General Assessment of the Impact of the War in Ukraine on the Shipping Industry Using Parametric Methods

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The ongoing Ukrainian war has introduced significant uncertainty and crisis into the global economy, particularly in financial and stock markets. This study is a part of a larger research project that aims to assess the impact of the conflict between Russia and Ukraine on shipping companies, given the direct influence of rising gas and oil prices on the valuation of freight transport service providers. Economic sanctions were imposed on Russia, leading to the destabilization of the global economy. Industries such as the global shipping and tourism sectors experienced significant declines in share value. Investors began reallocating their portfolios, seeking safer and less risky investments, such as gold stocks. The riskiness of a particular stock can be assessed by various methods, including volatility measurement. This paper focuses on calculating and presenting the volatility value of the shares of A. P. Moller-Maersk, the world's largest operator of container lines and vessels. Additionally, the STOXX50 index, i.e. the Euro Zone stock market index, representing the overall European market, is used for comparison. Another risk measure discussed in this paper is Value at Risk (VaR), a quantitative method used to predict potential cash losses over a certain time period. The parametric method of calculating VaR was used, which assumes the normal distribution of stock value fluctuations. VaR was calculated using historical stock price data of A. P. Moller-Maersk. Findings indicate significant volatility and high-risk environment in the financial markets. The calculated VaR of 27.66% for a 30-day period with the 95% confidence level reflects the substantial potential losses associated with investing in Maersk shares during the crisis, surpassing typical risk levels. In conclusion, the war in Ukraine has disrupted the maritime industry, which was already recovering from the impact of the COVID-19 pandemic. The sanctions imposed on Russia and the war situation in Ukraine have created uncertainty and turbulence in financial markets, prompting investors to seek safer investment options. The study emphasizes the need for continued monitoring of the impact of the war on the global maritime industry. The devastating effects of the war on the sector have significant implications for the global economy, human well-being, and future research in the field.

KEY WORDS
~ Parametric methods
~ Shipping companies
~ Impact of war
~ Stocks

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1. INTRODUCTION

The world is undergoing a period of crisis that will undoubtedly have serious and lasting consequences for the global economy, especially financial and stock markets. This study is a part of a larger study on the general assessment of parametric methods that focuses on the impact of the conflict between Russia and Ukraine on shipping companies, as the rising gas and oil prices directly affect the value of companies offering freight transportation services. The European Union chose to impose economic sanctions on Russia and provide military assistance to Ukraine. A large number of Russian citizens and companies have been included in the list of sanctions. However, imposing sanctions on Russia and the war situation in Ukraine

destabilized the entire world economy (Jeff, 2022; Nisha, 2022; Rajan, 2022). Many industries, such as global shipping industry and the tourism sector, are suffering and experiencing a decline in the value of their shares (King Benjamin, 1966; Smith, 1998). Investors are changing the structure of their portfolios and moving money towards "safer" and less risky investments that minimally lose value, such as gold stocks. There are several ways to express the level of risk involved in investing in a particular company (Šimićev, 2015). This paper will focus on the calculation and presentation of the volatility value of shares of the largest operator of container lines and vessels in the world, A. P. Moller-Maersk. Also, the data of the European stock exchange STOXX50 will be used for the same calculations, to compare the impact of the crisis on shares of Moller-Maersk and the overall European market. Another risk measure that will be mentioned in this paper is value at risk (VaR). The method of calculating value at risk is a quantitative method that can be used to predict potential cash losses over a time period with certain confidence (Alexander, 2008). Moller-Maersk's share price data will also be used to calculate VaR. All numerical data used for the analysis were downloaded from YAHOO! Finance, and cover the period from 1 January 2022 to 29 April 2022.

2. STATISTICAL METHODS

This paper aims to show that the current situation on the financial markets and the stock exchange significantly differs from the normal. Using volatility and VaR calculations, Europe will be shown to be in an unfavorable situation that is greatly affecting the global economy.

2.1. Volatility

Volatility is a statistical measure that indicates unpredictable changes of a particular variable in the observed period (Šošić, 2004). Volatility is specifically used in this paper to determine the range and velocity of the value of Maersk shares and the STOXX50 stock index. These values are expected to be significantly above the normal level, i.e. to reflect rapid stock prices fluctuations, confirming that the market is currently in crisis.

Volatility is measured as the standard deviation of the daily stock price fluctuation. Higher stock volatility poses a higher investment risk (Drew, 2004). Practically speaking, this measure shows by how much a share price can deviate from its average value, i.e. average price (Engle, 2013).

To calculate the standard return deviation, the daily return on the stock for each observed day needs to be determined first.

If P_t is the share price on day t, and R_t the return realized that same day

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (1)$$

The standard return deviation can be calculated using the following formula:

$$\sigma = \sqrt{\frac{1}{N-1} \sum_{t=1}^{N} (R_t - R^*)^2} \quad (2)$$

where:

σ - standard deviation of returns,

N - the number of days observed in this analysis - the number of daily returns

R* - the mean value of the observed returns

R_t - return realized on day t.

2.2. Value at Risk – Risk Value

Value at Risk (VaR) is a statistical measure for quantifying market risk. In particular, VaR represents potential financial losses within a company or an investment portfolio over a period of time (J.P. Morgan, 1996). This model was introduced in 1994 by investment bank J.P. Morgan, the world's leading financial institution, and it is used to predict the greatest potential cash loss.

There are three methods of calculation of this value: the historical method, the Monte Carlo simulation and the parametric method. The historical method, as the name suggests, is a method based on the assumption that the stock will fluctuate as it did in the past. Under that assumption, future risk can be predicted based on historical data. This is also the simplest method of determining risk value (Investopedia). Monte Carlo simulation is a method based on computational algorithms that receive random values that represent different scenarios. This procedure is repeated up to 10,000 times to take into account all possible outcomes, after which the level of risk is predicted based on the obtained numerical values. (Jayatti, 2022). In this paper, the parametric method, also called the variation and covariance method, was used. Parametric methods refer to statistical techniques that make assumptions about the distributional shape of data, enabling the estimation of parameters and inference. These methods offer a structured approach to data analysis by incorporating assumptions about the underlying population distribution. Parametric methods allow researchers to make statistical inferences and estimate essential parameters of interest concerning a population. However, it is important to carefully consider and justify assumptions like normalcy or linearity based on data characteristics (Roberts, 1977).

3. PARAMETRIC METHOD OF CALCULATING VaR

A change in the market price of a share directly indicates the realized return, i.e. whether it is profit or a loss. If the change is negative, share value dropped and investors lost money. If the change is positive, share value increased and investors made a profit.

The parametric method of calculating VaR is a method based on the assumption that the increase or decrease in the value of shares, i.e. market price fluctuation, follows the normal distribution. This risk value is specified for a specific period (t) with an alpha probability level (α). The period t is usually 1 to 30 days, while the probability level is between 95 - 99%.

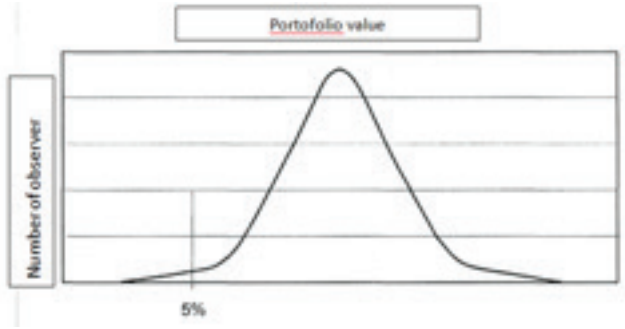

Figure 1.
Normal distribution curve (Šverko, 2022).

Assuming that stock value fluctuations are distributed normally, the level of probability can be changed, and the area under the curve and thus VaR (Mundar) determined.

In other words, VaR or risk value is the largest potential loss on a portfolio within a period, with a certain probability. For example, a 30-day VaR with a 95% confidence level indicates the largest possible loss on investment within 30 days, with a 95% confidence (normal distribution from Figure 1). Thus, there is a 5% probability that the loss will be greater than the calculated VaR value.

4. ANALYSIS OF VOLATILITY AND VaR

Volatility is a statistical measure of the dispersion of returns of a particular stock or the entire portfolio. When investing, investors can usually expect the volatility of an individual stock to be around 15%, with deviations of 10% - 15%. In most cases, stocks with volatility above this percentage are considered high risk and their fluctuations are more difficult to predict. The average value of stock index volatility is about 15% (Bams, 2017).

In this paper, volatility was calculated in MS Excel using the STDEV function, which immediately calculates the standard deviation of selected numerical amounts. These amounts are

Table 1.
Daily return on Maersk shares and the STOXX50 stock index.

Date	STOXX50	AMKBY	Daily change in price / return	
			STOXX50	AMKBY
Apr 29, 22	489,98999	14,45		
Apr 28, 22	494,01999	14,28	0,822%	-1,176 %
Apr 27,22	494,35001	13,94	0,067%	-2,381 %
Apr 26, 22	488,16	13,31	-1,252%	-4,519 %
Apr 25, 22	486,25	13,24	-0,391%	-0,526 %
Apr 22, 22	479,04001	13,68	-1,483%	3,323 %
Apr 21, 22	483,07999	14,13	0,843%	3,289 %
Apr 20, 22	486,20001	14,39	0,646%	1,840 %
Apr 19, 22	486,04999	13,95	-0,031%	-3,058%
Apr 18, 22	481,16	13,28	-1,006%	-4,803%
Apr 14, 22	484,51001	13,35	0,696%	0,527%
Apr 13, 22	479,79001	13,44	-0,974%	0,674%
Apr 12, 22	480,89999	12,79	0,231%	-4,836%
Apr 11, 22	483,35001	12,85	0,509%	0,469%
Apr 08, 22	474,44	13,19	-1,843%	2,646%

daily returns of Maersk shares, in the period from 1 January 2022 to 29 April 2022.

Daily returns on Maersk stocks were also calculated in Excel, as were daily returns on the STOXX50 index itself. Considering that the observed period covers less than 4 months, which is 81 working days, data from only a few daily records are given as an example.

The left side of the table contains the value of the Eurozone stock index (STOXX50) and Maersk shares (AMKBY), as well as the dates when the indicated prices were recorded. The right side of the table shows the daily return on the Maersk share and the STOXX50 index, which is expressed as a share price percentage change compared to the previous day.

Furthermore, these data were used to calculate the standard deviation, i.e. volatility, using the STDEV function in MS Excel.

As shown in Table 2, the volatility of Maersk shares increased to as many as 48%, which is significantly above their normal level of 15%, with a deviation of an additional 10-15%. Furthermore, the volatility of the STOXX50 stock index was 22%, which is also above its average level of 15%.

Table 2.
Volatility of Maersk shares (AMKBY) and the STOXX50 stock index.

Risk factor	Volatility
STOXX50	22.036%
AMKBY	48.197%

Figure 2.
Comparison of daily return on Maersk shares and the STOXX50 index.

Moreover, the comparison of the dispersion of daily returns between the Maersk stock (AMKBY - orange curve) and the STOXX50 stock index (blue curve) in Figure 2 shows a noticeable difference. The Maersk stock exhibits significantly more pronounced fluctuations in value compared to the European stock index. Considering that the STOXX50 index encompasses 50 largest companies from the Eurozone, its deviation is expected to be comparatively lower. The following data from Table 3 will be used to calculate VaR.

Table 3.
Volatility of Maersk shares (AMKBY) and the STOXX50 stock index.

	Volatility	Probability level	Investment amount
AMKBY	48.197%	95%	1,000,000 euros

To calculate VaR, the amount invested and the period for which the risk value is specified are required. If the investment is 1 million euros, and the period 30 days, with 95% confidence level, it is important to note that 95% of the area below the normal curve is within +/- 1.64 of the standard deviation.

Using MS Excel, it was calculated that the 30-day VaR with the probability level of 95% is estimated at 276,622 euros. That is, if an investor invests 1,000,000 euros in A.P.Moller-Maersk shares and "does not touch" them for 30 days, the maximum possible monetary loss is 276,622 euros or 27.66%, with 95% confidence. There is a 5% probability that the amount lost will still exceed that figure.

The VaR of 27.66% is an extremely high-risk value, given that obtained risk values for 30-day VaR at the probability level of 95% usually do not exceed 15% (Danielsson, 2000).

5. CONCLUSION

The war in Ukraine caused great disruption in the maritime industry, which had just begun to recover from the crisis caused by the coronavirus pandemic. Numerous sanctions imposed on Russia leave a big mark on the global financial system and economy. Uncertainty and turbulent changes in the market are forcing investors to withdraw their money from stocks and redirect it into "safer ports". Experts claim that financial markets are following a certain trend - during the great crisis, stocks significantly lose and gain in value, which can be seen from the volatility of the Maersk company, which reached as much as 48%. Furthermore, the calculation of the 30-day VaR with a probability level of 95% indicated potential predicted losses of as many as 27%, with a 5% chance of even greater losses. Considering the substantial disruptions in nearly all markets, it is currently more prudent to refrain from exposing oneself to riskier areas of the market, specifically stocks. The International Monetary Fund stated the war would exacerbate shipping costs, and conflict has also impacted shipping outside the conflict zone. Therefore, the impact of war in Ukraine and its ramifications on the global maritime industry need to be monitored continuously to stay abreast of anticipated future negative trends and losses. Results in this paper show the devastating impact of war on the maritime sector, not only on the global economy, but also on the health and quality of human lives and is therefore a good foundation for further research.

CONFLICT OF INTEREST:

The authors declare no conflict of interest.

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