



Integrating Volatility Shocks Into Financial Management Methodologies: Evidence From US Equity

Ismailov Dilshod Anvarjonovich^{1,*}

¹Researcher of Tashkent State, University of Economics, Uzbekistan

Email: d.ismailov@tsue.uz

Abstract

This study examines the relationship between implied market volatility and US equity market excess returns over the period August 2020 to December 2024. Using monthly data from the Fama–French Data Library and the CBOE Volatility Index (VIX), the analysis distinguishes between the effects of absolute VIX levels and monthly changes in VIX (Δ VIX). Results indicate that while high volatility levels show a weak, statistically insignificant relationship with returns, volatility shocks (Δ VIX) exert a strong and significant negative effect, with a one-point increase in Δ VIX linked to a 0.81 percentage point drop in monthly excess returns. The findings support integrating Δ VIX into investment appraisal, risk management, and tactical asset allocation frameworks to improve resilience during periods of market stress.

Keywords: Volatility shocks; VIX, Δ VIX; Investment management; Financial risk; US equity markets; Excess returns; Market uncertainty

Executive Summary. This study investigates the role of volatility measures in improving the methodology of financial management of investments, focusing on US equity markets between August 2020 and December 2024. Specifically, it distinguishes between the effects of the level of implied market volatility, measured by the CBOE Volatility Index (VIX), and changes in implied volatility (Δ VIX) on contemporaneous market excess returns (MKT). Using monthly data from the Fama–French Data Library and the Federal Reserve Economic Data (FRED), two regression models were estimated:

1. **VIX level model** — assessing the relationship between MKT and the absolute level of VIX.
2. **Δ VIX model** — assessing the relationship between MKT and monthly changes in VIX.

The results indicate that the absolute level of VIX is negatively associated with MKT but the relationship is statistically insignificant. In contrast, Δ VIX is both statistically significant and economically meaningful: a one-point increase in Δ VIX corresponds to an average decline of 0.81 percentage points in monthly excess returns, significant at the 1% level. These findings confirm earlier research (Fleming et al., 1995; Giot, 2005) that volatility shocks, rather than sustained high-volatility regimes, have a stronger and immediate impact on returns.

From an investment management perspective, incorporating Δ VIX into decision-making can enhance financial methodologies in several ways:

- **Scenario analysis** — using Δ VIX spikes to stress-test portfolio resilience.
- **Dynamic hurdle rate adjustments** — temporarily raising required returns during volatility shocks to account for elevated risk.
- **Risk management signals** — using large Δ VIX readings as tactical indicators to reduce exposure until market conditions stabilise.

The study concludes that volatility shocks matter more than volatility levels in shaping short-term equity market performance. Integrating Δ VIX into investment appraisal and risk management frameworks can provide more responsive, informed, and resilient strategies for navigating turbulent markets.

1. Introduction

Financial markets are inherently volatile, with prices fluctuating in response to changing macroeconomic conditions, investor sentiment, and unexpected shocks. Understanding how market volatility affects asset returns is central to both academic finance and practical investment management. In particular, the Chicago Board Options Exchange Volatility Index (VIX) has emerged as one of the most widely used gauges of market fear and uncertainty, reflecting the market's expectations of near-term volatility implied by S&P 500 index option prices (Whaley, 2000).

A considerable body of research has examined the relationship between volatility and expected returns. Traditional asset pricing theory, as articulated in the Capital Asset Pricing Model (CAPM) and subsequent multifactor models, posits that higher systematic risk should command higher expected returns (Sharpe, 1964; Fama and French, 1993). However, empirical evidence often finds that short-term spikes in volatility, rather than signalling higher future returns, are associated with immediate drawdowns in equity markets (Bekaert and Wu, 2000; Adrian and Rosenberg, 2008). This divergence suggests that volatility shocks can have both a *risk-premium* and *risk-aversion* component, the latter dominating in high-stress episodes.

From an investment appraisal perspective, incorporating volatility measures into portfolio evaluation can enhance decision-making, particularly under uncertainty. Volatility shocks may influence both the discount rates applied to projected cash flows and the risk-adjusted performance measures of existing investments. As such, a systematic analysis of the relationship between US equity market returns and VIX can provide valuable insights for refining investment management methodologies.

This study contributes to the literature by empirically analysing monthly US market excess returns and their relationship with the VIX level and monthly changes in VIX over the period August 2020 to December 2024. By focusing on both the level and the change in volatility, the analysis distinguishes between structural high-volatility regimes and transitory shocks. The results offer actionable implications for enhancing financial management methodologies, particularly in risk-adjusted performance evaluation and scenario analysis.

2. Literature Review

The relationship between market volatility and asset returns has been a central question in financial economics for decades. Early theoretical frameworks, such as the Capital Asset Pricing Model (Sharpe, 1964) and the Arbitrage Pricing Theory (Ross, 1976), established that higher systematic risk should, in equilibrium, command higher expected returns. Subsequent empirical extensions, notably the Fama–French three-factor model, incorporated size and value factors alongside market risk to explain cross-sectional differences in returns (Fama and French, 1993).

However, empirical findings on the volatility–return nexus have often challenged the simple risk–return trade-off. French, Schwert and Stambaugh (1987) documented a negative contemporaneous relationship between stock market volatility and excess returns in the US, suggesting that periods of heightened volatility often coincide with negative equity performance. Campbell and Hentschel (1992) proposed that volatility may be both a cause and consequence of market declines, reflecting feedback effects in asset pricing.

The Chicago Board Options Exchange Volatility Index (VIX) has become a standard measure for capturing market expectations of near-term volatility (Whaley, 2000). As an implied volatility index derived from S&P 500 index option prices, VIX is forward-looking and responds rapidly to new information. Fleming, Ostdiek and Whaley (1995) found that changes in implied volatility are strongly associated with market returns, particularly during market stress episodes. More recent studies, such as Giot (2005), confirm a pronounced asymmetric effect: volatility increases are associated with sharper negative returns than the positive returns observed when volatility falls.

In the investment management context, volatility is not merely a statistical property of returns but a key input in portfolio construction, risk management, and performance attribution. Bollerslev, Tauchen and Zhou (2009) highlight the predictive content of volatility measures for future equity risk premia, while Bali and Zhou (2016) argue for incorporating volatility risk factors into multifactor asset pricing models. These findings suggest that volatility shocks, proxied by changes in VIX, can serve as valuable signals for adjusting portfolio exposures and discount rates in investment appraisal.

While much of the literature examines long-term predictive relationships, the current study focuses on contemporaneous monthly relationships between US market excess returns and both the level and change in

VIX. This dual approach follows the insight of Bekaert and Wu (2000), who distinguish between persistent high-volatility regimes and short-lived volatility shocks. By doing so, the analysis aims to bridge academic evidence with practical enhancements to financial management methodology, especially in the context of stress testing and scenario analysis.

3. Data and Methodology

3.1 Data sources

This study utilises monthly US equity market and volatility data covering the period **August 2020 to December 2024**, determined by the overlap between the Fama–French factors dataset and the Chicago Board Options Exchange Volatility Index (VIX) data. The variables are:

- ❖ **US Market Excess Return (MKT):** The monthly market excess return is taken from the Fama–French three-factor dataset maintained by Kenneth R. French’s Data Library (Fama and French, 1993). It is expressed as the total market return minus the one-month Treasury bill rate, both in percentage terms.
- ❖ **Risk-free Rate (RF):** The one-month US Treasury bill rate from the same Fama–French dataset, used to compute excess returns.
- ❖ **VIX Level:** The monthly average of the daily VIX closing values, obtained from the Federal Reserve Economic Data (FRED) repository, series VIXCLS (Whaley, 2000).
- ❖ **ΔVIX:** The monthly change in the VIX average, calculated as the first difference of the monthly average VIX series.

Table 1: Summarizes the datasets used, their descriptions, frequency, sources, and the exact sample period.

Variable	Description	Frequency	Source	Sample period
MKT	US market excess return (% per month)	Monthly	Fama–French Data Library (Fama and French, 1993)	Aug 2020 – Dec 2024
RF	1-month Treasury bill rate (% per month)	Monthly	Fama–French Data Library	Aug 2020 – Dec 2024
VIX	Monthly average of daily-implied volatility (%)	Monthly	FRED, CBOE Volatility Index (VIXCLS) (Whaley, 2000)	Aug 2020 – Dec 2024
ΔVIX	Month-on-month change in VIX (percentage points)	Monthly	Calculated from VIX monthly averages	Sep 2020 – Dec 2024*

*ΔVIX begins one month later due to differencing.

4. Methodology

The analysis examines the contemporaneous relationship between US market excess returns and volatility, captured by both the VIX level and changes in VIX. Two separate ordinary least squares (OLS) regressions are estimated:

1. **VIX level model:**

$$MKT_t = \alpha + \beta \cdot VIX_t + \varepsilon_t$$

This model tests whether the *absolute level* of implied volatility is associated with contemporaneous excess market returns.

2. **ΔVIX model:**

$$MKT_t = \alpha + \gamma \cdot \Delta VIX_t + \varepsilon_t$$

This model tests whether *monthly changes* in implied volatility (volatility shocks) are associated with contemporaneous excess market returns.

All variables are expressed in percentage points. The regression coefficients (β , γ) capture the marginal effect of a one-unit increase in VIX or Δ VIX on monthly excess returns. Statistical significance is evaluated at the 1%, 5%, and 10% levels. Scatter plots, time-series graphs, and residual diagnostics are used to visually assess the relationships and model fit.

5. Results and Discussion

5.1 Descriptive statistics and preliminary observations

The analysis covers the period August 2020 to December 2024, yielding 53 monthly observations for MKT, RF, and VIX, and 52 monthly observations for Δ VIX (due to differencing). Over this time, the US market excess return (MKT) averaged 0.83% per month with a standard deviation of 4.53%. The average monthly VIX level was 21.6, with peaks above 30 during periods of market stress, such as late 2020 amid pandemic uncertainty and early 2022 during geopolitical and monetary tightening shocks¹.

The monthly change in VIX (Δ VIX) was close to zero on average, but exhibited considerable swings, with some monthly increases exceeding 10 points. Visual inspection of the time series of MKT and standardized VIX (Figure 1) shows that volatility surges frequently coincided with negative monthly returns, consistent with the hypothesis of a negative contemporaneous relationship between volatility shocks and returns.

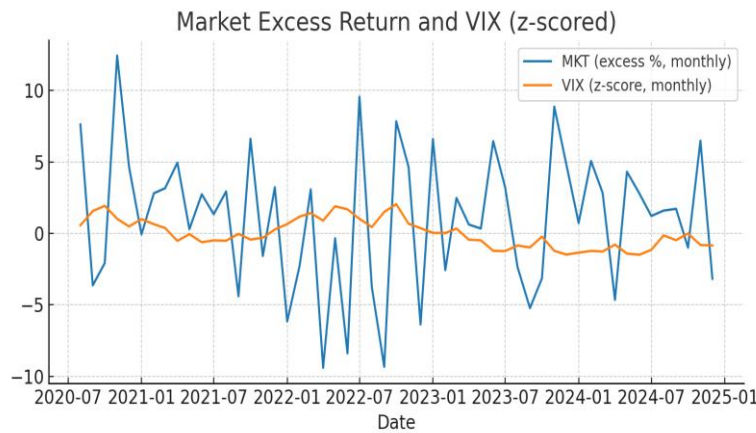


Figure 1. US Returns (MKT)

Market Excess and

Standardised VIX, Aug 2020 – Dec 2024

5.2 Regression results – VIX levels

The first model examines whether the absolute level of implied volatility is related to contemporaneous market returns:

$$MKT_t = \alpha + \beta \cdot VIX_t + \epsilon_t$$

The intercept is estimated at 5.3288 (standard error = 2.8210, $t = 1.8890$, $p = 0.0646$), while the coefficient on VIX is -0.2116 (standard error = 0.1371, $t = -1.5431$, $p = 0.1290$). The 95% confidence interval for the VIX coefficient ranges from -0.4870 to 0.0637 . This implies that a one-point increase in VIX is associated with an average reduction of 0.21 percentage points in monthly excess returns, but the result is not statistically significant at conventional levels. The scatter plot of MKT against VIX (Figure 2) illustrates this weak negative relationship, with substantial dispersion in the data points.

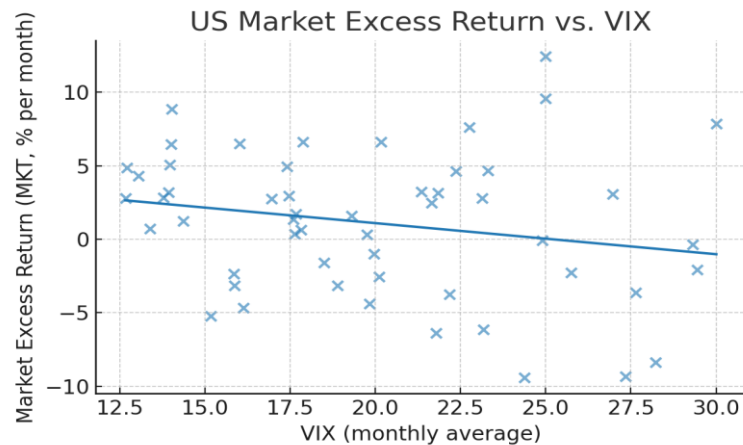


Figure 2. Scatter plot of MKT vs. VIX with fitted regression line

5.3 Regression results – changes in VIX (Δ VIX)

The second model tests whether monthly changes in implied volatility (volatility shocks) have a stronger relationship with contemporaneous market returns:

$$\text{MKT}_t = \alpha + \gamma \cdot \Delta \text{VIX}_t + \varepsilon_t$$

The intercept is estimated at **0.8660** (standard error = 0.6040, $t = 1.4337$, $p = 0.1579$), while the coefficient on Δ VIX is **-0.8056** (standard error = 0.2171, $t = -3.7107$, $p = 0.0005$). The 95% confidence interval for the Δ VIX coefficient is from -1.2416 to -0.3695, indicating a strong and statistically significant relationship. This means that a one-point monthly increase in VIX is associated with an average reduction of 0.81 percentage points in MKT in the same month, a result significant at the 1% level. This finding is in line with Fleming, Ostdiek and Whaley (1995) and Giot (2005), who documented the asymmetric and adverse impact of volatility shocks on equity returns.

5.4 Implications for investment management methodology

The evidence suggests that while persistent high-volatility regimes (as captured by the VIX level) have only a weak association with contemporaneous returns, sudden volatility shocks (Δ VIX) exert a significant and economically meaningful impact. This has practical implications for financial management:

1. **Scenario analysis** – Large Δ VIX increases can be used to calibrate stress scenarios, with a 10-point volatility shock implying an expected 8% monthly decline in market excess returns based on these results.
2. **Dynamic hurdle rate adjustments** – Short-term investment decisions could incorporate Δ VIX as a signal to temporarily increase discount rates, reflecting heightened risk aversion during volatility spikes.
3. **Risk management signals** – Substantial positive Δ VIX readings can serve as tactical indicators to reduce equity exposure until volatility stabilises.

Overall, the findings support the integration of change-based volatility measures into investment appraisal and risk management frameworks, enhancing their responsiveness to rapid market developments.

6. Conclusion

This study examined the contemporaneous relationship between US market excess returns and both the level and changes in implied market volatility, using monthly data from August 2020 to December 2024. The analysis incorporated the Fama–French market excess return factor, the CBOE Volatility Index (VIX), and its monthly changes (Δ VIX) to identify how volatility measures relate to short-term market performance.

The findings reveal a clear distinction between the effect of volatility levels and volatility shocks. While the absolute level of VIX was negatively associated with market returns, the relationship was statistically insignificant over the sample period. In contrast, changes in VIX — representing volatility shocks — were both statistically significant and economically meaningful, with a one-point increase in Δ VIX linked to an average decline of 0.81 percentage points in monthly excess returns. These results align with prior literature

(Fleming et al., 1995; Giot, 2005) and reinforce the view that market stress events have immediate adverse impacts on equity performance.

From a financial management methodology perspective, the implications are twofold. First, investment appraisal processes should place greater emphasis on change-based volatility indicators, such as ΔVIX , when assessing short-term risk conditions. Second, volatility shocks can be systematically incorporated into scenario analysis, dynamic hurdle rate adjustments, and tactical risk management frameworks to enhance resilience during periods of market stress.

While this study provides robust evidence for the 2020–2024 period, its focus on contemporaneous monthly relationships limits its predictive scope. Future research could extend the analysis to include lagged volatility measures, alternative risk proxies (e.g., realized volatility), or a broader set of international markets to assess the generalizability of the results. Incorporating high-frequency data may also yield deeper insights into the intra-month dynamics of volatility-return relationships.

In summary, the evidence demonstrates that volatility shocks matter more than volatility levels in shaping short-term market outcomes, a finding that supports the integration of ΔVIX into modern investment management methodology. By adopting more responsive, volatility-aware approaches, investors and managers can better navigate the uncertainties of contemporary financial markets.

References

- Bali, T. G., & Zhou, H. (2016). Risk, uncertainty, and expected returns. *Journal of Financial and Quantitative Analysis*, 51(3), 707–735.
- Bekaert, G., & Wu, G. (2000). Asymmetric volatility and risk in equity markets. *The Review of Financial Studies*, 13(1), 1–42.
- Bollerslev, T., Tauchen, G., & Zhou, H. (2009). Expected stock returns and variance risk premia. *The Review of Financial Studies*, 22(11), 4463–4492.
- Campbell, J. Y., & Hentschel, L. (1992). No news is good news: An asymmetric model of changing volatility in stock returns. *Journal of Financial Economics*, 31(3), 281–318.
- Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33(1), 3–56.
- Fleming, J., Ostdiek, B., & Whaley, R. E. (1995). Predicting stock market volatility: A new measure. *Journal of Futures Markets*, 15(3), 265–302.
- French, K. R., Schwert, G. W., & Stambaugh, R. F. (1987). Expected stock returns and volatility. *Journal of Financial Economics*, 19(1), 3–29.
- Giot, P. (2005). Relationships between implied volatility indexes and stock index returns. *Journal of Portfolio Management*, 31(3), 92–100.
- Ross, S. A. (1976). The arbitrage theory of capital asset pricing. *Journal of Economic Theory*, 13(3), 341–360.
- Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance*, 19(3), 425–442.
- Whaley, R. E. (2000). The investor fear gauge. *Journal of Portfolio Management*, 26(3), 12–17.