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DOES DOWNSIDE BETA MATTER IN ASSET PRICING? EVIDENCE FROM THE EGYPTIAN STOCK EXCHANGE

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Abstract *Several scholars pinpointed many predicaments in Sharpe's (1964) beta leading to the introduction of downside framework by Markowitz (1959). Subsequently, later studies investigated downside beta and its effectiveness in developed and developing markets. Egypt, an emerging market, exhibits characteristics such as thin trading, illiquidity, small number of listed firms, and relatively weaker corporate governance enforcement, which impacts its market efficiency. Thus, conventional beta designed and tested in developed markets may fail to account for these unique circumstances that exist in emerging countries as Egypt. This study aims to address this gap in the literature by testing the validity of conventional and downside risk measures using data from 55 Egyptian equity funds from 2012 to 2022. Fama & MacBeth's (1973) two-stage regression was employed. In the first stage, the downside beta was employed using Estrada's (2002) approach. Afterwards, the funds' excess returns over risk-free rate are regressed on the funds' risk measures. Results suggest a slight advantage for downside beta, indicated by a higher adjusted R-squared. Moreover, a robustness check was employed by dividing the sample into two sub-periods. The findings revealed that the conventional beta is unstable, while downside beta demonstrated consistent and significant results. These empirical findings align with previous studies by Yildiz et al. (2022), Ruthkowska-Ziarko et al. (2022), and Alrabadi et al. (2022).*

Keywords; CAPM, Conventional Beta, Downside Beta, Semi variance, Mutual Funds, Egypt.

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Introduction

The finance theory was based on the principle of risk and return. It was argued by Markowitz's (1952) "portfolio theory" that investors require additional returns for bearing additional risk. Accordingly, when given two different securities, rational investors would prefer the security with a higher return and the lower risk. This mean-variance optimization is especially significant in a security portfolio, where the weights of various securities are allocated to provide a portfolio with the maximum return and lowest risk. As a result, the mean-variance portfolio optimization theory was established. Such theory claimed that an investor should maximize returns for a given level of risk and minimize risk for a given level of return. Portfolios that met this mean-variance optimization conditions were then displayed on a risk versus return graph, producing the "Efficient Frontier". The positive linear relationship between a portfolio's risk and return was considered to be the foundation of portfolio theory (Seetharam, 2022).

The outcomes of optimal portfolios sparked interest in asset pricing literature, intending to determine which elements are significant in explaining securities returns. Sharpe's (1964) capital asset pricing model (CAPM) deemed market beta as an all-inclusive factor that influenced returns. A higher beta indicates greater market sensitivity, which results in a higher expected return. The CAPM was then heavily criticized by multiple authors due to its normative assumptions (Aygoren & Balkan, 2020). Fernandez (2015) argued that "CAPM does not explain facts or events, nor does it describe the past, present, or future state of something." Thus, it cannot be considered as a theory or a model. Baker *et al.* (2011) found that over the past 30 years, low-risk stocks, as determined by a stock's co-movement with the stock market, have been able to dramatically beat high-risk stocks. Hong *et al.* (2016) tested the validity of CAPM in the US market and found that the CAPM holds when there are few economic controversies, however, when there are a lot of economic controversies in the market the CAPM does not hold, which causes the stocks to be significantly overvalued.

Fama (1970) was able to justify the ineffectiveness of CAPM using Efficient Market Hypothesis (EMH). Based on its concept, if the currently accessible information is reflected in the current stock prices, then the component model estimates of stock returns are accurate. This could be attributed to the market equilibrium where all information is considered, allowing investors to be compensated for taking more calculated risks. On the other hand, equity markets are not always efficient, and investors may be able to take advantage of arbitrage opportunities. This highlights CAPM's disadvantage of not being able to quantify expected returns in response to a single risk factor (Thalassinos, Khan, Ahmed, Zada, & Ihsan, 2023).

The poor performance of CAPM has inspired many researchers to come up with new alternative models such as Fama & French's (1996) Three-Factor Model (FF3F). However, there is substantial research in the asset pricing literature that shows that even FF3F model falls short of explaining the anomalies in stock returns (Aygoren & Balkan, 2020). As a result, several researchers added new components to the FF3F model, such as momentum, liquidity, profitability, and investment, to determine the effects of various anomalies on returns of financial assets. Papers with one or more of these components are Brennan et al. (1996), Cahart (1997), Chan et al. (2005), and Fama & French (2015).

Despite the importance of developing and testing asset pricing models in various contexts, most empirical studies investigating asset pricing models and determinants of stock returns have been conducted in developed markets such as the US and some European markets (Ragab, Abdou, & Sakr, 2020). For example, Chen *et al.* (2022) empirically tested CAPM in the US market and found that CAPM explains the variations in stock returns. Moreover, Fernando *et al.* (2012) were able to prove that CAPM is indeed an effective tool and it is encouraged to use it to calculate the expected returns of Spanish securities.

With regards to emerging markets, several articles used time series regression and Gibbons Ross Shanken test (GRS) to test the explanatory power of CAPM, FF3F model, and Fama & French Five Factor Model (FF5F) model in Morocco, Egypt, Jordon, and Saudi Arabia. Their finding implied that CAPM is the least effective model as it does not explain the variations in stock returns. Meanwhile when comparing FF3F model and FF5F; both models provide incomplete descriptions of the returns, nevertheless, FF5F was found to be superior to FF3F (Taib & Benfeddoul, 2023) (Ragab, Abdou, & Sakr, 2020) (Salameh, 2020) (Alrabadi & Alrabadi, 2018) .These results could be mainly attributed to the fact that emerging markets have different features than developed markets. Thin trading, illiquidity, a small number of listed firms, a small number of investment research organizations, and less corporate governance enforcement are characteristics of emerging markets which lead to market inefficiency. As a result, typical asset pricing models designed and tested in developed markets may fail to account for these unique circumstances that exist in emerging countries (Ragab, Abdou, & Sakr, 2020).

Accordingly, researchers thought of new ways to measure systematic risk. Roy (1952) conceptualized downside risk by introducing the idea of safety-first investors, who prioritize reducing the likelihood that a loss would occur. Later, Markowitz (1959) advocated using semi-variance as a proxy for risk rather than variance. Further empirical research concluded that investors tend to place higher weights on losses relative to gains; therefore, they will often seek higher compensation for holding stocks with higher downside risk (Rashid & Hamid, 2015) (Ang, Chen, & Xing, 2006) (Estrada, 2002). Accordingly, downside risk has received considerable attention from researchers. Several approaches for measuring downside risk were developed, however, no consensus has yet emerged as to which risk measure best captures downside risk (Ali, 2019).

This paper aims to investigate which risk measurement is more appropriate in the Egyptian stock exchange (EGX). In other words, should investors and stock analysts adopt conventional CAPM or Downside CAPM (D-CAPM)? The CAPM will be tested using conventional beta from Sharpe's model versus the downside beta associated with achieving returns below the assumed level.

This paper follows the following structure. Section 2 briefly discusses the literature on using conventional and downside risk measures. Section 3 highlights the dataset and methodology. Section 4 articulates the research results and discussion. The last section provides conclusion and recommendations for future research.

Literature Review

The CAPM is a mathematical model that represents the relationship between systematic risk and the expected return on assets, particularly stocks. The CAPM technique is widely used in finance to price risky securities and forecast asset returns based on risk and cost of capital. Despite various research articles that continue to question traditional models' effectiveness, practitioners and academics continue to rely on CAPM due to its attractive simplicity (Ayub, Samaila Kausar, Zakaria, & Jadoon, 2020) (Ling, Sun, & Wang, 2020) (Chhapra & Kashif, 2019). Moreover, Damodaran (2006) argues that CAPM has survived throughout the years due to its simplicity and that multi-factor models are better at explaining past returns, however, their effectiveness decreases with expected returns. At its heart, asset pricing is a difficult issue; because positive deviations from the mean are given less weight by investors than negative deviations. Accordingly, the mean-semi-variance has been proposed as an alternative approach to the mean-variance method in portfolio analysis and asset pricing, where the beta coefficient based on the LPM is an equivalent measure to conventional beta in the downside framework. Such beta is also known as the "downside beta coefficient." D-CAPM is derived from this and is used in the finance literature to quantify the cost of capital by identifying the risk-return relationship (Rutkowska-Ziarko, Mmarkowski, Pyke, & Amin, 2022).

Using data from developed and emerging markets Estrada (2002, 2007) concluded that downside measures can better explain the variability of returns in cross-sectional relationships than conventional betas. Post et al. (2006) were able to empirically prove that downside risk measures are essential for explaining higher average stock returns. Atilgan et al. (2013) used fixed-effect panel regression and found a significant positive relation between monthly predicted market returns and downside risk in emerging markets. Tasai et al. (2014) used a dynamic conditional correlation model on a sample of developed countries. Their findings indicated that downside beta can better explain the variability in expected returns. Moreover, Ajrapetova (2018) analyzed Estrada's model to investigate the effectiveness of conventional and alternative asset pricing models in explaining cross-sectional asset returns. Their findings argue that emerging market investors should prioritize total risk (standard deviation) rather than systematic risk measures (beta). Furthermore, concerning systematic risk measurements, they found that downside beta outperformed conventional beta. In addition, Ali (2019) concluded that downside beta is more helpful in China for implementing effective trading strategies over the medium and long run. As evidence suggests that holding stocks with high downside risk results in a positive reward, and this reward is not explained by other cross-sectional effects and is consistent across robustness tests.

On the contrary, in their reexamination of the relation between various downside risk measures and expected returns of 26 developed markets, Atilgan et al. (2019) discovered that systematic downside risk and cross-sectional equity returns are not significantly correlated. They found an insignificant strong negative relation at the portfolio level. Moreover, Atilgan et al. (2020) examined the relation between downside beta and equity returns in the United States. They replicated Ang, Chen, and Xing's (2006) study, which yielded a positive relationship between downside beta and future equity returns for equal-weighted portfolios of NYSE companies. However, such a relationship does not hold after controlling other return determinants or changing the weights of securities within the portfolio. They also expanded their original sample to include AMEX/NASDAQ stocks and used different downside beta measures and could not find a downside risk premium.

However, Ayub et al. (2020) replaced the conventional beta in the 5-factor model with downside beta and included a momentum variable. The authors then evaluated their new model, called 6factor model, using data from the Pakistani stock exchange (PSX-100). Their findings implied that their 6-factor model using downside beta was a better option for investors to calculate the expected returns of equities compared to the 6-factor model using conventional beta.

Yildiz et al. (2018) conducted a comparative analysis of the explanatory power of CAPM and DCAPM in Turkey. They employed 22 risk measures based on mean-variance and semi-variance approaches. Mean-semi-variance approaches were found to have significant explanatory power for stock returns. In contrast, mean-variance failed to explain stock returns. Lu et al. (2019) concluded that bear beta has a strong relation with the expected returns of stocks listed in S&P500 index. Yildiz et al. (2022) compared conventional risk measures to the downside risk measures in both emerging and developed markets to investigate which risk parameter is better at predicting stock returns. This article evaluated 16 risk measurements using a sample of 4,531 companies from 20 developed and 25 emerging markets. They concluded that downside betas outperform conventional betas in explaining stock returns. Moreover, they were able to empirically prove that there is a correlation between markets, especially after negative shocks such as pandemics which makes downside beta more reliable. Ruthkowska-Ziarko et al. (2022) explored conventional and downside risk measures in the United Kingdom. They also contributed to the literature by using conditional relationships as an approach to asses CAPM correlation with risk. The conditional models indicated that downside measures have a slight advantage over conventional measures.

According to Table 1- See appendix- the majority of the discussed articles were conducted on developed markets. To our knowledge, very few articles investigated the validity of downside risk in MENA region, specifically Egypt. Alrabadi et al. (2022) investigated the effect of downside risk on stock returns. They analyzed 92 companies listed on Amman Stock Exchange and concluded that downside risk has a significant positive impact on stock returns. In addition, El-Masry and El-Mosallamy (2016) examined the performance of 21 Saudi mutual funds using the CAPM and D-CAPM models over the period 2005-2011. Their findings revealed that downside beta is more relevant in terms of its higher explanatory power than the traditional beta. Hence, D-CAPM could be more relevant in evaluating the performance of mutual funds in emerging markets. Accordingly, and following those studies, the suitability of the D-CAPM versus the conventional CAPM will be examined in the Egyptian Market

Methodology

The net asset values between January 1st, 2012, and December 31st, 2022 for Egyptian mutual funds were collected and analyzed for this study. Mutual funds that have available data during the specified time frame were included in the sample. Accordingly, 35 Money market funds were excluded; as they only invest in government, treasury prime and municipal securities (Apergis, 2022). Moreover, all funds that are listed in foreign markets and those with missing data within the specified time frame were excluded from the sample. After exclusion, the sample included 55 Egyptian mutual funds (Table 2). Table 3 illustrates the types of funds analyzed in this study. All data were collected from the Thomson Reuters Refinitiv Eikon database.

Table 2. Exclusion and Inclusion Criteria

Population	99
Excluded Money Market Funds	36
Excluded Funds with missing data	8
Final Sample	55

Source: Authors' Creation

Table 3. Sample Classification

Growth Funds	31
Fixed Income Funds	6
Growth and Income Funds	8
Islamic	10

Source: Authors' Creation

A time series of weekly rates of return were calculated for each fund according to the following equation:

$$R_{it} = \frac{(NAV_{i,t} - NAV_{i,t-1}) + Income}{NAV_{i,t-1}}$$

where R_{it} is the rate of return on the i-th mutual fund at time t, $NAV_{i,t}$ is the net asset value (price) of the i-th security at time t, $NAV_{i,t-1}$ is the net asset value of the i-th security after s days of investing starting at time t, and

Income includes dividends distributions, capital gain yields, and interest distributions.

The returns of the funds were then regressed with 2 market indices (EGX30 and EGX100) to know which index is a better fit for the chosen funds. The regression analysis revealed that EGX100 can better explain the variations in selected mutual funds due to high adjusted R-square for EGX100 models. Moreover, 10-year government bond yield was used as a proxy for the risk free-rate as the time horizon of research is 10 years (Damodaran, 2006).

Systematic Risk Measures

Conventional CAPM:The conventional CAPM considers the economic situation of the markets as the main source of risk. Economic situation risk is reflected in the market portfolio which includes all available assets. In practice, stock indices approximate such portfolios. According to Sharpe (1964), the beta is the primary measure of systematic risk, which expresses the sensitivity of changes in a given asset to changes in market conditions. The conventional CAPM assumes a linear relation between the expected returns of assets and the systematic risk expressed by the beta coefficient. This relationship can be expressed by the following equation:

$$E(R_i) = R_f + \beta_i [R_m - R_f]$$

Where $E(R_i)$ and R_m are the expected return on the i-th asset and the market portfolio, respectively; R_f is the risk-free rate; and β_i is the beta coefficient for the i-th asset, which reflects the sensitivity of a given asset to changes in the stock index as a proxy of the market portfolio.

Downside CAPM :However, unlike the conventional approach, the D-CAPM only recognizes risk as a deviation from the assumed rate of return. Measures of downside risk are based on semi-measures, such as semi-covariance and semi-variance of returns. This paper will adopt Estrada's (2002) technique for measuring downside beta as; unlike the other methods it considers the skewness of returns. The downside beta is calculated using the following equation:

$$\beta_i^E = \frac{E[\min(R_{it} - E(R_i); 0) \min(R_{mt} - E(R_m);0)]}{E[\min(R_{mt} - E(R_m);0)]^2}$$

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Unconditional Relationships of Conventional and Downside CAPM:Following the work of Ali (2019), Fama & MacBeth's (1973) two-step approach will be employed. In the first stage, the whole sample period (10 years) was considered to calculate the conventional and downside risk betas. The betas were calculated using weekly time-series regression of funds' excess returns against market index excess returns. Afterwards, the funds' excess returns over risk-free rate are the regressed on the funds risk measures that were calculated in the first step. In other words, the excess return was the dependent variable while the systematic risk measures were the independent variables. The unconditional cross-sectional relationship was estimated for each week of the sample period using the following formulas:

Table 4. Unconditional Regression Models

Risk Measure	Model
Conventional Beta	$R_{it} = \lambda_{0t} + \lambda_{1t}\hat{\beta}_i + \eta_{it}$
Downside Beta	$R_{it} = \lambda_{0t} + \lambda_{1t}\hat{\beta}_i^E + \eta_{it}$

Results & Discussion

Table 5 – see appendix - provides a summary of stage one results, where the conventional beta was calculated for all the selected funds using weekly returns from 2012 to 202. All the betas were found to be significant at 0.01 significance level and the average adjusted R-squared in 55%, implying that 55% of the variations in excess returns of funds are explained by the variations in the market index excess returns.

Table 6 provides a summary of stage one results, where the downside beta was calculated for all the selected funds using weekly returns from 2012 to 2022. All the betas were found to be significant at 0.01 significance level and the average adjusted R-squared in 76%, implying that 76% of the variations in excess returns of funds are explained by the variations in the market index excess returns. The results of stage one implies that downside beta has a higher explanatory power than downside beta. However, further analysis must be conducted to verify these preliminary findings. Table 7 illustrates the hypotheses for the parameters for unconditional CAPM relationships. If the null hypothesis was rejected this would indicate the existence of a relationship between the beta coefficient and excess returns of funds.

Table 7. Hypotheses for the parameters of unconditional Beta Relationships

Risk Measure	The Null Hypothesis	The Alternative Hypothesis
$\boldsymbol{\beta_i}$	H0: E(λ_1) = 0	H0: E(λ_1) > 0
$\boldsymbol{\beta_i^E}$	H0: E(λ_1) = 0	H0: E(λ_1) > 0
Constant Term	H0: E(λ_0) = 0	H0: E(λ_0) ≠ 0

Regression analysis was used to investigate the relationship between realized returns, Sharpe beta, and downside beta across mutual funds. Tables 8 & 9 display the estimated parameters of cross-sectional unconditional regression in the conventional and downside framework. The adjusted R-squared for Sharpe's beta was found to be 22% and both regression coefficients; λ_0 and λ_1 were found to be significant (P-value < 0.05); which implies that there is a relationship between the excess return and conventional beta. Based on the regression analysis, investors in the EGX are rewarded with a positive risk market risk premium of approximately 0.1% per week. With regards to the downside beta, estimated parameters λ_0 and λ_1 were found to be positive and significant (P-value < 0.05). The Adjusted R-squared for downside beta is 26%. Our results are aligned with Yildiz *et al.* (2022), Ruthkowska-Ziarko *et al.* (2022), and Alrabadi et al. (2022).

Table 8. Estimates of unconditional CAPM relation in the conventional framework

Model: $R_{it} = \lambda_{0t} + \lambda_{1t}\hat{\beta}_i + \eta_{it}$

Coefficient	**Mean**	**t-Stat**	**P-value**	**Average R^2**
λ_{0t}	0.0369980	2.462542	0.0171	0.22057
$\lambda_{1t}\hat{\beta}_i$	0.100315	6.517349	0.0000	

Source: Authors' Creation

Table 9. Estimates of unconditional CAPM relation in the downside framework

Model:
$R_{it} = \lambda_{0t} + \lambda_{1t}\hat{\beta}_i^E + \eta_{it}$

Coefficient	**Mean**	**t-Stat**	**P-value**	**Average R^2**
λ_{0t}	0.071347	24.73841	0.0000	0.26108
$\lambda_{1t}\hat{\beta}_i^E$				
	0.035514	1.564498	0.0123	

Source: Authors' Creation

This study aims to verify the stability of attained results across different time frames. Thus, RutkowskaZiarko et al., (2022) methodology was adopted and the sample was divided into two sub-periods. The first sub-periods contain the excess returns of funds from 2012 to 2016 and the second sub-period included excess returns of funds from 2017 to 2022. Tables 10 & 11 present the results of the unconditional beta relationship for the two sub-periods.

Table 10. Estimates of unconditional CAPM relation in the conventional framework Sub-period 1 & 2

Model:
$R_{it} = \lambda_{0t} + \lambda_{1t}\hat{\beta}_i + \eta_{it}$

Periods	**Coefficient**	**Mean**	**t-Stat**	**P-value**	**Average** R^2
Sub-period 1 (2012 – 2016)	λ_{0t}	0.368952	14.83711	0.0000	0.270760
	$\lambda_{1t}\hat{\beta}_i$	0.571439	4.587991	0.0000	
Sub-period 2 (2017 – 20122)	λ_{0t}	0.516046	15.13928	0.0000	0.042495
	$\lambda_{1t}\hat{\beta}_i$	-48.17404	-1.842975	0.0709	

Source: Authors' Creation

Table 11. Estimates of unconditional CAPM relation in the downside framework Sub-period 1 & 2

Model: $R_{it} = \lambda_{0t} + \lambda_{1t}\hat{\beta}_i^E + \eta_{it}$

Periods	**Coefficient**	**Mean**	**t-Stat**	**P-value**	**Average** R^2
Sub-period 1 (2012 – 2016)	λ_{0t}	0.716328	56.13531	0.0000	0.208930
	$\lambda_{1t}\hat{\beta}_i^E$	24.96937	3.906657	0.0003	
Sub-period 2 (2017 – 20122)	λ_{0t}	0.0797302	9.529941	0.0000	0.120330
	$\lambda_{1t}\hat{\beta}_i^E$	0.025862	2.895967	0.0055	

Source: Authors' Creation

The results of the unconditional CAPM relationship in the sub-periods differ from the whole sample analysis. In the first sub-period, both coefficients are found to be positive and significant. However, in the second sub-period $\lambda_1$is negative and insignificant. These results are aligned with Hong et al. (2016) findings which emphasize that CAPM does not hold when there are a lot of economic controversies in the economy. In 2017, the Egyptian pound devaluated against the US dollar followed by Covid-19 in 2019 and 2020 and devaluation of the currency again at the end of 2022. All the previously mentioned events created a lot of economic controversies which reflected on the Egyptian stock market and lead to the ineffectiveness of the conventional CAPM.

On the contrary, the results of downside beta are more stable as the coefficients of downside beta were found to be positive and significant throughout both sub-periods. These findings imply that downside beta is a better measurement and should be used to calculate the expected returns of mutual funds in the Egyptian market. Such findings are aligned with Yildiz *et al.* (2022), RuthkowskaZiarko *et al.* (2022), and Alrabadi et al. (2022).

Conclusion

According to asset pricing literature assets with higher sensitivity to market down movements are rewarded with higher returns (Markowitz, 1952). Post *et al.* (2006), Tasai *et al.* (2014), Lu *et al.* (2019), Atilgan *et al.* (2020), and Ruthkowska-Ziarko *et al.* (2022) provided empirical proof that downside measures can better explain the variations in returns in developed markets, while Yildiz *et al.* (2018), Ali (2019), and Ayub *et al.* (2020) investigated the downside framework in developing markets. Nonetheless, very few articles tested the validity of downside measures in the Egyptian market.

Egypt is considered an emerging market which is characterized by thin trading, illiquidity, small number of listed firms, small number of investment research organizations, and less corporate governance enforcement which leads to weak form efficiency or inefficiency. As a result, typical asset pricing models designed and tested in developed markets may fail to account for these unique circumstances that exist in emerging countries like Egypt (Ragab, Abdou, & Sakr, 2020). Thus, this study aimed to address this gap in the literature by testing the validity of conventional and downside risk measures using data from 55 Egyptian equity funds from 2012 to 2022. The main implications of this study is that it is equally important for practitioners to report on performance using conventional beta and CAPM as well as the downside beta and DCAPM, and if there are discrepancies, then the downside beta could be the superior measure given the asymmetrical distribution of returns in the emerging market of Egypt.

Downside risk measures provide a comprehensive assessment of potential investment losses, enabling investors to gain a deeper understanding of the risk-return tradeoff. This, in turn, facilitates more informed decision-making and enhances risk management practices, leading to greater precision in the pricing of financial assets. Moreover, downside risk measures act as a protective mechanism for investors, shielding them from potential losses and the adverse effects of asymmetric information. Additionally, these measures align effectively with the preferences of risk-averse investors who prioritize the avoidance of losses over overall volatility. Consequently, policymakers should actively promote the utilization and disclosure of downside risk measures to cater to the needs of a significant investor population, thereby stimulating increased investor participation and fostering market efficiency.

Nevertheless, this study has several limitations which include using only mutual funds to evaluate the risk measures, and the study covers a sampling period of 10 years against one Benchmark which is considered a short period to come up with definitive conclusions. The areas of future research could test the validity of risk measures on a portfolio and stock level to ensure the robustness of the results. Further investigation should consider the effect of market uncertainty on risk measures. In other words, which risk measure performs better when there is high market uncertainty. Moreover, instead of just focusing on CAPM and DCAPM, other models and their complementing downside models should be investigated.

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Appendix

Table 1. Summary of Existing Literature

Studies	**Context**	**Findings**
Post & Vilet. (2006)	United States	Downside risk measures are essential for explaining higher average stock returns
Atilgan & Demirtas. (2013)	27 emerging markets (mostly Asian) & 25 developed	Significant positive relation between monthly predicted market returns and downside risk in emerging markets
Tasai *et al.* (2014)	23 developed	Downside beta can better explain the variability in expected returns
Ajrapetova (2018)	23 developed & developing	Downside beta outperformed conventional beta
Yildiz & Erzurumlu. (2018)	Turkey	Mean semi-variance has significant explanatory power for stock returns
Atilgan *et al.* (2019)	26 developed markets	Downside beta is more helpful in China for implementing effective trading strategies over the medium and long run
Lu & Murray (2019)	United States	Bear beta has a strong relation with expected returns
Ali (2019)	China	Downside beta is more helpful in China for implementing effective trading strategies over the medium and long run
Atilgan *et al.* (2020)	United States	Relationship between downside beta and future stock returns does not hold
Ayub *et al.* (2020)	Pakistan	6-factor model using downside beta was a better option for investors to calculate the expected returns of equities compared to the 6-factor model using conventional beta
Yildiz *et al.* (2022)	25 emerging (mostly Asian) & 20 developed	Downside betas are better than CAPM at explaining the stock returns
Ruthkowska-Ziarko *et al.* (2022)	United Kingdom	Downside measures have a slight advantage over conventional measures.

Source: Authors' Creation based on the cited articles

Table 5. Conventional Beta

#	Fund Name	Fund Type	SD	Conventional Beta	Significance	Adj R2
1	AAIB Arab African International Bank Shield	Growth Fund	3.61%	0.544	0.000	43.88%
2	ABC Investment Fund	Growth Fund	4.32%	0.643	0.000	42.78%
3	Al Ahli Bank of Kuwait - Egypt Fund	Growth Fund	3.49%	0.614	0.000	59.93%
4	Al Ahly National Bank of Egypt (1)	Growth & Income	3.17%	0.531	0.000	54.14%
5	Al Ahly National Bank of Egypt (2)	Fixed Income	3.24%	0.547	0.000	55.17%
6	Al Ahly National Bank of Egypt (6) - Bashayer	Islamic	3.08%	0.508	0.000	52.65%
7	Al Baraka Fund	Islamic	3.34%	0.561	0.000	54.64%
8	Al Hayah Islamic Equity Fund	Islamic	3.54%	0.629	0.000	61.22%
9	Al Watany Bank of Egypt- Namaa	Growth & Income	3.33%	0.484	0.000	40.78%
10	Al Wefak Fund	Growth & Income	3.32%	0.572	0.000	57.32%
11	Pioneers (1) - Amwal Al-Raeed	Growth Fund	3.27%	0.584	0.000	61.80%
12	Arab Investment Bank Fund II (Helal)	Islamic	3.48%	0.583	0.000	54.36%
13	Arab Investment Bank Fund III (Sanady)	Growth & Income	2.81%	0.343	0.000	28.76%
14	AT Al Baraka Balanced	Islamic	2.97%	0.512	0.000	57.45%
15	Banque Misr (1)	Growth & Income	2.76%	0.474	0.000	57.17%
16	Banque Misr (6) - Al Hessn	Islamic	3.35%	0.595	0.000	60.95%
17	Banque Misr (2)	Growth Fund	3.36%	0.601	0.000	61.78%
18	Banque Misr (3)	Growth Fund	3.44%	0.607	0.000	64.99%
19	Banque Misr's Capital (5) - Al Omr	Growth Fund	2.33%	0.34	0.000	42.19%
20	Beltone - Gems	Growth Fund	3.20%	0.356	0.000	23.90%
21	Beltone - Insight	Growth Fund	3.71%	0.497	0.000	34.68%
22	Bloom Bank Egypt Equity	Growth Fund	3.47%	0.616	0.000	60.80%
23	CIB and Faisal Islamic - Al Aman	Islamic	3.50%	0.623	0.000	61.17%
24	CIB(2) - Istethmar	Growth Fund	3.54%	0.633	0.000	61.73%
25	CIB (6) - Hemaya	Fixed Income	2.31%	0.232	0.000	19.55%
26	CIB - Thabat	Fixed Income	2.29%	0.229	0.000	19.17%
27	Credit Agricole 4 - Al Thiqa	Growth Fund	2.90%	0.504	0.000	58.41%
28	EDBE (1) - Al Khabeer	Growth Fund	3.33%	0.574	0.000	57.35%
29	EFG - Al Massi	Growth Fund	2.61%	0.428	0.000	52.09%
30	EFG & Bank of Alexandria (1)	Growth Fund	3.14%	0.529	0.000	54.78%
31	EFG & Bank of Alexandria (3) - BOA	Fixed Income	2.29%	0.228	0.000	19.14%
32	EFG & Banque du Caire (1)	Growth Fund	3.27%	0.570	0.000	58.80%
33	EFG& Credit Agricole (1)	Growth & Income	3.23%	0.549	0.000	55.80%
34	EFG Credit Agricole (2)	Growth Fund	3.23%	0.553	0.000	56.72%
35	EFG SAIB (3) - Al Rabeh	Fixed Income	2.21%	0.225	0.000	19.93%
36	Egyptian Gulf Bank Mutual Fund	Growth Fund	3.27%	0.559	0.000	56.45%
37	Faisal Islamic Bank of Egypt Mutual Fund	Growth Fund	3.31%	0.464	0.000	37.89%
38	HC & Misr Iran Development	Growth & Income	3.43%	0.590	0.000	57.20%

	Bank (1)					
39	HC & National Bank of Egypt (3)	Growth Fund	3.34%	0.589	0.000	60.19%
40	HC & Bank for Dev. & Agricultural - Hasad	Growth Fund	2.21%	0.225	0.000	19.84%
41	HC& Suez Canal Bank (1)	Growth Fund	3.40%	0.600	0.000	60.19%
42	Misr Al Mostkbal Investment Fund	Growth Fund	3.48%	0.605	0.000	58.58%
43	Misr El Kheir Fund	Growth Fund	3.40%	0.513	0.000	43.87%
44	Naeem Misr Fund	Islamic	3.71%	0.544	0.000	41.65%
45	National Bank of Egypt Fixed Income Fund	Fixed Income	2.37%	0.233	0.000	18.58%
46	National Bank of Egypt (5)	Fixed Income	3.26%	0.547	0.000	54.30%
47	National Bank of Egypt (7)	Growth Fund	5.69%	0.663	0.000	50.93%
48	NBK Egypt - Al Mizan	Growth & Income	2.82%	0.287	0.000	16.26%
49	Pharos I	Growth Fund	3.41%	0.568	0.000	53.62%
50	Prime Housing & Development Bank - Al Tameer	Growth Fund	3.40%	0.596	0.000	59.29%
51	Prime & SAIB (2)	Growth Fund	3.38%	0.589	0.000	58.63%
52	QNB Al Ahli - Tadawol	Growth Fund	3.53%	0.371	0.000	21.32%
53	QNB Al Ahli (2) - Tawazon	Growth Fund	3.42%	0.386	0.000	24.55%
54	Sanabel Fund	Islamic	3.34%	0.583	0.000	58.98%
55	Suez Canal Bank Egypt (2) - Ajial	Growth Fund	3.54%	0.575	0.000	50.87%
56	United Bank Fund - Rakhaa	Islamic	2.23%	0.224	0.000	19.28%
	Average		**3%**	**0.499**	**0.000**	**55%**

Source: Authors' Creation

Table 6. Downside Beta

#	Fund Name	Fund Type	Semi-Deviation	Downside Beta	Significance	Adj R2
1	AAIB Arab African International Bank Shield	Growth	5.90%	0.771	0.000	67.22%
2	ABC Investment Fund	Growth	6.68%	0.804	0.000	56.62%
3	Al Ahli Bank of Kuwait - Egypt Fund	Growth	5.77%	0.829	0.000	78.49%
4	Al Ahly National Bank of Egypt (1)	Growth & Income	5.60%	0.782	0.000	74.82%
5	Al Ahly National Bank of Egypt (2)	Fixed Income	5.67%	0.803	0.000	76.82%
6	Al Ahly National Bank of Egypt (6) - Bashayer	Islamic	5.38%	0.773	0.000	75.11%
7	Al Baraka Fund	Islamic	5.50%	0.780	0.000	77.54%
8	Al Hayah Islamic Equity Fund	Islamic	5.76%	0.823	0.000	80.73%
9	Al Watany Bank of Egypt-Namaa	Growth & Income	6.16%	0.766	0.000	68.63%
10	Al Wefak Fund	Growth & Income	5.47%	0.789	0.000	77.42%
11	Pioneers (1) - Amwal Al-Raeed	Growth	5.61%	0.809	0.000	79.98%
12	Arab Investment Bank Fund II (Helal)	Islamic	5.69%	0.804	0.000	78.53%
13	Arab Investment Bank Fund III (Sanady)	Growth & Income	6.13%	0.702	0.000	58.07%
14	AT Al Baraka Balanced	Islamic	5.31%	0.761	0.000	0.762
15	Banque Misr (1)	Growth & Income	5.31%	0.750	0.000	74.72%
16	Banque Misr (6) - Al Hessn	Islamic	5.64%	0.809	0.000	80.47%
17	Banque Misr (2)	Growth	5.72%	0.809	0.000	79.20%
18	Banque Misr (3)	Growth	5.66%	0.785	0.000	81.38%
19	Banque Misr's Capital (5) - Al Omr	Growth	5.31%	0.68	0.000	64.30%
20	Beltone - Gems	Growth	5.93%	0.742	0.000	56.63%
21	Beltone - Insight	Growth	4.10%	0.767	0.000	61.64%
22	Bloom Bank Egypt Equity	Growth	5.74%	0.812	0.000	79.18%
23	CIB and Faisal Islamic - Al Aman	Islamic	5.70%	0.815	0.000	80.63%
24	CIB(2) - Istethmar	Growth	5.74%	0.815	0.000	80.18%
25	CIB (6) - Hemaya	Fixed Income	4.74%	0.628	0.000	51.89%
26	CIB - Thabat	Fixed Income	6.50%	0.627	0.000	50.79%
27	Credit Agricole 4 - Al Thiqa	Growth	5.41%	0.759	0.000	75.33%
28	EDBE (1) - Al Khabeer	Growth	5.63%	0.792	0.000	78.09%
29	EFG - Al Massi	Growth	5.28%	0.720	0.000	70.73%
30	EFG & Bank of Alexandria (1)	Growth	5.56%	0.771	0.000	76.53%
31	EFG & Bank of Alexandria (3) - BOA	Fixed Income	6.33%	0.632	0.000	51.10%
32	EFG & Banque du Caire (1)	Growth	5.72%	0.786	0.000	78.12%
33	EFG& Credit Agricole (1)	Growth & Income	5.60%	0.781	0.000	77.21%
34	EFG Credit Agricole (2)	Growth	5.66%	0.781	0.000	77.08%
35	EFG SAIB (3) - Al Rabeh	Fixed Income	6.17%	0.622	0.000	51.41%
36	Egyptian Gulf Bank Mutual Fund	Growth	5.61%	0.776	0.000	77.12%
37	Faisal Islamic Bank of Egypt	Growth	5.80%	0.762	0.000	68.83%

	Mutual Fund					
38	HC & Misr Iran Development Bank (1)	Growth & Income	5.64%	0.800	0.000	77.99%
39	HC & National Bank of Egypt (3)	Growth	5.67%	0.801	0.000	79.94%
40	HC & Bank for Dev. & Agricultural - Hasad	Growth	6.60%	0.620	0.000	51.35%
41	HC& Suez Canal Bank (1)	Growth	5.66%	0.800	0.000	79.34%
42	Misr Al Mostkbal Investment Fund	Growth	5.63%	0.803	0.000	78.70%
43	Misr El Kheir Fund	Growth	5.52%	0.742	0.000	69.13%
44	Naeem Misr Fund	Islamic	5.87%	0.791	0.000	69.75%
45	National Bank of Egypt Fixed Income Fund	Fixed Income	6.38%	0.621	0.000	50.06%
46	National Bank of Egypt (5)	Fixed Income	5.61%	0.789	0.000	74.97%
47	National Bank of Egypt (7)	Growth	5.69%	0.663	0.000	50.93%
49	Pharos I	Growth	5.60%	0.809	0.000	76.50%
50	Prime Housing & Development Bank - Al Tameer	Growth	5.63%	0.793	0.000	78.34%
51	Prime & SAIB (2)	Growth	5.63%	0.793	0.000	78.30%
52	QNB Al Ahli - Tadawol	Growth	5.75%	0.701	0.000	56.94%
53	QNB Al Ahli (2) - Tawazon	Growth	5.41%	0.676	0.000	56.53%
54	Sanabel Fund	Islamic	5.52%	0.792	0.000	79.17%
55	Suez Canal Bank Egypt (2) - Ajial	Growth	5.72%	0.784	0.000	74.62%
56	United Bank Fund - Rakhaa	Islamic	6.32%	0.621	0.000	51.07%
	Average		**6%**	**0.757**	**0.000**	**76%**

Source: Authors’ Creation