http://journals.uokerbala.edu.iq/index.php/ijas/index
Iraqi Journal for Administrative Sciences
المجلة العراقية للعلوم الإدارية

Beyond Mean-Variance: Asymmetric Returns and Downside Risk in an Extreme Frontier Market

Mohammed Faez Hasan [*1]

ما بعد المتوسط - التباين: العوائد غير المتناظرة ومخاطرة الجانب السلبي في السوق شديد التقلب

محمد فائز حسن [*1]
1. كلية الإدارة والاقتصاد، قسم العلوم المالية والمصرفية، جامعة كربـــلاء، العراق. ***المؤلف المراسل**
College of Administration and Economics, Department of Financial and banking Sciences , University of Karbala, Iraq, Email: Mohammed.faiz@uokerbala.edu.iq ***Correspondent author**

Article Information

Article history: DD/MM/YY
Received: 21/12/2025
Accepted:11/01/2026
Available online: 05/03/2026

Keywords: Asymmetric Returns, Extreme Frontier Market

تاريخ الاستلام: 2025/12/21
تاريخ قبول النشر: 2026/01/11
تاريخ النشر: 2026/03/05

الكلمات المفتاحية: العوائد غير المتناظرة، السوق شديد التقلب

Abstract **DOI: https://doi.org/10.71207/ijas.v22i87.5605**

The paper is attempt to understand the asymmetry of the stock return pattern and downside risks on the Iraqi stock exchange, one of the most extreme frontier markets around the world; for the purpose of this study, we have collected and analyzed extensive daily datasets for 57 stocks on the ISX60 index, spanning August 2014 to August 2024, and through the lens of distributional analysis and the lens of various downside risk metrics (i.e., semi-variance, value-at-risk, conditional value-at-risk), and maximum drawdown, such that risk is characterized and analyzed without the usage of standard deviation). What we have discovered is that there is considerable deviation from the normal distribution across the data, where 40.4% of the stocks had a negative skewness, and an overall significant excess kurtosis (mean of 175.13) was present, such that there was no acceptance of normal distribution in our data at any conventional levels of significance. There is a noticeable discrepancy in and of itself by the varying levels of realized downside risk associated with each stock and overall across the collection of the banking sector stocks, i.e., banking sector stocks had a downside risk of an annual return of -14.55% and a maximum drawdown of -82.36% compared to the industrial stocks that have a downside risk of an annual return of +6.41% and a maximum drawdown of -41.24%. There is significant asymmetry evidenced by temporal analysis, as there is a noticeable decline in negative skewness from 61.4% of the stocks during the crisis period (2014-2018) to 26.3% during the stabilization period (2019-2024). In this high volatility environment, the Sortino ratio is a more appropriate measure of risk-adjusted performance than the Sharpe ratio. The results emphasize mean-variance optimization's shortcomings when applied to frontier markets and further reinforce the significance of incorporating measures of downside risk into the construction of portfolios and the management of risk in emerging markets with structural instability and low liquidity.

Citation: Faez Hasan, Mohammed. (2026). Beyond Mean-Variance: Asymmetric Returns and Downside Risk in an Extreme Frontier Market, *Iraqi Journal for Administrative Sciences*, 22(87), 152.167.
الاقتباس: فائز حسن، محمد. (2026). ما بعد المتوسط - التباين: العوائد غير المتناظرة ومخاطرة الجانب السلبي في السوق شديد التقلب، *المجلة العراقية للعلوم الإدارية*، 22(87)، 152-167.

المستخلص

تهدف هذه الدراسة إلى تحليل عدم تماثل عوائد الأسهم ومخاطر الجانب السلبي في سوق العراق للأوراق المالية (ISX) كأحد الأسواق ذات الميول عالية التذبذب. تم جمع وتحليل بيانات يومية لـ 57 سهماً ضمن مؤشر ISX60 للفترة الممتدة من أغسطس 2014 إلى أغسطس 2024، بالاعتماد على مقاييس مخاطر الجانب السلبي (مثل شبه التباين، والقيمة المعرضة للخطر، والسحب الأقصى) بدلاً من الانحراف المعياري التقليدي .أظهرت النتائج انحرافاً كبيراً عن التوزيع الطبيعي للبيانات، حيث سجلت 40.4% من الأسهم التواءً سلبياً مع تفرطح مفرط (متوسط 175.13). وبرز تباين قطاعي واضح، إذ عانى القطاع المصرفي من مخاطر سلبية سنوية (-14.55%) وسحب أقصى (-82.36%)، مقارنة بأداء أفضل للقطاع الصناعي. زمنياً، انخفضت نسبة الأسهم ذات الالتواء السلبي من 61.4% خلال فترة الأزمة (2014-2018) إلى 26.3% خلال فترة الاستقرار. تخلص الدراسة إلى أن نسبة (Sortino) تعد مقياساً أدق للأداء المعدل بالمخاطر من نسبة "شارب" (Sharpe) في هذه البيئة، مما يؤكد قصور نماذج "المتوسط - التباين" وضرورة دمج مقاييس الجانب السلبي عند إدارة المحافظ في الأسواق منخفضة السيولة مثل سوق الأسهم في العراق.

1. Introduction

Accurately assessing risk within equity markets has always been one of the most prominent challenges of current finance. Since Markowitz (1952) mean-variance optimization has been the foundation of modern portfolio theory. An expectation is that the return of assets is normally distributed, and this expectation has been, and still is, the basis of countless models and strategies for investing. However, there is overwhelming evidence that stock return distributions are nonnormal (Karoglou, 2010) - specifically, negatively skewed and the distributions have excess kurtosis (this means that there is more weight in the tails and less in the center than for the figure we would obtain from a normal distributed return). In many developing markets, over and above the evidence just noted, distributions of return asymmetries tend to be exacerbated (i.e. more and larger returns).

Standard deviation has been the measure of risk in investments for a long time. Different metrics have been used to measure risks which have been shown to explain losses more accurately. From a behavioral finance perspective, investors appear to exhibit loss aversion, this means that investors are more concerned or afraid of losing money than of losing an equivalent amount of money (van Bilsen et al., 2020). However, when using the mean-variance analysis, the positive and negative returns are looked at as though the losses and gains are the same. This gap in psychology and risk measurement is where the downside risk measures have come into play. By using the theory and computation from Rockafellar and Uryasev (2000), CVaR has been shown to be better than VaR in the case of positive deviation as it has more straightforward properties. CVaR has been discussed more in recent years by Lim et al. (2011) in terms of its difficulties, where it has been shown to be sensitive to estimation errors.

Frontier markets consist of emerging economies that have unique potential within the global equity markets that is still largely under researched. They have unique risk diversification opportunities than developed markets that are also different than the emerging markets. As diversification opportunities within emerging markets is also more pessimistic than in the frontier markets, creating a balanced portfolio in these markets is more difficult. Thomas et al.'s (2022) show that moving beyond emerging markets into frontier markets is necessary for greater diversification, it also poses new and greater risks that are more difficult to assess and incorporate into a balanced portfolio. The Iraqi Stock Exchange (ISX) is post conflict reconstruction frontier market operating under very difficult circumstances. A unique case for studying extreme frontier markets is developing asymmetric return patterns and supporting more negative return risks is the ISX60 index, which includes ISX's most liquid and extreme frontier market equities across varying economic verticals, i.e. banking, industry, agriculture and services. For the policymakers in developing a more sophisticated financial system, and also for the investors, the diversification opportunity that is offered, developing a more sophisticated financial system is developing a more sophisticated financial system, and also for the investors, the diversification opportunity that is offered.

This research analyzes patterns in returns in addition to downside risk in Iraqi stocks by examining a detailed dataset comprised of 57 stocks listed within the ISX60 index for analysis from August 2014 to August 2024. We adopt a more sophisticated approach for

the measurement of risk which encompasses a distribution analysis by way of estimating skewness and kurtosis, as well as an extensive set of downside risk measures including semi-variance, Value at Risk (VaR), Conditional Value at Risk (CVaR), maximum drawdown, and risk-adjusted performance measures. There are several findings worth discussing. First, we evidence widespread negative skewness (40.4% of stocks) and universal excess kurtosis. Furthermore, all stocks reject normality at the conventional levels of significance. Second, we report that there is considerable downside risk heterogeneity across sectors, with banking stocks exhibiting significantly greater levels of downside exposure relative to industrial stocks. Third, we provide evidence of changes over time with respect to the asymmetry of distribution, with negative skewness, on the whole, more prevalent in the earlier crisis years (2014-2018) than in the later years of relative calm (2019-2024). These findings add to the developing literature on the risk attributes of frontier markets and provide empirical evidence that can assist in the construction of portfolios under difficult market conditions.

The subsequent sections will outline our work. In Section 2 we review the literature on the pertinent topics such as asymmetric return patterns, measures of downside risk, and the characteristics of frontier markets. In Section 3 we outline our data and methodology by providing details of the ISX60 dataset and our all-encompassing risk measurement framework. In Section 4 we offer our empirical findings, including assessments of the distributional attributes, the measures of downside risk, and sectoral divergence. In Section 5 we analyze the impact of our findings on the management of portfolios and the assessment of risk in frontier markets. In Section 6 we offer concluding remarks, including the principal takeaways and recommendations for subsequent inquiry.

2.Literature Review

2.1.Asymmetric Return Patterns in Equity Markets

The empirical evidence that contradicts the classical portfolio theory's normality assumption has sparked increased interest in financial markets return asymmetry. Chen et al. (2021) analyzed the US industry return's higher moments and reported the presence of significant time-varying gaps on skewness, kurtosis, and return’s directional movement. Over different business cycles, this phenomenon, in which the asymmetry of the distribution changes, was noted. During recessions, the findings showed that negative skewness was more pronounced, which indicates an increase of downside risk during turbulence in the market. Further, Amaya et al. (2015) proved that the cross-section equity return of negative skewness stocks is realized skewness; thus, the greater the crash risk, the greater the negative skewness stock have higher returns in the future. The presence of this means that equity markets risk dynamic has been complemented, but it also means the static measuring of risk is inadequate.

Incorporating higher moments into asset pricing is based on the problems associated with the mean-variance optimization. One such example is the negative news threshold hypothesis proposed by Ekholm and Pasternack (2005). Consequently, firm disclosing asymmetric information tends to produce negative skewness in stock return. They determined that, in the case of stock-promise management-structured firms, unscheduled

news announcements were the most firm specific, thus return asymmetric. Regarding the behavioral finance, clearly investors feel the pain of losing more than the pleasure of winning and, hence, the protective hedging is preferred over speculation. This kind of behavior results from the asymmetric preference loss structure and therefore, the dominant measure of risk should be the downside loss volatility and the upside profit volatility. The phenomenon is often more severe in developing countries where there are more structural market imperfections, the extent of liquidity and information unsynchronization is higher.

2.2.Downside Risk Measures and Portfolio Performance

The development of alternative measures of downside risk has been facilitated by the understanding that traditional measures of volatility fail to capture the investors' perception of risk adequately. In the early 1990s, Sortino and van der Meer (1991) constructed the first attempt at rationalizing the measurement of downside risk. They argued that measuring volatility using standard deviation is counterproductive to investors, as it equally penalizes favorable and unfavorable deviations. They advanced an alternative measure of risk, termed downside deviation, which focuses exclusively on returns which fall below an acceptable level of return (minimum acceptable return). This measure is more applicable to loss averse investors. In her study on NYSE firms, Rutkowska-Ziarko (2023) examined the application of downside risk measures and profitability ratios and noted that the firms with stronger profitability metrics had lower downside beta and better downside risk-adjusted returns.

Quantifying downside exposure using Value at Risk (VaR) and Conditional Value at Risk (CVaR) focuses on tail risk without moment-based distributional concerns. CVaR is a loss measure created by Rockafellar and Uryasev (2000) that has proven computationaltractability and coherence as a measure of risk. While VaR identifies the loss threshold at a confidence level, CVaR calculates the expected loss given that the loss has crossed the VaR threshold, thus, tail event losses are more apparent. CVaR is the downside measure used in mean-CVaR personalized portfolio construction by Yu et al. (2021) that demonstrates CVaR portfolios as providing more downside risk protection than mean-variance portfolios. Subsequently, these measures are the most used in practice, especially after the adoption of these measures in banking regulations.

2.3. Risk Characteristics of Frontier and Emerging Markets

Defining frontier markets as less developed emerging economies with a smaller market capitalization and low market liquidity helps us understand their market specific risks as different than developed or other emerging markets. Recent literature shows that asymmetric return and downside risks in frontier markets is more severe as compared to sufficiently developed markets. Examining the geopolitical risk spillovers in Middle Eastern and African stock markets, Eissa and Al Refai (2024) document asymmetric volatility transmission (i.e., negative shocks to the system cause greater cross market contagion than positive shocks). It was found that the Middle Eastern markets have region-specific patterns of response to geopolitical shocks, with the intensity of downside risk increasing during periods of crisis.

The pandemic was a chance to assess how downside risk behavior changes across a spectrum of market development levels. The volatility of return risk on the downside was studied by Raza and Hashmi (2022) for the time of the pandemic for the developed markets of the USA and the UK and the emerging markets of China and Pakistan. While all markets had a higher level of downside risk, developed markets suffered a more severe impact owing to a higher level of integration of their financial markets. This result is puzzling, but it shows that during global crises, the relative seclusion of frontier markets can provide a buffer. However, this comes at the price of a lack of diversification during more stable periods. The scant studies on the Iraqi equity markets are a result of the paucity of available data and the recent development of the market after years of conflict and reconstruction. This is a case that is on the extreme end of the frontier market classification, where there are severe structural breaks and very little foreign investor participation.

3.Data and Methodology

3.1. Data Description

The current research is based on a detailed dataset on daily closing prices obtained from the Iraq Stock Exchange (ISX) with special focus on the constituents of the ISX60 index. The ISX60 index is the flagship index of the Iraq stock market and is representative of the most liquid and actively traded securities of the country. The dataset is made up of 57 distinct equities from 7 diversified economic sectors, giving an adequate representation of the Iraqi economy. The data spans toda a period of 10 years from 3rd August 2014 to 1st August 2024 which has been periodised into 2304 daily observations. The given time period has been historically significant in terms of irregular market conditions and includes a number of unprecedented and unique economic events that the world had witnessed, the most prominent of which are the staggering of the markets and the subsequent economic recovery, the price volatility of crude oil, shifts in the structures of government (regime shifts), the COVID economic crisis, etc. Such a time period is most suited for analyzing the conditions that characterize the asymmetric pattern of the financial returns and the phenomenon of downside risk etc. Furthermore, the dataset is also free of any missing values which signifies its reliability and consistency with most time series analytical tools. Mirroring the structure of the Iraqi economy, the sample exhibits a comparable sectoral composition. The most extensive sector is Banking, comprising 16 stocks (28.1% of the sample). This is closely followed by the Industrial sector, also featuring 16 stocks (28.1% as well). Hotels and Tourism contains 8 stocks (14.0%), Agriculture has 6 stocks (10.5%). Services has 5 stocks (8.8%), Insurance consists of 4 stocks (7.0%), and Investments is the smallest sector with 2 stocks (3.5%). Such distribution shows that Iraq's economy is largely characterized by the presence of banking and industrial activities in the formal equity market.

The prices of all the stocks are in Iraqi Dinar (IQD), which also shows the official positive closing prices from ISX for the ISX60 index. Closing values for the ISX60 index are included as well so that the performance of each stock can be compared with that of the

market as a whole. Prior to the analysis, the data was processed to detect and confirm potential ISX outliers to gauge the quality of the IQD.

3.2.Return Calculation

Daily returns are calculated using continuously compounded (logarithmic) returns, following standard practice in financial econometrics. For each stock *i* at time *t*, the return is computed as:

$$r_{i,t} = ln(P_{i,t} / P_{i,t-1}) \ldots. 1$$

where $P_{i,t}$ represents the closing price of stock *i* on day *t*. Logarithmic returns are preferred over simple returns for several reasons: they are time-additive, approximately normally distributed for small changes, and symmetrically treat positive and negative price movements. This formulation is particularly appropriate for examining distributional properties and calculating risk measures.

3.3.Distributional Analysis

To describe the return distributions and check for any asymmetry, we compute the mean, median, standard deviation, minimum, maximum, and interquartile range for each stock and each sector. These metrics offer insights on the central tendency and dispersion. The primary focus lies on two higher-order moments that capture distributional asymmetry and tail behavior. Skewness measures the asymmetry of the return distribution around its mean, calculated as the standardized third moment:

$$Skewness = E[(r - \mu)^3] / \sigma^3 \ldots..2$$

Negative skewness describes a distribution wherein the tail is extended towards the more negative side, indicating more frequent occurrence of extreme losses rather than extreme gains. Kurtosis measures, the, concentration of returns in the tails of the distribution relative to the normal distribution. This is the fourth standardized moment and, excess kurtosis (kurtosis minus 3) measures the deviation from normality. Positive excess kurtosis indicates fat tails and a higher likelihood of extreme events.

The Jarque-Bera test is used to test the null hypothesis of normality, where skewness and kurtosis are combined into one test statistic which follows a chi-square distribution under the null hypothesis. If we reject normality, we obtain statistical evidence of return asymmetry which justifies the use of risk measures other than standard deviation.

3.4. Downside Risk Measures

Understanding that investors are worried about downside volatility more than other total volatility, we incorporate more refined measures of downside risk. Semi-variance measures the spread of returns that are below a given target (minimum acceptable return or MAR). When MAR is set to zero, semi-variance is given by:

$$Semi\text{-}variance = (1/n) \Sigma [min(r_t, 0)]^2 \ldots..3$$

The downside deviation, defined as the square root of semi-variance, provides a more interpretable measure in return units and serves as the denominator in the Sortino ratio.

Value at Risk (VaR) quantifies the maximum expected loss over a specified time horizon at a given confidence level. We calculate historical VaR at 95% and 99% confidence levels, representing the loss threshold exceeded in only 5% and 1% of cases, respectively. Mathematically, VaR_α corresponds to the negative of the α-percentile of the return distribution.

Conditional Value at Risk (CVaR) or Expected Shortfall, goes beyond Value at Risk (VaR) by assessing losses on average when the losses exceed the VaR threshold. VaR, grossing out the losses beyond the threshold, scores the risk, and CVaR provides a better risk score by incorporating the losses on the extreme tail beyond the threshold. CVaR is the average of the returns in the worst (1-α)% tail of the distribution. Maximum Drawdown (MDD) measures the maximum extent of return decline total return. This expresses the extent of worst-case loss an investor may suffer over an investor's chosen time frame. This even assesses the extreme loss historically and the duration of the subsequent recovery stretch.

3.5. Risk-Adjusted Performance

To estimate risk-adjusted returns, factoring in downside risk, we compute the Sortino ratio. It is a shifted version of the Sharpe ratio, where downside deviation replaces standard deviation in the denominator:

$$Sortino\ Ratio = (Mean\ Return - MAR) / Downside\ Deviation \quad .....4$$

When return outcomes reflect downside asymmetry, Sortino ratios tends to be a better risk-adjusted performance measure, since it only punishes detrimental volatility. Additionally, we compute conventional Sharpe ratios. Thus, we will be able to analyze stock and sector rankings when they concentrate on downside risk.

3.6. Sector-Level Analysis

Each stock is assigned the above metrics which are then summed up for each sector to discern more distinct and systematic downside risk patterns for each sector individually. Sector Returns are constructed as equally weighted portfolios of the constituent stocks which yields comparable calculations across sectors of different sizes. This method identifies the sectors having the highest level of asymmetric and substantial downside risk offering an opportunity for potential diversification in portfolios and downside risk containment within the Iraqi equity market.

4.Empirical Results

4.1. Descriptive Statistics of Returns

Sectors of the table show the daily market returns of the components of the ISX60. Each sector displayed different distinct returns. Two of the sectors with the most notable returns include the industry sector, which returned an average of 6.41% yearly, and the agriculture sector, which returned an average of 0.95%. On the other hand, negative average annual returns and poor annual return performances are seen in the banking sector (-14.55%), insurance (-9.79%), and investments (-14.27%), which are also reported for this review period. Most adverse return periods average -1.49% ISX60 index returns.

There is an apparent difference in the pattern of volatility across each sector. Agricultural stocks have the greatest variation in price, as evidenced by a standard deviation of 2.06% each day. Volatility, at 1.24% every day, is also high in the Investments sector, despite it having only two constituent stocks. Industry sector has the lowest volatility at 1.05% each day, indicating more stable price movements. At the mid-level of sectoral volatility is the market index (ISX60) at a standard deviation of 1.62% each day.

Table (1) Descriptive Statistics by Sector

Sector	Mean (%)	Std Dev (%)	Min (%)	Max (%)	Skewness	Kurtosis
Agriculture	0.004	2.06	-45.41	46.24	-0.60	277.57
Banking	-0.058	1.36	-16.42	18.80	-0.11	24.25
Hotels	-0.001	1.59	-28.87	31.60	-0.37	202.90
Industry	0.025	1.05	-14.54	15.70	0.06	53.89
Insurance	-0.039	1.26	-14.51	16.57	-0.44	23.26
Services	-0.015	1.51	-34.42	37.73	-0.94	235.44
Investments	-0.057	1.24	-20.89	21.47	-0.11	122.71
ISX60 Index	-0.006	1.62	-28.78	27.78	-0.48	104.55

Note. Mean and standard deviation are daily values multiplied by 100. Kurtosis values represent excess kurtosis.

Analysis of individual stocks identifies significant heterogeneity even within the same sector. For instance, among 57 stocks, the daily returns yield both large losses and large gains. In fact, the most individual stock daily return dispersion (i.e. daily standard deviations of 10% or greater), is coupled with the least dispersion (i.e. daily standard deviations of less than 3%) within individual stock return daily deviations of the Iraqi equity market.

4.2..Return Distribution Characteristics

The moments of order above the set mean indicate the absence of a normal distribution of returns for the constituents of the ISX60 index. Skewness and excess kurtosis for each of the considered sectors are presented in Table 1. Notably, there are 6 out of 7 sectors with negative skewness, the Services sector with the highest of these (most negative) asymmetry of -0.94 (in parentheses) followed by Agriculture with -0.60, and the ISX60 index with -0.48, the Insurance and Hotels sectors (sub-indexes) with -0.44 and -0.37, and only the Industry sector with a positive skewness of 0.06. The negative skewness in the aforementioned sectors suggests that these sectors are likely to experience more extensive and more frequent adverse moves than positive shifts in the average returns, resulting in a more negative skewness (left tail extremity) of the distribution of returns.

At the individual stock level, there is negative skewness present for 23 out of 57 stocks (40.4\%) in the full sample period. This shows that there is a noticeable asymmetry in the ISX equity market. The average skewness across all stocks is -0.28, with a -29.18

minimum and 8.86 maximum, which shows a great deal of variation in distributional asymmetry. The negative skewness of Iraqi stocks indicates that the stocks possess large negative returns which present risk to investors who are averse to downside risk.

Positive values of excess kurtosis show evidence of distributions of returns having fat tails. Positive excess kurtosis is displayed in all sectors, with values between 23.26 (Insurance) and 277.57 (Agriculture). In the ISX60 index, excess kurtosis was 104.55, implying that extreme returns happen much more often than what a standard distribution would suggest. In the sample, all 57 stocks, or 100\%, had positive excess kurtosis over 3, with a total average excess kurtosis of 175.13. Numerous stocks had exceedingly high kurtosis with values over 500, indicating numerous extreme changes in values throughout the time period of the sample.

There is empirical evidence backing the described patterns. Jarque-Bera for all 57 stocks at the 5% and 1% levels rejects the null of normality. Such overwhelming rejections reveal the insufficiency of any of the modeling approaches on ISX returns that sustain normality and provides an empirical rational for the reliance on other risk metrics incorporating non symmetry and tail risk. Negative skewness coupled with high kurtosis means that ISX stocks are at risk of extreme negative outlier events and that the distributions of these stocks are contradicting the fundamental assumption of normality in traditional portfolio theory.

4.3.Downside Risk Analysis

Table 2 provides an overview of downside risk across all sectors. From the results, it is clear that an imbalance exists when it comes to the level of downside risk for each of the sectors. The Investments sector presents the largest downside deviation at 7.04% and is considerably greater than the remainder of the sectors. This higher downside risk is partially due to a lack of diversity in the sector (it only has two stocks) and the high focus of the sector on investment companies. At 2.14%, Agriculture has the second highest downside deviation, which is in accordance with the sector's overall volatility. On the contrary, industry sector has the least downside deviation at 1.00%, which implies that while the sector exhibits a fair amount of overall volatility, it tends to have less pronounced downside deviations.

Table (2) Downside Risk Measures by Sector

Sector	Downside Dev (%)	VaR 95% (%)	VaR 99% (%)	CVaR 95% (%)	Max DD (%)
Agriculture	2.14	3.38	5.93	8.08	-53.26
Banking	1.30	2.24	3.87	5.46	-82.36
Hotels	1.57	2.59	4.38	6.05	-56.91
Industry	1.00	1.68	2.97	4.31	-41.24
Insurance	2.14	2.03	4.33	6.21	-74.79
Services	1.53	2.42	4.12	5.57	-70.42

Investments	7.04	2.01	3.56	8.98	-78.57
ISX60 Index	1.69	2.66	5.20	7.31	-65.93

Note. Downside deviation calculated using zero as minimum acceptable return. VaR and CVaR are reported as positive values. Max DD represents maximum drawdown.

Value at Risk (VaR) measures confirm the divergent risk profiles across sectors. At the 95% confidence level, daily VaR ranges from 1.68% (Industry) to 3.38% (Agriculture), indicating that under normal market conditions, daily losses exceeding these thresholds occur only 5% of the time. At the more stringent 99% confidence level, VaR increases to a range of 2.97% (Industry) to 5.93% (Agriculture). The ISX60 index records a 99% VaR of 5.20%, suggesting that extreme daily losses beyond 5.20% occur approximately once per 100 trading days or roughly 2-3 times per year.

Conditional Value at Risk (CVaR) provides insight into the magnitude of losses beyond the VaR threshold. CVaR estimates exceed VaR across all sectors, reflecting the severity of tail events. The Agriculture sector shows a 95% CVaR of 8.08%, while the Investments sector exhibits the highest 99% CVaR at 8.98%. These findings indicate that when extreme losses do occur, they are substantially larger than the VaR estimates suggest, emphasizing the importance of tail risk management in the ISX market.

When calculating maximum drawdown, we consider the total accumulated losses over the entire sample. Of the losses, the most extreme drawdown was identified in the Banking sector at -82.36%, followed by Investments at -78.57%, and Insurances at -74.79%. The aforementioned drawdowns indicate a heavy decline in the market over the years of 2014-2017 due to the clash of ISIS which was further complicated by the market distortion of COVID-19 in 2020. Industry sector had the least maximum drawdown at -41.24%, which shows a decent level of resilience. For the ISX60 index, the recorded maximum drawdown was -65.93% which further emphasizes the deep and prolonged phase of bearish market conditions that were faced by Iraqi equities in the course of the sample.

4.4. Risk-Adjusted Performance

Table 3 compares Sharpe ratios and downside Sortino ratios across different sectors. The Industry sector stands out with an annualized Sortino ratio of 0.61. This indicates that it has positive returns and low downside volatility. The agriculture sector comes next with a Sortino ratio of 0.04 and the others having negative Sortino ratios due to negative average returns. The Banking sector captures negative returns and high downside deviation with the most negative risk-adjusted performance at a Sortino ratio of -1.12.

How prioritization of downside risk impacts the ranks of other ratios is evident in the evaluation of Sortino and Sharpe ratios. Banking (1.05), Industry (1.05), and Hotels (1.01) each have Sortino/Sharpe ratios greater than 1.0, indicating total volatility exceeds downward volatility in these sectors. It means in these sectors, there is a considerable amount of upward volatility which, although contributes to the overall risk of the sector, from the perspective of an investor, it is not harmful risk. Conversely, the Investments sector exhibits a Sortino/Sharpe ratio of 0.18 which indicates a deficient asymmetric risk, as it entails more downward volatility than total volatility.

Performance that has been adjusted for risk at the individual stock level is highly disparate. Stocks that achieved the highest Sortino ratios performed positively and showed downside deviation control and achieved annualized Sortino ratios between 0.08 and 0.23. That said, most stocks showed negative Sortino ratios, which is indicative of the difficult market conditions for that time period. The high variance in risk adjusted stock returns highlights the significance of stock picking in the Iraqi equity market.

4.5.Time-Varying Patterns in Return Asymmetry

Analysis of subsamples shows significant time-dependent changes in return asymmetry. Each sample having been split by January 2019 gives two sub-periods of almost equal length. These sub-periods include an early period (August 2014 - December 2018) and a late period (January 2019 - August 2024). In the early period, average skewness of the stocks is recorded as -0.60, out of which 35 of the 57 stocks (61.4\%) demonstrated negative skewness. Such negative asymmetry is recorded with the increase in the geopolitical risk, the conflicts and the volatility of the oil prices affecting the economy of Iraq.

In the late period, the average skewness is 0.54, and only 15 out of 57 stocks (26.3%) show negative skewness. The increase in positive skewness signals that market conditions have improved and there are less frequent extreme negative events. The changes in asymmetry indicate that the downside risk of the ISX market is time dependent and impacted by the macroeconomic and political climate. Thus, downside risk is characterized by more complex patterns and needs to be factored into the risk management approach as it addresses the more complex, changing time dependent asymmetries.

The evolution over time of various characteristics of the returns reinforces the need to keep analyzing the distributional aspects of frontier markets. The changes in the ISX market from negative skewed to more balanced and positively skewed distributions demonstrate the market's maturation and stabilization post-ISIS and the subsequent improvement in local security. However, the fat-tailed phenomenon in all sub-periods suggests that outliers are still an unrelenting characteristic of the Iraqi equity returns, irrespective of the degree of negative skewness.

5.Discussion

5.1.Interpretation of Findings

The stock market in Iraq shows evidence of imbalanced return patterns and risk of loss. The finding that 40.4% of stocks show negative skewness and that these stocks are universally non-normally distributed demonstrates that ISX stock return distributions do not conform to the expected distributions of most portfolios constructed following Modern Portfolio Theory. Most other distributions of returns are characterized by large positive and large negative returns, while the distribution of returns in this case has a large negative return with little or no likelihood of a large positive return. This distribution of risk and return is unhealthy for the investor. The negative skewness implies that the measures of risk that are based on the standard deviation more likely than not underestimate the risk in

the Iraqi stock market, specifically the stocks that are negatively skewed, for the reason that such measures of risk ignore the negative skewness of the return distribution.

An average excess kurtosis figure of 175 for all stocks suggests that extreme returns are more common than what standard distributions would forecast. The occurrences of such extreme events are not commonplace, yet with an fatter tail, they are more likely than what standard models would assume. The muddliness that negative skewness combined with high kurtosis causes is identifiable in the risk management arena, as a shift of the distribution to the left with greater mass probability in the extreme left tail is evident. All these attributes align with markets with structural breaks, lack of liquidity, and with crises that occur intermittently, all of which are typical of frontier markets, such as Iraq.

The progression of return asymmetry over time is remarkable. For example, negative skewness which is the presence of large negative returns relative to smaller positive returns, dropped from 61.4% of stocks in the 2014 to 2018 period to 26.3% of stocks in the 2019 to 2024 period. This shift is indicative of increased confidence in the underlying market stability. This kind of pattern is matched to the slow post-conflict reconstruction of Iraq, following the ISIS war, increased improvement in the security situation, and the more completely revitalitalized economic activities. Despite still present fat tails in the two time periods, suggest the greater likelihood of extreme negative events in the period of less concern about the market suffering large negative shocks from the outset. The extreme negative events were even more skewed in the past and would hence have required an even higher measurement of market volatility. It shows that the risks associated with frontier markets are dynamic rather than static, and hence will require more frequent monitoring.

5.2.Sector-Specific Insights

The case study exemplifies varied degrees of downside risk, which illustrates the heterogeneity characterizing the sub-sectors of the business model, the regulatory constraint framework, and the degree and complexity of exposure to macroeconomic shocks. The annualized sector performance of the Banking sector: -14.55%, and its extreme maximum drawdown of -82.36%, show how the sector's vulnerability to credit risk, the presence of distressed assets, and the scrutiny of capital sufficiency constraints during an economic downturn. The Iraqi banking sector during the ISIS conflict and the subsequent reconstruction phase was characterized by disrupted lending cycles and impaired credit. This explains the sector's negative skewness and disproportionate higher risk in the downside. The banking sector's stocks are overly vulnerable to the systematic risk of the economy.

The Industy sector demonstrates the most positive and consisten return profile and relatively the most resilence to drwaodons of the sector at -6.41% annualized return on average with -1.00% annualized downside deviation with a maximum drawdown of -41.24% being the lowest of all. This explains that the Industy sector sub-components e.g manufacturing, construction materials, and petrochemicals, were able to capture the positive reconstruction and infrastructure adoption demand during the sample period. Additionally, the sector explains most of the near-zero downside skewnness and downside risk which makes it the most preffered for risk-adjustment purposes. This moderate

downside risk coupled with lack of positive return characterizes the Services and Insurance sector as being in a middle position. On the other hand, the Investments sector illustrates extreme downside deviation of 7.04% with the result being a calr character of the sector and its high concentration with regards to the overall market sentiment.

5.3.Comparison with Other Markets

While the return characteristics of the ISX are consistent with what has been documented for other frontier and emerging markets, the degree of negativity skewness and excess kurtosis, and the presence of fat tails, are more pronounced. Middle Eastern equity markets studies also documented negative skewness and excess kurtosis, especially during crisis periods, whether political or economic. However, the degree of excess kurtosis observed is greater than other emerging markets. The average excess kurtosis of the Iraqi stocks was 175. Thus, Iraq is a bin case, or an outlier, of frontier markets. The patterns the Iraq Stock Exchange exhibits are more comparable to those of markets that have experienced civil disorder or extreme economic breakdown, such as Egypt during the Arab Spring or Pakistan during Episodes of Terrorism.

The ISX market's asymmetry and time series variables similar to improving recent years distributional properties reflect recovery trends in other post conflict equity markets. Other markets post crisis, which transitioned from highly negatively skewed to more symmetric, have similar trends. It indicates that the ISX is likely experiencing a more generalized post conflict market normalization. Nevertheless, the factor indicating the difference is a persistent prevalence of fat tails in the frontier markets than in the developed markets where the tail risk is more contained than in the global financial crisis.

6. Conclusion

This research documents the Iraqi Stock Exchange anomalies in distribution, where conventional portfolio theory fails. It will focus on the Iraqi Stock Exchange (ISX) during the time period 2014-2024, comprised of 57 stocks across 7 sectors. The study will examine asymmetric stock returns (negative return skewness) and the presence of fat tail (excess kurtosis > 0) distributions which will contribute to evolving the measurement of risk in frontier markets. The study will establish that 40.4% of ISX stocks have negative skewness, they all have extreme excess kurtosis and the ISX in total (all 57) will reject the normal distribution. Maximum drawdown will be reported to be as low as -41.24% for the Industry and as low as -82.36% for Banking. There will be 2 time frames during which risk in the market will be examined, 2014-2018 and 2019-2024, reporting that risk asymmetry improves during the time frame of Iraq transition from conflict to stabilization.

The exposed results show the shortcoming of Markowitz's (1952) framework which rests on the assumption of Symmetric and Normal distributions of return which our data has shown to be grossly false. When downside deviations are disproportionate to upside movements, standard deviation shows severe misleading consequences. The Sortino ratio positively confirms that investors should be inclined to asymmetric risk measures (in this case, loss measures) that capture the true distributions of adverse loss, and this has shown to be an empirical explanation of finance behavior theories on loss aversion, particularly in the context of a frontier market, which is often overlooked.

Practical implications are clear-cut and certain. Investors need to integrate new metrics of downside risk—semi-variance, Value at Risk, and Conditional Value at Risk—at the forefront of risk assessment, as the traditional metrics of volatility considerably underpredict the tail risk exposure. Instead of embedding downside risk as variance minimization, portfolio construction must embed downside risk. In the allocation of sectors, the downside risk must dominate, so the Industry risk profile should be preferred to Banking's deep drawdowns. Integrated risk management incorporates stress tests with fat tail risks, as fat extreme events tend to be more frequent when compared to other markets. There should be more active circuit breakers, and tighter control should be attainable from the regulators. International investors need to analyze the tail risks and adjust their positions.

There are geographical limitations which impact our findings. However, Iraq does offer an interesting case for extremely remote behavior at times of stress. Our sample period captures phenomena which, due to their extremity, are likely to increase asymmetries (ISIS, COVID-19). Daily data may mask intraday data points due to lack of liquidity. Integrating multiple sectors means that cross-border data loses intra-sector variability. Iraq's special features may best be appreciated through cross-border comparative studies. Describing real-time forecasting will be enhanced by predictive modelling that takes into account macroeconomic regime shifts, volatility of oil prices, and geopolitical risk. Practitioners might find the analysis of portfolio algorithms with one or more higher moment(s) useful. In the context of the return generating puzzle, pricing of downside risk premia in frontier markets is worth examining. Given that institutional investors are increasingly interested in the portfolio diversification payoffs of frontier markets, asymmetric downside risk is a critical factor in understanding the true potential of frontier markets. This makes the downside risk of frontier markets important to the institutional investors.

Acknowledgement: Author does acknowledge the relationship manager and the staff of Iraq stock exchange for their permit to get dataset of ISX60.
Funding: Author have not received funding from any party (self-funding).
AI in writing: Author declared that he utilized the application of proofreading and grammar checking.
Conflict of interest: the Author declarant has no conflict of interest
Author Bibliography:

References

1. Amaya, D., Christoffersen, P., Jacobs, K., & Vasquez, A. (2015). Does realized skewness predict the cross-section of equity returns? *Journal of Financial Economics, 118*(1), 135-167. https://doi.org/10.1016/j.jfineco.2015.02.009
2. Chen, X., Li, B., & Worthington, A. C. (2021). Higher moments and US industry returns: Realized skewness and kurtosis. *Review of Accounting and Finance, 20*(1), 1-22. https://doi.org/10.1108/RAF-06-2020-0171

3. Eissa, M. A., & Al Refai, H. (2024). Context-dependent responses to geopolitical risk in Middle Eastern and African stock markets: An asymmetric volatility spillover study. *International Review of Economics & Finance, 94*, Article 103402. https://doi.org/10.1016/j.iref.2024.103402
4. Ekholm, A., & Pasternack, D. (2005). The negative news threshold—An explanation for negative skewness in stock returns. *European Journal of Finance, 11*(6), 511-529. https://doi.org/10.1080/1351847042000286702
5. Harvey, C. R., & Siddique, A. (2000). Conditional skewness in asset pricing tests. *Journal of Finance, 55*(3), 1263-1295. https://doi.org/10.1111/0022-1082.00247
6. Jondeau, E., & Rockinger, M. (2003). Conditional volatility, skewness, and kurtosis: Existence, persistence, and comovements. *Journal of Economic Dynamics and Control, 27*(10), 1699-1737. https://doi.org/10.1016/S0165-1889(02)00079-9
7. Karoglou, M. (2010). Breaking down the non-normality of stock returns. *European Journal of Finance, 16*(1), 79-95. https://doi.org/10.1080/13518470902872343
8. Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*(2), 263-291. https://doi.org/10.2307/1914185
9. Lim, A. E. B., Shanthikumar, J. G., & Vahn, G. Y. (2011). Conditional value-at-risk in portfolio optimization: Coherent but fragile. *Operations Research Letters, 39*(3), 163-171. https://doi.org/10.1016/j.orl.2011.03.004
10. Mandelbrot, B. (1963). The variation of certain speculative prices. *Journal of Business, 36*(4), 394-419. https://doi.org/10.1086/294632
11. Markowitz, H. (1952). Portfolio selection. *The Journal of Finance, 7*(1), 77-91. https://doi.org/10.1111/j.1540-6261.1952.tb01525.x
12. Takahashi, H., & Xu, P. (2016). Trading activities of short-sellers around index deletions: Evidence from the Nikkei 225. *Journal of Financial Markets*, *27*, 132-146. https://doi.org/10.1016/j.finmar.2015.05.001
13. Peiro, A. (1999). Skewness in financial returns. *Journal of Banking & Finance, 23*(6), 847-862. https://doi.org/10.1016/S0378-4266(98)00119-8
14. Shah, S. A., Raza, H., & Hashmi, A. M. (2022). Downside risk-return volatilities during Covid 19 outbreak: A comparison across developed and emerging markets. *Environmental Science and Pollution Research, 29*(46), 70179-70191. https://doi.org/10.1007/s11356-022-20715-y
15. Rockafellar, R. T., & Uryasev, S. (2000). Optimization of conditional value-at-risk. *Journal of Risk, 2*(3), 21-42. https://doi.org/10.21314/JOR.2000.038
16. Rutkowska-Ziarko, A. (2023). Downside risk and profitability ratios: The case of the New York Stock Exchange. *The North American Journal of Economics and Finance, 68*, Article 101993. https://doi.org/10.1016/j.najef.2023.101993
17. Sortino, F. A., & van der Meer, R. (1991). Downside risk. *The Journal of Portfolio Management, 17*(4), 27-31. https://doi.org/10.3905/jpm.1991.409343
18. Thomas, N. M., Kashiramka, S., Yadav, S. S., & Paul, J. (2022). Role of emerging markets vis-à-vis frontier markets in improving portfolio diversification benefits. *International Review of Economics & Finance, 78*, 95-121. https://doi.org/10.1016/j.iref.2021.11.012

19. van Bilsen, S., Laeven, R., & Nijman, T. (2020). Consumption and portfolio choice under loss aversion and endogenous updating of the reference level. *Management Science, 66*(9), 3927-3955. https://doi.org/10.1287/mnsc.2019.3393
20. Yu, C., & Liu, Y. (2021). A personalized mean-CVaR portfolio optimization model for individual investment. *Mathematical Problems in Engineering, 2021*, Article 8863597. https://doi.org/10.1155/2021/8863597