.771 ***		0.951***
Observation	3,690		3,690		3,690	
NoHausman Test	PMG vs. MG $p$ -value: 0.829		MG vs. DFE $p$ -value: 0.999		DFE vs. PMG $p$ -value: 0.036	

Note: \*\*\*, \*\*, and \* indicate statistical significance at 1, 5, and 10%, respectively.

limited and regulatory constraints imposed by the State Securities Commission are prominent, this can lead to excessive market reactions, resulting in temporary overvaluation followed by price corrections that decrease Tobin's Q. Lastly, an increase in dividend premiums may signal pessimistic sentiment, as investors tend to favor dividend-paying stocks during times of market uncertainty. Given the low proportion of dividend-paying firms in Vietnam, this shift can dampen confidence in growth-oriented companies, further lowering Tobin's Q in the short term.

Over the long run, the DFE estimates show a significant positive association between the sentiment index and Tobin's Q (coefficient = 0.897,  $p < 0.01$ ). This result suggests that persistent positive investor sentiment contributes to higher firm valuation by bolstering confidence in future economic conditions and stimulating investment in firms with growth potential. The components of the sentiment index contribute to this effect in various ways. A high equity issuance ratio over time signals that firms are capitalizing on market optimism to raise funds for growth-focused investments, such as expanding operations or implementing new technologies, which increases firm value and Tobin's Q. A sustained high number of IPOs indicates a growing market with emerging investment opportunities, enhancing long-term investor confidence and supporting a higher Tobin's Q. A consistently high advance-decline ratio reflects a steady upward market trend, driven not only by sentiment but also by fundamental improvements, thereby further elevating firm valuation. Lastly, a reduction in the dividend premium over time may signal bullish sentiment, as investors increasingly favor growth-oriented companies over dividend-paying ones, a trend that supports higher Tobin's Q in the

context of Vietnam's emerging market. This long-term positive effect contrasts with the short-term negative impact, emphasizing the dual nature of sentiment: while short-term speculative activity can lead to overvaluation and subsequent corrections, long-term sentiment represents broader market optimism that underpins firm valuation.

Table 10 presents the findings from the Panel Autoregressive Distributed Lag (ARDL) model that explores the effect of Tobin's Q on investor sentiment within the Vietnamese stock market. This analysis corresponds to Equation (2), which complements Equation (1) discussed earlier. The model is estimated using three methods: Pooled Mean Group (PMG), Mean Group (MG), and Dynamic Fixed Effects (DFE). The Hausman test is employed to determine the most suitable approach. The test results (MG vs. PMG:  $p = 0.0000$ ; MG vs. DFE:  $p = 0.9513$ ; DFE vs. PMG:  $p = 0.0358$ ) suggest a preference for DFE over PMG ( $p < 0.05$ ), and DFE is not rejected against MG ( $p > 0.1$ ). Nevertheless, the MG vs. PMG test ( $p = 0.0000$ ) indicates significant heterogeneity in long-run coefficients across firms, supporting the use of MG over PMG. To maintain consistency with the findings in Equation (1), where DFE was favored, and considering the high  $p$ -value for MG vs. DFE (0.9513), the DFE results are prioritized for analysis, while recognizing potential heterogeneity in the limitations section.

In the short run, the DFE results indicate that investor sentiment (Sent) is significantly negatively affected by its own lagged value ( $\Delta \text{Sent} = -0.136$ ,  $p < 0.01$ ). This negative persistence implies that previous negative sentiment shocks (such as market declines or unfavorable rumors) continue to influence investor sentiment in the short term. In the context of the Vietnamese stock market, where retail investors are

**Table 10.** Panel ARDL estimation results for Equation (2)

Variables	PMG		MG		DFE	
	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error correlation		-0.003**		-0.374***		-0.364***
$\Delta \text{ Sent}$		-0.477***		-0.428***		-0.136***
Tobin's Q	-0.256***	0.972***	-0.213	1.143***	-0.063	0.038 **
Constant		0.905***		0.871**		0.123***
Observation	3,690		3,690		3,690	
Hausman Test	MG & PMG $p$ -value: 0.0000		MG vs. DFE $p$ -value: 0.9513		DFE vs. PMG $p$ -value: 0.0358	

Note: \*\*\*, \*\*, and \* indicate statistical significance at 1, 5, and 10%, respectively.

predominant and tend to engage in herding behavior (Nguyen & Truong, 2021), negative sentiment can quickly propagate, reinforcing a cycle of pessimism in the short run.

Tobin's Q has a notable positive effect on investor sentiment in the short term (coefficient = 0.038,  $p < 0.05$ ). This suggests that an increase in Tobin's Q, indicating a higher market valuation relative to the replacement cost of assets, boosts investor sentiment. A high Tobin's Q (typically above 1) reflects potential competitive advantages or growth opportunities (Tobin & Brainard, 1977), which can enhance investor confidence, especially in an emerging market like Vietnam. Retail investors, who are often more reactive to market signals and may lack comprehensive financial knowledge might perceive a high Tobin's Q as a sign of promising future performance, leading to heightened optimism. This effect is likely captured in the sentiment index components, such as an increase in the advance-decline ratio (AD) driven by herding behavior or a rise in the number of IPOs as companies seek to leverage favorable market conditions.

In the long run, the DFE results indicate no statistically significant association between Tobin's Q and investor sentiment (coefficient =  $-0.063$ ,  $p > 0.1$ ). This outcome suggests that the positive influence of Tobin's Q on sentiment is temporary and does not extend into the long term. In the Vietnamese market, while Tobin's Q may temporarily enhance investor confidence through signaling effects, long-term sentiment is more likely influenced by broader factors such as macroeconomic conditions (e.g., GDP growth, inflation), overall market sentiment, or regulatory policies, rather than firm-specific valuation indicators like Tobin's Q. The short-lived nature of this effect aligns with the sentiment-driven behavior observed in Vietnam's market, where retail investors often react to short-term indicators but adjust their outlook based on fundamental economic factors over time (Phan et al., 2023).

Table 11 shows the Granger-Causality test results between Tobin's Q and sentiment. The findings indicate that, at the 5% significance level, neither of the null hypotheses is rejected, suggesting a bidirectional causal relationship between Tobin's Q and sentiment. This highlights that both variables influence each other in the Vietnamese stock market. However, the Granger causality from sentiment to Tobin's Q

is more pronounced than the reverse causality from Tobin's Q to sentiment.

**Table 11.** Granger-causality test result

Null Hypothesis	P-value
Sentiment does not Granger-cause Tobin's Q	0.000
Tobin's Q does not Granger-cause sent	0.045

Table 11 presents the results of the Granger-causality test between Tobin's Q and sentiment using the Dumitrescu–Hurlin test for panel data with two regression equations as follows:

$$Tobin's Q_{i,t} = \alpha_i + \sum_{k=1}^k \gamma_{i,k} Tobin's Q_{i,t-k} + \sum_{k=1}^k \beta_{i,k} Sent_{i,t-k} + \varepsilon_{i,t}, \quad (5)$$

$$Sent_{i,t} = \alpha_i + \sum_{k=1}^k \gamma_{i,k} Sent_{i,t-k} + \sum_{k=1}^k \beta_{i,k} Tobin's Q_{i,t-k} + \varepsilon_{i,t}, \quad (6)$$

where  $Tobin's Q_{i,t}$  and  $Sent_{i,t}$  are the observations of the two stationary variables for company  $i$  in period  $t$ .

## 4. DISCUSSION

This study establishes a bidirectional relationship between investor sentiment and Tobin's Q in Vietnam's stock market, aligning with prior findings on sentiment and financial indicators. The positive short-term effect of Tobin's Q on sentiment mirrors Li et al. (2021), Al-Nasseri et al. (2021), and Ugurlu-Yildirim et al. (2021), who identified a two-way interaction between sentiment and stock returns. However, this study focuses on Tobin's Q, rather than stock returns, and provides a novel lens on how firm valuation shapes investor confidence. Conversely, the negative short-term impact of sentiment on Tobin's Q, followed by a positive long-term effect, contrasts with studies like Phan et al. (2020) and Truong et al. (2021), which found sentiment primarily drives stock volatility in Vietnam without exploring firm valuation metrics. This discrepancy may stem from Vietnam's market characteristics: retail investors, dominant in the market (Nguyen & Truong, 2021), often exhibit herd behavior, leading to short-term

overvaluation and subsequent corrections. Over the long term, sustained optimism aligns with expectations of firm growth, enhancing Tobin's Q. The short-term influence of Tobin's Q on sentiment reflects retail investors' sensitivity to valuation signals, though this effect diminishes as investors adjust expectations based on fundamental data.

Future research could explore additional factors, such as macroeconomic variables or social media-derived sentiment, to deepen understanding of these dynamics. Moreover, these findings can inform regulatory policies by the State Securities Commission to mitigate sentiment-driven volatility, enhancing market stability in Vietnam.

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## CONCLUSION

This study aims to assess the reciprocal influence between firm valuation and investor perceptions within Vietnam's stock market. The analysis reveals distinct patterns: initially, heightened investor optimism correlates with a temporary decline in firm valuation, suggesting potential overestimations that adjust over time. Conversely, sustained positive perceptions contribute to an enhanced firm valuation over an extended period. Additionally, firm valuation positively affects investor perceptions in the short term, reinforcing market confidence, though this effect wanes over time. Statistical tests confirm a mutual interaction, highlighting a dynamic short-term cycle. These findings establish a pioneering examination of how valuation metrics and investor attitudes interact in an emerging market, offering a foundation for deeper insights into market behavior and its implications for financial decision-making.

## AUTHOR CONTRIBUTIONS

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Supervision: Trang Tran Thi Thu.

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Visualization: Dien Do Thi.

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