COVID-19 CRISIS AS A SYSTEMATIC RISK: AN EMPIRICAL STUDY IN THE EGYPTIAN STOCK MARKET

Mustafa Hussein Abd-Alla*
Sadat Academy for Management Sciences, Cairo, Egypt

Abstract

This paper examines the ability of beta (β) to measure the systematic risks posed by the COVID-19 crisis and analyzes the impact of the COVID-19 crisis on stock returns for a sample of 50 stocks, grouped on the basis of size and value in the Egyptian Stock Market. CAPM beta of the stock was used to represent the systematic risk stocks, market capitalization was used to construct the large and small stocks portfolios and the book-to-market equity ratio was used to construct high medium and small portfolios. The results showed that systematic risks measured by beta increased after COVID-19 crisis for all sample stocks, the portfolios consisting of stocks with high and medium B/M ratio and the portfolios consisting of small capitalization stocks and big capitalization stocks. However, the COVID-19 crisis has no effect on systematic risks for the portfolio consisting of stocks with low B/M ratio. The results also indicated that stock returns decreased after the COVID-19 crisis for all sample stocks, the portfolios consisting of stocks with low B/M ratio and the portfolios consisting of big stocks. However, the COVID-19 crisis does not affect stock returns for the portfolios consisting of stocks with high and medium B/M ratio and the portfolios consisting of small stocks.

Keywords: CAPM model; beta; Systematic Risk; COVID-19.

JEL codes: G01, G12

Introduction

The appropriate relationship between risk and the expected return is one of the biggest problems that the theory of the capital market is facing. Different models have been developed to examine the relationship between the expected return and risk, the most important of these models is the Capital Asset Pricing Model (CAPM), which was presented by Sharpe (1964) and Lintner (1965) and was developed based on portfolio

* Corresponding author, **Hussein Abd-Alla Mustafa** - m_haa60@yahoo.com

theory by Harry Markowitz (1952).

Based on the CAPM model, there is only one factor that explains the return of any asset, which is the systematic risk. Therefore, the CAPM model is also known as a single-factor model. According to Sharpe (1964), there are two types of risks. The first is called systematic risk, which is the risk responsive to the total risks of the combination of investments, it also cannot be diversified. Therefore, investors cannot minimize systematic risk through diversification. Systematic risks are caused by factors out of control of the company and factors that are external to the company. Systematic risks can be measured through the beta coefficient. Beta coefficient is the measure of the risk of stock's volatility in comparison to the overall market. Therefore, the coefficient of beta is the measure of the sensitivity of a stock's returns to the market returns. The second type of risks is called unsystematic risk, which is specified in the individual asset.

Many studies have been done to test the ability of the CAPM to explain the relationship between the expected return and risk; these studies were supportive of the implications of the CAPM model. Also, they found that there is a linear relationship between the expected return of an asset and its systematic risk measured by beta (Black et al, 1972; Sharpe and Copper, 1972; Fama and MacBeth, 1973; Strong and Xu, 1997). In contrast, there are studies which criticise the empirical testing of the CAPM model and the use of the beta as a risk measure, and rejectthe linear relationship between risk and return (Roll 1976; Nimal 2006).

The Coronavirus or so-called COVID-19 has quickly become a global crisis. The virus emerged in December 2019 in the city of Wuhan in China, and it became a threat to the health of individuals as well as to the global economy and the stock markets. The Egyptian Ministry of Health and Population, and the World Health Organization announced in a joint statementthe first confirmed infection of the new Coronavirus on February 14th, 2020. This study examine the ability ofthe beta factor to reflect the risks posed bythe COVID-19 crisis and examines the impact of theCOVID-19 crisis on the systematic risk and stock returns in the Egyptian Stock Market. The study will be organized as follows. In Section 1, the study introduction, which discusses an aspect of the historical development of different pricing models, and a brief summary of the COVID-19 virus. InSection 2 we will provide a literature review. Section 3 presents the data and methodology. Section 4, presents empirical results, and finally, the conclusions will be provided in Section 4.

1. Literature review

Sharpe (1964) and Lintner (1965) developed the Capital Asset Pricing Model (CAPM); it was built on the work of Harry Markowitz (1959) who developed the "mean-variance model". The (CAPM) model proposes a positive linear relationship between the expected risk of the asset and its expected rate of return. The only related risk measure is systematic risk, which is measured through beta. Beta measures the sensitivity of the returns on the stocks or portfolio to the market portfolio returns. The CAPM equation according to the Sharpe and Lintner assumptions is expressed as

follows:

$$E(R_{it}) = R_f + ß\ (R_{mt} - R_f) \quad (1)$$

Where:

$$ß = \frac{Covariance(Ri, Rm)}{Variance(Rm)}$$

Where, $E(R_{it})$ is the expected return on asset i, and ß is the market beta that measures the sensitivity of the return on asset to variation in the return of the market portfolio. R_f is the risk-free rate, and R_{mt} is the market return. According to the Sharpe-Lintner CAPM equation, the expected return equates to the risk-free rate of return R_f plus the market risk premium multiplied by the beta coefficient, where the market risk premium consists of the expected market return R_{mt} minus the risk-free rate times. Black, Jensen and Scholes (1972) used time series regression to test the CAPM model in the New York Stock Exchange from 1931 to 1965. They found that there is a linear relationship between the expected average portfolio return and beta factor.

Logue and Merville (1972) indicated that the beta of the company stock can measure the extent to which a company is influenced by macroeconomic conditions since the stock returns reflect the potential and current earning of the company against general economic conditions.

Sharpe and Copper (1972) created 10 portfolios and then arranged them according to the calculated beta coefficient, for all stocks listed on the NYSE from 1931 to 1967. The study found that there is a direct relationship between the returns and the risks of the portfolios that were created, as the study found that 95% of the change in returns is due to the change in the beta coefficient.

Fama and MacBeth (1973) used two-path regressions of returns to examine whether the relation between expected return and betas are linear. The results showed that there is a positive relationship between the expected return and betas. Therefore the results support the CAPM model and concluded that the return of assets is a linear function of the beta factor.

Banz (1981) explained the size effect, where he examined the relationship between the stock returns and market capitalization on the NYSE, from 1926 to 1975. He found that smaller companies have higher risk-adjusted returns than large companies.

In their earlier study, Fama and French (1992) used a sample of non-financial stocks listed on the NYSE, NASDAQ, and AMEX from 1963 to 1990 to examine the ability of the market beta coefficient, size of the firm, book to market equity ratio, Earnings/Price ratio (E/P), and leverage, to predict the stock returns. They found no relationship between the market beta factor and the stock returns, they also found that stocks with high book-to-market equity ratios (value stocks) and small stocks have high returns compared to stocks with low book-to-market equity ratios(growth stocks) and big stocks. Fama and French (1993) provided a different perspective on capital asset pricing models. They expanded their study in (1992) from common stocks to U.S

government and corporate bonds in addition to stocks. They confirm that portfolios were created based on the market factor, book-to-market-equity (BE/ME) and size have important effects on stock returns.

Strong and Xu (1997) examined the relationship between beta and the expected return on stocks listed on the London Stock Exchange from 1960 to1992. To analyse this relationship, the study used the two-pass regressions method. The study found that there is a positive relationship between beta and the expected rate of return if the beta factor is the only variable affecting the expected rate of return.

Clare et al. (1998) concluded that the beta factor had great explanatory power for the expected return on the London Stock Exchange. Gonzalez (2001) examined the ability of the CAPM model to explain stock returns for all stocks listed on the Venezuela Stock Exchange from 1998 to 1992. He found that the CAPM model was unable to explain the expected return on the Venezuela Stock Exchange.

Choudhry (2005) examined the effect of the Asian financial crisis which took place from 1997 to 1998 in Malaysian and Taiwanese firms on the time-varying beta. He found evidence of the impact of the financial crisis on the time-varying beta of the firms, where Malaysian firms were more affected than the Taiwanese firms.
Spyridis (2009) concluded that the CAPM model is unable to explain the expected return on the Athens Stock Exchange (ASE).

Choudhry and Jayasekera (2015) examined the impact of asymmetric information (good or bad news) on the beta of firms in the United Kingdom from 2004 to 2010; this period includes the global financial crisis. They found that the beta for most firms increases from the pre-financial crisis to the financial crisis period.

Alexandridis and Hasan (2019) examined the impact of the global financial crisis (GFC) in the summer of 2007 on the multi horizon nature of systematic risk. They concluded that the size of betas increases during the financial crisis period compared with the pre-crisis period.

Zhanga et al. (2020) examined the impact of the COVID-19 crisis on the risk of the stock market for a group of financial markets around the world. The study used data up to 27 March, 2020. They concluded that there was a great increase in the risks and volatility in the global financial market in response to the crisis.

2. Data and methodology

2.1 Data

The Egyptian Stock Exchange is the oldest Stock Exchange in the Middle East, where it was established in the 19th century, when the Alexandria Stock Market was established in 1883, followed by the Cairo Stock Market in 1903. The study used daily stock data for a sample of firms listed on the Egyptian Stock Market to examine the ability of the beta factor, which measures the systematic risk, on reflecting the risks resulting from the COVID-19 crisis, and examines the impact of COVID-19 crisis on stocks returns in the Egyptian Stock Market. Data included:

- Daily stock returns,whichwere calculated by the following equation:

$$R_{it} = \frac{(P_t - P_{t-1})}{P_{t-1}} \quad (2)$$

where (R_{it}) is the daily stock return on day t, (P_t) is the stock value on day t and (P_{mt-1}) is the value of the stock on day (t-1).

- Daily returns of the EGX30 index, which is used as a proxy for the market portfolio. EGX30 index includes the largest 30 companies in terms of liquidity and activity. Daily returns of the EGX30 index are calculated by the following equation:

$$R_{mt} = \frac{(P_{mt} - P_{mt-1})}{P_{mt-1}} \quad (3)$$

where (R_{mt}) is the daily market index return on day t, (P_{mt}) is the EGX 30 value on day t and (P_{mt-1}) is the value of the EGX 30 on day (t-1).

- Daily returns on the Postal Savings are used as a proxy for the risk-free rate, obtained from Egypt Post.
- Data on book values of equity are extracted from the financial statements of the firms.

Not all stocks are chosen for the test. Following conditions have to be met:

- Stocks should be listed on the EGX100 index. EGX100 index is a price index that measures the performance of the 100 most active companies in the Egyptian Stock Exchange, including both the 30 companies of EGX 30 Index and the 70 companies of EGX 70 Index.
- The trading currency on the stock should be the Egyptian pound.
- Stocks of banks and financial institutions are excluded, This is due to special financing nature that differs from other companies and which may affect the results of the study.
- The ratio of the book value to the market value should be positive, as the negative book value means a negative sign, where the company might be close to bankruptcy, and thus it may affect the results of the study.

The number of stocks satisfying the test conditions is 50 stocks listed on the EGX100 index in the Egyptian Stock Exchange.

2.2 Methodology

The study examines the ability of beta factor to reflect the systematic risks resulted from the COVID-19 crisis and examines the impact of COVID-19 crisis on stock returns in the overall Egyptian Stock Market, as well as for a group of portfolios formed on the basis of size and value factors. Stock returns and beta factors will be calculated for each of the sample stocks in the period from January 1, 2015 to February 13, 2020, before the official announcement of the first confirmed case of COVID-19 by the Egyptian Ministry of Health. Stock returns and beta factors will also be calculated for each of the sample stocks after the official announcement of the first case of COVID-19 on February 14, 2020 to June 1, 2020. For data that is normally distributed,

the paired sample t-test will be used, and for data that is not normally distributed, Wilcoxon signed-rank will be used to compare stocks beta and stock returns before and after the COVID-19 crisis. The Kolmogorov–Smirnov test will be used to test the normality.

The Capital Asset Pricing Model (CAPM) is used to estimate the stock's beta coefficient by using the following equation:

$$R_{it} - R_f = \alpha + ß_{mt} (R_{mt} - R_f) + \varepsilon_{it} \quad (3)$$

where: (R_{it}) and (R_{mt}) are the rates of return on asset (i) and market portfolio at the time (t), respectively. (R_f) is the risk-free rate at the time (t), ($ß_{mt}$) is the beta of stock (i), (ε_{it}) is the error term, and (α) is the intercept.

To construct the large and small stocks portfolios, all sample stocks are ranked based on the firm size (market capitalization in June of each year t). The median sample size is used to construct two portfolios (Big and Small) according to the split point which is 50%, where the highest 50% stocks according to size are the big stocks portfolio and the lowest 50% stocks according to size are the small stocks portfolio. The sample stocks are also ranked by book-to-market equity ratio, where the stocks are divided into 3 portfolios. The first portfolio is 30% of the whole sample stocks, which has the highest book-to-market equity ratio. The second portfolio is 40% of whole sample stocks have book-to-market equity ratio in medium and the third portfolio is 30% of whole sample stocks, which has the lowest book-to-market equity ratio.

3. Empirical Results

3.1 Empirical results for stock returns and beta factors for all sample stocks

Table (1) shows the statistical results of the paired sample t-test for stock returns and beta factors for all sample stocks before and after the COVID-19 crisis.

Table no. 1. The statistical tests of stock returns and beta factor for all sample stocks

BETA								
Description	Mean	St. Deviation	Paired Samples Test					
				Paired Differences		t	df	Sig. (2-tailed)
			before - after	Mean	Std. Deviation			
before	0.4905	0.50879						
after	0.7445	0.45503		-0.25395	0.51906	-3.46	49	0.001
RETURN								
Description	Mean	St. Deviation	Paired Samples Test					
				Paired Differences		t	df	Sig. (2-tailed)
			before - after	Mean	Std. Deviation			
before	0.0012	0.00277						
after	-0.0015	0.00451		0.0027	0.00567	3.367	49	0.001
Correlations (Beta and Return)								
	Pearson Correlation			Sig. (2-tailed)				
before	0.343			0.015				
after	0.14			0.331				

Source: Author's construction

For all sample stocks, the results showed that the average beta after the official announcement of the first confirmed case of COVID-19 is larger than the average beta before the official announcement of the first confirmed case of COVID-19, where it equals (0.7445) with a standard deviation equals (0.45503) after COVID-19 crisis, and it equals (0.4905) with a standard deviation equals (0. 50879) before COVID-19 crisis.

From the t.test output above, the t-value (t) is (-3.460), and its p-value is (0.001) < (0.05), thus the null hypothesis, is rejected which asserts there is no significant difference between beta coefficient values before and after COVID-19 crisis, is rejected. So, there is a significant average difference between beta coefficient values before and after COVID-19 crisis. This shows that COVID-19 crisis has led to an increase in systematic risks in the Egyptian Stock Market. The results also indicate that the beta factor can reflect the systematic risks; therefore beta is a good measure of risk in the Egyptian Stock Market.

Results also showed that the mean returns after the COVID-19 crisis are less than the mean returns before the COVID-19 crisis, where it equals (-0.0015) with a standard deviation equals (0.00451) after COVID-19 crisis, and it equals (0. 0012) with a standard deviation equals (0.00277) before COVID-19 crisis and the t.test output showed that the t-value (t) is (3.367), and its p-value is (0.001) > (0.05), so the null hypothesis is rejected which asserts there is no significant difference between returns before and after COVID-19 crisis. This shows that COVID-19 crisis caused a significant decrease in stocks returns in the Egyptian Stock Market.

The results also showed that the relationship between beta and return is positive and significant at the (0.05) level before COVID-19 crisis, where Pearson's correlation coefficient equals (0.343). However, the correlation between beta and return is not statistically significant after COVID-19 crisis during the study period.

The results also showed that they don't support the basic result of the capital asset pricing model (CAPM) which provides that high-beta stock should have a higher return to compensate investors for their higher risk, where the results showed that the average beta before crisis equals (0.4905) with an average return equals (0.00102), while the average beta after crisis equals (0.7445) with an average return equals (-0.0015).

3.2 Empirical results for beta factor for portfolios formed according to book-to-market equity ratio

Table no. 2 shows the statistical results for stocks beta for portfolios formed according to book-to-market equity ratio before and after the COVID-19 crisis, where the table shows the statistical results of the portfolios of high, medium and low book-to-market equity ratio.

Table no. 2. The statistical tests of stock beta for portfolios formed according to book-to-market equity ratio

HIGHT								
after - before	Description	N	Mean Rank	Z	Asymp. Sig. (2-tailed)	Description	Mean	St. Deviation
	Negative Ranks	1	3	3.107	0.002	before	0.373893	0.324723258
	Positive Ranks	13	7.85					
	Ties	1				after	0.791895	0.484205615
	Total	15						
MEDIUM								
after - before	Description	N	Mean Rank	Z	Asymp. Sig. (2-tailed)	Description	Mean	St. Deviation
	Negative Ranks	4	9.75	-2.254	0.024	before	0.508272	0.53240272
	Positive Ranks	15	10.07					
	Ties	1				after	0.687445	0.436485483
	Total	20						
LOW								
	Mean		Std. Deviation		Std. Error Mean			
beta before crisis	0.5693		0.64062		0.16541			
beta after crisis	0.7541		0.50804		0.13117			
after - before	Paired Differences		t		Sig. (2-tailed)			
	Mean	Std. Deviation						
	0.18479	0.76387	0.937		0.365			

Source: Author's construction

Data for stocks with a high and medium book-to-market equity ratio were not normally distributed, therefore Wilcoxon signed-rank test was used to compare beta factor before and after the official announcement of the first confirmed case of COVID-19. Data for companies with low book-to-market equity ratio were normally distributed, therefore the paired sample t-test was used to compare beta factor before and after the official announcement of the first confirmed case of COVID-19, and p-value <0.05 was considered significant.

Results showed that for stocks with high and medium book-to-market equity, the mean beta factor after the COVID-19 crisis is larger than the mean beta factor before the COVID-19 crisis, where the mean equals (0.7919) with a standard deviation equals (0.4842) after COVID-19 crisis, and it equals (0.3739) with a standard deviation equals (0. 3247) before COVID-19 crisis for stocks with high book-to-market equity, and the mean equals (0.6874) with a standard deviation equals (0.4365) after COVID-19 crisis, and it equals (0.5083) with a standard deviation equals (0. 5324) before COVID-19 crisis for stocks with medium book-to-market equity.

The results also showed that the positive mean rank (these are mean ranks for which beta after COVID-19 crisis was greater than beta before COVID-19 is larger than the negative mean rank (these are mean ranks for which beta before COVID-19 crisis was greater than beta after COVID-19 for stocks with a high and medium book-to-market equity ratio. This indicates that the systematic risks after COVID-19 crisis are likely higher than the systematic risks before COVID-19 crisis for stocks with a high and medium B/M ratio.

The test of Wilcoxon signed-rank shows that the observed difference between both beta factor before and after COVID-19 crisis is significant, where the z-value is (3.107), and its p-value is (0.002) < (0.05) for stocks with a high B/M ratio, and the z-value is (-2.254), and its p-value is (0.024) < (0.05) for stocks with a medium B/M ratio. Thus we can reject the null hypothesis which asserts there is no significant difference between beta coefficient values before and after COVID-19 crisis. This shows that COVID-19 crisis caused a significant increase in systemic risks for stocks with a high and medium B/M ratio.

For the portfolio consisting of stocks with low B/M ratio, the t-value (t) is (0.937), and its p-value is (0.35) > (0.05), so the null hypothesis is accepted which asserts there is no significant difference between beta coefficient values before and after COVID-19 crisis. This shows that COVID-19 crisis has no effect on systemic risks for the portfolio consisting of stocks with low B/M ratio.

3.3 Empirical results for stock returns for portfolios formed according to book-to-market equity ratio

Table no. 3 shows the statistical results for stock returns for portfolios formed according to book-to-market equity ratio before and after COVID-19 crisis, where the table shows the statistical results of the portfolios of high, medium and low book-to-market equity ratio.

Table no. 3. The statistical tests of stock returns for portfolios formed according to book-to-market equity ratio

HIGHT								
beforee - after	Description	N	Mean Rank	Z	Asymp. Sig. (2-tailed)	Description	Mean	St. Deviation
	Negative Ranks	4	7.5	-1.417	0.156	before	0.000965	0.003402457
	Positive Ranks	10	7.5					
	Ties	1				after	-0.00129	0.0038074
	Total	15						
MEDIUM								
beforee - after	Description	N	Mean Rank	Z	Asymp. Sig. (2-tailed)	Description	Mean	St. Deviation
	Negative Ranks	5	7.8	-1.18	0.238	before	0.000366	0.000987221
	Positive Ranks	5	3.2					
	Ties	10				after	-0.00037	0.005036595
	Total	20						
LOW								
beforee - after	Description	N	Mean Rank	Z	Asymp. Sig. (2-tailed)	Description	Mean	St. Deviation
	Negative Ranks	3	7.33	-2.167	0.03	before	0.002082	0.003701933
	Positive Ranks	12	8.17					
	Ties	0				after	-0.00228	0.004150378
	Total	15						

Source: Author's construction

Data for stocks with a high, medium and low book-to-market equity ratio were not normally distributed, therefore Wilcoxon signed-rank test was used to compare the mean returns before and after COVID-19 crisis, and p-value <0.05 was considered significant.

Results showed that for stocks with high and medium book-to-market equity ratio, the z-value is (-1.417), and its p-value is (0.156) > (0.05) for stocks with a high B/M ratio, and the z-value is (-1.18), and its p-value is (0.238) > (0.05) for stocks with a medium B/M ratio, this indicates that the null hypothesis is accepted, which asserts there is no significant difference between the mean returns before and after COVID-19 crisis. This shows that COVID-19 crisis does not affect the mean returns of the portfolios consisting of stocks with high and medium B/M ratio.

For the portfolio consisting of stocks with low B/M ratio, the results showed that the positive mean rank (these are mean ranks for which mean returns before COVID-19 crisis were greater than mean returns after COVID-19) is larger than the negative mean rank (these are mean ranks for which mean returns after COVID-19 crisis were greater than mean returns before COVID-19) for stocks with low book-to-market equity ratio. This indicates that the mean returns before COVID-19 crisis are likely higher than the mean returns after COVID-19 crisis for the portfolio consisting of stocks with low B/M ratio.

The test of Wilcoxon signed-rank shows that the observed difference between mean returns before and after COVID-19 crisis is significant, where the z-value is (-2.167), and the p-value is (0.03) < (0.05) for stocks with a low B/M ratio. Thus we can reject the null hypothesis which asserts there is no significant difference between mean returns before and after COVID-19 crisis. This shows that COVID-19 crisis caused a significant decrease in mean returns for the portfolio consisting of stocks with low B/M ratio.

3.4 Empirical results for beta factor for portfolios formed according to the firm size

Table no. 4 shows the statistical results for stocks beta for portfolios formed according to the firm size before and after COVID-19 crisis, where the table shows the statistical results of large and small stocks portfolios.

Table no. 4. The statistical tests of stock beta for portfolios formed according to the firm size

BIG						
		N	Mean Rank	Sum of Ranks	Z	Asymp. Sig. (2-tailed)
after - before	Negative Ranks	5	10	50	-2.857	0.004
	Positive Ranks	19	13.16	250		
	Ties	2				
	Total	26				
SMALL						
		N	Mean Rank	Sum of Ranks	Z	Asymp. Sig. (2-tailed)
after - before	Negative Ranks	3	10	30	-3.285	0.001
	Positive Ranks	20	12.3	246		
	Ties	1				
	Total	24				

Source: Author's construction

Data for small and big stocks were not normally distributed, therefore Wilcoxon signed-rank test was used to compare mean beta before and after COVID-19 crisis, and p-value <0.05 was considered significant.

Results showed that the positive mean rank (these are mean ranks for which beta after COVID-19 crisis was greater than beta before COVID-19) is larger than the negative mean rank (these are mean ranks for which beta before COVID-19 crisis was greater than beta after COVID-19) for small and big stocks. This indicates that the systematic risks after COVID-19 crisis are likely higher than the systematic risks before COVID-19 crisis for small and big stocks.

The test of Wilcoxon signed-rank shows that the observed difference between both beta factor before and after COVID-19 crisis is significant, where the z-value is (-2.857), and its p-value is (0.004) < (0.05) for big stocks, and the z-value is (-3.285), and its p-value is (0.001) < (0.05) for small stocks. Thus we can reject the null hypothesis which asserts there is no significant difference between beta coefficient values before and after COVID-19 crisis. This shows that COVID-19 crisis caused a significant increase in systemic risks for small and sig stocks.

3.5 Empirical results for stock returns for portfolios formed according to the firm size

Table no. 5 shows the statistical results for stock returns for Portfolios formed according to the firm size before and after COVID-19 crisis, where the table shows the statistical results of large and small stocks portfolios.

Table no. 5. The statistical tests of stock returns for portfolios formed according to the firm size

BIG								
beforee - after	Description	N	Mean Rank	Z	Asymp. Sig. (2-tailed)	Description	Mean	St. Deviation
	Negative Ranks	5	14.9	-2.572	0.01	befor	0.0016363	0.0033985
	Positive Ranks	21	13.17					
	Ties	0				after	-0.00203	0.0044385
	Total	26						
small								
beforee - after	Description	N	Mean Rank	Z	Asymp. Sig. (2-tailed)	Description	Mean	St. Deviation
	Negative Ranks	5	15.3	-1.878	0.06	befor	0.0006344	0.0020943
	Positive Ranks	18	11.08					
	Ties	1				after	-0.001073	0.0045024
	Total	24						

Source: Author's construction

Data for small and big stocks were not normally distributed, therefore Wilcoxon signed-rank test was used to compare mean beta before and after COVID-19 crisis, and p-value <0.05 was considered significant.

For big stocks, results showed that the positive mean rank (these are mean ranks for which mean returns before COVID-19 crisis was greater than mean returns

after COVID-19) is larger than the negative mean rank (these are mean ranks for which mean returns after COVID-19 crisis was greater than mean returns before COVID-19). This indicates that the mean returns before COVID-19 crisis are likely higher than the mean returns after COVID-19 crisis. Wilcoxon signed-rank test shows that the observed difference between mean returns before and after COVID-19 crisis is significant, where the z-value is (-2.572), and its p-value is (0.01) < (0.05) for big stocks. Thus we can reject the null hypothesis which asserts there is no significant difference between mean returns before and after COVID-19 crisis. This shows that COVID-19 crisis caused a significant decrease in mean returns for big stocks.

For small stocks, the z-value is (-1.878), and its p-value is (0.06) > (0.05), this indicates that the null hypothesis is accepted which asserts there is no significant difference between the mean returns before and after COVID-19 crisis. This shows that COVID-19 crisis does not affect the mean returns of small stocks.

Conclusions

This paper investigated the ability of the systematic risk factor (β) to reflect the COVID-19 risks, and examine the impact of COVID-19 crisis on stock returns for a sample of 50 stocks divided by size and value in the Egyptian Stock Market. The sample was divided according to firm size into 2 portfolios (Big and Small). The sample was also divided according to book-to-market equity ratio into 3 portfolios (high, medium and low).

The results showed that the COVID-19 crisis led to an increase in the systemic risks for all sample stocks, the portfolios consisting of stocks with high and medium B/M ratio and the portfolios consisting of small and big stocks. Therefore, systematic risks were reflected in a company's stock beta, and beta is an appropriate measure of systematic risks. The COVID-19 crisis also led to a decrease in stock returns for all sample stocks, stocks with low B/M ratio and big capitalization stocks. However, the COVID-19 crisis has no effect on systemic risks for the portfolio consisting of stocks with low B/M ratio, also it has no effect on stock returns for the portfolios consisting of stocks with high and medium B/M ratio and the portfolios consisting of small capitalization stocks.

Results of the study have important implications from the practical side, especially for investors who want to create suitable portfolios based on return and risk. Through the results of the study, we notice that the worst portfolio in terms of performance in the Egyptian Stock Market during the Covid-19 crisis is the big stocks portfolio. As the systemic risks have increased, at the same time, the return on the portfolio has decreased.

The study examined a short period, which is beyond the researcher's control. Future studies may include more years for periods before, during, and after the crisis, and may include larger sample size, and it may include many other financial markets in developing and developed countries.

References

[1] Alexandridis, A. K., and Hasan, M. S., 2020. Global financial crisis and multiscale systematic risk: Evidence from selected European stock markets. *International Journal of Finance & Economics.* 25(4), pp. 518-546.

[2] Banz, R. W., 1981. The relationship between return and market value of common stocks. *Journal of financial economics*, 9(1), pp.3-18.

[3] Black, F., Jensen, M. C. and Scholes, M., 1972. The capital asset pricing model: Some empirical tests. *Studies in the theory of capital markets*, 81(3), pp. 79-121.

[4] Choudhry, T. and Jayasekera, R., 2015. Level of efficiency in the UK equity market: empirical study of the effects of the global financial crisis. *Review of Quantitative Finance and Accounting*, 44(2), pp. 213–242.

[5] Choudhry, T., 2005. Time-varying Beta & the Asian Financial crisis: Evidence from Malaysian and Taiwanese Companys. *Pacific-Basin Finance Journal*, 13(1), pp. 93-118.

[6] Clare, A., Priestley, R. and Thomas, S., 1998. Reports of Beta's Death are Premature: Evidence from the UK. *Journal of Banking and Finance.* 22(9), 1207-1229.

[7] Fama, E. F. and MacBeth, J. D., 1973. Risk, return, and equilibrium: Empirical tests. *Journal of political economy*, 81(3), pp.607-636.

[8] Fama, E. F. and French, K. R., 1992. The Cross-Section of Expected Stock Returns. *The Journal of Finance.* 47, pp. 427-465.

[9] Fama, E. F. and French, K. R., 1993. Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics.* 33, 3-56.

[10] González, M., 2001. CAPM performance in the Caracas Stock Exchange from 1992 to 1998. *International Review of Financial Analysis*, 10(3), pp. 333-341.

[11] Lintner, J., 1965. Security prices, risk, and maximal gains from diversification. *The journal of finance*, 20(4), pp. 587-615.

[12] Logue, L. and Merville, J., 1972. Financial policy and market expectations. *Financial Management*., 1(3), pp. 37-44.

[13] Markowitz, H., 1952. Portfolio Selection. *The Journal of Finance*, 7(1), pp. 77–91.

[14] Nimal, P.D., 2006. An empirical analysis of CAPM. *Graduate School of Economic Research, Risk and Research in Economics and Management*. Japan: Shiga University.

[15] Roll,R., 1977. A critique of the asset pricing theory's tests; part I: On past and potential testability of the theory', *Journal of Financial Economics*, 4, pp. 129-176.

[16] Sharpe, W. F. and Copper, G. M., 1972. Risk-return classes of New York stock exchange common stocks, 1931–1967. *Financial Analysts Journal*, 28(2), pp. 46-54.

[17] Sharpe, W. F. and Copper, G. M., 1972. Risk-return classes of New York stock exchange common stocks, 1931–1967. *Financial Analysts Journal*, 28(2), pp. 46-54.

[18] Sharpe, W.F., 1964. Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *Journal of Finance*, XIX, pp. 425-442.
[19] Spyridis, T., 2009. Testing the risk and return trade-off in the Athens stock exchange (*Doctoral dissertation, University of Greenwich*).
[20] Strong, N., and Xu, X. G., 1997. Explaining the cross-section of UK expected stock returns. *The British Accounting Review*, 29(1), pp. 1-23.
[21] Zhang, D., Hu, M., and Ji, Q., 2020. Financial markets under the global pandemic of COVID-19. *Finance Research Letters*, 101528.