Rising Borsa Istanbul Trading amid 2023 Inflation Sparks Concerns of Stock Market Bubbles?

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Abstract:

This study delves into the detection of speculative bubbles in Borsa Istanbul, highlighting the limitations of monthly observations and the critical role of weekly data in capturing market nuances. Utilizing the Sup Augmented Dickey Fuller Test (SADF) and Generalized Sup Augmented Dickey Fuller Test (GSADF), the research contrasts the efficacy of monthly and weekly data in identifying speculative tendencies through the price-dividend ratio. Initially, the study portrays potential speculative trends marked by significant increases in investor activity, trading volume, and the BIST 100 index. However, contrary to the early indicators suggesting the formation of a speculative bubble, the empirical analysis for 2023 reveals no definitive evidence of bubbles in the price-dividend ratio. The study emphasizes that while monthly data may signal potential market irregularities, it falls short of capturing transient yet significant speculative episodes, essential for making informed investment decisions in the volatile environment of Borsa Istanbul, emphasizing the indispensable nature of weekly data in detecting nuanced market behaviors. The study underlines the need for a layered, temporally sensitive approach to financial analysis, advocating for continuous adaptation and sophistication in methodologies to navigate the complexities of financial markets effectively.

JEL classification: G14, G17

Key Words: Speculative Bubbles, GSADF, BIST100, Borsa Istanbul

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1. Introduction:

AThe history of financial bubbles provides valuable insights into market dynamics and investor behavior. These bubbles, characterized by rapid price surges followed by steep declines, have occurred throughout history. For instance, the Dutch Tulip Mania of the 1630s witnessed skyrocketing tulip bulb prices due to speculation, only to later crash, illustrating irrational market behavior. Similarly, the South Sea Bubble in 1720 showcased how speculation and misleading information inflated stock prices, resulting in financial ruin and impacting the British economy. The Greater Fool Theory explains the psychology behind bubbles, where assets are overpriced as investors believe they can sell to a "greater fool" at a profit, regardless of intrinsic worth. Herd behavior, where investors follow the crowd without considering fundamentals, also contributes to bubble formation. In the 20th and 21st centuries, there were more examples like the 1929 stock market crash, the dot-com bubble of the late 1990s, and the 2008 global financial crisis caused by a housing market bubble, highlighting the recurring nature of financial bubbles and their profound economic impacts, emphasizing the need for understanding and regulation in financial markets (Zhao, 2022; Simon, 2003; Goetzmann, 2015).

The term "financial bubbles" lacks a universally accepted definition in academic literature, presenting a spectrum of multifaceted interpretations. At one end, Goetzmann (2015) operationalizes financial bubbles by defining a boom as a 100% single-year or three-year price increase, and a crash as a 50% dip within one or five years, offering a clear quantitative framework. On the other end, Simon (2003) captures the behavioral aspect, describing bubbles as initially justifiable price increases, often fueled by speculation, that lead to sharp declines when speculative fervor subsides. Together, these perspectives frame the discussion of financial bubbles as both a measurable market pattern and a consequence of speculative market psychology.

Diverging from these foundational views, several theorists explore different dimensions of bubbles. Blanchard and Watson (1982) and Grossman and Diba (1988a) contend that bubbles can represent 'rational deviations' from fundamental asset values. In contrast, Santoni and Dwyer (1990) and Fama (2014) delve into the psychology of market participants, viewing bubbles as deviations from rational behavior or as irrational surges followed by predictable declines. This diverse array of definitions highlights the nuanced understanding of "financial bubbles" within academic discourse, underlining the complex interplay between fundamental value, investor psychology, and market dynamics in their formation and burst.

According to Sornette (2003) financial bubbles in emerging markets follow a distinct historical pattern. Subtle economic improvements ignite optimism, attracting investors and fueling speculation with leverage and international capital. Asset prices soar, driven by novice investors and decoupling from real economic output, until the capital inflow dries up, precipitating a crash. Yao and Luo (2009) identify rapid price rises, inflated P/E ratios, and sharp declines as hallmarks of such bubbles, with recoveries taking years. Additionally, Greenwood et al. (2017) add increased volatility, prolific stock issuance, and rapid valuation surges, particularly among new entrants, to the list of bubble indicators.

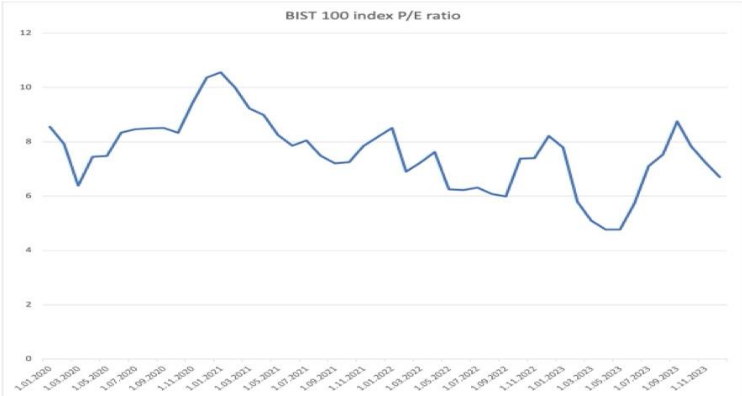
Viewed through the lens of established bubble indicators, Borsa Istanbul's recent performance exhibits concerning parallels. According to MKK's data (2023), between February and October 2023, investor numbers surged by 120%, coinciding with a doubling of trading volume (Figure 1). These trends suggest an influx of speculative capital seeking quick profits. Additionally, a steadily rising P/E ratio (Figure 2) and an 80% surge in the BIST 100 index (Figure 3) are causing legitimate worries of a potential stock market bubble. These observations, including a sudden increase in investor participation, soaring trading volumes, and elevated price valuations exceeding fundamentals, indicate possible asset price decoupling from intrinsic value. Although preliminary, they warrant further investigation into the potential emergence of a Turkish stock market bubble, which this paper aims to do.

Building upon this foundational understanding, the current study is methodically segmented into five key sections to dissect and analyze speculative bubbles within Borsa Istanbul. The first section establishes the theoretical background of financial bubbles. The second critically reviews relevant literature on stock market price bubbles. The third outlines data collection and methodology. The fourth section presents detailed findings. Finally, the fifth section synthesizes the results, offering a reflective summary and discussing their significance for Borsa Istanbul's speculative bubbles, providing a cohesive conclusion to the analysis.

Figure (1) : Trading volume :

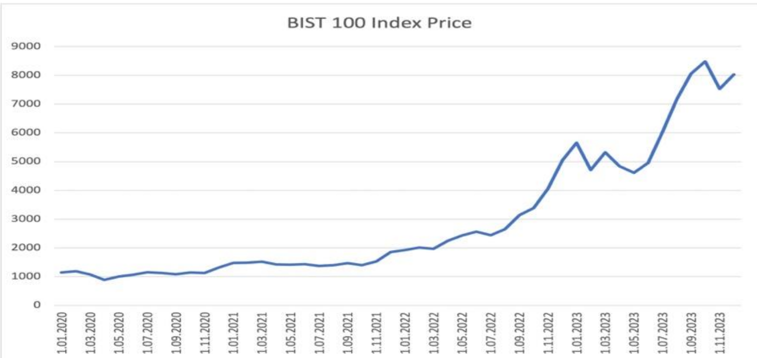
Source: Refinitiv Eikon DataStream.

Figure (2) : P/E ratio :



Source: Refinitiv Eikon DataStream.

Figure (3) : BIST index price :



Source : Refinitiv Eikon DataStream

2. Literature Review

The emergence of speculative bubbles in financial markets remains a focal point of economic research, especially within emerging economies. This literature review synthesizes key findings from various studies on speculative bubbles in these markets, highlighting methodologies and outcomes that illuminate our understanding of financial dynamics in these regions. Ehsan, J. Barkley and Jamshed (2008) analyzes daily stock market returns in 27 emerging markets from the early 1990s to 2006. They employed various methodologies, including the Hamilton regime-switching model and Hurst's rescaled range analysis, to detect nonlinear speculative bubbles. Their findings rejected the absence of bubbles, indicating prevalent nonlinear speculative bubbles in most markets, except for Mexico, Sri Lanka, Taiwan, and Malaysia. In their study, Liaqat, Nazir and Ahmad (2019) use the (GSADF) test to identify stock bubbles in Pakistan Stock Exchange (PSX) using monthly data for the period 2007–2016.The study confirms the presence of multiple bubbles in the PSX, varying across sectors. Using the same methodology, Liaqat, et al. (2020) found correlations between stock price bubbles in Pakistan and China Stock Exchanges. Nazir et al. (2020) utilized the (SADF) test to analyze monthly data of nominal and real returns from stock markets of the (SAARC) countries, aiming to detect the presence of rational bubbles. Their analysis confirmed the existence of such bubbles across these markets, noting variability in their occurrence and duration across different markets and periods. This finding underscores the prevalence and diverse nature of speculative activities in the SAARC region's stock markets.

In a parallel study focusing on a different market, Costa et al. (2017) utilized Johansen cointegration and Granger causality tests to analyze the performance of 27 Brazilian stocks each semester from 1990 to 2010. Their findings indicated the presence of bubbles in 20 out of the 27 stocks analyzed.Further adding to the discourse, a study by Wei-Xing and Didier (2008) employed a more sophisticated approach, combining the Log Periodic Power Law (LPPL) model with Johansen cointegration and Granger causality tests. Their investigation into the South African stock market identified speculative bubbles in a significant number of stocks.

However, Deev, Kajurova, and Stavarek (2012) conducted an analysis on the markets of Visegrad countries and reported no evidence of speculative bubbles. This absence of detected bubbles during the examined period highlights the variability in bubble formation across different regional markets and the importance of context-specific factors in influencing market behavior.

On the other hand, Qian (2006) utilized various tests with the price-dividend ratio (PD) to analyze 37 different markets. The study confirmed the presence of bubbles at different times across these markets, indicating a more widespread occurrence of speculative behavior in global stock markets. This finding underscores the importance of employing a diverse set of tools and indicators for a more comprehensive analysis of speculative activities. In a more recent study, Shaikh et al. (2023) employed the (Rtadf) tests on monthly time-series data. They found significant growth driven by credit or speculative bubbles in markets like China, Indonesia, Malaysia, Pakistan, Taiwan, and Thailand. Conversely, no evidence of bubbles was detected in South Korea, India, and the Philippines. This study further suggests that the GSADF test could be an effective tool in detecting impending financial crises, thereby contributing to economic and financial stability.

Tsangyao et al. (2016) utilized the (GSADF) test to analyze the stock (PD) ratio across BRICS stock markets. Their analysis confirmed the presence of multiple speculative bubbles, each varying in duration and intensity across different countries. Wang et al. (2021) extended this analysis to 22 (EMEs), documenting a pattern of exuberance in the mid-2000s that was consistent with the findings for the BRICS countries. Notably, while the presence of bubbles was pervasive, their intensity and persistence varied significantly. This indicates notable temporal and regional variations in the occurrence and sustainability of speculative bubbles.Adding to the discourse on emerging markets, Mahjoub and Nabavi (2019) focused on Iran's stock market. Their study identified four distinct bubbles during the 84 months analyzed, with 18 months experiencing bubbles and the remaining 66 months characterized by balanced market conditions.

Lee and Yoon (2023) conducted an extensive analysis of technology stock indices during the COVID-19 pandemic, uncovering that not all indices experienced bubbles. Their study encompassed twelve European indices, revealing that seven exhibited COVID-19 related bubbles. Specifically, Turkey's XUTEK index was highlighted as remaining in a bubble for an extended 32-month period. Furthermore, Lee and Yoon's research also suggests a correlation between global trading activity and the likelihood of bubble formation. For instance, the Hong Kong market with its active global investor base, is more susceptible to bubble formation compared to markets dominated by domestic investors, such as Shanghai.

However, Lehkonen (2010) offers a differing perspective through an examination of rational bubbles in Chinese stock markets and China-related share indices in Hong Kong. Utilizing a duration dependence test on both monthly and weekly abnormal market returns, the study from 1992 to 2008 found no substantial evidence of bubbles in the Hong Kong market based on monthly data. Yet, a contrasting discovery was made with weekly data, where bubbles were detected across all Mainland Chinese stock markets. This discrepancy between monthly and weekly observations underscores the importance of time frames in bubble detection. Lastly, Zhao et al. (2018) focused on internet-based finance stocks, typically found in the Chinese markets, and discovered a general trend of negative bubbles, indicating a widespread undervaluation during the studied period. This finding adds another layer to the understanding of market dynamics, suggesting that bubbles can manifest not only as overvaluations but also as significant undervaluations.

Similarly, as numerous papers address speculative bubbles in emerging markets, there is also a significant subset of research focuses on Turkey. In their respective studies,researchers such as Gök (2021), Yanık and Aytürk (2011), Kirkpinar, Erer, E., and Erer, D. (2019), and Akdağ (2020) have employed various methodologies, examined diverse variables, and conducted analyses over different periods, including the tumultuous COVID-19 era. Their work spans years from 1990 to 2021, utilizing both weekly and monthly data intervals. Despite their comprehensive analyses, these studies did not conclusively identify the presence of speculative bubbles in the Borsa Istanbul market. Conversely, several other researchers, including Sağlam and Başar (2020), Zeren and Yilanci (2019), Koy (2018), Çitak (2019) and Başoğlu (2012), were able to detect bubbles using the GSADF test and different variables to various aspects of the Turkish stock market. Additionally, Erdinç Altay (2008) documented rational bubbles in the Istanbul Stock Exchange during 1998 to 2006.These findings collectively highlight the presence of bubbles in the Turkish stock market. They illustrate the diverse methodologies, variables, and timeframes employed in bubble research and highlight the GSADF test's particular relevance in detecting speculative bubbles and serving as an early warning mechanism.

Building upon an extensive review of financial bubble literature, this study addresses two interconnected objectives. First, it rigorously investigates the potential presence of a speculative bubble within Borsa Istanbul in 2023, aligning with initial observations and classic bubble indicators as mentioned in the introduction. This inquiry leverages established theoretical frameworks and empirical findings from the literature review, applying them to the context of Borsa Istanbul. Second, inspired by varying approaches in the literature concerning observation frequency's impact on bubble detection, the study critically compares the implications of weekly and monthly data in identifying potential bubbles. This addresses methodological questions about the most effective temporal resolution for analyzing and predicting market bubbles, particularly in emerging markets like Turkey.

3. Methodology

The theoretical framework adopted in this paper is rooted in the pioneering work of Philips, Wu, and Yu (2011, hereinafter, PWY) and Philips, Shi, and Yu (2013, 2015, hereinafter, PSY). PWY (2011) introduced a model called the Sup ADF (SADF) test. This test involves a recursive right-tail unit root ADF and is capable of identifying and timestamping single asset pricing bubbles, including aspects such as their onset, duration, and collapse date. While cointegration-based methods have traditionally dominated asset bubble identification, the Sup-ADF test is offering a distinct advantage. Its strength lies in its heightened sensitivity to explosive price trends, coupled with the ability to pinpoint bubble initiation and termination dates. However, this efficacy diminishes with longer time series and rapidly changing markets, as the inherent limitation of the SADF test lies in its capacity to detect only a single bubble within the data. Recognizing this constraint, PSY (2015) developed the Generalized Sup-ADF (GSADF) test, empowering researchers to discern the presence of multiple bubbles within a single analysis. This advancement significantly broadens the applicability of Sup-ADF-style techniques in complex market environments characterized by the potential for multiple bubble formations.

The underlying assumption governing the (Price-dividend ratio) series $\{yt\}$ is that it evolves as a random walk,with the drift component becoming increasingly negligible over time.

$$y_t = dT^{-\eta} + \theta y_{t-1} + \varepsilon_t, \quad \varepsilon_t \sim^{iid} N(0, \sigma^2), \quad \theta = 1 \qquad (1)$$

Within a framework where d represents a positive constant, T denotes the sample size, and η exceeds (1/2), we introduce a flexible sub-sample observation window within the full sample. This window is characterized by a starting point r_1 and an ending point r_2, where r_2 is determined by adding the window size r_w to r_1 ($r_2 = r_w + r_1$). To model this window's dynamics, we employ an ADF regression equation, expressed as follows:

$$\Delta y_t = \alpha_{r1,r2} + \beta_{r1,r2}\, y_{t-1} + \sum_{i=1}^{k} \phi_{r1,r2}^{i}\, \Delta y_{t-1} + \varepsilon_t \qquad (2)$$

Where :

$\varepsilon_t \sim^{iid} N(0, \sigma^2)$

k : lag order

$\beta_{r1,r2}$, $\alpha_{r1,r2}$, $\phi_{r1,r2}^{i}$: Regression coefficients

To rigorously assess the presence of rational bubbles within the series, we employ a right-tailed test that recursively computes the ADF statistic within a framework of rolling regression windows, and ADF statistic (t-ratio) based on this regression is denoted by ADF_{r1}^{r2} .This approach centres on the following hypotheses:

H0: $\beta_{r1,r2} = 0$, signifying an absence of rational bubbles, with the series exhibiting a unit root.

H1: $\beta_{r1,r2} > 0$, indicating mildly explosive behaviour or the existence of rational bubbles, accompanied by a unit root.

According to Caspi (2017) the four tests—the standard ADF test, the rolling window ADF test, the PWY supremum ADF (SADF) test, and the PSY generalized SADF (GSADF) test—share a common foundation, they diverge in their approach to determining the critical parameters r_1 and r_2, which define the observation window within the time series data. The SADF test, pioneered by PWY, adopts a unique approach to bubble detection. It leverages recursive ADF statistic calculations within a framework characterized by a fixed starting point and a dynamically expanding window. This method empowers the user to determine the initial window size, tailoring the analysis to specific data characteristics. As the figures (4) shows the test commences by anchoring the estimation window's starting point at the first observation within the sample, effectively setting $r_1 = 0$. The initial endpoint, r_2, is then strategically positioned based on a user-defined minimum window size, denoted as r_0. This initial window size, expressed as a fraction, is captured by $r_w = r_2$.

As the analysis progresses, the estimation window gracefully expands, with its endpoint r_2 aligning with r_w and traversing a path from r_0 to unity. For each iteration, the ADF statistic is meticulously calculated for the sample spanning from 0 to r_2, and this crucial metric is denoted as ADF_0^{r2}.

$$\textbf{SADF}(r_0) = \sup\{ADF_0^{r2}\},\ r_2 \in [r_0, 1] \qquad \textbf{(3)}$$

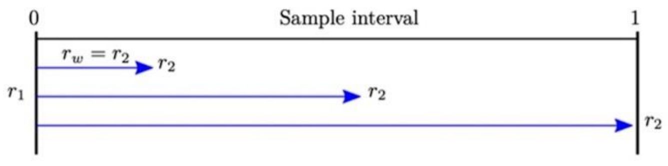


Figure (4) : SADF procedure (Caspi,2017)

Building upon the foundation of the SADF test, PSY introduced the Generalized SADF (GSADF) test, a refined technique that wields dual-moving windows for enhanced bubble detection capabilities. This innovative approach employs recursive regression methods, but with a crucial distinction: both the starting point r_1 and ending point r_2 of the observation window now dynamically traverse the data, offering a more comprehensive analysis (figure 5).

Specifically, the GSADF test allows r_1 to gracefully move within a carefully defined range, spanning from 0 to $r_2 - r_0$, effectively expressed as $r_1 \in [0, r_2 - r_0]$. This expanded flexibility in window positioning, coupled with an increased number of regressed samples, amplifies the test's power to uncover multiple bubbles, even within intricate market patterns.

The GSADF test's enhanced sensitivity to explosive price behavior or in our case the price-dividend ratio, coupled with its capacity to pinpoint multiple bubbles, positions it as an effective tool for navigating the complexities of financial markets. **the GSADF statistic is defined as** :

$$\text{GSADF}(r_0) = \sup \{ADF_{r1}^{r2}\} . \quad (4)$$

$$\mathbf{r_1 \in [0, r_2 - r_0]}$$

$$\mathbf{r_2 \in [r_0 , 1]}$$

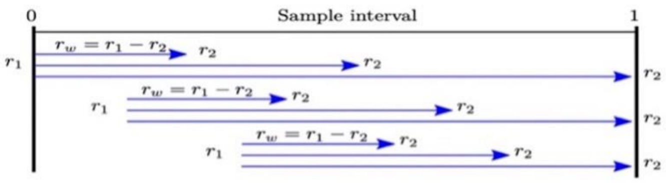


Figure (5) : GSADF procedure (Caspi,2017)

Within a statistical framework that incorporates an intercept term and postulates a random walk model with a progressively diminishing drift (dT^{-n}, where d represents a constant and n exceeds 1/2) for the null hypothesis, the GSADF test statistics converge towards a distinct limit distribution that can be expressed mathematically as follows :

$$\sup_{\substack{r_2 \in [r_0, 1] \\ r_1 \in [0, r_2 - r_0]}} \left\{ \frac{\frac{1}{2} r_w \left[W(r_2)^2 - W(r_1)^2 - r_w \right] - \int_{r_1}^{r_2} W(r) dr \left[W(r_2) - W(r_1) \right]}{r_w^{1/2} \left\{ r_w \int_{r_1}^{r_2} W(r)^2 dr - \left[\int_{r_1}^{r_2} W(r) dr \right]^2 \right\}^{1/2}} \right\}. \quad (5)$$

Where $r_W = r_2 - r_1$ and W is a standard Brownian motion process. The effectiveness of the GSADF test in identifying bubbles hinges on the choice of the minimum window size (r_0). In situations with limited data observation (small T), setting (r_0) too low can starve the initial estimation window, hindering accurate bubble detection. Conversely, when abundant data is available (large T), a smaller (r_0) becomes feasible, minimizing the risk of overlooking early explosive episodes due to unnecessarily large windows. This trade-off highlights the importance of tailoring (r_0) to the specific data context, balancing the need for robust estimation with sensitivity to early bubbles. Therefore, the general rule of **(0.01 + 1.8 / √T)** used by PSY (2012) has been implemented to calculate the minimum window size (r_0). Whereas, according to Caspi (2017) in term of the number of observations the initial window size will be [T(0.01 + 1.8 / √T)]. To assess the statistical significance of the identified bubbles, the study leveraged Monte Carlo simulations. Relying on the Rtadf add-in for E-Views by Caspi (2017). This robust approach employed simulations to generate a reference distribution for the test statistics, enabling the calculation of precise p-values and reliable assessments of bubble presence.

In this study, we explore the dynamics of the Borsa Istanbul market, particularly focusing on the BIST 100 index, through a dual-frequency data approach to better understand potential speculative bubbles. Monthly data (1994-2023) offers a macro perspective on market evolution, while weekly observations (2012-2023) provide finer granularity for bubble detection. This methodological choice is informed by the approach employed in a prior study by Başoğlu (2012), which utilized the GSADF test on the weekly (PD) ratio for the BIST 100 index from 1990 until 2012. Extending the investigation beyond 2012 with weekly data ensures methodological consistency with previous research while also enriching the existing literature with contemporary insights. Through this dual-frequency lens, we critically compare monthly and weekly data within the framework of bubble detection, seeking to identify the most effective temporal resolution for capturing the Borsa Istanbul's speculative nuances.

The Price to dividend ratio :

The price-to-dividend (PD) ratio was chosen for bubble detection based on its alignment with rational bubble theory. Pan (2018) cautions against neglecting fundamental shifts in bubble analysis, as focusing solely on price movements (e.g., HP filter) can misinterpret legitimate growth or temporary fluctuations as bubbles. The PD ratio avoids this pitfall by directly incorporating market fundamentals through present value of future dividends, a primary factor in stock valuation (Diba & Grossman, 1988a). This value reflects both tangible returns and investor expectations, allowing for the identification of speculative deviations when prices significantly diverge from what dividends suggest. Therefore, the PD ratio serves as a robust indicator for bubble detection, bridging the gap between price movements and underlying fundamentals, as theoretically supported by rational bubble theory (Blanchard & Watson, 1982).

Data collection :

The secondary data used in this study is gathered from the official database of Refinitiv Eikon for the flagship BIST 100 index spanning January 1994 to November 2023.The exact data extracted is the dividend yield calculated as dividends per share divided by the current market price per share, multiplied by 100. This then serves as a springboard to derive the price-dividend ratio, illuminating the connection between the index's price and its underlying market fundamentals.

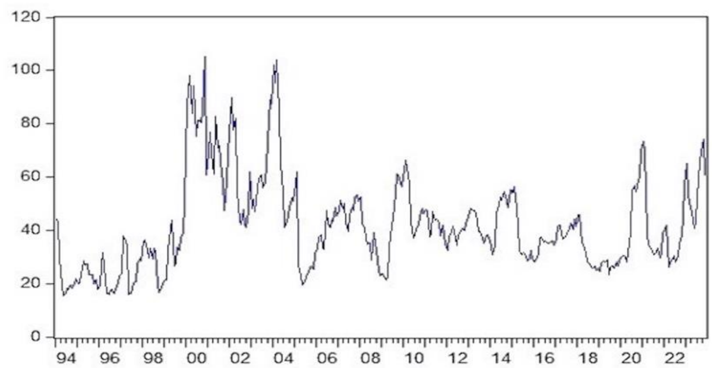


Figure (6) : BIST 100’s Price-dividend ratio.

The (PD) ratio for the BIST 100 index (1994-2023) exhibits cyclical fluctuations, not a linear trend. Distinct upward spikes and varying troughs mark the near 30-year period, with a recent upward trend suggesting a potentially dynamic shift in the relationship between stock prices and dividend payouts

4. Results and Discussions

The analysis begins with an examination of the descriptive characteristics of the price dividend ratio, such as normality and skewness, for both weekly and monthly data. This is followed by an analysis of bubbles in the (PD) ratio using the (SADF) and (GSADF) in EViews 10 software.

Table 1 : Descriptive statistics of price dividend ratio.

	Mean	**Median**	**Std. Dev.**	**Skewness**	**Kurtosis**	**Jarque-Bera**	**Probability**	**Observations**
Monthly observation (P/D)	41.87281	38.76000	17.79558	1.116870	4.261500	98.44047	0.000000	359
weekly observation (P/D)	39.51786	37.74000	11.13817	0.983475	3.574639	108.6517	0.000000	621

The descriptive statistics for the (PD) ratio of the BIST 100 index reveal notable indicators that warrant attention regarding a potential bubble. In the case of monthly data, there is a right-skewed distribution with a mean of 41.87 and a median of 38.76. The high skewness value of 1.12 and a kurtosis of 4.26, surpassing the kurtosis of a normal distribution (which is 3), signal the presence of outliers and a predisposition for extreme price fluctuations. The wide standard deviation of 17.80 confirms substantial monthly volatility. Furthermore, the Jarque-Bera test, with a p-value of 0.000, rejects the assumption of normality. When examining the weekly data, a similar pattern emerges, with slightly lower skewness (0.98) and kurtosis (3.57), along with reduced variability (standard deviation of 11.14). Nevertheless, normality is again rejected (p=0.000). These empirical findings, in alignment with Lux and Sornette's (1999) observations on skewed data in bubble contexts, raise concerns about heightened speculation and the potential for future market instability.

Analyzing the SADF and GSADF results (Tables 2 and 3), the monthly data, spanning from 1994 to 2023, fails to provide statistical evidence supporting the existence of a bubble. Both the SADF and GSADF test statistics (0.590846 and 1.205587, respectively) do not exceed critical values at conventional confidence levels. Moreover, the p-values (0.3170 and 0.4990) indicate a failure to reject the null hypothesis of no explosive behavior. However, in the case of weekly data, covering the period from 2012 to 2023, the situation becomes more intricate. While the SADF statistic (-0.047144, p=0.6840) aligns with the monthly data in negating bubble presence, the GSADF statistic (2.376359, p=0.0340) surpasses critical values at the 90% and 95% levels, suggesting potential bubble activity in this shorter timeframe. This divergence implies that recent weekly data may unveil transient speculative episodes not evident in the broader historical context of the monthly analysis, showcasing the increased sensitivity of the weekly data in capturing such dynamics.

In an in-depth examination of the SADF and GSADF, we observe distinct episodes that suggest speculative bubble behaviour interspersed with patterns consistent with a random walk. The SADF graph (Figure 7) reveals a spike exceeding the 95% critical threshold around 1999-2000, coinciding with the tech boom, suggesting a potential bubble. However, this surge is transient, returning to lower levels, indicative of no sustained bubble behavior. Similarly, the GSADF graph shows spikes in 1999-2000 and 2020-2021, potentially linked to the tech boom and COVID-19 responses, respectively. Notably, these peaks are temporary, with other fluctuations mirroring a random walk pattern, highlighting the sporadic nature of these potential bubble episodes.

The weekly tests conducted from 2012 to 2023 were designed as a chronological extension of Başoğlu's (2012) analysis. Başoğlu’s research successfully identified a significant bubble within the 1999-2000 timeframe, pinpointed more precisely from December 1999 to February 2000, using weekly data. While this bubble manifested as a noticeable spike in our monthly data analysis, it eluded definitive detection, prompting the pursuit of weekly data scrutiny for the subsequent period. Our research extended the analysis to weekly data from 2012 to 2023 to thoroughly investigate the speculative behaviors that were suggested by spikes in the monthly data, especially during the 2020-2021 period, which coincided with the economic disruptions of the COVID-19 pandemic. The aim was to leverage the higher sensitivity of weekly data to confirm these potential bubbles and to explore the presence of any additional speculative episodes beyond 2021 especially for year of 2023. This endeavor was undertaken to enhance the existing chronicle of speculative periods in the Turkish equity market, ensuring a seamless and detailed examination of its fluctuating speculative dynamics.

In this extended weekly dataset (Figure 8), the SADF graph reveals only transient movements toward the critical threshold, particularly noticeable in early 2013 and late 2022. These movements, while indicative of potential market exuberance, do not demonstrate the persistent and expansive nature typically associated with a bubble, as they do not remain above the 95% critical value line for a significant duration. This suggests that, the recent fluctuations observed in our weekly dataset reflect short-term speculative tendencies rather than long-term, sustained bubbles.

Turning to the weekly GSADF graph, more pronounced spikes are evident, mirroring the heightened sensitivity of the GSADF test to multiple bubble episodes. The significant exceedance above the critical value during the early 2020 period aligns with the economic uncertainty driven by the COVID-19 pandemic, suggesting an 8-month bubble from June 2020 to February 2021, consistent with the heightened market exuberance and subsequent volatility observed globally during this time. Additional spikes in January 2013 and from 2022 to 2023 are noted, but their brevity implies these were not persistent bubbles but rather short-term speculative episodes.

In our research, contrasting with Akdağ's (2020) monthly analysis of 20 markets, including Turkey's BIST 100 index from 2004 to 2019, which did not detect bubbles and advised investors to include such markets in their portfolios, we provide a more nuanced perspective. While Akdağ observed no bubbles in the BIST 100 index on a monthly basis, our study identifies crucial differences when incorporating weekly data. The monthly data showed potential bubble indicators through significant spikes during 1999-2000 and 2020-2021, suggesting the possibility of their existence. However, it was the detailed weekly data that revealed the presence of short-lived speculative behavior, not apparent in the monthly analysis. This distinction emphasizes the importance of using both temporal resolutions in bubble detection. Monthly data can signal potential irregularities and general market trends, but weekly data, with its finer granularity, is crucial for identifying rapid market shifts and transient speculative episodes in markets like Borsa Istanbul.

Our findings highlight the necessity for a layered approach in bubble detection, combining both monthly and weekly observations. This method provides a more comprehensive view of market volatility and speculative risk, crucial for informed investment decisions, particularly in dynamic markets like Borsa Istanbul.

Further, our 2023 empirical analysis, despite preliminary indicators suggestive of a speculative bubble in Borsa Istanbul marked by a dramatic surge in investor participation, significant trading volume increase, and a substantial rise in the P/E ratio and BIST 100 index, did not confirm bubble presence when tested with SADF and GSADF methodologies. This highlights the complex, dynamic nature of financial markets, where certain conditions may signal bubble risk, but actual formation and detection are contingent on multiple interacting factors, not always leading to a bubble within a specific timeframe.

5. Conclusion

This study embarked on a comprehensive exploration of speculative bubbles within Borsa Istanbul, rigorously navigating the intricacies of market dynamics with a dual lens on monthly and weekly data. Our empirical investigation, grounded in robust statistical methodologies such as the (SADF) and (GSADF), has meticulously revealed nuanced facets of bubble formation and behavior.Initial signals, driven by a dramatic influx of investors, surging trading volume, and skyrocketing P/E and BIST 100 indices, suggested a looming bubble. However, this anticipated narrative was compellingly contradicted by the subsequent empirical analysis for 2023. Subjected to rigorous scrutiny through the SADF and GSADF methodologies, the data unveiled an unexpected absence of definitive bubble detection. This revelation challenges the initial hypothesis, reminding us that while certain market conditions can signal the risk of bubbles, the actual formation and detection depend on a multitude of interacting factors, and statistically, we can encounter unexpected results.

In the face of apparent speculative activities and market exuberance, our findings underscore the criticality of adopting a nuanced, multi-temporal approach to bubble detection and financial analysis. The study highlights that while monthly data can signal broad market trends and potential irregularities, the incorporation of weekly data is indispensable for a more refined detection of rapid market shifts and speculative episodes. This layered approach not only enriches the understanding of market volatility but also provides portfolio managers and investors with a more comprehensive risk profile, particularly crucial in the context of rapidly evolving markets like Borsa Istanbul.

In conclusion, this research contributes significantly to the academic discourse on financial bubbles by offering empirical evidence of the time-sensitive nature of bubble formation, which can manifest variably across different temporal resolutions. The contrasting insights gained from the monthly and weekly data analyses serve as a testament to the dynamic and often unpredictable nature of financial markets, urging continuous vigilance, sophisticated analysis, and flexible strategies in investment decision-making.

Table 2: Monthly observations :

	SADF	GSADF
Test statistics	0.590846 (p=0.3170)	1.205587(p=0.4990)
90%	1.916333	2.951814
95%	1.461155	2.227561
99%	1.229425	1.981666

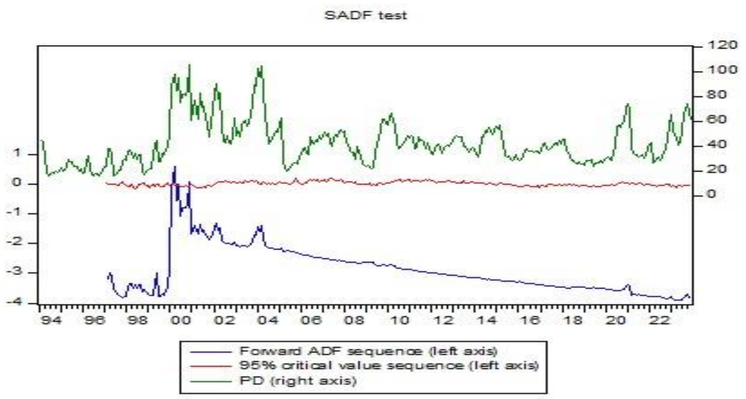
Using the Rtadf add-in within E-views software, 1000 Monte Carlo simulations were conducted, generating critical values. These simulations began with an initial window size of 38, meticulously analysing the entire dataset of 359 observations to ensure robust and informative results.

Table 3: weekly observations :

	SADF	GSADF
Test statistics	-0.047144 (p=0.6840)	2.376359 (p=0.0340)
90%	1.925814	2.717422
95%	1.439509	2.251462
99%	1.184384	2.030406

Using the Rtadf add-in within E-views software, 1000 Monte Carlo simulations were conducted, generating critical values. These simulations began with an initial window size of 51, meticulously analysing the entire dataset of 621 observations to ensure robust and informative results.

Figure (7) Monthly observations graph :



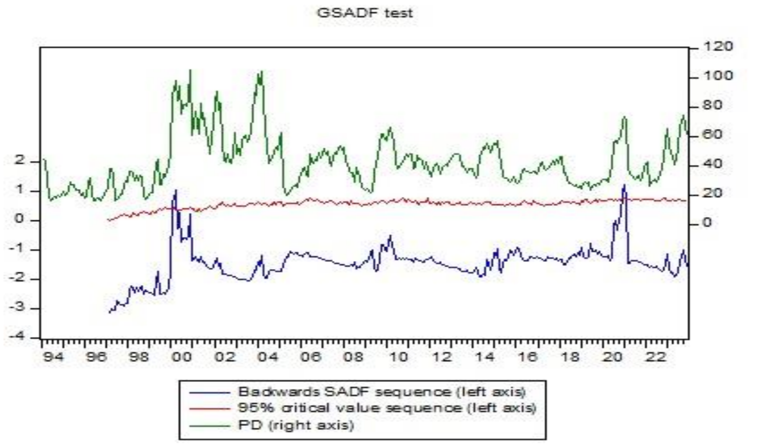
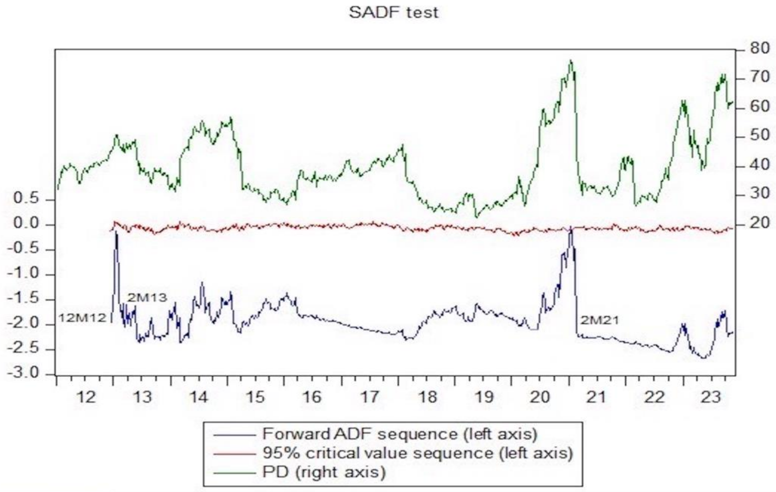
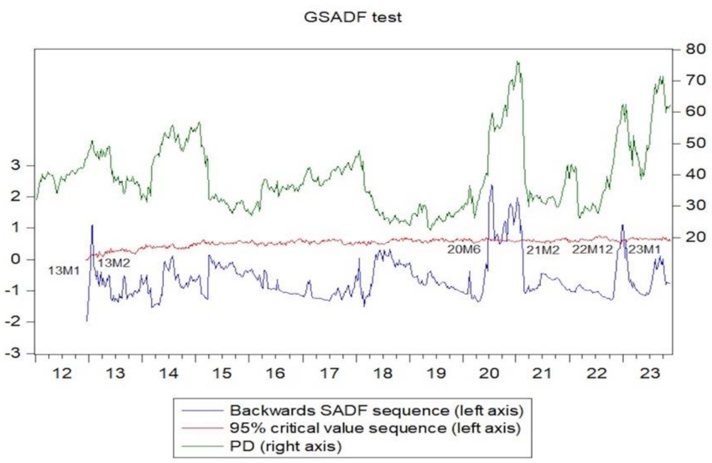


Figure (8) weekly observations graphs :





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