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Integrating and Updating the Stock Market Regulation: A Significant Approach to Enhance the Information Efficiency of the Stock Market

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ABSTRACT

This study investigates the potential for improving stock market efficiency through innovative and integrated regulatory measures. It examines the effects of three proposed measures: (1) requiring shareholders to agree on a unified stock valuation model for stock price setting, (2) encouraging long-term investment horizons, and (3) controlling the behaviors of short-term traders. Using a simulated stock market designed for a virtual company, along with a micro-survey, the study tests six hypotheses related to the impact of these measures on market efficiency. Findings indicate that adopting a unified stock valuation model significantly enhances information efficiency. Additionally, implementing a maturity tax along with the unified model effectively extends shareholders' investment horizons. However, dynamic price limits, which are tied to the fair value derived from the unified model, show limited effectiveness in curbing speculative behavior during market crashes. The study concludes that integrating and updating stock market regulations can improve information efficiency, offering valuable insights for regulators and policymakers, particularly in emerging markets. The limitations include the simulated environment's inability to fully replicate real-world market complexities as well as relatively small sample sizes. Future research should incorporate larger and more diverse samples, extend the simulation duration, and validate findings using additional data sources to strengthen the reliability of the results.

JEL classification: G14, G18, G12

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1. Introduction

The stock market is a vital component of the global economy, enabling companies to raise capital and allowing investors to allocate funds (Brigham & Houston, 2022). However, existing regulatory frameworks often lack integration, resulting in inefficiencies (Saad, 2023). Unlike tangible goods, stocks represent ownership in companies rather than consumable products, which complicates the application of traditional supply-demand pricing mechanisms. To address this, a regulated pricing mechanism is proposed, whereby issuing companies, under regulatory oversight, assume responsibility for pricing. Shareholders would agree upon an efficient valuation model, supervised by the stock market regulator, to generate fair values based on fundamental factors. This approach aims to mitigate speculative influences and enhance overall market efficiency.

The proposal draws upon the analogy of a voting campaign, where currently traders collectively determine the market stock price trend. To ensure efficiency, the campaign would focus on selecting and agreeing upon a common stock valuation model, redirecting market forces toward this model. Moreover, unlike isolated measures—such as taxes, trading halts, or price limits—the proposal advocates for an integrated regulatory framework that incorporates these measures collectively. To establish a fair and efficient pricing mechanism, the stock market regulator would identify approved valuation models. Shareholders would then choose a model aligned with their company's profile. Once the fair value is determined, price limits or taxes would serve a protective function rather than a restrictive role.

The research question driving this investigation is: "Can we improve the stock market efficiency by introducing the following regulatory measures: shareholders in a firm are required to agree on a unified stock valuation approach (Saad, 2023), shareholders in a firm are encouraged to have a long-term investment horizon, and the behaviors of short-term traders are regulated?" The findings of Saad (2023) indicate that the Earnings model demonstrates superior information efficiency in incorporating all available data and determining stock valuations. Nevertheless, to fully leverage the advantages of this stock valuation model, it is necessary to update regulatory measures, particularly the implementation of a new stock pricing mechanism in which shareholders agree on a single stock valuation model to generate stock prices.

This study employs a simulated stock market environment to investigate the impact of regulatory measures on market efficiency. The methodology involves two distinct groups: (1) a group of highly qualified finance lecturers and analysts acting as rational evaluators to establish benchmark stock price trends, and (2) finance students simulating emotional traders operating under both unregulated and regulated market scenarios. The virtual company serves as the focal point for evaluating pricing behaviors and market dynamics. A micro-survey further assessed the effectiveness of specific regulatory measures that could not be tested within the simulation.

The key finding reveals that regulating markets to adopt a unified stock valuation model improves information efficiency. Additionally, complementary measures, such as maturity taxes, were found to extend investment horizons. The research contributes to the existing body of knowledge by highlighting the importance of integrating and updating regulatory frameworks to address inefficiencies in stock markets.

The paper is structured as follows: Section 1 introduces the study and its research question, followed by the literature review and hypotheses development in Section 2, research methods in Section 3, presenting the results in Section 4, and discussion and conclusion in Section 5.

2. Literature Review

2-1. Efficient Market Hypothesis or Efficient Market Objective?

Degutis and Novickytė (2014) defined an efficient stock market as one where stock prices accurately reflect fundamental corporate information. Statman (2019) delineates three levels of efficiency: directional, proportional, and value efficiency. Zahid and Simga-Mugan (2024) found out that while integrated capital markets enhance risk-sharing and efficiency, cross-border barriers, such as information asymmetry, hinder these benefits. Li et al. (2024) concluded that AI adoption significantly reduces stock price crash risk, thereby improving stock market information efficiency. However, studies have revealed investor irrationalities, including overconfidence (Barber & Odean, 2001) and

overreaction (De Bondt & Thaler, 1985), which challenge the assumptions of the Efficient Market Hypothesis (EMH) (Aliber, Kindleberger, & Solow, 2015). Baltussen (2009) critiqued EMH assumptions regarding investor behavior, and empirical evidence demonstrates EMH violations in markets such as Korea, Taiwan, and India (Cheung, Wong, & Ho, 1993; Poshakwale, 1996), as well as inefficiencies in both developed and emerging markets (Alam, Yasmin, Rahman, & SalahUddin, 2011; Hawaldar, Rohit, & Pinto, 2017). Mishkin and Eakins (2011) reported mixed evidence regarding semi-strong form efficiency, while Kumar et al. (2021) highlighted the increasing use of stock markets for speculative gambling. To address these inefficiencies, proposing an "efficient market objective," as an alternative to EMH, shifts the focus toward actively improving market efficiency.

2-2. Stock Market Regulatory Practices for Enhancing Market Efficiency

Investor trust and market efficiency are crucial for market growth (Hamedinia et al., 2022), with regulatory actions playing a key role in enhancing efficiency (Hamedinia et al., 2022). Trading halts, for instance, aid in price reflection and improve efficiency (Bildik, 2004; Kim et al., 2008;). Price limits in China reduce volatility and enhance value, but they may delay price discovery (Dong, 2019). While some argue that their benefits are limited (Bao et al., 2020; Lehmann, 1989;), others suggest that relaxing them could reduce volatility (Chang & Chang, 2021). Transaction taxes, proposed post-GameStop (Duggan, 2021), raise concerns about reduced efficiency (Miller & Tyger, 2020; Saret, 2014), but may mitigate volatility and boost efficiency (Eichfelder & Lau, 2017; Stiglitz, 1989). Veryzhenko et al. (2022) also suggested a non-value-added tax for efficiency. This review underscores the complex link between regulatory actions and market performance, which is deemed vital for understanding efficiency.

2-3. Valuation Models for Determining Fair Value in Efficient Markets

Bidgoli, Bajalan, and Mahmoodi (2010) evaluated stock valuation models in the Tehran Stock Exchange, identifying the P/E multiple as the most effective, while the RIM and DCF models were found to underperform. The P/E model's success was attributed to its popularity among Iranian investors, whereas the RIM's poor performance stemmed from low popularity and inflationary effects on book value. Penman and Sougiannis (1998) found RIM superior to DDM and FCF models due to lower valuation errors. Similarly, Jiang and Lee (2005) highlighted RIM's strength in incorporating volatile earnings and book values, outperforming DDM's reliance on dividends. Lee et al. (1999) supported RIM-derived intrinsic value ratios over other multiples, and Francis et al. (2000) confirmed RIM's accuracy and explanatory power over DDM and FCF models, emphasizing the role of accounting book value. Mayes and Shank (2012) equated the earnings model's value to the constant growth DDM. Saad (2023) demonstrated the NAPV model's efficiency over income-based models, stressing the importance of regulatory measures and model advancements. Tehrani (2006) underscored RIM's flexibility and its integration of ratios such as P/E and P/B, making it preferable to DDM.

The efficiency of the stock market could potentially be improved if shareholders in a firm were to adopt a single, unified stock valuation model to determine stock prices (Saad, 2023). However, the literature on such a unified stock valuation model remains limited. In theory, implementing a stock pricing mechanism based on a unified valuation model could generate fair stock values that reflect the fundamental factors incorporated in the model, as represented by its dynamic variables. This approach would replace the current supply-and-demand pricing mechanism which is susceptible to irrational behavior from traders and investors. Consequently, the informational efficiency of the stock market would be enhanced.

The following hypotheses formulated for this study provide specific expectations for each regulatory measure in relation to stock market efficiency:

H1: The unregulated market is information efficient.

H2: The DDM-regulated market is information efficient.

H3: The RIM-regulated market is information efficient.

H4: The EM-regulated market is information efficient.

H5: The concurrent implementation of a maturity tax and the adoption of a unified stock valuation model by shareholders results in extended investment horizons.

H6: The implementation of dynamic price limits, surrounding the values derived from a unified stock valuation model, is effective in mitigating speculative trading activities.

The hypotheses investigate the impact of a unified stock valuation approach on information efficiency and investor behavior. H1 to H4 suggest that adopting various models, such as Dividend Discount Model (DDM), Residual Income Model (RIM), and Earnings Model (EM), will improve information efficiency in regulated markets. H5 proposes that a maturity tax along with unified valuation models can promote long-term investments. H6 focuses on controlling short-term trading through dynamic price limits based on unified valuations. Figure 1 aligns the study's research question with respect to the pertinent hypotheses.

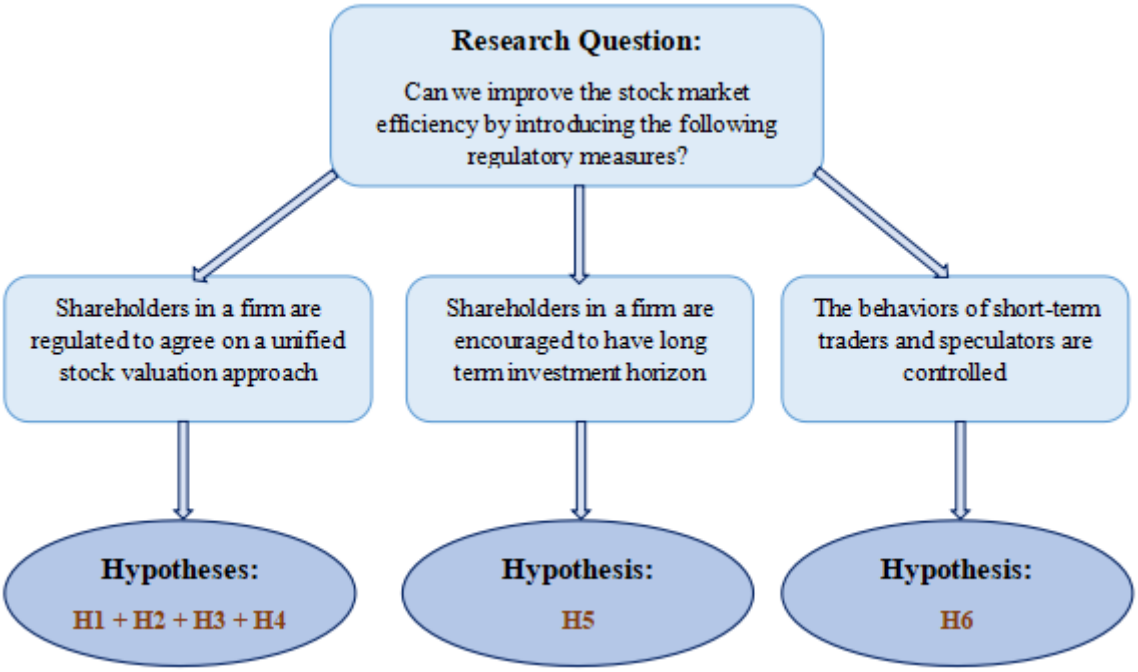


Fig. 1. Research Question and Hypotheses

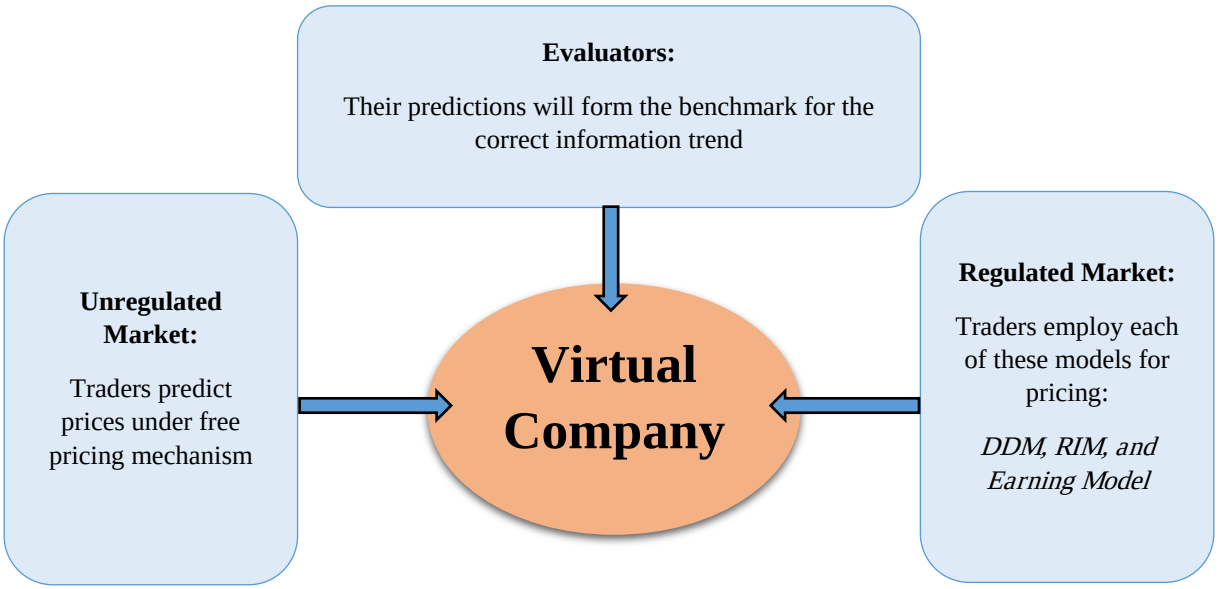
3. Materials and Methods

3-1. Samples and Data Collection in the Simulated Stock Market

The simulation employed in this study is designed to value the stock of a virtual company with a realistic history and a well-planned future of news and developments. The group of evaluators, placed in an environment that ensures they act as rational analysts, will analyze all relevant information to estimate the fair stock price of this virtual company. In parallel, the group of traders, assumed to exhibit emotional behavior similar to real stock market traders, will evaluate the same information to price the stock under two distinct market scenarios: an unregulated market and a regulated market. Figure 2 illustrates the key simulation parameters followed by a detailed explanation of each parameter.

To ensure the study's validity and practical relevance, Whirlpool Corporation was selected as the basis for the virtual company after obtaining explicit permission. Whirlpool was chosen due to its industry relevance as a global leader in home appliances, its extensive and accessible historical financial data, and its financial complexity, which includes both no-growth and growth components—ideal for applying advanced valuation models, such as the Residual Income Model (RIM) and Earnings-Based Models. To maintain anonymity and prevent recognition, the company was renamed Ahoo Co. This approach allows participants to engage with authentic, real-world data in a controlled, simulated environment. Ahoo Co. integrates Whirlpool's historical performance data, enabling participants to analyze past trends, apply technical analysis techniques, and evaluate financial performance over time. The virtual company framework facilitates the testing of various strategies,

regulatory scenarios, valuation approaches, and decision-making models without exposing participants or the company to real-world consequences. To enhance the simulation's realism, a dynamic future for Ahoo Co. was designed, incorporating simulated market events, such as news releases, financial announcements, rumors, and other factors that influence financial markets.



Virtual Company: Ahoo Co.

Fig. 2. The Structure of the Simulated Stock Market

The initial stock price of Ahoo Co. was established at $400 per share, derived through a value decomposition approach that separates the company's value into two components: no-growth and growth. This methodological choice allows for the application of advanced valuation models, such as the Residual Income Model (RIM) and Earnings-Based Models, focusing specifically on evaluating these distinct components. By decomposing the stock's value, the study ensures a robust foundation for participants to assess and interpret the company's financial performance within the simulated market.

To establish the benchmark for correct growth estimation and fair stock price trends, a total of 20 highly qualified finance lecturers and analysts were tasked with analyzing and evaluating all new information released into the simulated stock market. Their predictions served as the benchmark for the correct information trend and were compared with the traders' predictions. The evaluators emulated "Homo-Economicus" investors by making rational decisions, applying probability laws, and processing information efficiently. They were provided with sufficient time and full access to relevant, unbiased data for valuation.

To ensure efficiency, consistency, and ease of data collection, the evaluators submitted their price range predictions using Google Forms. This platform was chosen for its accessibility, user-friendly interface, and ability to streamline the collection and aggregation of responses in real-time. The average of their daily growth rate estimates determines the final daily growth rate estimate for the stock price, establishing the benchmark for accurate growth estimation and a fair information trend.

The decision to have a limited and smaller sample size for the evaluators, in contrast to the 65 traders, was driven by the aim of prioritizing the quality of estimation sources over quantity. It is acknowledged that having an unbiased evaluator with full access to information could be more efficient than a larger group of 65 traders driven by self-interest. The group of 20 evaluators was a highly specialized and homogeneous group, and their smaller sample size was offset by their consistency and rationality in estimating stock prices. Moreover, the time constraints faced by the lecturers and analysts involved in the study necessitated a smaller sample of evaluators. These experts needed to dedicate their time and attention to the simulated stock market during the research period. Expanding the sample size in future research could overcome this limitation. Table 1 presents the qualification criteria and the percentage of evaluators in each group who meet each criterion.

Table 1. Qualification Criteria and Percentage of Evaluators Group Fulfilling Each Criterion

% of the evaluators fulfilling this criterion.	
The evaluator possesses experience in teaching undergraduate courses related to finance	100%
The evaluator possesses experience in teaching graduate courses related to finance	80%
The evaluator holds a doctoral degree (PhD or DBA)	90%
The evaluator is a holder or a candidate of the Chartered Financial Analyst (CFA) designation	20%
The evaluator possesses practical knowledge and expertise in the field of financial markets	70%

The Simulated Stock Market spanned five weeks, representing a five-year lifespan for a virtual company, with each trading day signifying a quarter. To capture real-world dynamics, a total of 65 finance students acted as potential traders. They had access to comprehensive information, including financial statements, news, market rumors, and market data, to predict stock price movements under two scenarios: before and after proposed regulatory measures. This simulation aims to provide insights into the information efficiency of the simulated stock market both with and without these regulatory measures.

The simulated market aimed to mirror the real stock market by including traders with varying educational backgrounds and experience levels. The sample included educated traders with formal finance education, experienced traders without formal education, and non-experienced traders lacking any finance education. Each subgroup contributed diverse perspectives and skills, reflecting the participants diversity in a real financial market. Figure 3 depicts the sample breakdown, highlighting the proportions of educated versus non-educated trader and further dividing non-educated traders into experienced and non-experienced subgroups.

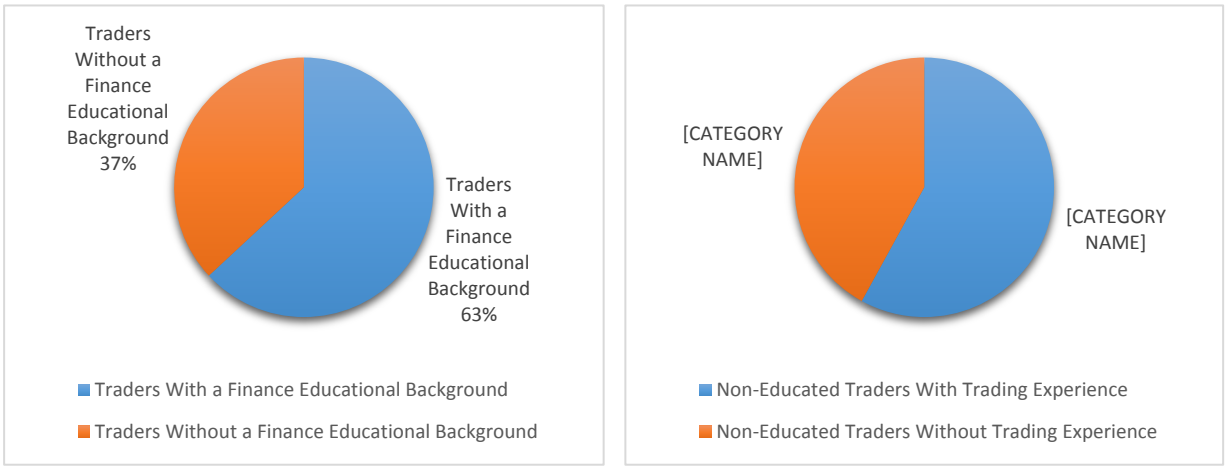


Fig. 3. Education and Experience of Traders in the Simulated Stock Market

The chosen sample size of 65 traders was justified based on statistical and practical considerations. A power analysis for a repeated-measures design, with a medium effect size (Cohen's d = 0.5, $\alpha = 0.05$, and power = 0.80), suggested a minimum of 64 traders per each market. Our sample of 65 traders exceeded this threshold, ensuring robust statistical power. Additionally, with 65 traders submitting daily stock price estimates over several weeks, our sample size ensures consistent and stable daily averages, reducing the influence of individual deviations. Over a span of 20 days, equivalent to 5 virtual years in the company's life, the group of traders will produce a total of 1300 price estimations (65 traders x 20 days) in the unregulated market and similar estimations in the regulated markets. Finally, practical and financial constraints, including trader availability and compensation that should be distributed to traders at the end of the experiment, influenced our sample size.

In the unregulated market, traders predicted prices under a free pricing mechanism. To mimic real market conditions, they received daily news packages containing market rumors, fake news, overestimation, and underestimation, along with relevant information about the virtual company. Traders reacted to this information and priced the stock accordingly. They submitted their daily price growth predictions and the resulting stock price estimates through a Google Form. The average of all traders' prices represented the virtual stock's market price. Traders competed for a monetary prize based on their pricing performance, simulating emotions such as greed and fear of loss.

In the regulated market, traders are required to use a single stock valuation model to estimate stock prices across scenarios. They agree on one of the following models: the NAPV-Earning model, Constant-Growth DDM, or Constant-Growth RIM. The regulatory measure ensuring consensus on model variables is more critical than the assumptions used to derive those variables, as it can effectively mitigate weak assumptions within the models.

The following is the formula used in the Constant-Growth DDM framework:

$$V_0 = \frac{D_1}{k - g} \tag{1}$$

Whirlpool's cost of equity ('k') and sustainable growth rate ('g') were calculated using historical beta, ROE, and retention ratio.

The following is the formula used in the Constant-Growth RIM framework:

$$V_0 = B_0 + \frac{ROE - k}{k - g} B_0 \tag{2}$$

Book value per share ('Bo') is derived from Ahoo Co.'s balance sheet; while ROE, k, and g ensure RIM-DDM consistency.

The following is the formula used in the Earning model framework:

$$Stock's\ IntrinsicValue = NoGrowthvalue + PVGO \tag{3}$$

During the strategic planning of the virtual company's future, a deliberate effort was made to distinguish between the no-growth and growth aspects of the company. This approach allows us to assess the no-growth value of the company at the end of each quarter, based on the financial statements that reflect this value. The Present Value of Growth Opportunities (PVGO) is determined by summing up all the Net Present Values (NPVs) expected from Ahoo Co.'s future expansion projects.

3-2. Additional Regulatory Measures: Micro Survey

A micro survey evaluated the impact of specific regulatory measures on market efficiency, which virtual experiments cannot assess. Conducted with traders in the simulated stock market, it explored four measures: (1) standardizing valuation models to enhance accuracy, (2) implementing price limits around fair values to stabilize markets, (3) encouraging long-term investments and curbing speculation (e.g., via a Maturity Tax), and (4) evaluating trading halts during unfair valuations. The survey probed traders' perceptions and decision-making to analyze how these measures influence market dynamics and efficiency, providing insights for enhancing market stability.

3-3. Statistical Analysis

3-3-1. OLS Regression Analysis: Variables and Hypotheses

Figure 4 illustrates the hypotheses concerning the relationship between the independent variable and the dependent variables under different scenarios within the study.

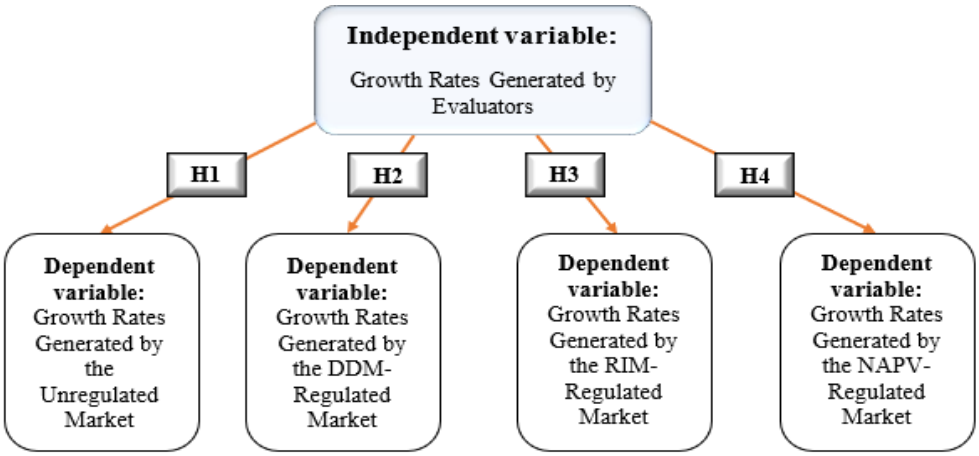
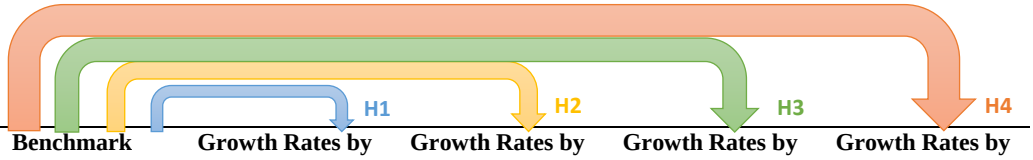


Fig. 4. Variables and Hypotheses Under Different Scenarios

Table 2 presents the time series growth rates generated by each group, along with the relevant hypotheses that will be analyzed and tested:

Table 2. Growth Rates and Hypotheses by Group



Period	Benchmark Growth Rates by Evaluators	Growth Rates by Unregulated Market	Growth Rates by DDM - Regulated Market	Growth Rates by RIM - Regulated Market	Growth Rates by Earning Model - Regulated Market
2022 (Q1)	12.55% *	-7.25% **	No dividends ***	39.58%	18.00%
2022 (Q2)	11.13%	0.00%	No dividends	6.43%	13.23%
2022 (Q3)	35.05%	-4.31%	No dividends	18.37%	23.66%
2022 (Q4)	34.01%	-6.97%	No dividends	12.83%	35.48%
2023 (Q1)	-9.73%	8.10%	65.59%	10.82%	-5.52%
2023 (Q2)	21.46%	-2.24%	41.63%	16.16%	23.40%
2023 (Q3)	22.65%	5.73%	38.61%	19.71%	21.78%
2023 (Q4)	18.85%	-4.07%	-9.81%	22.82%	20.86%
2024 (Q1)	22.96%	5.93%	20.99%	16.76%	16.67%
2024 (Q2)	-11.13%	2.93%	32.50%	17.36%	-11.41%
2024 (Q3)	12.65%	3.89%	2.23%	19.60%	12.94%
2024 (Q4)	-9.84%	3.49%	-61.28%	-1.16%	-11.76%
2025 (Q1)	-13.06%	4.10%	-37.20%	6.56%	-11.67%
2025 (Q2)	-16.23%	0.23%	-16.50%	3.52%	-14.15%
2025 (Q3)	-11.54%	-4.16%	2.23%	3.12%	-10.13%
2025 (Q4)	30.50%	-1.93%	309.92%	-0.45%	16.17%
2026 (Q1)	-21.46%	-0.74%	2.23%	11.71%	-14.98%
2026 (Q2)	-33.44%	-7.92%	-61.13%	-30.71%	-21.16%
2026 (Q3)	-17.43%	-6.45%	2.23%	6.00%	-14.78%
2026 (Q4)	-26.20%	-5.75%	8.91%	-78.84%	-44.10%

* This growth rate is calculated as the average of all growth estimations provided by the 20 evaluators during this quarter. The data follows a normal distribution.

** This is calculated as the average of all growth estimations provided by the 65 traders (unregulated) during this quarter. The data follows a normal distribution.

*** The company pays no dividend in year 2022. The quarterly observations in 2022 will be excluded from the regression analysis.

H1: The unregulated market is information efficient ➔ Shareholders in the unregulated market reflect the variation in stock price growth rates estimated by evaluators.

H2: The DDM-regulated market is information efficient ➔ Shareholders using the DDM model reflect the variation in stock price growth rates estimated by evaluators.

H3: The RIM-regulated market is information efficient ➔ Shareholders using the RIM model reflect the variation in stock price growth rates estimated by evaluators.

H4: The EM-regulated market is information efficient ➔ Shareholders using the Earning model (EM) reflect the variation in stock price growth rates estimated by evaluators.

The evaluators' benchmark will be compared against four dependent variables using simple regression models: Unregulated Market, DDM-Regulated Market, RIM-Regulated Market, and Earning Model-Regulated Market. The study assesses the impact of regulatory measures on market information efficiency by analyzing growth rate data. Quarterly growth rates from evaluators (the benchmark) will be regressed against those from the market under two scenarios: free pricing and regulated pricing. The methodology aligns with the Capital Asset Pricing Model (CAPM) regression analysis, where the beta coefficient (slope) quantifies an asset's sensitivity to market fluctuations. The beta coefficient compares evaluators' growth rates (benchmark) with market growth rates under both unregulated and regulated scenarios, revealing the market's information efficiency in each case.

3-3-2. Unit Root Testing for Non-Stationarity

Time series data may follow a random walk pattern. Unit root tests are vital for non-stationary time series. Augmented Dickey-Fuller tests in EViews at the 5% significance level will assess unit roots in quarterly growth rates, such as evaluators, markets, and models. Non-rejection indicates non-stationarity, requiring first differencing for regression analysis.

3-3-3. Residual Analysis: Serial Correlation, Heteroscedasticity, and Normality

After OLS regression, a residual analysis was conducted to check the serial correlation, heteroscedasticity, and residual normality. The Durbin-Watson test assessed serial correlation, Breusch-Pagan-Godfrey test checked heteroskedasticity, and Jarque Bera test evaluated normality. Adjustments such as adopting the Hansen method for serial correlation and Huber-White standard errors for heteroskedasticity were made when assumptions were violated.

3-3-4. Robustness Checks: Robust Least Squares

Robustness checks were employed to verify that our results were not overly sensitive to specific assumptions, outliers, or methodological choices. Robust Least Squares (RLS) is an alternative regression method that is employed when there are concerns about violations of the assumptions of ordinary least squares (OLS) regression. Within the EViews software, RLS was executed using the MM-estimation method and adopting Huber Type I standard errors and covariance estimates.

3-3-5. Descriptive Analysis: Micro Survey

The survey data, primarily ordinal in nature with limited response choices, were analyzed using descriptive statistics. Comparing medians from different questions provided insights into the effects of regulatory measures on behaviors such as holding periods, speculative actions, and market preferences regarding liquidity. This analysis aimed to offer valuable insights into how these regulatory interventions may influence market efficiency within the simulated stock market environment.

In addition to the previous four hypotheses, the following hypotheses should be tested in this survey analysis:

> **H5:** The concurrent implementation of a maturity tax and the adoption of a unified stock valuation model by shareholders results in extended investment horizons.
>
> **H6:** The implementation of dynamic price limits, surrounding the values derived from a unified stock valuation model, is effective in mitigating speculative trading activities.

4. Results

4-1. Simulation Results

4-1-1. Unregulated Market

Figure 5 illustrates the quarterly growth rates derived from two distinct groups: the evaluators responsible for establishing the benchmark of information efficiency, and the traders operating within an unregulated stock market characterized by a free pricing mechanism.

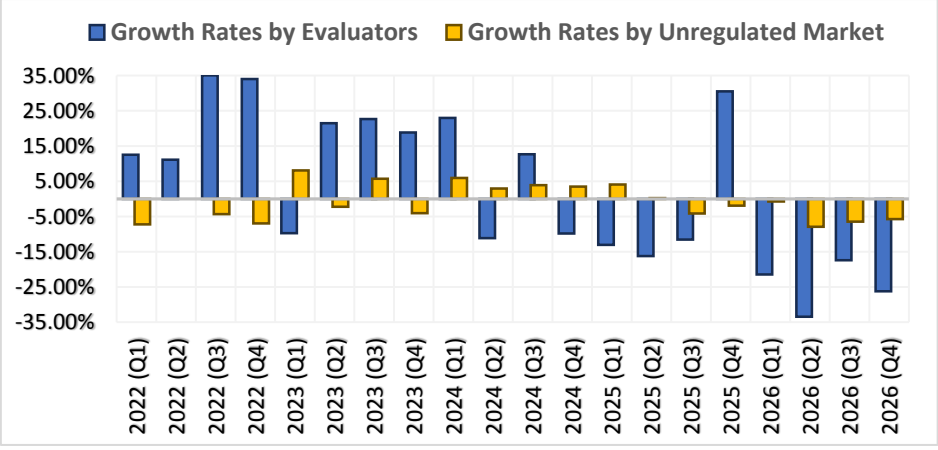


Fig. 5. Efficient Benchmark Vs. Unregulated Market

4-1-2. Regulated Market

Figure 6 illustrates the quarterly growth rates produced by a group of evaluators along with the regulated market, which applies three distinct valuation models—namely, the Earning Model, the Dividend Discount Model (DDM), and the Residual Income Model (RIM)—to determine stock prices.

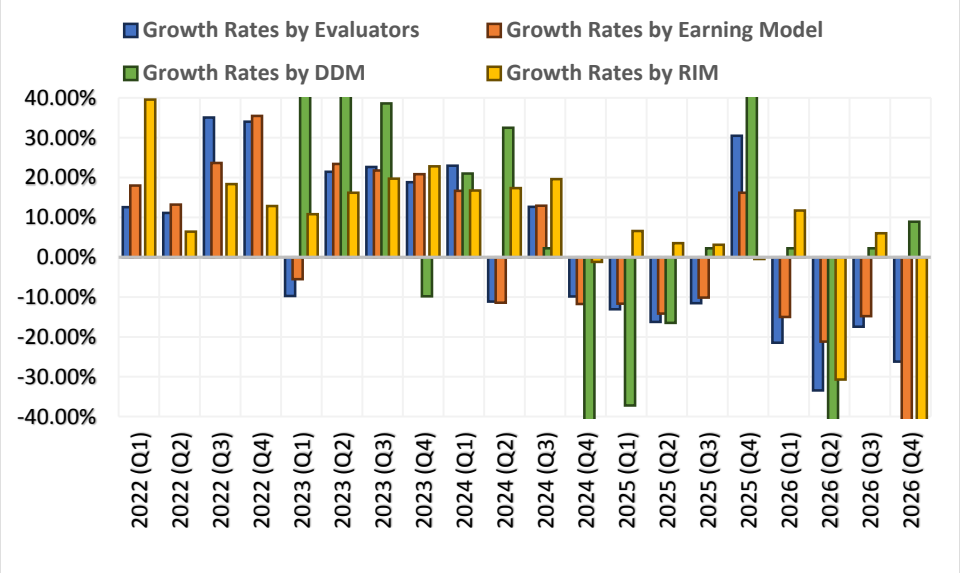


Fig. 6. Efficient Benchmark Vs. Regulated Market

4-2. Key Statistical Findings

4-2-1. Non-Stationarity Findings

Table 3 presents the results of the Augmented Dickey-Fuller Unit Root Test conducted on the quarterly time series growth rates of evaluators, unregulated market, the DDM, the RIM, and the earning Model. The null hypothesis assumes that each time series contains a unit root at a significance level of 5%.

Table 3. Augmented Dickey-Fuller Unit Root Test on Quarterly Time Series Growth Rates

Time series	Augmented Dickey-Fuller test statistic	MacKinnon (1996) one-sided p-values	Decision	Data to be used in regression
Evaluators	-4.71	0.0071	Reject the null: covariance stationary	Original time series
Unregulated market	-1.59	0.7533	Fail to reject the null: random walk	First differences
DDM- Regulated Market	-3.54	0.0016	Reject the null: covariance stationary	Original time series
RIM- Regulated Market	-0.07	0.9910	Fail to reject the null: random walk	First differences
Earning Model-Regulated Market	-4.54	0.0098	Reject the null: covariance stationary	Original time series

As the growth rates of the unregulated market and the RIM-regulated market exhibit unit roots, it indicates that the time series are not covariance stationary. Consequently, when conducting regression analysis with the independent variable represented by the time series generated by the group of evaluators, we will employ the first differences of these time series.

4-2-2. OLS Regression Analysis

The scatter plots displayed in Figure 7 depict the relationship between the growth rates produced by the evaluators, which serve as the independent variable in each model, and the growth rates associated with the respective dependent variables in four distinct scenarios: Unregulated market, DDM-Regulated Market, RIM- Regulated Market, and Earning Model- Regulated Market. Each plot also includes both the R-squared value and the P-value for its corresponding model.

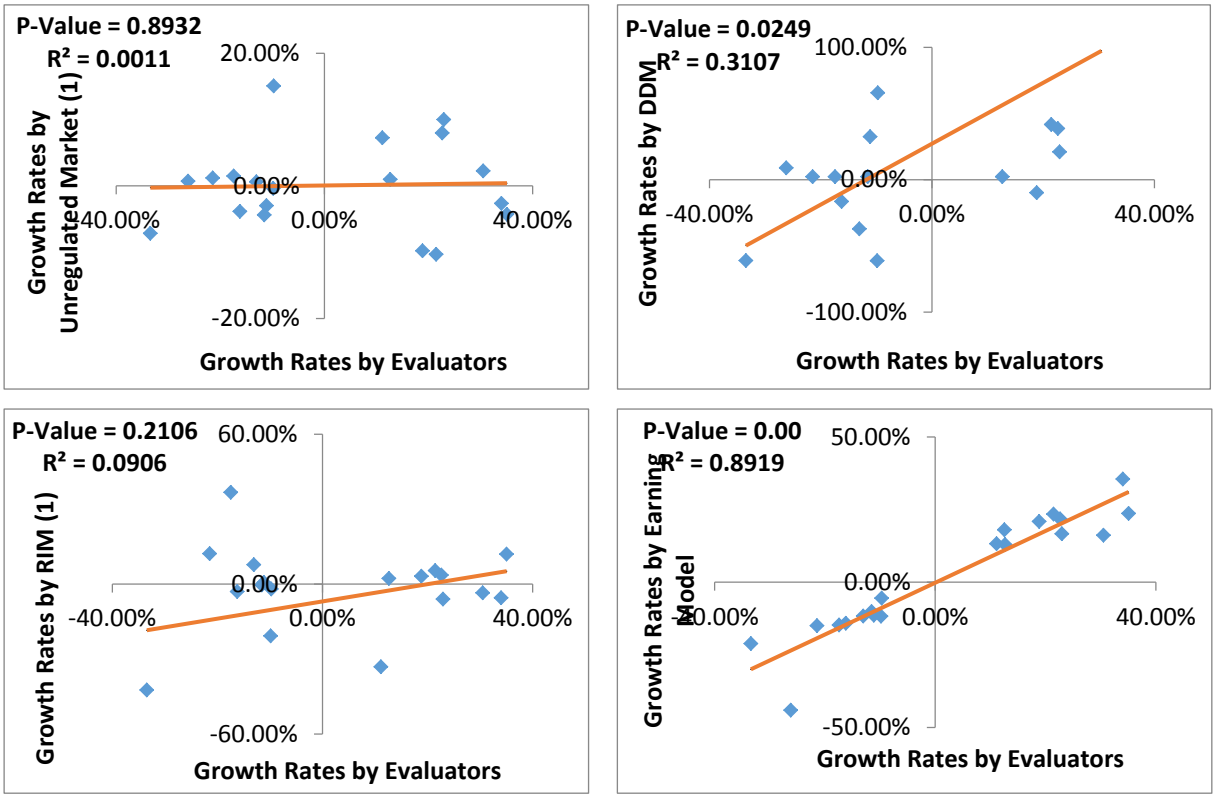


Fig. 7. Scatter Plots of OLS Simple Regression Models

Figure 8 displays the confidence intervals for the slope coefficient of the independent variable "evaluators," when it is regressed on each of the specified dependent variables. The confidence intervals are calculated at significance levels of 1%, 5%, and 10%, respectively.

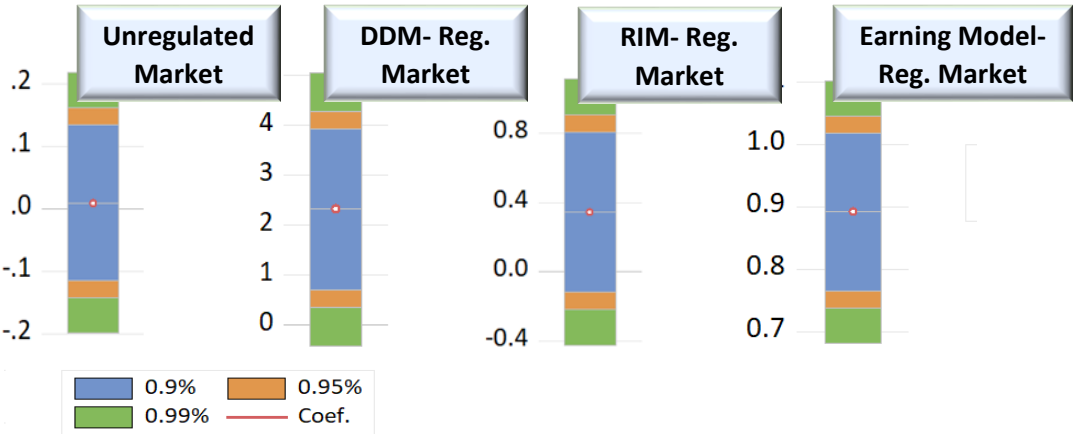


Fig. 8. Confidence Intervals of 'Evaluators' Regression Coefficients

4-2-3. Autocorrelation, Heteroscedasticity, and Normality

We conducted a DW test to determine if there was positive serial correlation in the regression analysis. The null hypothesis was that the regression exhibits no positive serial correlation. Critical values from the Durbin-Watson (DW) table were used, with the upper critical value of 1.41, at a 5% significance level for one independent variable (k=1) and a sample size of 20 (n=20). Table 4 presents the DW statistic obtained from EViews, and based on the results, we failed to reject the null hypothesis, indicating the absence of positive serial correlation in all the models used.

Table 4. Durbin-Watson Autocorrelation Test Results

Dependent variable	Independent variable	Durbin-Watson statistic	Decision
Unregulated market **(1) ***	Evaluators	3.284	no positive serial correlation
DDM- Regulated Market	Evaluators	1.505	no positive serial correlation
RIM- Regulated Market **(1) ***	Evaluators	2.570	no positive serial correlation
Earning Model- Regulated Market	Evaluators	1.534	no positive serial correlation

* First differentiated series

We performed a Breusch-Pagan-Godfrey test to investigate the presence of heteroscedasticity in the regression analysis. The null hypothesis assumed that the regression displays homoskedasticity. Table 5 presents the Breusch-Pagan chi-squared test statistic for each model, calculated using EViews. The test statistic was then compared to the one-tailed critical value of 3.841, obtained from the chi-squared distribution table, with one degree of freedom and a significance level of 5%.

Table 5. Breusch-Pagan-Godfrey Heteroscedasticity Test Results

Dependent variable	Independent variable	Breusch Pagan statistic	Decision
$Residuals^2$ – Free market (1)	Evaluators	0.431911	No Heteroscedasticity
$Residuals^2$ – DDM	Evaluators	4.056757	Heteroscedasticity
$Residuals^2$ – RIM (1)	Evaluators	4.052599	Heteroscedasticity
$Residuals^2$ – Earning Model	Evaluators	0.875185	No Heteroscedasticity

The time series analysis of DDM-Regulated Market and RIM-Regulated Market reveals that the variance of the residuals is not constant across observations. Consequently, it is necessary to employ Huber-White (Robust) standard errors, rather than the original standard errors, to draw accurate conclusions regarding the OLS regression analysis. Table 6 displays the revised confidence intervals and p-values for these two models after incorporating the Huber-White (Robust) standard errors in the statistical tests.

Table 6. Updated Results Using Huber-White (Robust) Standard Errors

Model	Slope coefficient	p-value	95% CI		99% CI	
			Low	High	Low	High
DDM- Regulated Market	2.300133	0.0999	-0.499716	5.099982	-1.585900	6.186165
RIM- Regulated Market (1)	0.345557	0.2675	-0.290350	0.981464	-0.527982	1.219095

Before drawing conclusions from the regression analysis, it is crucial to conduct tests for the normality of the residual's distribution. Table 7 presents the outcomes of the Jarque-Bera probability tests conducted on the residuals of the regression models at the 5% significance level, involving the evaluators as independent variables and each of the other dependent variables.

Table 7. Analyzing the Normality of the Residuals

Model	P-test (Jarque Bera)	Kurtosis	Skewness	Are the residuals normally distributed?
Unregulated Market (1)	0.69	2.94	0.48	Yes
DDM- Regulated Market	0.0005	6.29	1.72	No
RIM- Regulated Market (1)	0.04	5.15	-0.86	No
Earning Model- Regulated Market	0.001	5.56	-1.57	No

With the exception of the unregulated market model, all the other models exhibit residuals that do not follow a normal distribution. To ensure the validity of our regression analysis in such cases, we employed Robust Least Squares in the next section with the MM-estimation method. Additionally, we will utilize Huber Type I standard errors and covariance to obtain more reliable results.

4-2-4. Robustness Checks Results

Table 8 presents the outcomes of applying the MM-estimation method to the Robust Least Squares regression for models with non-normally distributed residuals. The results obtained through this RLS analysis will be utilized to draw the essential conclusions required for testing our research hypotheses.

Table 8. Robust Least Squares with the MM-Estimation Method

Model	Slope coefficient	p-value	R-squared	95% CI		99% CI	
				Low	High	Low	High
DDM- Regulated Market	0.835033	0.0646	0.1128	-0.1340	1.8041	-0.5099	2.1801
RIM- Regulated Market (1)	-0.015302	0.9183	0.0001	-0.3301	0.2994	-0.4477	0.4171
Earning Model- Regulated Market	0.844115	0.0001	0.6714	0.7267	0.9615	0.6833	1.0048

4-2-5. Micro Survey Results

Table 9 displays the supplementary questions aimed at gathering responses from respondents. These questions are designed to provide indications about the crucial aspects within the integrated regulatory framework.

Table 9. Micro Survey Results

Aspect	*Key Findings*
Long-Term Investment Mindset	A majority of over 65% of the participants intend to retain their shares for a period exceeding 3 years. According to the median value, participants are expected to hold shares for an average period of 3 years.
Impact of Maturity Tax	In the presence of maturity tax rates, participants are expected to hold their shares for an average duration of 5 years, as indicated by the median value.
Risk Tolerance During Market Crash	Based on the median value, participants are projected to sell 20% of their shares due to the market crash.
Risk Tolerance with Price Limits	If stock price limits are implemented around the moving fair value, participants are estimated to sell 20% of their shares during the market crash, based on the median value.
Preference for Certainty or Liquidity	A significant majority of participants, accounting for 74.2%, express a preference for waiting until a guaranteed fair value is reached rather than engaging in immediate sales at uncertain prices.

5. Discussion and Conclusion

5-1. Analyzing the Findings

Regression analysis tested four hypotheses on market information efficiency. For H1, the 95% confidence interval failed to reject the null hypothesis, indicating inefficiency in the unregulated market. H2 and H3, tested using robust least squares regression due to non-normal residuals, also suggested inefficiency in the DDM- and RIM-regulated markets, as their confidence intervals included zero. In contrast, H4, tested using MM-estimation robust regression, indicated significant results at the 95% and 99% confidence levels, confirming information efficiency in the EM-regulated market. Therefore, only the EM-regulated market effectively reflected evaluators' growth rate variations, supporting H4 while rejecting H1, H2, and H3 as illustrated by Table 10.

Table 10. Simulation Hypothesis Testing Results

Hypothesis	Market Type	Efficiency Status	Confidence Interval
H1	Unregulated Market	Inefficient	Included zero
H2	DDM-Regulated Market	Inefficient	Included zero
H3	RIM-Regulated Market	Inefficient	Included zero
H4	EM-Regulated Market	Efficient	Excluded zero (95%, 99%)

In addition, questionnaire results supported H5, indicating that over 65% of respondents favored long-term investments, with holding periods extending to five years post-maturity tax. Combined with a unified valuation model, this tax prolonged investment horizons. Conversely, H6 was unsupported, as dynamic price limits failed to curb speculative sell-offs during crashes, with a consistent 20% sell-off rate observed regardless of limits, as illustrated by Table 11.

Table 11. Survey Hypothesis Testing Results

Hypothesis	Key Finding	Outcome
H5	Over 65% of respondents intended to hold shares for >3 years; maturity tax extended holding periods to 5 years.	Supported
H6	Dynamic price limits did not reduce speculative sell-offs (20% sell-off rate).	Unsupported

5-2. Conclusion: Addressing the Research Question

This study explored enhancing stock market efficiency through regulatory interventions. Results revealed that a unified stock valuation model, if information-efficient, can improve market efficiency, as seen in the EM-regulated market. However, other regulated markets lacked similar efficiency, highlighting the need for appropriate valuation models. Complementary measures, such as regulating short-term traders and enforcing a maturity tax, extended investment horizons and promoted long-term commitments. While dynamic price limits tied to fair value aimed to curb speculation, their effectiveness requires further scrutiny. The synergy of unified valuation models and maturity taxes shows promise for fostering extended investment periods. In conclusion, integrating and updating the stock market regulations is a significant approach for enhancing the information efficiency.

5-3. Implications for Practice

Stock market regulators, whose primary goal is promoting market efficiency, can benefit significantly from the findings of this study. Regulators should require shareholders to vote on and adopt a single unified stock valuation model from an approved list, tailored to each company's needs. The chosen model, applied periodically under regulatory supervision, would derive fair stock values reflecting the company's fundamentals. Shareholders and investors could subsequently trade shares at these dynamic, fundamentals-based values. Additionally, regulators should implement measures to encourage long-term investments and reduce speculative behaviors.

We recommend stock market regulators, especially in emerging markets, to adopt this approach to enhance market efficiency. To mitigate adverse reactions, regulators could introduce "value stocks," priced using this new valuation method. Companies would retain common and preferred stocks, while offering value stocks as an additional instrument for investors seeking protection against market inefficiencies. This instrument lays the ground for implementing this approach in the future.

Implementing this new approach will pose practical challenges. Resistance to change is inevitable, particularly from EMH proponents who uphold market efficiency. Moreover, a core principle of capitalism is a free market, where supply and demand determine prices without government intervention. Therefore, adopting this approach in a capitalist system will face significant hurdles unless regulators attribute market crashes and bubbles to excessive market freedom. Additionally, large shareholders who benefit from stock overvaluation are unlikely to support this proposal, as it poses a threat to their wealth.

5-4. Limitations of the Study

While this study provides valuable insights into enhancing stock market efficiency through regulatory interventions, several limitations should be acknowledged. First, the simulated stock market environment, though carefully designed, may not fully replicate the complexities of real-world markets, potentially limiting the generalization of the findings. Second, the sample size, while sufficient for initial analysis, may not capture the full diversity of market participants, introducing potential selection bias. Third, the reliance on self-reported data from questionnaires could be subject to social desirability or recall bias.

To address these limitations, future research could incorporate larger and more diverse samples, extend the simulation duration to capture long-term effects, and validate the findings using additional data sources. Robustness checks and alternative statistical methods were also employed to mitigate biases and strengthen the reliability of the results.

References

Alam, M. M., Yasmin, S., Rahman, M., & SalahUddin, M. G. (2011). Effect of policy reforms on market efficiency: Evidence from dhaka stock exchange. *Economics Research International, 2011*(1), 864940. http://dx.doi.og/10.1155/2011/864940

Aliber, R., Kindleberger, C., & Solow, R. (2015). *Manias, panics, and crashes: A history of financial crises.* Palgrave Macmillan.

Baltussen, G. (2009, October 18). Behavioral finance: An introduction. *SSRN Electronic Journal*. http://dx.doi.org/10.2139/ssrn.1488110

Bao, Z., Kalayci, K., Leibbrandt, A., & Oyarzun, C. (2020). Do regulations work? A comprehensive analysis of price limits and trading restrictions in experimental asset markets with deterministic and stochastic fundamental values. *Journal of Economic Behavior & Organization , 178*, 59-84. https://doi.org/10.1016/j.jebo.2020.07.012

Barber, B., & Odean, T. (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *The Quarterly Journal of Economics, 116*(1), 261-292. https://doi.org/10.1162/003355301556400

Bidgoli, G. R., Bajalan, S., & Mahmoodi, V. (2010). Performance assessment of valuation models in Tehran Stock Exchange. *Financial Research Journal, 10*(26), 21-40. https://jfr.ut.ac.ir/article_20030.html

Bildik, R. (2004). Trading halts and the advantage of institutional investors: Evidence from the Istanbul Stock Exchange. *SSRN Electronic Journal.* http://dx.doi.org/10.2139/ssrn.688941

Brigham, E. F., & Houston, J. F. (2022). *Fundamentals of financial management* (16th ed.). Cengage Learning.

Chang, Y.-K., & Chang, C.-J. (2021). The magnet effect under relaxed daily price limits: Evidence from Taiwan. *The International Journal of Business and Finance Research , 15*(1), 33-44. RePEc:ibf:ijbfre:v:15:y:2021:i:1:p:33-44

Cheung, Y.-L., Wong, K.-A., & Ho, Y.-K. (1993). The pricing of risky assets in two emerging Asian markets_Korea and Taiwan. *Applied Financial Economics, 3*(4), 315-324. https://doi.org/10.1080/758534943

De Bondt, W., & Thaler, R. (1985). Does the stock market overreact? *The Journal of finance, 40*(3), 793-805. https://doi.org/10.1111/j.1540-6261.1985.tb05004.x

Degutis, A., & Novickytė, L. (2014). The efficient market hypothesis: A critical review of literature and methodology. *Ekonomika , 93*(2), 7-23.

Dong, M. (2019). The impact of price limits on stock volatility and price delay: Evidence from China. *SSRN Electronic Journal. http://dx.doi.org/10.2139/ssrn.3478342*.

Duggan, V. (2021, February 7). *The deeper lesson from GameStop: Let's look at taxing the speculators who gamble for financial gain*. The Journal. https://www.thejournal.ie/readme/column-gamestop-financial-transactions-tax-victor-duggan-5346346-Feb2021/

Eichfelder, S., & Lau, M. (2017, January). The impact of financial transaction taxes on stock markets. In *Proceedings. Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association* (Vol. 110, pp. 1-45). National Tax Association.

Francis, J., Olsson, P., & Oswald, D. (2000). Comparing the accuracy and explainability of dividend, free cash flow, and abnormal earnings equity value estimates. *Journal of Accounting Research, 38*(1), 45-70. https://doi.org/10.2307/2672922

Hamedinia, H., Raei, R., Bajalan, S., & Rouhani, S. (2022). Analysis of stock market manipulation using generative adversarial nets and denoising auto-encode models. *Advances in Mathematical Finance & Applications, 7*(1), 149-167. Doi: 10.22034/AMFA.2021.1933112.1608

Hawaldar, I. T., Rohit, B., & Pinto, P. (2017). Testing of weak form of efficient market hypothesis: Evidence from the Bahrain bourse. *Investment Management and Financial Innovations , 14*(2), 376-385. http://dx.doi.org/10.21511/imfi.14(2-2).2017.09

Jiang, X., & Lee, B.-S. (2005). An empirical test of the accounting-based residual income model and the traditional. *The Journal of Business, 78*(4), 1465-1504. https://doi.org/10.1086/430866

Kim, Y., Yagüe, J., & Yang, J. (2008). Relative performance of trading halts and price limits: Evidence from the Spanish Stock Exchange. *International Review of Economics & Finance, 17*(2), 197-215. https://doi.org/10.1016/j.iref.2007.06.003

Kumar, A., Nguyen, H., & Putnins, T. (2021). Only gamble in town: Stock market gambling around the world and market efficiency. *SSRN Electronic Journal*. http://dx.doi.org/10.2139/ssrn.3686393

Lee, C., Myers, J., & Swaminatha, B. (1999). What is the intrinsic value of the Dow? *Journal of Finance, 54*(5), 1693-1741. https://doi.org/10.1111/0022-1082.00164

Lehmann, B. N. (1989). Commentary: Volatility, price resolution, and the effectiveness of price limits. In F. R. Edwards (Ed.), *Regulatory Reform of Stock and Futures Markets: A Special Issue of the Journal of Financial Services Research* (pp. 107-111). Springer Netherlands. https://doi.org/10.1007/978-94-009-2193-1_9

Li, S., Younas, M. W., Maqsood, U. S., & Zahid, R. A. (2024). Tech for stronger financial market performance: The impact of AI on stock price crash risk in emerging market. *International Journal of Emerging Market, ahead-of-print. https://doi.org/10.1108/IJOEM-10-2023-1717*

Mayes, T., & Shank, T. (2012). *Financial analysis with Microsoft Excel* (3rd ed.). Cengage Learning.

Miller, C., & Tyger, A. (2020). *The impact of a financial transactions tax.* Tax Foundation.

Mishkin, F. S., & Eakins, S. G. (2011). *Financial markets and institutions (The prentice hall series in finance)* (7th ed.). Pearson College Div.

Penman, S., & Sougiannis, T. (1998). A comparison of dividend, cash flow, and earnings approaches to equity valuation. *Contemporary Accounting Research , 15*(3), 343-383. https://doi.org/10.1111/j.1911-3846.1998.tb00564.x

Poshakwale, S. (1996). Evidence on the weak-form efficiency and the day of the week effect in the Indian stock market. *Finance India, 10*(3), 605-616.

Saad, M. (2023). How a novel stock valuation model outperforms traditional models in information efficiency: Implications for shareholders and regulators. *Journal of Finance and Economics, 11*(2), 113-130. DOI:10.12691/jfe-11-2-5

Saret, J. N. (2014). *The effect of French and Italian transaction taxes on equity market microstructure and market efficiency.* Two Sigma Thematic Research.

Statman, M. (2019). *Behavioral finance: The second generation* (1st ed.). CFA Institute Research Foundation .

Stiglitz, J. E. (1989). Using tax policy to curb speculative short-term trading. *Journal of Financial Services Research, 3*, 101-115. https://doi.org/10.1007/978-94-009-2193-1_2

Tehrani, R. (2006). P/E, P/B evaluating indicators and their combined performance using residual income model in Tehran Stock Exchange. *Journal of the Faculty of Humanities and Social Sciences, 6*(22), 37-56. https://sid.ir/paper/404790/en

Veryzhenko, I., Jonath, A., & Harb, E. (2022). Non-Value-Added tax to improve market fairness and quality. *Financial Innovation, 8*(1), 1-30. https://doi.org/10.1186/s40854-021-00327-0

Zahid, R. A., & Simga-Mugan, C. (2024). The impact of international financial reporting standards adoption on the integration of capital markets. *International Journal of Finance & Economics, 29*(1), 229-250. https://doi.org/10.1002/ijfe.2684