North American Journal of Economics and Finance 76 (2025) 102369

Contents lists available at ScienceDirect

North American Journal of Economics and Finance

journal homepage: www.elsevier.com/locate/najef

Market broadening and future volatility: A study of Russell 2000 and S&P 500 equal weight ETFs☆

Abbas Valadkhani [a], Barry O'Mahony [b]

[a] Department of Accounting, Economics and Finance, Swinburne University of Technology, Hawthorn, Australia
[b] College of Business, Abu Dhabi University, United Arab Emirates

ARTICLE INFO

JEL Classification:
C58
G11
G32
E44

Keywords:
Market broadening
Volatility
Russell 2000
S&P500
EGARCH

ABSTRACT

This paper investigates the relationship between market broadening and future volatility in the U. S. using monthly data from May 2003 to July 2024. Market broadening is measured by the price returns of two exchange-traded funds (ETFs): the S&P 500 Equal Weight ETF (RSP) and the Russell 2000 Equal Weight ETF (IWM). We employ an Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model to ensure the conditional variance remains positive, even when ETF returns are negative. Our findings support an inverted-U hypothesis, suggesting that market gains were more widely dispersed until 2014 but have since become concentrated among mega-cap stocks. More importantly, the results indicate that broadening market participation significantly reduces future volatility. This effect is consistent regardless of whether market broadening is measured using RSP or IWM. Our estimated time-varying GARCH series exhibit strong co-movements and co-jumpings with the VIX index, accurately capturing most of its turning points and critical events. This study offers practical insights into market behavior, investment strategies, and the risks of gains mainly driven by mega-cap companies, especially for market-cap ETF investors, without the need to analyze individual stocks or use hard-to-get data.

1. Introduction

Despite extensive research on market breadth, a notable gap persists in the literature. While prior studies have explored market breadth as a predictor of returns, and its relationship with trading volume and volatility at the stock level, none have specifically adopted a macro perspective on how market broadening influences future volatility using widely accessible measures such as the Russell 2000 and equal-weighted S&P 500 returns. By addressing this relationship, this study provides an in-depth understanding of the role market broadening plays in shaping future volatility within the framework of leading benchmark indices. The accessibility and replicability of these measures make them invaluable for both practitioners and researchers, facilitating a bridge between theoretical models and real-world market dynamics. Broader market participation across stocks or sectors generally indicates a robust and resilient market environment. It indicates a unified market trend capable of sustaining rallies. In contrast, returns driven by a few mega-cap stocks suggest underlying weakness, which could signal the potential for a market correction or downturn.

This issue is especially pertinent in the current market context, where substantial rallies in major technology stocks may obscure

☆ We thank the editor (Professor Beladi) and an anonymous referee, whose invaluable input and comments considerably improved an earlier version of this article. The usual caveat applies.

E-mail addresses: abbas@swin.edu.au (A. Valadkhani), barry.omahony@adu.ac.ae (B. O'Mahony).

https://doi.org/10.1016/j.najef.2025.102369
Received 4 September 2024; Received in revised form 7 January 2025; Accepted 11 January 2025
Available online 13 January 2025

underlying vulnerabilities within smaller constituents of indices such as the Nasdaq Composite and the S&P 500. The dominance of a small group of large-cap stocks—often dubbed the "magnificent seven" (Amazon, Apple, Alphabet, Microsoft, Nvidia, Meta, and Tesla)—has concentrated market gains, overshadowing the fragility of the broader market (Krauskopf, 2024). This concentration amplifies concerns about the scope of market, particularly in cap-weighted indices, which may expose passive and index investors to concentration risk. Smaller-cap indices, such as the Russell 2000, have significantly underperformed their large-cap counterparts, highlighting these disparities in market performance (Berg, 2024).

This study contends that market broadening directly exerts a negative impact on future market volatility. When broad participation spans a diverse array of securities, risk is distributed more evenly, resulting in lower volatility and a more stable market environment. Conversely, when market movements are driven by only a few stocks, volatility tends to increase as these movements become concentrated within a narrow set of stocks or sectors. Such concentration heightens the market's susceptibility to abrupt shifts, driven by seasonality, sectoral cyclicality, earnings reports, regulatory changes, geopolitical events, or unexpected economic data. These stock-specific factors can lead to significant declines in a select group of individual stocks. In contrast, strong market participation tends to keep the VIX index subdued, reflecting investor confidence and reduced concerns over abrupt market fluctuations. When market participation weakens, however, the VIX often rises, signaling heightened investor anxiety and a potential for increased market instability. By examining market broadening through fluctuations in Russell 2000 and equal-weighted S&P 500 returns, we gain a clearer insight into its impact on the volatility of major cap-weighted indices, such as the S&P 500. These metrics provide a practical framework for assessing both price actions and trading volumes, bridging the gap between theoretical models and real-world market dynamics.

Therefore, this paper makes two key contributions to the literature. First, it employs RSP (S&P 500 Equal Weight ETF) and IWM (Russell 2000 ETF) as accessible indicators of market broadening in the U.S., offering early warning signals about whether market gains are broadly distributed or concentrated among a few large-cap stocks. This approach not only streamlines the analysis of real-time market dynamics but also offers a replicable method for tracking market participation, providing invaluable tools for both investors and analysts. An analysis of market broadening over the past two decades reveals an inverted-U shape pattern, indicating a transition from broad-based participation to increased concentration. This shift is crucial for understanding the changing dynamics of market participation, particularly for market-cap ETF investors, as it highlights the move from a diversified market to one increasingly dominated by a small group of large-cap stocks. Furthermore, the paper explores the lagged effects of market broadening on time-varying volatility. By examining how changes in market concentration influence future volatility, this study enhances our comprehension of the interplay between market participation and stability. The findings underscore the delayed impact of market broadening on volatility, offering valuable insights for risk management and investment strategy development.

2. Literature review

The concepts of market breadth and market broadening, while interconnected, provide distinct perspectives on market dynamics. Market breadth evaluates the health of the market by analyzing the ratio of advancing to declining stocks. Strong market breadth reflects widespread participation in market movements, often indicating a robust and sustainable trend (Krauskopf, 2024). Conversely, market broadening refers to an increasing number of stocks contributing to market trends over time. Unlike market breadth, which offers a snapshot of sentiment, broadening emphasizes the progressive inclusion of a wider base of stocks, whether in bullish or bearish phases. Both concepts are crucial for understanding market behavior, as market breadth focuses on the immediate health of market trends, while market broadening captures structural shifts that enhance market resilience.

The present study adopts two proxies, the S&P 500 Equal Weight ETF (RSP) and the Russell 2000 Equal Weight ETF (IWM), to examine market broadening through both price actions and trading volumes. The price movements of these equal-weighted ETFs reflect participation across a more diversified set of stocks compared to traditional cap-weighted indices, as highlighted in Text B. When RSP and IWM rise, it signals that market gains are not concentrated in a few large-cap stocks but are instead distributed across smaller and mid-cap stocks. This broad participation is further reinforced by the volumes traded, providing a dual perspective on market broadening. The observed dynamics suggest healthier market conditions, as noted by Zaremba et al. (2021), who emphasize the predictive power of market breadth for future stock returns. Zaremba et al. (2021) and Hedegaard (2018) introduce a market timing strategy leveraging the predictive power of market breadth. Zaremba et al. (2021) define market breadth as the difference between the average number of rising and falling stocks within a portfolio, considering it a robust predictor of future stock returns across 64 countries from 1973 to 2018. Their study associates market breadth with herd behavior, demonstrating that high breadth portfolios consistently outperform low breadth ones. For each country, the excess returns in month t from the market portfolio are regressed on the market breadth variable used to forecast returns for that month (Zaremba et al., 2021). A positive and significant coefficient for the market breadth variable suggests its predictive power for future performance (Hedegaard, 2018; Zaremba et al., 2021).

Previous research has predominantly focused on market breadth at the stock level, such as the work of Liu, Zhao, and Kong (2023), which identifies a positive correlation between breadth indicators like ownership breadth and stock price volatility. These studies often attribute this relationship to the sequential arrival of new information and competition for liquidity (e.g., Copeland, 1976; Tauchen and Pitts, 1983). Several studies consistently observe a positive relationship between asset price volatility and trading volume (Jones et al., 1994; Bessembinder and Seguin, 1993). This relationship can be explained by two main hypotheses: the sequential arrival of new information, which drives both trading volume and price movements (Copeland, 1976), and the mixture of distribution hypothesis, where information affects both price and volume dynamics (Andersen, 1986; Tauchen and Pitts, 1983). Fung and Patterson (1999), for example, explore the interactions among return volatility, trading volume, and market depth in currency futures markets, finding that

return volatility significantly influences trading volume and market depth. Theoretical models, including competitive microstructure models (Kim and Verrecchia, 1991) and information flow models (Tauchen and Pitts, 1983), underpin these findings, distinguishing between informational and non-informational factors in assessing market efficiency and volatility.

Bian et al. (2020) further find that in the Chinese stock market, a higher number of shareholders (ownership breadth) reduces stock price volatility by supplying liquidity, while a greater number of traders increases volatility through competition for liquidity. Similarly, Liu, Zhao, and Kong (2023) examine the influence of enterprise digital transformation on ownership breadth and stock price volatility, using data from Chinese A-share listed firms (2003–2019) and text analysis methods. Their findings reveal that digital transformation significantly enhances ownership breadth, a trend that persists across subsequent periods. This effect is more pronounced in firms with lower investor attention, greater stock underpricing, and in regions with advanced digital infrastructure. Importantly, Liu et al. (2023) identify increased media coverage and investor attention as key mechanisms linking digital transformation to broader ownership. However, they also document that digital transformation exacerbates stock price volatility, driven by the growth of individual investors. From a policy perspective, they advocate for companies to embrace digital transformation while mitigating associated risks, and for governments to enhance regional digital infrastructure to support these transitions effectively. These findings complement earlier studies by underscoring the interplay between digitalization, ownership structures, and market dynamics.

The differences between the study's findings and prior literature stem from conceptual distinctions between breadth and broadening in market analysis. Traditionally, market breadth is defined by changes in the number of investors or the difference between the average number of rising and falling stocks within a portfolio (Liu et al., 2023). While breadth focuses on the movements of stocks within a given market, broadening refers to the increasing inclusion of stocks in market movements, often signaling shifts in market sentiment. An analogy can be drawn to the distinction between a few large, mega-cap tech stocks, which tend to be more prone to volatility due to their concentrated market influence, versus the more stable nature of the broader S&P 500 index, which is diversified across different sectors and market capitalizations, diluting the impact of individual stock movements. In the present study, we find that market broadening can result in falling volatility because the increasing participation of diverse sectors and smaller-cap stocks helps to smooth out the fluctuations typically seen in a concentrated market, leading to greater overall stability. Such findings align with the observations of Hanke et al. (2019), who assert that diversification within equal-weighted portfolios enhances stability and performance. Hanke et al. (2019) also assert that actively managed mutual funds benefit significantly from diversification returns through the EMV (Equal-Minus-Value) factor, which represents the return difference between equal-weighted and market-weighted portfolios. They show that EMV enhances the explanation of mutual fund performance and propose that the significant EMV tilt in many funds may result from managers acting on noisy signals, rather than deliberate strategy.

Furthermore, the negative correlation between market breadth and future volatility observed in this study aligns with theoretical models emphasizing market efficiency. By distributing market participation across a wider base of stocks, equal-weighted indices like RSP and IWM inherently promote liquidity and reduce systemic risk, diverging from the stock-based volatility trends identified by Liu et al. (2023) and Bian et al. (2020). Esqueda, Assefa, and Mollick (2012) investigate the broadening of the investor basis hypothesis, focusing on how financial integration reduces volatility in emerging markets. However, this reduction is less significant than previously believed and does not result in higher turnover. This suggests that while financial integration expands the investor base, its impact on market activity and stability is more complex than initially assumed. Krauskopf (2024) examines the broadening gains in the U.S. stock market, emphasizing how this trend reflects heightened optimism about the economy. He underscores that a more inclusive rally across various sectors mitigates the market's susceptibility to sharp reversals, particularly if reliance on a few dominant technology stocks diminishes. This broadening phenomenon is attributed to investor confidence that anticipated Federal Reserve rate cuts will stimulate U.S. economic growth. As a result, investors are increasingly allocating capital to regional banks, industrial firms, and other sectors poised to benefit from a robust economy and lower interest rates (Krauskopf, 2024).

The present study thus contributes a macro perspective to the literature, highlighting how market broadening, measured via equal-weighted ETF performance, can provide insights into volatility dynamics distinct from those derived from individual stock analyses. This work bridges gaps between micro- and macro-level studies by integrating insights from price actions, trading volumes, and broader market indices. It offers a nuanced understanding of market behavior, underscoring the importance of equal-weighted ETFs as proxies for assessing market broadening and its implications for volatility and stability in financial markets.

3. Method

Monthly price returns of RSP and IWM are used as proxies for market participation. Increasing returns in these ETFs indicate market broadening, meaning that more stocks are making positive gains. Conversely, decreasing returns in RSP or IWM, while SPY either rises or shows minimal movement, suggest market narrowing, where gains are concentrated in a few large, mega-cap stocks. Since these return series can take negative values, we apply an Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model (Nelson, 1991). The EGARCH model is selected because its logarithmic specification ensures that the conditional variance remains positive, even with negative returns. To estimate the time-varying volatility for SPY and assess the effects of market broadening, the following mean and variance equations are employed[1]:

[1] The SPDR S&P 500 ETF (SPY) is an exchange-traded fund that tracks the performance of the Standard & Poor's 500 index, which includes 500 of the largest publicly traded companies in the U.S.

$$r_t = \gamma + \varepsilon_t \tag{1}$$

$$\ln(\sigma_{\varepsilon t}^2) = \omega + \alpha_1 \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right| + \beta_1 \ln(\sigma_{t-1}^2) \tag{2}$$

Where:

r_t = monthly market returns defined as logarithmic changes in SPY prices,
γ = expected average monthly return during the sample period,
ε_t = the residual term,
ω = the intercept in the variance equation,
α_1 = the 1st order ARCH (Autoregressive Conditional Heteroskedasticity) effect,
β_1 = the 1st order GARCH (General ARCH) effect,

Equations (1) and (2) present the mean and variance equations, respectively. A higher ω indicates a higher level of volatility in the absence of any future shocks. If the ARCH coefficient is close to zero, past shocks have a limited impact. On the other hand, a larger GARCH coefficient indicates that past volatility has a more prolonged and persistant effect on current volatility. It should be noted that the Ljung-Box *Q* statistics for the correlograms of squared residuals from the EGARCH (1,1) model were not statistically significant at the 1 %, 5 %, or 10 % levels, even with up to 36 lags (36 months) considered. These results suggest that including higher-order ARCH and GARCH terms in our model is unnecessary. To assess the dynamic effects of market broadening, we separately incorporate the lagged monthly returns of the RSP and IWM funds into the variance equations (3) and (4), respectively. That is:

$$\ln(\sigma_{\varepsilon t}^2) = \omega + \alpha_1 \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right| + \beta_1 \ln(\sigma_{t-1}^2) + \lambda_1 \Delta Ln(RSP_{t-1}) \tag{3}$$

$$\ln(\sigma_{\varepsilon t}^2) = \omega + \alpha_1 \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right| + \beta_1 \ln(\sigma_{t-1}^2) + \eta_1 \Delta Ln(IWM_{t-1}) \tag{4}$$

Where:

λ_1 = the lagged effect of market broadening, proxied by the S&P500 equal-weight ETF return, on time varying volatility, and
η_1 = the lagged effect of market broadening, proxied by the Russell 2000 ETF return, on time varying volatility.

Using equations (3) and (4), we can test our hypothesis that future market volatility decreases when the market begins to broaden. If the *z* statistics for λ_1 and η_1 are both negative and statistically significant, we will not be able to reject this hypothesis.

4. Data

Although SPY was launched in February 1993, RSP and IWM were introduced in May 2003 and June 2000, respectively. Consequently, to ensure a consistent comparison, we restricted our sample period to May 2003 through July 2014. All monthly ETF prices were obtained *from yahoo finance* and the VIX index was obtained from *investing.com*. Table 1 presents the descriptive statistics for three monthly return series over the sample period, encompassing 254 monthly observations. Among these series, the S&P500 Equal-Weight ETF (RSP) records the highest average monthly return, while the Russell 2000 posts the lowest. However, the market-cap weighted S&P 500 ETF (SPY) exhibits the lowest standard deviation. Consequently, SPY achieves the highest average monthly return per unit of standard deviation, while the Russell 2000 has the lowest.

All return series display negative skewness and kurtosis well above 3, leading to the rejection of the normality assumption by the Jarque-Bera test at the 1 % significance level. This finding suggests an extended and thicker left tail in the return distribution, implying a higher probability of extreme negative returns or outliers beyond what is typical in a normal distribution. Negative skewness indicates more frequent downward price movements, while elevated kurtosis, described as leptokurtic, reflects a greater concentration of extreme events, underscoring substantial downside risk. Table 1 also presents the results of the augmented Dickey-Fuller test (Dickey and Fuller, 1979) and the Innovation Outlier test (Vogelsang and Perron, 1998), confirming the stationarity of all return series. The break dates for SPY and RSP were identified in October 2008, during the global financial crisis, which was expected. In contrast, the break date for IWM occurred in March 2020, coinciding with the early stages of the COVID-19 pandemic.

5. Results and practical implications

Using monthly observations from June 2003 to July 2024, we first estimate equations (1) and (2), with the results detailed in Table 2. The constant in the mean equation is statistically significant at the 1 % level, indicating an average monthly return of 0.85 %, which corresponds to an annualized return of 10.2 % (0.0085*12). Both the ARCH coefficient (0.540) and the GARCH coefficient (0.863) are significant at the 1 % level and fall within the acceptable range. Furthermore, All of the *Q*-statistics are statistically insignificant up to 36 lags, suggesting that additional ARCH and GARCH terms are unnecessary in the variance equation (these results available from the authors upon request).

In Fig. 1, we present the normalized VIX index alongside the time-varying GARCH series derived from equations (1) and (2). Remarkably, the GARCH (1,1) series closely follows the VIX index, with a strong correlation coefficient of 0.66. This demonstrates that the estimated time-varying volatility effectively mirrors all significant turning points, including those during the global financial crisis

Table 1
Summar statistics and unit root test results.

Description	Monthly return (%)		
	SPY	RSP	IWM
Mean	0.684	0.714	0.640
Std. Dev.	4.279	4.930	5.752
Mean/Std. Dev.	0.160	0.145	0.111
Skewness	−0.790	−0.848	−0.722
Kurtosis	4.75	6.49	4.99
Jarque-Bera	58.8	159.0	64.0
Unit root tests:			
ADF t ratio	−15.57	−15.20	−15.66
Innovation outlier test:			
Min *t* ratio	−16.73	−16.54	−16.65
Break date	October 2008	October 2008	March 2020

Notes: This table provides the descriptive statistics for three monthly return series over the sample period from May 2003 to July 2024, comprising 254 monthly observations. Among the series, the S&P500 Equal-Weight ETF (RSP) exhibits the highest average monthly return, while the Russell 2000 has the lowest. However, the standard deviation is lowest for the SPDR S&P500 ETF (SPY). Consequently, SPY offers the highest average monthly return per unit of standard deviation, whereas the Russell 2000 offers the lowest. All return series are negatively skewed and exhibit kurtosis well above 3. Therefore, the Jarque-Bera test rejects the normality assumption at the 1% significance level. According to the ADF and Innovation Outlier tests, all return series are stationary. The break dates for SPY and RSP occurred in October 2008, amidst the global financial crisis, while the break date for IWM occurred in March 2020, coinciding with the early stages of the COVID-19 pandemic.

Table 2
Estimated EGARCH models.

	Equation (1)			Equation (1)			Equation (1)		
Mean	Coeff.	*z*	*p*-value	Coeff.	*z*	*p*-value	Coeff.	*z*	*p*-value
γ	0.0085	3.88	0.00	0.0062	2.71	0.01	0.0065	2.82	0.00
Variance	Equation (2)			Equation (3)			Equation (4)		
	Coeff.	*z*	*p*-value	Coeff.	*z*	*p*-value	Coeff.	*z*	*p*-value
ω	−1.3076	−2.98	0.00	−1.0499	−2.69	0.01	−0.9798	−2.80	0.01
α_1	0.5400	6.42	0.00	0.2718	2.57	0.01	0.2797	2.88	0.00
β_1	0.8634	13.70	0.00	0.8669	15.54	0.00	0.8800	18.14	0.00
λ_1	–	–	–	−5.8382	−4.21	0.00	–	–	–
η_1	–	–	–	–	–	–	−4.5735	−4.00	0.00

Notes: The negative coefficients for the lagged monthly returns of RSP ($\lambda_1 = -5.84$) and IWM ($\eta_1 = -4.57$) are both statistically significant at the 1 % level. This suggests that broader market participation, whether measured by the S&P 500 Equal Weight ETF (RSP) or the Russell 2000 constituents (IWM), reduces our time-varying GARCH series, which closely follows the VIX index. This close correlation is evidenced by their conspicuous co-movements and co-jumpings in Fig. 1.

in November 2008 and the onset of the COVID-19 pandemic in March 2020.

The scatterplots in Fig. 2 show a distinct fanning out of data points over the sample period (May 2003 − July 2024), indicating a weakening relationship between the market-cap S&P 500 ETF (SPY) and the other price series (RSP and IWM) as we move from left to right along the *x*-axis. In essence, we found a trend contrary to market broadening, particularly in the context of the Russell 2000 ETF prices. This divergence implies that while the SPY, which represents large-cap stocks, continues to appreciate, the broader market, as reflected by RSP and IWM, fails to keep pace. This phenomenon suggests that market gains are increasingly concentrated among a few large-cap stocks rather than being distributed widely across the market. The trend is especially pronounced in the Russell 2000 ETF (IWM), which tracks smaller-cap stocks and shows a marked divergence from the SPY.

Building on the observations in Fig. 2, we proceed to estimate equations (3) and (4), incorporating the lagged monthly returns of RSP and IWM into the variance equation, respectively. According to Table 2, the first-order ARCH and GARCH coefficients in both equations fall within a similar range, indicating consistency across the two models. The estimated coefficients for the lagged monthly returns of RSP ($\lambda_1 = -5.84$) and IWM ($\eta_1 = -4.57$) are both statistically significant at the 1 % level and exhibit negative signs. These findings suggest that broader market participation exerts a dampening effect on future market volatility. Whether market broadening is defined by the inclusive nature of collective participation in the S&P 500 Equal Weight ETF or by an even more extensive engagement through the Russell 2000 constituents, it appears to reduce market volatility. This conclusion underscores the importance of diverse and widespread market participation in stabilizing financial markets.

The combined findings in Table 2 and Fig. 3 raise significant concerns about the heavy concentration of gains and the deteriorating state of market risk in the U.S. Fig. 3 provides a time plot of two relative measures of market broadening, alongside the fitted values from a quadratic regression model, spanning the period from May 2003 to July 2024. Both graphs in Fig. 3 provide clear evidence

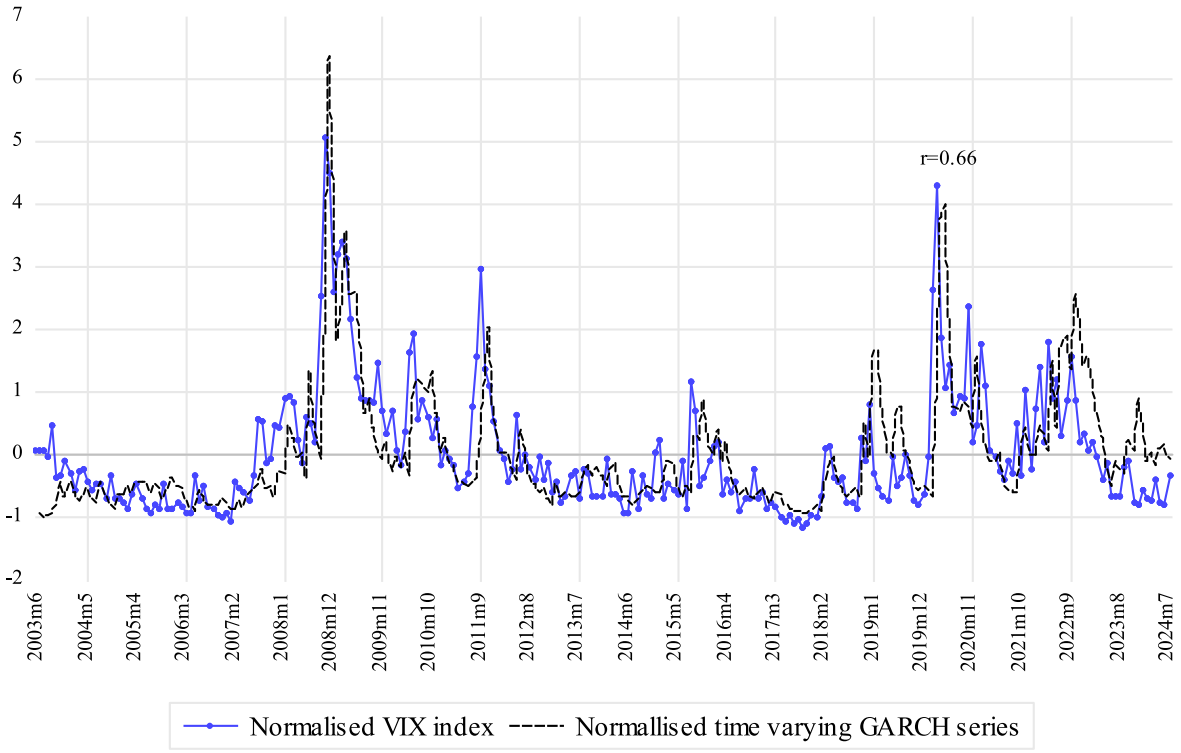

Fig. 1. Normalized VIX index versus normalized GARCH (1,1) series. Notes: This graph compares the normalized VIX index with the normalized time-varying GARCH (1,1) series derived from equations (1) and (2). The time-varying volatility closely tracks the VIX index, exhibiting a strong correlation coefficient of 0.66. This indicates that the estimated time-varying volatility effectively captures all significant turning points, including those during the global financial crisis in November 2008 and the onset of the COVID-19 pandemic in March 2020.

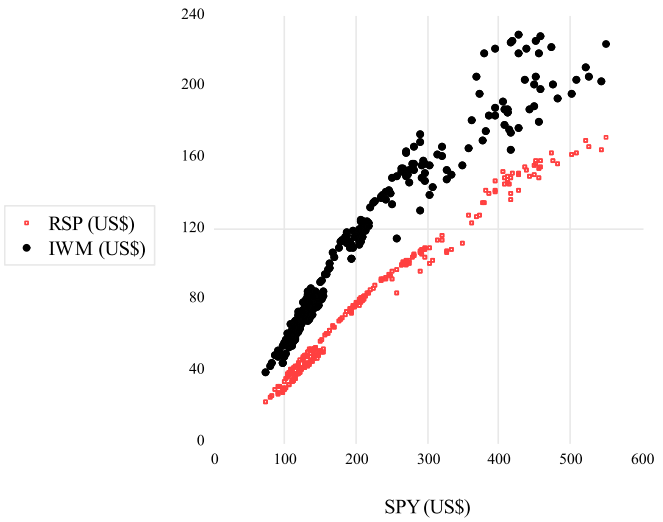

Fig. 2. SPY prices vs. two market broadening measures: RSP and IWM prices. *Notes:* The scatterplots clearly illustrate that during the sample period (May 2003 – July 2024), the data points fan out. This indicates that the relationship between the market-cap S&P500 ETF (SPY) and the other two price series (RSP and IWM) is weakening as SPY prices rise over time, moving from left to right on the *x*-axis. In other words, we observe a trend opposite to market broadening, especially in the context of the Russell 2000 ETF prices (IWM).

supporting the inverted-U hypothesis concerning market broadening. Initially, the data shows a period of increasing market broadening, where a wide range of stocks participated in driving market gains. This phase reflects a broad-based market environment. However, as market conditions evolved, the broadening reached a peak, after which it began to decline. The latter part of the graph

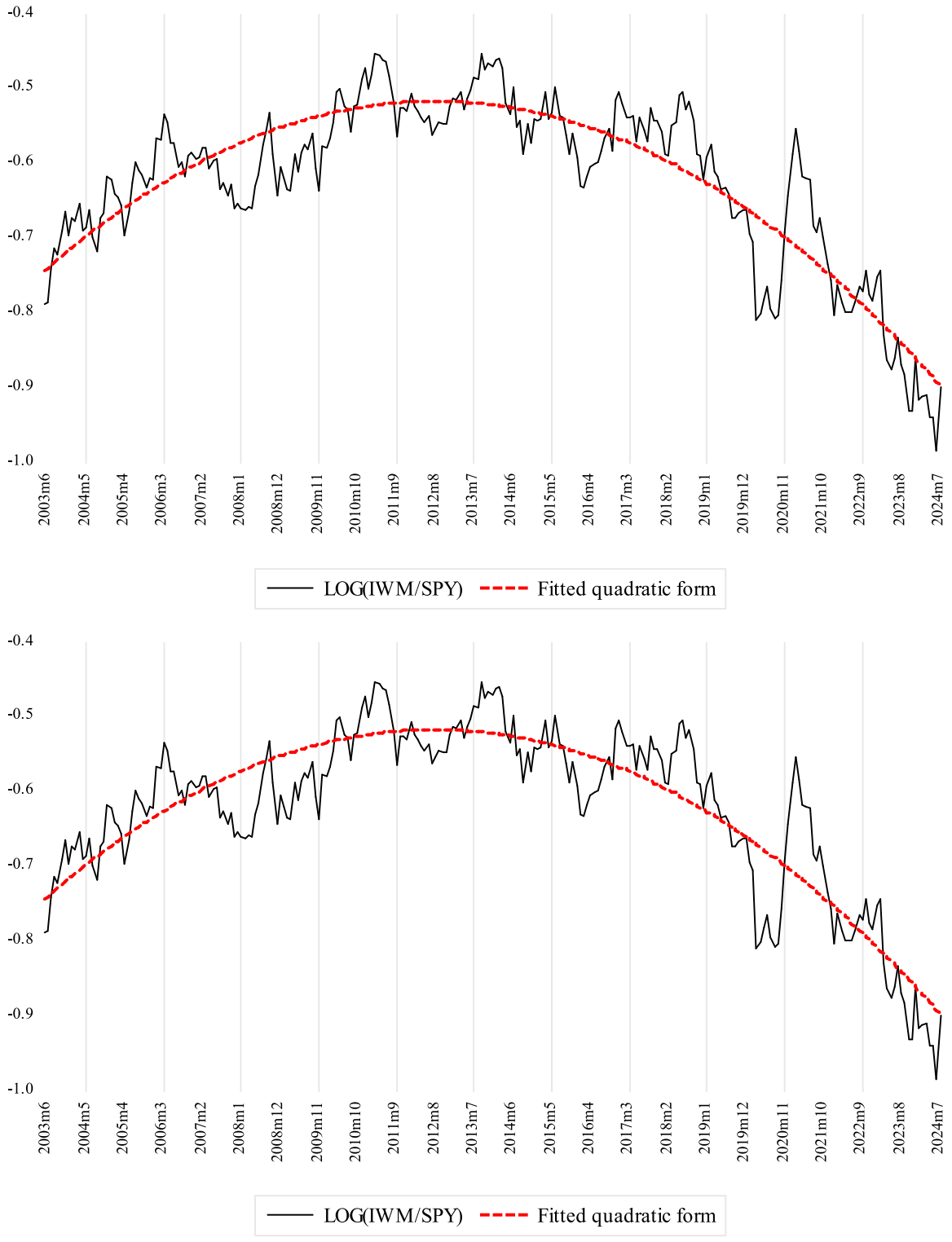

Fig. 3. Time plot of two proxies for market broadening. *Notes:* These two graphs show the time plot of two measures of market broadening and the fitted values from running a quadratic form where each dependent variable is regressed on a constant, a time trend (T_t) and $(T_t)^2$ during the sample period. Both measures indicate that the market was broadening until around 2013, but after 2013, the opposite has been occurring, with only several mega caps dominating the market.

highlights a narrowing (heavy concentration) market, where fewer stocks, particularly large-cap stocks, became the primary drivers of market performance. This pattern illustrates the classic inverted-U shape: an initial expansion of participation across many stocks followed by a concentration of gains in a select few, underscoring the shift from a diversified market to one dominated by a limited number of leading stocks. The quadratic regression model, represented by the red dotted line in the graph, captures this non-linear trend effectively. It highlights a peak around 2014, after which the distribution of market gains became more concentrated, particularly among large-cap tech stocks.

This narrowing of market participation is especially pronounced within the Russell 2000 ETF (IWM), where smaller-cap stocks began to lag behind their larger counterparts. The increasing concentration of gains in a limited number of companies has critical implications for market stability, volatility and hence investor strategies. A market driven by a few large-cap stocks can be more volatile and susceptible to sharp corrections if those few stocks underperform for any reasons such as disappointing earnings reports, downward revisions of future earnings forecasts, unexpected regulatory changes, or negative macroeconomic developments. Moreover, this concentration trend complicates portfolio diversification, as the advantages of spreading investments across a broad range of stocks/sectors are diminished, particularly for passive and index investors.

The visual and quantitative depiction of market dynamics over the past three decades in Fig. 3 underscores the transition from a broad-based market to one increasingly dominated by large-cap stocks. Most previous studies in the literature have focused on individual stocks or have not utilized RSP and IWM in the context of market volatility, limiting their scope. By contrast, this study provides a helicopter view of the market, avoiding the intricacies of individual stocks or indicators that are not easily accessible on all trading days. This broader perspective has important implications for understanding market behavior, shaping investment strategies, and evaluating the risks associated with the recent market gains driven primarily by a small group of mega-tech stocks. When just a few companies are behind the bulk of market returns, it raises concerns about the sustainability of these gains. Even index or market-cap weighted ETFs are not immune to this issue, as they can have a heavily skewed allocation toward the "Magnificent Seven" stocks. As a result, the remaining 493 stocks in the S&P 500 index contribute less to diversification, which can lead to increased risk and a lack of balance in the overall portfolio. Investors and market analysts must carefully consider this evolving landscape and adjust their reliance on market-cap ETFs, sectoral allocation, and risk management strategies, as large-cap stocks increasingly drive market performance.

6. Conclusion

This paper examines how market broadening influences volatility, specifically how broader market participation often signals greater stability, while narrower participation may reveal underlying weaknesses. The study utilizes two easily accessible indicators of market broadening: the S&P 500 Equal Weight ETF (RSP) and the Russell 2000 ETF (IWM). These ETFs serve as useful proxies to gauge whether market gains are becoming more broadly distributed or are increasingly concentrated among a few mega-cap stocks. To achieve this, we employed an EGARCH model, which inherently ensures that the conditional variance remains positive, even when the return series of RSP and IWM exhibit negative values. Our analysis covered monthly data from May 2003 to July 2024, leveraging a robust and recent dataset including monthly ETF prices and the VIX index to examine the effects of market broadening on volatility. We find that market broadening, as measured by RSP and IWM, has shown a significant evolution over the past two decades. Initially, there was a period of broad-based market participation, but this trend reached a peak around 2014 before shifting towards greater concentration among mega-cap stocks. This observation supports an inverted-U hypothesis, indicating a transition from a diversified market environment to one increasingly dominated by a few mega-cap stocks.

Furthermore, the analysis of the lagged effects of broader market participation in the variance equations indicates a significant negative influence on time-varying market volatility. The findings suggest that a broader market can reduce volatility, highlighting the importance of widespread participation and implied diversification in maintaining market stability. The narrowing of market over time, particularly evident in the lacklustre performance of smaller-cap stocks relative to their large-cap counterparts, signals increased concentration risk. This trend has practical implications for investors, as a market dominated by a few large-cap stocks can become more volatile and susceptible to sharp corrections if these stocks experience disappointing earnings, regulatory shifts, or macroeconomic pressures.

The strong co-movements and co-jumpings between the estimated time-varying GARCH series and the VIX index in this study highlight the robustness of our approach, underscoring the crucial role of market broadening in shaping future volatility. By utilizing the S&P 500 Equal Weight ETF (RSP) and the Russell 2000 ETF (IWM) as daily signaling tools, we offer an intuitive method for early risk detection and volatility assessment. This framework not only enhances the precision of investment strategies but also contributes to a more nuanced understanding of market dynamics, providing investors with a valuable tool for navigating market uncertainties and optimizing portfolio management.

Author contributions

Abbas Valadkhani (70 %): Conceptualization, Econometric analysis, Software; Data collection, Methodology, Validation, Discussion, Writing, and Editing.

Barry O'Mahony (30 %): Conceptualization, Empirical analysis, Review of literature, Discussion, Writing, and Editing.

CRediT authorship contribution statement

Abbas Valadkhani: Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Methodology,

Investigation, Formal analysis, Data curation, Conceptualization. **O'Mahony:** Conceptualization, Formal analysis, Investigation, Writing – review & editing, Writing – original draft, Validation, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

References

Andersen, T. G. (1986). Return volatility and trading volume: An information flow interpretation of stochastic volatility. *Journal of Finance, 41*(1), 168–204.

Berg, S. 2024, Unlocking opportunities: Market broadening and a new chapter for emerging markets. *T. Rowe Price,* November 2024 (accessed 3 January 2025: https://www.troweprice.com/financial-intermediary/us/en/insights/articles/2024/q4/market-broadening-and-a-new-chapter-for-emerging-markets.html).

Bessembinder, H., & Seguin, P. J. (1993). Price volatility, trading volume, and market depth: Evidence from futures markets. *Journal of Financial and Quantitative Analysis, 28*(1), 21–39.

Bian, J., Chan, K., & Fong, W. M. (2020). Investor participation and the volatility-volume relation: Evidence from an emerging market. *Emerging Markets Review, 45*, Article 100741.

Copeland, T. E. (1976). A model of asset trading under the assumption of sequential information arrival. *Journal of Finance, 34*(1), 1149–1168.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74* (366), 427–431.

Esqueda, O. A., Assefa, T. A., & Mollick, A. V. (2012). Financial globalization and stock market risk. *Journal of International Financial Markets, Institutions and Money, 22* (1), 87–102.

Fung, H. G., & Patterson, G. A. (1999). The dynamic relationship of volatility, volume, and market depth in currency futures markets. *Journal of International Financial Markets, Institutions and Money, 9*(1), 33–59.

Hanke, B., Keswani, A., Quigley, G., Stolin, D., & Zagonov, M. (2019). The equal-weight tilt in managed portfolios. *Economics Letters, 182*, 59–63.

Hedegaard, E., 2018. Time-Varying Leverage Demand and Predictability of BettingAgainst-Beta. https://doi.org/10.2139/ssrn.3194626. Accessed 25 July 2024.

Jones, C. M., Kaul, G., & Lipson, M. L. (1994). Transactions, volume, and volatility. *Review of Financial Studies, 7*, 631–651.

Kim, O., & Verrecchia, R. E. (1991). Trading volume and price reactions to public announcements. *Journal of Accounting Research, 29*, 302–321.

Krauskopf, L. 2024. Broadening gains in US stock market underscore optimism on economy. *Reuters*, 1 October 2024 (Accessed 3 January 2025: https://www.reuters.com/markets/us/broadening-gains-us-stock-market-underscore-optimism-economy-2024-09-30/?utm_source=chatgpt.com).

Liu, S., Zhao, H., & Kong, G. (2023). Enterprise digital transformation, breadth of ownership and stock price volatility. *International Review of Financial Analysis, 89*, Article 102713.

Nelson, D. B. (1991). Conditional heteroskedasticity in asset returns: A new approach. *Econometrica, 59*, 347–370.

Tauchen, G., & Pitts, M. (1983). The price variability–volume relationship in speculative markets. *Econometrica, 51*, 485–505.

Vogelsang, T. J., & Perron, P. (1998). Additional test for unit root allowing for a break in the trend function at an unknown time. *International Economic Review, 39*, 1073–1100.

Zaremba, A., Szyszka, A., Karathanasopoulos, A., & Mikutowski, M. (2021). Herding for profits: Market breadth and the cross-section of global equity returns. *Economic Modelling, 97*, 348–364.