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# 11 AD ALTA

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# AD ALTA: JOURNAL OF INTERDISCIPLINARY RESEARCH

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# A     SOCIAL SCIENCES

# AN IMPACT OF THE CRISIS ON THE STOCK MARKET EFFICIENCY

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Abstract: In the midst of crisis, the stock market's efficiency tends to decrease due to growing uncertainty and chaos in the financial environment. The purpose of the research was to analyze the stock market's efficiency on the example of the European countries (Germany, France, Italy and Spain) in the crisis period 2020-2021. The practical value of the research lies in revealing the dependence of the European stock markets on external shocks through the economic slowdown in the European countries, dependence on the state of the US and Chinese economies, trading policy and demand for Chinese consumers goods.
Keywords: stock market, efficiency form, crisis period, stock market's efficiency.

## 1 Introduction

In a chaotic and crisis-ridden financial environment, investors are more responsive to change by increasing the risk of investing in assets. As a result, the stock market's efficiency decreases, forasmuch as the information volume grows several times; by the way, the information is poorly predictable leading to a high volatility level of stock prices. Consequently, investors prefer to invest in the post-crisis period. Analysis of the stock market's efficiency in the crisis period allows forming recommendations for investors on the distribution of assets in the stock markets. The stock market's efficiency in the pre-crisis period is characterized by low volatility and heterogeneity, however, high volatility and homogeneity is observed in the post-crisis period. During the crisis period, the stock market is characterized by increased returns volatility, which arises due to growing uncertainty and rising levels of information. The issue of reducing market profitability can be solved by controlling the information dissemination.

The purpose of the academic paper lies in analyzing the stock market's efficiency on the example of the European countries (Germany, France, Italy and Spain) in the crisis period 2020 – 2021.

In order to achieve the purpose outlined, the following objectives are defined, namely:

- To assess the dynamics of stock markets' indices in Europe (Germany, France, Italy and Spain) for the period 2019 – 2021, in particular, to identify features of profitability and volatility in the pre-crisis period (2019) and in the crisis period (2020 – 2021).
- To construct autocorrelation functions of the yield indices dependence on stock market indices in Europe (Germany, France, Italy and Spain) for the period 2019 – 2021.
- To determine the stock markets' efficiency based on stock indices of the European countries (Germany, France, Italy and Spain).

## 2 Literature Review

The stock market's efficiency means that the stock prices' formation is based on all available information that is easily disseminated and comprehensible (Mishra, Das & Pradhan, 2009). Stocks and their prices do not depend on historical prices and other factors (the industry, market development), as well as on external information (Jain, Vyas & Roy, 2013). Efficiency

also implies the absence of a systematic way of using trading opportunities and generating excess profits (Mishra, Das & Pradhan, 2009). The stock price is generated randomly, and its change does not depend on the previous values; the investor cannot apply any useful information to get additional profit (Jain, Vyas & Roy, 2013).

Reilly and Brown (1997) define an efficient market as one in which a stock price responds instantly when new information is obtained; consequently, the current stock price instantly reflects all the stock information. Due to its efficiency, the market does not contain a template for using a trading opportunity and generating additional economic profit. Fama (1970) defines an efficient market as the one, where prices always reflect recent information and insists on three efficiency types depending on the information availability, namely: weak, semi-strong, and strong.

Weak efficiency of the market form exists provided that the securities prices reflect all the information about the history of past prices and returns. In the case of the stock market's weak form, investors do not obtain excessive yields on trading strategies based on past prices and profits. Thus, stock returns are unpredictable and follow random wondering. In case of semi-strong market's efficiency, securities prices reflect all public information available on the market to investors. Investors in this case receive a profit not higher than the average one, making decisions based on public information. A high efficiency form involves price formation based on all information, even confidential company's information; consequently, the investor cannot make excessive profit when investing in the asset.

The negative and positive impact of the financial crisis on the efficiency of the stock market is being discussed in the scientific literature. A systematic review of the literature conducted by Lim & Brooks (2011) on weak market's efficiency suggests that there is abundant empirical research on the predictability of returns based on past price changes in stock markets. The crisis of 1997 had a negative impact on 8 stock markets in Asia, including Hong Kong, Singapore, Korea, Thailand, and the Philippines, which recovered in the post-crisis period (Lim, Brooks & Kim, 2008). The financial crisis of 2008 had a negative impact on the Indian stock market's efficiency (Mishra, Das & Pradhan, 2009). Along with this, Jain, Vyas & Roy (2013) revealed the weak form of the Indian stock market's efficiency during the economic downturn.

The 2008 crisis negatively affected the stock prices' efficiency in the stock markets of the Eurozone countries, which led to the emergence of patterns of stock price movements aimed at returning to the average level (Anagnostidis, Varsakelis & Emmanouilides, 2016). Liao et al. (2019) found that the efficiency of 16 EU markets was affected by the financial crisis of 2018. Todea & Lazar (2012), based on the efficiency assessment of ten markets in Central and Eastern Europe, revealed changes in market inefficiency over time, proving the adaptability of markets; after all, efficiency was found in 7 markets out of 10. The investigation conducted by Mahmood, Xinping, Shahid & Usman (2010) proved the weakness or efficiency of the Chinese stock market after the 2008 crisis, namely: past data on market movements are of little use for obtaining super-profits in the current period, and the global crisis does not significantly affect the market efficiency. Emenike Kalu (2017), based on studying the weak form of the Nigerian Stock Exchange efficiency after the global crisis, revealed the profitability of the exchange and its sectors. Investors forecast the profit-making capacity of the banking sector using a fundamental analysis of profitability. A nonlinear model and fundamental analysis should be used to forecast the profitability of the stock exchange and Sharia shares. The consumer goods sector as well as the oil and gas sector can be predicted by

applying technical and fundamental analysis (Emenike Kalu, 2017).

Choi (2021), in the light of investigating of the US stock market sectors' efficiency during the 2020 pandemic have revealed that the consumer sector has the highest efficiency, and the utilities sector – the lowest efficiency. Fazlollahi, Ozatac & Gokmenoglu (2020), examining the stocks of energy companies and the weak stock markets' efficiency form of the US, China, Canada, Australia, Saudi Arabia and India, found different efficiency levels that vary and deviate. The financial crisis of 2007-2009 and changes in the energy sector in 2015 significantly influenced the evolution schedule of market efficiency, which has recovered over time, excluding the Indian energy sector. The US market proved to be the most efficient. Zhu et al. (2019) revealed the efficiency of seven Latin American markets and little volatility in the post-crisis period, which ensured the investment growth. Sabbaghi & Sabbaghi (2018) found weak efficiency in most advanced stock markets, while the US market was identified as a weak and inefficient one. Vieito et al. (2013), investigating the markets of the G20 countries, revealed strong simultaneous effects as a result of the 2007 crisis, except for Saudi Arabia, associated with increased activity. In general, the 2007 crisis resulted in lower yields and increased volatility with greater efficiency of individual markets.

Thus, the review of the literature points out to the limitations of studies on the stock markets' efficiency in the European countries in the face of external shocks, including the pandemic spreading. Perception of the efficiency of developing countries' markets cannot be used when making investment decisions in asset management.

**3 Methodology**

The values of the following indices have been used in the research, namely: Euro Stoxx 50 (STOXX50E) (50 largest enterprises in the Eurozone), DAX (GDAXI) (the largest companies in Germany), CAC 40 (FCHI) (40 largest companies in France by capitalization), IBEX 35 (IBEX) (35 largest companies in Spain), Italy 40 (invit40) (40 largest companies in Italy). The sample comprised observations for the period 01.01.2019 – 08.07.2021, which includes the values of closing, opening, minimum and maximum prices, yields indices.

The following formula has been used to calculate the yields indices, namely:

$$R_t = \log\left(\frac{I_t}{I_{t-1}}\right) \tag{1}$$

where $I_t$ – stock price at the time of market closing.

A standard deviation based on closing prices has been used to calculate volatility. Volatility is an important indicator of the stock market, assessing the change in the asset's price over a certain period of time and estimating the risk of future price changes. The difference between the minimum and maximum stock price has been also used to calculate volatility (Average True Range).

In order to examine the stock market's efficiency, an autocorrelation test has been applied. Autocorrelation function (ACF) makes it possible to conduct assessment of the linear dependence between the yields of the current period and the yields assets of previous periods.

Autocorrelation of the sample (autocorrelation function ACF) $lag - i$ of yields values $R_t$ is determined by the formula:

$$\rho_\ell = \frac{\sum_{t=\ell+1}^{T}(R_t - \bar{R})(R_{t-\ell} - \bar{R})}{\sum_{t=1}^{T}(R_t - \bar{R})^2}, 0 \le \ell < T-1 \tag{2}$$

where $\rho_\ell$ – sequential correlation coefficient of the yields index with $lag$ $\ell$, T – number of observations, $R_t$ – yields for the period $t$, specified in the equation (1.1), $\bar{R}$ – the average value of the return sample and $\ell$ – lag period. ACF is used to detect differences in sequential correlation coefficients in different periods during which the yields indices change. The null ACF hypothesis: $\rho_\ell = 0$, that is, the correlation is 0, alternative $\rho_\ell \neq 0$. If $R_t$ is an uncorrelated sequence, value $\rho_\ell$ is bigger than the significance level $\alpha$. Therefore, the null hypothesis of random yields wandering (stock prices) should be rejected if the profitability $R_t$ is consistently correlated (Emenike Kalu, 2017).

In order to perform joint testing of several yields correlation values of $R_t$ the modified Ljung – Box Q test is used (Box and Pierce Q modification). "Ljung– Box Q involves subjecting the squared error series to standard tests of serial correlation based on autocorrelation structure using portmanteau tests as follows" (Emenike Kalu, 2017):

$$Q_{LB}(m) = T(T+2) \sum_{\ell=1}^{m} \frac{\widehat{\rho_\ell^2}}{T - \ell} \tag{3}$$

where $T$ – sample size, $m$ – the number of autocorrelation coefficients used in the test. Provided that $R_t$ is "an inid sequence", Q-statistics is an asymptotically random variable chi-square with freedom degrees equal to the number of autocorrelation coefficients ($m$). The null hypothesis is as follows: the first $m$ ACF autocorrelation lags from $\varepsilon_t^2$ are equal to zero (Tsay, 2005). Therefore, the decision rule lies in deviating from the null hypothesis if the value $p$ is less than or equal to the $\alpha$ significance level.

**4 Results**

The reasons for the volatility of the European stock market are diverse. One of the reasons is the expectation of economic decrease in the Eurozone leading countries in early 2019, namely: Italy, the construction sector in the UK, the technology sector and Germany's retail sector. The basic factors include the reduction of oil prices due to the risks of the global economic contraction, which led to a reduction in demand for risky assets (as of January 3, 2019).

The reduction in oil prices is caused by reserves decrease by 2,3 million barrels. The contraction of the European stock market is also caused by reduced activity of the European companies in the field of health, technology, transport and finance. The report of the German company specialized on the technology SAP development in January 2019 informed investors about the reduction of orders, which led to a potential loss of 950 million EUR in revenue. The stocks' price of Siemens Healthineers Company has decreased due to the rising cost of its services. Problems with the delivery of Royal Mail Company led to a reduction in its shares.

Write-off of bad loans of the Spanish bank Bankia in the fourth quarter of 2018 resulted in loss emergence. Net Loss Reports of Deutsche Bank for the fourth quarter of 2018 as well as Spanish banks Caixabank and Sabadell led to a decline in their stock prices. Air Shuttle (a Norwegian carrier) stock pricing also declined due to abandonment of short-term expansion plans. Ryanair has published a report on reducing profits due to low ticket prices, which caused decrease of stocks of other airlines (Air France-KLM, Lufthansa, Wizz Air, EasyJet). However, the growth of companies in other sectors of the economy (for example, the Dutch Philips conglomerate) kept the increase of Euro Stoxx 50. Industrial companies have become leaders in growth and ensured the increase of Euro Stoxx 50: the forecast of flat path in tariffs on Chinese goods has caused the growth of stocks of Daimler, BMW, Volkswagen, Ferrari and Fiat

Chrysler. The stock market also grew in early 2019 due to the growth of companies specializing in the production of luxury goods, namely: Kering, LVMH, Salvatore Ferragamo, Moncler and Burberry. In early 2019, news about China – the US trading relationship and the potential of the Chinese economy significantly determined the dynamics of the European stock market. Herewith, the business activity of the industrial sector to a lesser extent determined the stock market growth, despite the decline in Germany, Great Britain, Italy and China.

In 2019, the volatility of the European stock market depended on the growth or decline of certain sectors (or the largest companies) of the economy worldwide. However, in early 2020, news of the emergence and spread of the pandemic had a significant impact on the European stock market's volatility, holding back growth even with the increase of the European companies or positive forecasts for the EU economy.

During the period 21.01 – 24.01.2020, the news release about the spread of the virus in Asia led to a reduction in the value of German futures on DAX by 110 points or 0,8%, French futures on CAC 40 by 45 points or 0,8%, British futures on FTSE by 46 points or 0,6%.On January 21, 2020, the news of the virus spreading caused a reduction in the cost of Euro Stoxx 50 by 24 points or 0,6%. In general, on January 21, 2020, the German DAX decreased by 69 points or 0,5%, the French CAC 40 – by 58 points or 1%, the British FTSE 100 – by 84 points or 1,1% under the influence of corporate news. The pan-European Euro Stoxx 50 index decreased by 30 points or 0,8%. The potential risk of reduced demand for air travel to Asia due to the virus spreading caused a reduction in the share price of national European airlines: the stock price of Deutsche Lufthansa decreased significantly (by 2,2%), Air France KLM – by 1,7%. Along with this, the share price of budget airlines increased due to the growth of EasyJet's revenues by 4,9% in the first quarter. Companies of luxury sector were also affected. News on the state of the virus spreading and morbidity determined the dynamics of Asian stock markets, which affected the volatility of the European markets during January – March 2020. For instance, for the period 27.01 – 05.02.2020 the news dissemination on morbidity and mortality, isolation of Chinese cities in China restrained the growth of the European stock markets. This is caused by the dependence of the European certain economic sectors on Chinese consumers. World Health Organization news on the potential of anti-virus measures to some extent restrained the stock market decline (for instance, the WHO lifted restrictions on trade with China on travel to the country).

In addition to the pandemic, the European stock market's volatility was affected by the factors as follows: weak economic growth in the EU and the risks of declining GDP (for instance, weak economic indicators in Germany and France); risks of trade conflict in Europe; the process of Britain's exit from the EU (for instance, on March 12, 2020, the market grew due to the decision of the British Parliament to vote against the exit without approval, which means the lack of drastic decisions); dynamics of sales of the largest manufacturers in Europe (for instance, the reduction of profits of the semiconductor manufacturer STMicroelectronics in the first quarter of 2020).

The European stock market is dependent on external shocks, including pandemic and government measures to counter its spreading, caused the decrease of stock prices. The dynamics of the Euro Stoxx 50 index for the period February – March 2020 was mostly negative: the average value of stock prices of 50 most European companies decreased by 4,17% in February compared to January, by 3,41% in March compared to February 2020 year (see Figure 1). The stock prices included in the index fell sharply in the period of 01.02 – 01.03.2020: from 3,329 to 2,786 EUR. According to news reports, the core reason for the sharp drop is the spread of the virus within Europe, in Germany, France, Italy, and Spain, which led to a decrease in the forecasts for economic growth in the Eurozone countries.
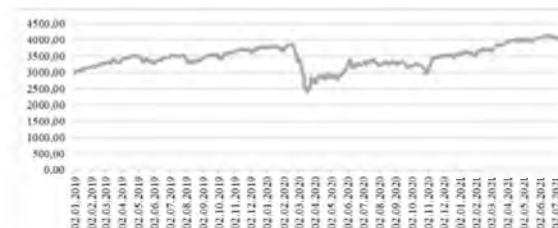


*Figure 1 – Dynamics of the Euro Stoxx 50 index (STOXX50E), January 1, 2019 – July 08, 2021*
Source: Investing (2021c).

Thus, the European stock markets depend on the foreign policy of the United States and China (including trade and customs), economic growth in Asia, the US and Asian stock markets, the economy and certain sectors (companies) of Europe. The decrease of the American and Asian markets leads to a decline in the European stock market; after all, the volatility of the Euro Stoxx 50, DAX, CAC 40, IBEX 35 and Italy 40 indices are interrelated (Figure 2-5).

The yields of the DAX index began to decline steadily from February 20, 2020 to March 12, 2020 (Figure 2), in particular due to the stocks' reduction of Daimler AG manufacturer by 41% during this period, Volkswagen AG Vz by 34%, Bayerische Motoren Werke AG by 32,6%, Siemens AG Class N by 35%, Delivery Hero AG by 28%, Linde PLC by 29,7%, Deutsche Telekom AG by 30,2%, Deutsche Bank AG by 51%, Munchener Ruck AG by 39%, Fresenius Medical Care AG & Co by 21,4%, SAP SE by 29,8%, Deutsche Boerse AG by 24,9%, BAYER AG by 36%.
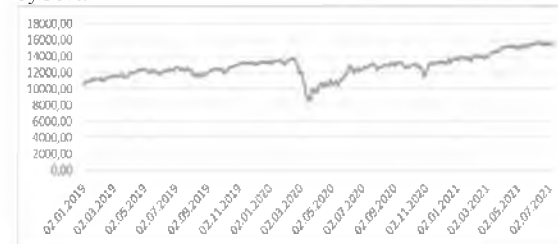


*Figure 2 – Dynamics of the DAX index (GDAXI), January 1, 2019 – July 08, 2021*
Source: Investing (2021b).

The CAC 40 yield index fluctuated in January 2020. On the whole, it decreased by 2,87%; in February 2020, the yield decreased by 8,55%, in March 2020 – by 17,21% (significantly for the period 05.03 – 12.03). The yields decrease was caused by stock price slump of Kering SA by 12% 12,03, Hermes International SCA (HRMS) by 5,82%, EssilorLuxottica SA by 7,17%, Engie SA by 17,2% and other stocks included in the index.



*Figure 3 – Dynamics of the CAC 40 index (FCHI), January 1, 2019 – July 08, 2021*
Source: Investing (2021a).

The volatility of the IBEX 35 yield index was negative for the period from February 20 to February 12, 2020. In particular, on March 12, 2020, the yield decreased by 14,06%; therewithal, crash of the market was due to a reduction of the companies' shares value in various sectors of the economy.

*Figure 4 – Dynamics of the IBEX 35 index (IBEX), January 1,*
*2019 – July 08, 2021*
Source: Investing (2021d).



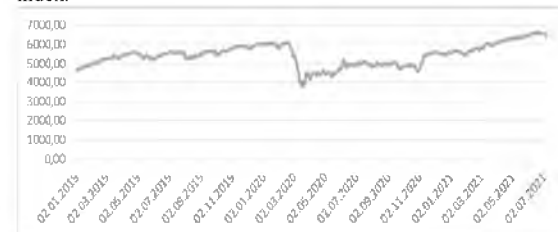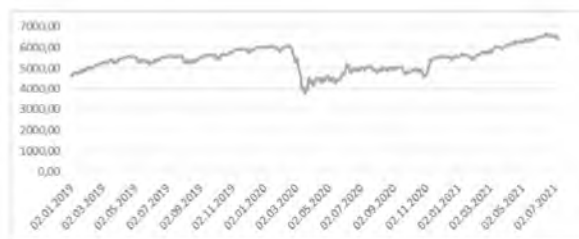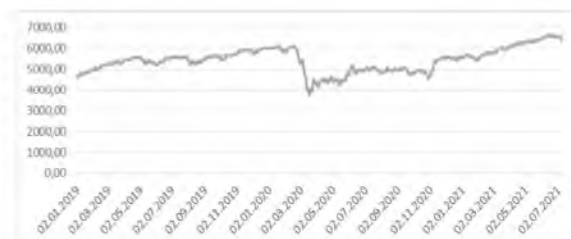*Figure 5 – Dynamics of the Italy 40 (invit40) index, January 1,*
*2019 – July 08, 2021*
Source: Investing (2021e).

Share prices of the index Italy 40 (invit40) fell sharply for the period 01.02 – 01.03.2020 (from 2,151 to 1,659 EUR). The drop was due to a decrease in share prices in all sectors of the economy. Similar to the dynamics of the IBEX 35 yield index, the Italy 40 (invit40) yield index decreased for the period 20.02 – 12.03.2020 by 41,4% (on 12.03.2020 – by 16,64%). The average value of the yield index for the period 2019 – 2021 was as follows: EuroStoxx50 – 0,0513%, CAC40 – 0,0561%, IT40 – 0,0545%, IBEX35 – 0,0081%, DAX – 0,069% (Table 1). It stands to mention the significant volatility of the yield indices, namely: the standard deviation of EuroStoxx50 for 2019 – 2021 was 1,4275%, CAC40 – 1,4361%, IT40 – 1,5796%, IBEX35 –

1,5004%, DAX – 1,4793%. Herewith, volatility increased due to significant growth in 2020 – 2021. In the pre-crisis period (2019), the average yield was as follows: EuroStoxx50 – 0,09%, CAC40 – 0,0958%, IT40 – 0,01021%, IBEX35 – 0,0354%, DAX – 0,0943%. During the crisis period (2020 – 2021) the average yield was as follows: EuroStoxx50 – 0,03%, CAC40 – 0,03%, IT40 – 0,02%, IBEX35 – 0,0009%, DAX – 0,0542%. This means that during the crisis the stocks yield of the largest companies decreases, while the stock market volatility increases (the standard deviation of the analyzed indices during the crisis is characterized by higher values compared to the pre-crisis period or the average for 2019 – 2021).

Table 1: Descriptive statistics of Indices return 2019-2021

| 2019-2021 | EuroStoxx50 | CAC40 | IT40 | IBEX35 | DAX |
|---|---|---|---|---|---|
| Average | 0,05% | 0,06% | 0,05% | 0,01% | 0,07% |
| Standard error | 0,06% | 0,06% | 0,06% | 0,06% | 0,06% |
| Standard deviation | 1,43% | 1,44% | 1,58% | 1,50% | 1,48% |
| Dispersion | 0,02% | 0,02% | 0,02% | 0,02% | 0,02% |
| Minimum | -12,40% | -12,28% | -16,64% | -14,06% | -12,24% |
| Maximum | 9,24% | 8,39% | 9,06% | 8,57% | 10,98% |
| Number | 635 | 635 | 635 | 635 | 635 |
| During crisis (2020-2021) | EuroStoxx50 | CAC40 | IT40 | IBEX35 | DAX |
| Average | 0,03% | 0,03% | 0,02% | -0,01% | 0,05% |
| Standard error | 0,09% | 0,09% | 0,10% | 0,09% | 0,09% |
| Standard deviation | 1,71% | 1,72% | 1,89% | 1,82% | 1,75% |
| Dispersion | 0,03% | 0,03% | 0,04% | 0,03% | 0,03% |
| Minimum | -12,40% | -12,28% | -16,64% | -14,06% | -12,24% |
| Maximum | 9,24% | 8,39% | 9,06% | 8,57% | 10,98% |
| Number | 389 | 389 | 389 | 389 | 389 |
| Prior to crisis (2019) | EuroStoxx50 | CAC40 | IT40 | IBEX35 | DAX |
| Average | 0,08% | 0,10% | 0,10% | 0,04% | 0,09% |
| Standard error | 0,05% | 0,05% | 0,06% | 0,05% | 0,06% |
| Standard deviation | 0,80% | 0,82% | 0,91% | 0,78% | 0,89% |
| Dispersion | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% |
| Minimum | -3,26% | -3,57% | -2,87% | -2,77% | -3,11% |
| Maximum | 2,17% | 2,31% | 2,44% | 1,91% | 3,37% |
| Number | 246 | 246 | 246 | 246 | 246 |

*Source: author's calculation*

Analysis of autocorrelation functions of yields indices (Figure 6) shows the absence of a linear dependence of current yields on past yields values of shares included in the indices DAX, CAC 40, IBEX 35, Italy 40 (correlation coefficients do not exceed -0.2 – +0, 2). This means that during the crisis, the European stock markets are efficient in a weak form; investors decide to invest in assets based on publicly available information, including public information and reporting of international organizations as well as leading companies' reports. However, efficiency is diminishing due to the proliferation of information and rumors, resulting in increased uncertainty. However, the analysis of news content bears evidence of reduction in stock prices, which are included in key European indices with any information available, which raises concerns about the negative impact of the virus spreading, especially in the transport sector. The decline of indices return also occurred in the case of news dissemination about the situation in the US or Asian stock market. This indicates the dependence of the European market on the two most influential financial centers: the United States

and China; the government's international policies of these centers instantly affect the volatility of the company's shares.

**5 Discussion**

The present research has revealed that investors possess information from different sources that is equally accessible to all market participants and instantly affects the stock prices of the largest companies in Europe (Germany, France, Italy and Spain). Decisions of international organizations, such as the WHO, influence the decision to invest in stock markets' assets, the volume of which has decreased in the event of increasing investors' concerns about the virus spreading when news has been released on an increase in morbidity, mortality, and potential negative consequences of the virus. Over the period February – March 2020, news about the virus was released every two days and changed investors' sentiment, hindering the market, which had been growing due to certain economic sectors despite the slow growth in the European countries. During this period, the return of the indices DAX, CAC 40, IBEX 35, Italy

40 steadily decreased with a certain difference in time and decline rate. After a significant downturn in February – March 2020 and rising volatility, stock markets have gradually.
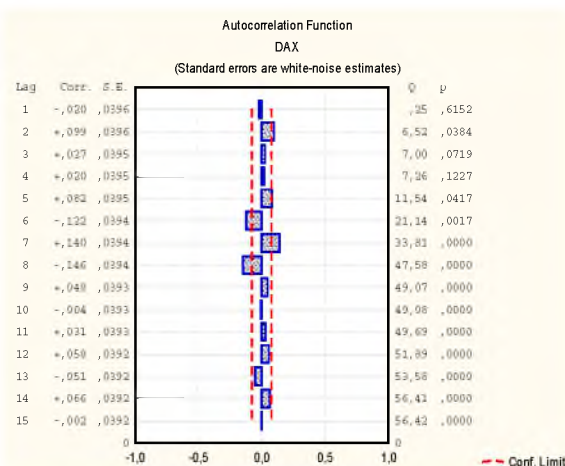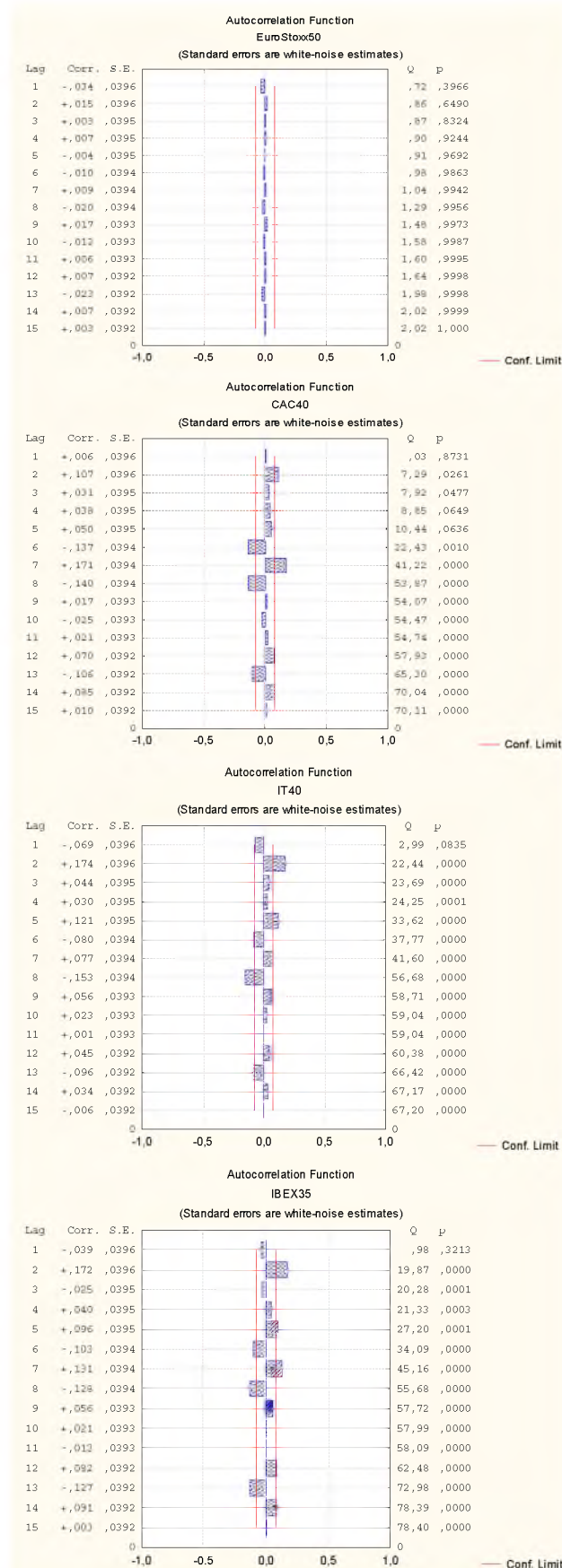










*Figure 6 – Autocorrelation Function of Indices return*
Source: author's calculation

Herewith, in case the reporting of the leading companies, the shares of which are included in the analyzed indices, to a lesser extent has determined the decline level of return, the news about the virus (due to uncertainty) has caused a restraint in market growth or a significant decline.

The negative impact of the 1997 crisis on Asian stock markets (Hong Kong, Philippines, Malaysia, Singapore, Thailand and Korea) has been revealed in the scientific work of Lim, Brooks & Kim (2008). Similar to the present research, Lim, Brooks & Kim (2008) also argue for the recovery of most markets in the post-crisis period in terms of improved market efficiency. Based on the working assumption of Lim, Hinich, & Brooks (2006) about the deviation of markets from equilibrium based on the nonlinear serial dependences identified by the authors, caused by external shocks, market inefficiency may be associated with the news release during the crisis period. Kaminsky and Schmukler (1999), in their investigation, have collected news releases in order to identify those causing significant market shocks. However, the authors have found a significant increase in the number of news and rumors during the crisis, which makes it difficult to control new information. Thus, the results of the present research on the growth of index returns volatility are not surprising, forasmuch as the crisis leads to an increase in the uncertainty of the financial environment, in which investors sharply and instantly react to each piece of news by reducing investments in the company's assets. The present research has revealed that news from the US and Asian markets affected the situation in European stock markets. As Kaminsky and Schmukler (1999) point out, "in such a chaotic financial environment, investors will overreact not only to local news but also to news coming from other markets, especially when news events have been unfavorable". It has been revealed in the research that information spreads quickly; it is easily accessible to market participants, and, after all, it is one of the conditions for stock market efficiency (Mishra, Das & Pradhan, 2009). Along with this, according to autocorrelation analysis of the European index stocks, shares prices do not depend linearly on historical prices, but are contingent on other factors, in particular, news coming from different sectors of the economy, and from information available from the outside (Jain, Vyas & Roy, 2013).

For instance, external information about the risk of rising customs rates between China and the United States, or slumping of the US or Asian stock markets, immediately affected the fall of stock indices in Europe. This means that the efficiency of the European stock market declined during the crisis. Another condition of efficiency – the lack of a systematic way to use trading opportunities and generate excess profits (Mishra, Das & Pradhan, 2009) – was met; after all, the yield of stock indices decreased significantly during the news spreading about the

dangers of the virus with simultaneous increase in yield volatility. Taking into consideration that the current values of stock prices depended on the past ones, and the autocorrelation of some indices yields ranged from -0.2% to +0.2%, the stock prices of the European companies were formed and changed taking into account previous values (Jain, Vyas & Roy, 2013). However, it can also be a consequence of the instantaneous adaptation of stock prices of the European indices (Reilly and Brown, 1997) upon receipt of new uncertain information, as a result of which the current stock price instantly reflects all information about the stock. Take all these points together, it cannot be argued about the efficiency of the European stock markets during the crisis, forasmuch as the market contained templates for seizing a trading opportunity and generating additional economic profit, including templates similar to the 2008 crisis. Thus, the conducted research has made it possible to conclude about the weak form of European markets' efficiency, as evidenced by the reflection of securities prices of all information about the history of past prices and returns. In the period after the momentary fall of the market in February – March 2020, stock markets gradually restored the average yield value at the level of the pre-crisis period.

**6 Conclusion**

The academic paper has introduced various reasons for the volatility of returns on the European stock market. Whilst in 2019, the growth of the market was negatively affected by expectations of economic downturn in the leading countries of the Eurozone (Italy, the UK construction sector, technology sector and Germany's retail sector), the decline in oil prices due to the risks of global economic downturn, then in early 2020, news of the emergence and spread of the pandemic significantly affected the volatility of the European stock market. As a result, the increase of shares' prices of the leading stock indices was restrained even with the growth of the European companies or positive forecasts for the growth of the EU economy. The yield dynamics of stock prices of Euro Stoxx 50, DAX, CAC 40, IBEX 35 and Italy 40 indices for the period February – March 2020 was negative and began to decline steadily during this period. An analysis of the autocorrelation functions of the index returns indicates that there is no linear dependence of the current return on the past yield stock values included in the indices (the correlation coefficients do not exceed the values -0,2 – +0,2). This means that during the crisis, the European stock markets are efficient in a weak form. However, efficiency is diminishing due to the proliferation of information and rumors, resulting in increased uncertainty.

Analysis of news content bears evidence of stock prices reduction included in key European indices, with any information raising concerns about the negative consequences of the virus spreading, especially in the transport sector. The decline in the yield of the indices also occurred in the case of the news releasing concerning the situation in the American or Asian stock market. This testifies to the dependence of the European market on the two most influential financial centers of the United States and China, the foreign policy of the government of which instantly affects the volatility of company's stocks.Further investigations should be aimed at identifying the reasons for the recovery of stock markets in the post-crisis period and the effectiveness of government policy towards ensuring the stability of the European stock markets.

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