
Analysing the Disruptive Effect of Economic Downturns on Stock Market Crashes in European Financial Markets

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Abstract:

Purpose: Earlier this year in March, European financial markets faced a financial crisis generated by security incidents in America ending with the failure of Silicon Valley and Signature Bank. This was a time when the intervention of guarantee bodies was needed to temper the financial shock.

Design/Methodology/Approach: The methods consist of quantifying the analyses' effects of the economic slowdown on stock market prices by identifying the risk of a stock market crash through an analysis of stock market prices in Frankfurt, Paris, Madrid, Milan and Amsterdam. As a result, we proposed five new econometric models regarding risks on financial markets.

Findings: We appreciate that uncertainty conditions manifest a direct influence on economic deceleration, there is a knock-on effect of the main drivers of uncertainty, hyperinflation, rising interest rates, economic deceleration and financial quotes of companies traded on financial markets. The effects of the financial shock manifested itself in the decline of shares of several regional banks such as First Republic Bank, Western Alliance Bancorporation and PacWest Bancorp. There have also been effects in Europe, the biggest being the collapse of the giant Credit Suisse, which was taken over by UBS as a solution to restore confidence in the financial mechanisms of the European markets

Practical implications: The results of the study will highlight the effect of economic stress on the magnitude of price movements and the conditions for triggering stock market crashes.

Originality value: The results of the study will be useful tools for financial decision-makers to increase the level of financial security and could form the basis for changes in the financial strategy of listed entities.

Keywords: Uncertainty, economic deceleration, financial market, financial mechanisms, economic slowdown.

JEL classification: D53, O16, E44.

Paper type: Research paper.

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1. Introduction

The current trend of European stock markets is declining as the US Central Bank warned of higher interest rates in Germany and insurance measures were triggered against banks that did not implement the mandatory board diversity policy. Thus, there have been fluctuations in the DAX index, which is currently (beginning of March 2023) up from the annual minimum on September 30, 2022, when the values of the DAX index reached the quotation of 12,000 euro, which are currently quoted at 15,428 euro.

The best performing listed entities are Fresenius Medical Care AG & Co. KGaA and Deutsche Boerse AG (MarketWatch, 2023b). The Paris stock exchange also saw a 1.3% drop, with the stock market index quoted at 7220.67 euro. On the Paris stock exchange, shares in the BNP Paribas SA banking group declined by 1.7% and Societe General SA by 1%. The European Central Bank said that in the current geopolitical context, cyber security measures should be stepped up following the increase in cyber-attacks on financial institutions in the euro area.

Concerns about cybersecurity and the effects of the economic crisis have also had a knock-on effect on other European stock exchanges, with the AEX index on the Amsterdam stock exchange hitting an annual low in October when the index value was 633 euro compared to the current rising value of 756.2 euro. Between February 2022 - February 2023 the index fell by 0.75% amid cyber security problems and the economic crisis combined with hyperinflation.

The Italian Milan Stock Exchange Index (FSEMIB) was heavily affected by the outbreak of the covid pandemic with the second major downturn occurring with the outbreak of the war in Ukraine, a crisis that affected the stock market until the end of 2022, triggering a chain reaction of investors.

In Spain, the effect of the economic crises and the pandemic destabilized the stock index, which reached the minimum of quotations immediately after the onset of the covid pandemic, these being influenced until the end of 2020, the next syncope being marked by the beginning of the war in Ukraine, with less intense effect than the pandemic on the stock exchange, an effect that was maintained until the end of September 2022.

These aspects were enhanced by media reports of poor financial stability assurances in US markets, which triggered a contagion effect on the Spanish financial market, considered by analysts to be very sensitive to a crisis of confidence. Also in Spain, the suspension of dividends in the movable sector influenced Merlin and Colonial shares, which reflected on the value of Ibex.

In this context, there are significant influences of the economic crisis on the dynamics of stock indices, which motivates our research, whose defined purpose is

to assess the impact of the deceleration on financial markets in the European Union through the following study objectives:

O1: Determination based on literature study of stock market deceleration models based on the study of the impact of economic crises;

O2: Consolidation of databases on quotations of the main European stock indices (of the stock exchanges in France, the Netherlands, Germany, Italy and Spain);

O3: Determining the economic and financial model of stock market deceleration based on the study of the correlative distribution of the evolution of European stock indices;

O4: Dissemination of model results and formulation of conclusions.

The study continues with the presentation of the results of literature research, presentation of methodology, results, discussions and will end with the dissemination of conclusions.

2. Literature Review

In the specialized literature there are numerous models for forecasting financial risk, both due to the high interest in the studied field of investors and due to the perpetual need for return expressed by stakeholders in relation to the decision to invest in the assets and liabilities of listed entities. A significant section is the analysis of how to design monetary volatility (Grima and Thalassinou, 2020).

Thus, a collective of English authors (Corte, Kozhan and Neuberger, 2021) have identified an overall risk factor affecting stock market returns, namely a method of flattening stock market volatility. Another article (Plíhal and Lyócsa, 2021) models accumulated volatility in exchange rates, showing that acting as an investor in the stock exchange helps strengthen financial security through an intelligent algorithm to avoid accumulations of low-yield annuities.

Other study (Fukasawa, 2021) shows that deviations from underlying volatility through market scaling can be avoided by using marginal market impact functions. In an interesting approach (Li and Xing, 2022) showed the importance of controlling volatility for determining the cost of demand with a high level of predictability.

Authors Thomas Gehrig and Klaus Ritzberger (Gehrig and Ritzberger, 2022) analysed the role of intermediaries in procuring timely feedback in dynamic markets. The authors show that in order to achieve the equilibrium of the price result indicator, a wider product market differentiation and an element of deceleration of excess volatility is needed. Analysis of the catastrophic effects of various economic and pandemic phenomena (Chowdhury, Khan and Dhar, 2022) highlighted the unstable equilibrium of stock index quotations and their vulnerability to changes in macroeconomic factors (Thalassinou and Pociovalisteanu, 2007).

Yaming Ma and others (Ma, Wang and He, 2022) confirms the theory of catastrophic effects in a study analysing economic policies of uncertainty and the realized volatility of financial markets. On the basis of Fourier data series they show that the spillover effect of economic policy uncertainty on financial market volatilities exhibits distinctive regional characteristics depending on the intensity of the uncertainty phenomenon manifested at the macroeconomic level.

Another study (Deng, Xu and Lee, 2022) the global study on the reaction of financial markets to the outbreak of the Covid pandemic shows that macroeconomic developments, in particular changes in interest rates as a result of changes in monetary policy, influence financial markets in an inversely proportional way (lower interest rates generate a positive response in financial markets) and this is related to the level of restrictions imposed by the outbreak of the pandemic.

The authors suggest that the role of lockdown policy has had beneficial effects on financial markets according to the results presented in the study. According to the authors (Rahman *et al.*, 2022; Su *et al.*, 2022) shows that after the end of the pandemic there has been a rapid and unprecedented recovery in the European stock market, with significantly higher returns given a fairly long holding period.

Analysing periods of recession, some authors (Sallai, Mészáros and Kiss, 2022) shows that their effect is always felt as an inflection point in the stock markets so that the change in the index evolution panel contains negative adjustments in the value of quotes, as stock indices are connected to the central index. During periods of economic growth, the fluctuation of quotations is oscillating with a positive trend and the connection tends to diversify (Pociovalisteanu *et al.*, 2010).

The literature review shows that although extensive in volume and thematically varied, the literature does not cover the topic of financial markets affected by macroeconomic conditions and a study of European financial markets is needed to analyse the impact of the economic downturn on financial markets in the European Union (Thalassinos *et al.*, 2006; 2012).

3. Research Methodology

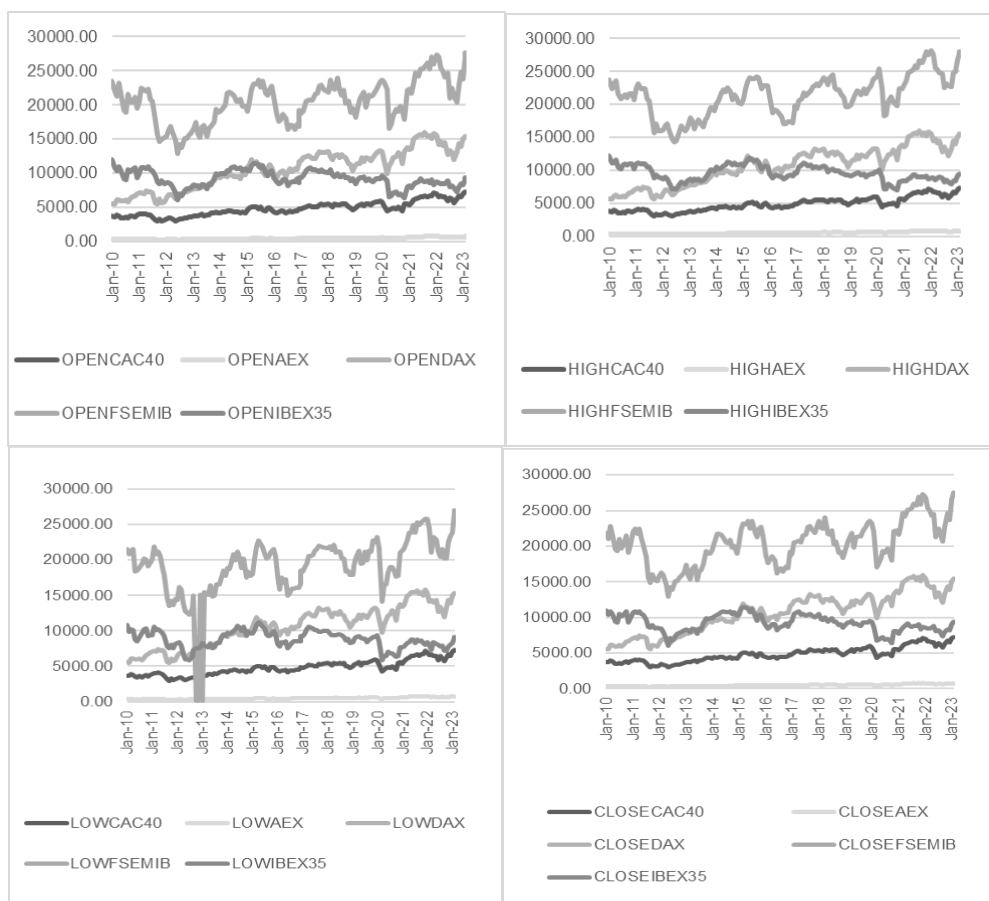
In order to achieve the research objectives, the authors proceeded to consolidate the databases on the values of the minimum, maximum and closing opening quotations of the stock market indicators:

- DAX: The DAX 30 index is the stock market index of the German stock market, which is made up of the 30 largest companies traded on the Frankfurt stock exchange (MarketWatch, 2023b);
- CAC40: It is the stock market index in France and is made up of the 40 largest companies traded on the Bourse de Paris (MarketWatch, 2023a);

- FSEMIB: The index measures the performance of 40 Italian stocks and seeks to replicate the broad sectoral weights of the Italian stock market (MarketWatch, 2023c);
- IBEX35: It is the benchmark stock index of Bolsa de Madrid, Spain's main stock exchange (MarketWatch, 2023d);
- AEX: The AEX Index, derived from the Amsterdam Exchange Index, is a stock market index composed of Dutch companies trading on Euronext Amsterdam, formerly known as the Amsterdam Stock Exchange (INDEXEURO: AEX, 2023).

The authors proceeded to consolidate the databases over a period of 10 months, taking into account the monthly variation of the stock market indicators, obtaining a dashboard of the evolution of the 5 undecided quotes as shown in Figure 1.

Figure 1. Evolution of the 5 stock market indicators in the analysed countries



Source: Elaborated by the authors according to the stock market indicators of the analyzed states, available at (INDEXEURO: AEX, 2023; MarketWatch, 2023b; 2023a; 2023d; 2023c).

The authors formulate, in order to achieve the research objectives, the following working hypotheses:

H1: Under conditions of economic stress, stock prices tend to increase their amplitude of variation by at least the economic intensity of the shock;

H2: Due to the impact of long-term economic development, stock market indices have prevailed upward trend;

H3: Following economic crises stock markets tend to return to pre-crisis values within a time horizon that depends on the security of the macroeconomic climate.

The methods used consist of statistical analysis of data series distributions and econometric modelling.

4. Research Results and Discussion

The autocorrelation model of stock indices was applied by correlative regression variation test, obtaining regressions with different factor of statistical significance (Table 1).

Table 1. *Model Summary.*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
OPENCAC40	0.908	0.824	0.823	440.815
OPENAEX	0.941	0.885	0.884	46.655
OPENDAX	0.938	0.881	0.880	995.124
OPENFSEMIB	0.542	0.294	0.289	2647.812
OPENIBEX35	0.335	0.112	0.107	1131.808

Source: Authors' calculations using SPSS v 25.

After designing the 5 econometric models, it resulted that stable economies with a high degree of economic development, such as Germany, France and the Netherlands, showed high values of statistical significance, while the economies affected by the economic and pandemic crisis, such as Italy and Spain, have a low level of statistical significance, the variation of quotations in the case of Spain, its value approaching 0.

Overall it proves the H1 hypothesis that under conditions of economic stress stock prices tend to increase their amplitude of variation by at least the amount of economic intensity of the shock.

The Anova test designed for each individual econometric model validated the homogeneity of the data by means of an error distribution test that allowed the rejection of the null hypothesis in 5 out of 5 cases and the maintenance of the alternative hypothesis, the value of the Sig coefficient of the F function being lower than the chosen error significance threshold of 0.05 (Table 2).

Table 2. ANOVA analysis

Model	Distribution	Sum of Squares	df	Mean Square	F	Sig.
OPENCAC40	Regression	142775688.389	1	142775688.389	734.752	0.000
	Residual	30507940.199	157	194318.090		
	Total	173283628.588	158			
OPENAEX	Regression	2618757.674	1	2618757.674	1203.092	0.000
	Residual	341740.225	157	2176.689		
	Total	2960497.899	158			
OPENDAX	Regression	1146269518.467	1	1146269518.467	1157.531	0.000
	Residual	155472570.151	157	990271.147		
	Total	1301742088.618	158			
OPENFSEMIB	Regression	457346545.655	1	457346545.655	65.234	0.000
	Residual	1100712807.320	157	7010909.601		
	Total	1558059352.975	158			
OPENIBEX35	Regression	25493292.992	1	25493292.992	19.901	0.000
	Residual	201115422.783	157	1280989.954		
	Total	226608715.775	158			
The independent variable is Date.						

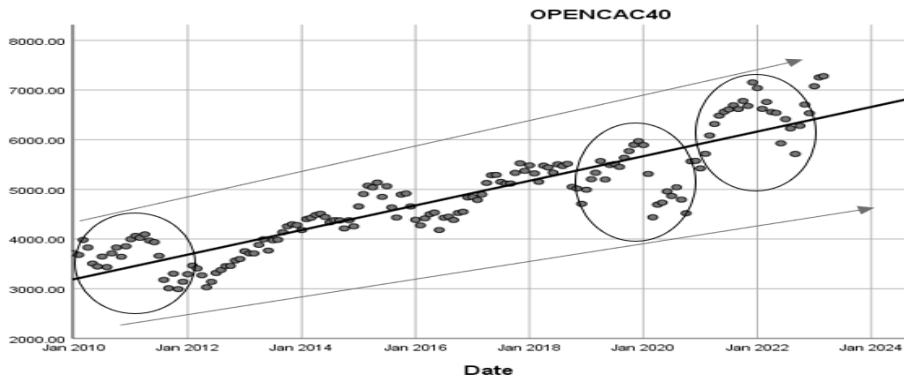
Source: Authors' calculations using SPSS v 25.

The Anova test demonstrated that in the case of France, Germany and the Netherlands the value of regression squares is higher than the residual value, which confirms the validity of the model on the stable growth economic function, while in the case of Italy and Spain the value of regression squares proved lower than the residual value, which confirmed the H2 hypothesis due to the impact of long-term economic development, stock indices developments prevailed upward.

The analysis of the distributions of the errors with respect to the trend line for the French stock market indices shown in Figure 2 reveals that the moments 2010-2012, 2020-2021 and 2022 corresponding to the three major catastrophic events of the European economy destabilised the evolution of the stock market index creating

deviations from the linear distribution pattern in a degressive manner but overall the evolution of the index coincided with the evolution of the growth rate of the French economy.

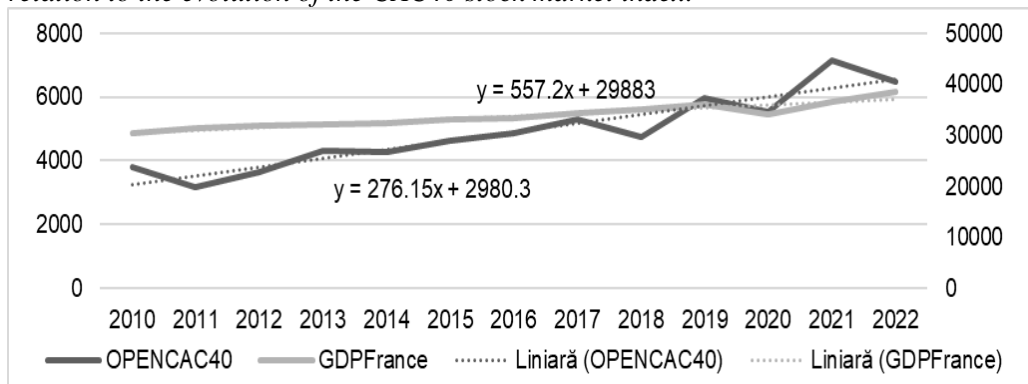
Figure 2. Dynamics of the regression variable of the French stock market indicator after econometric model design.



Source: Elaborated by authors.

From Figure 3 it follows that, as a result of overcoming economic crises, the French stock market tends to return relatively quickly to pre-crisis values, which proves the H3 working hypothesis.

Figure 3. The trend evolution of the GDP France macroeconomic indicator in relation to the evolution of the CAC40 stock market index.

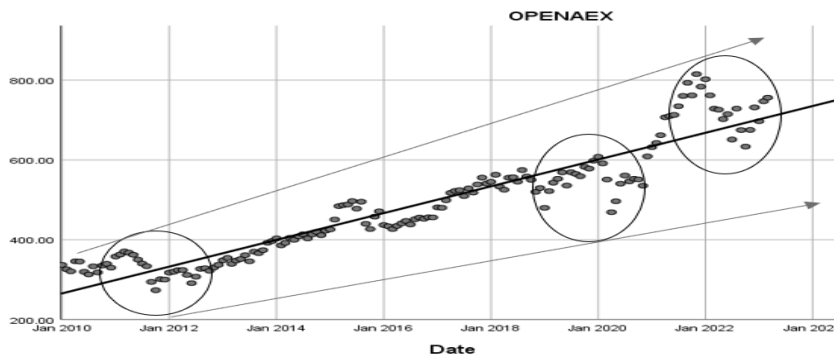


Source: Elaborated by the authors according to (MarketWatch, 2023a).

Analysis of error distributions versus trend right in Dutch stock indices shown in Figure 4 reveals that the moments 2010-2012, 2020-2021 and 2022 corresponding to the 3 major catastrophic events of the European economy destabilized the evolution of the stock market index, creating deviations from the linear distribution model in a

degressive manner, but overall, the evolution of the index coincided with the evolution of the growth rate of the Dutch economy.

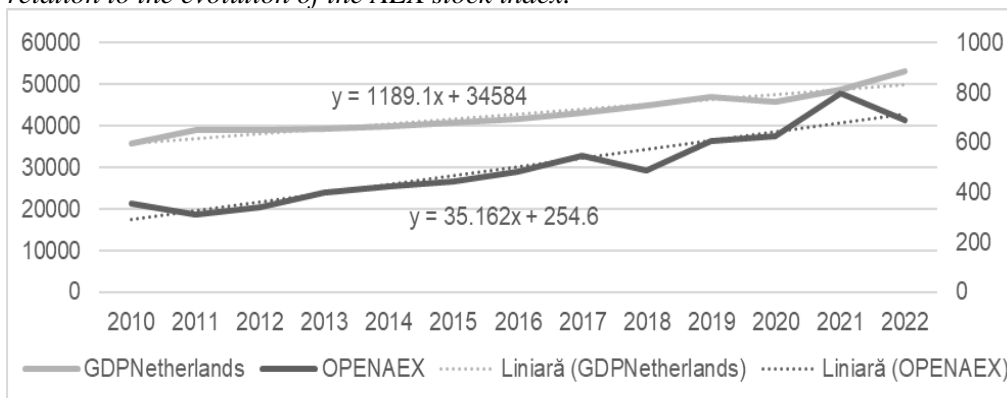
Figure 4. Dynamics of the regression variable of the Dutch stock exchange indicator after the design of the econometric model.



Source: Elaborated by authors.

Figure 5 shows that, as a result of overcoming economic crises, the Dutch stock market tends to return relatively quickly to pre-crisis values, which proves the working H3 hypothesis.

Figure 5. The trend evolution of the macroeconomic indicator GDP Netherlands in relation to the evolution of the AEX stock index.

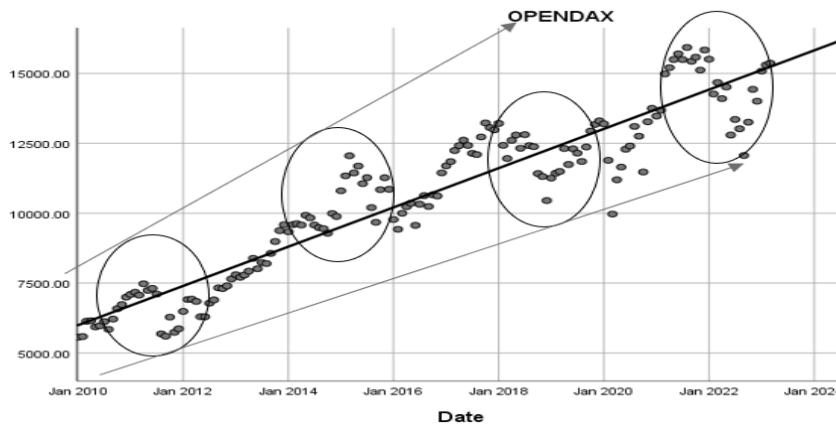


Source: Elaborated by the authors according to (INDEXEURO: AEX, 2023).

The analysis of the distributions of the errors from the trend line for the German stock indices shown in Figure 6 reveals that the moments 2010-2012, 2020-2021 and 2022 corresponding to the three major catastrophic events of the European economy destabilized the stock index evolution creating deviations from the linear distribution pattern in a degressive manner but overall the evolution of the index coincided with the evolution of the growth rate of the German economy (Figure 7).

The period 2014-2016 represents a strong recovery period for the German economy, which contributes to the increase in the amplitude of the normal variation from the trend curve.

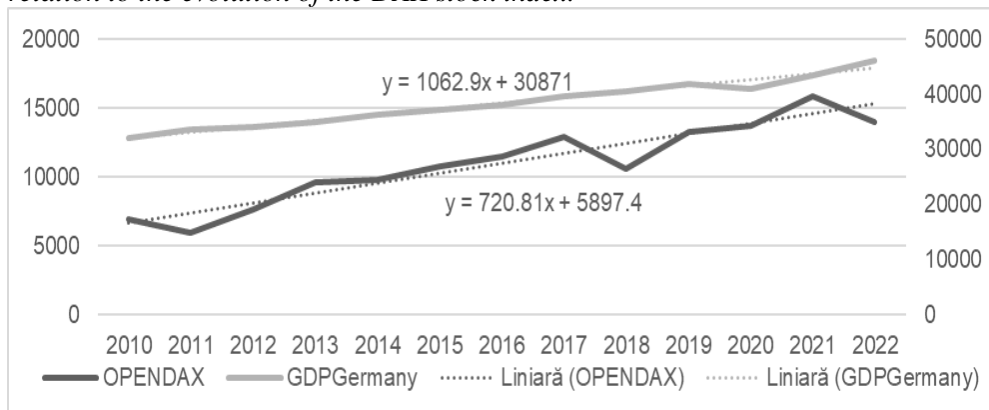
Figure 6. Dynamics of the regression variable of the German stock market indicator after econometric model design.



Source: Elaborated by authors.

From Figure 7 it follows that, as a result of overcoming economic crises, the German stock market tends to return relatively quickly to pre-crisis values, which demonstrates the working H3 hypothesis.

Figure 7. The trend evolution of the macroeconomic indicator GDP Germany in relation to the evolution of the DAX stock index.

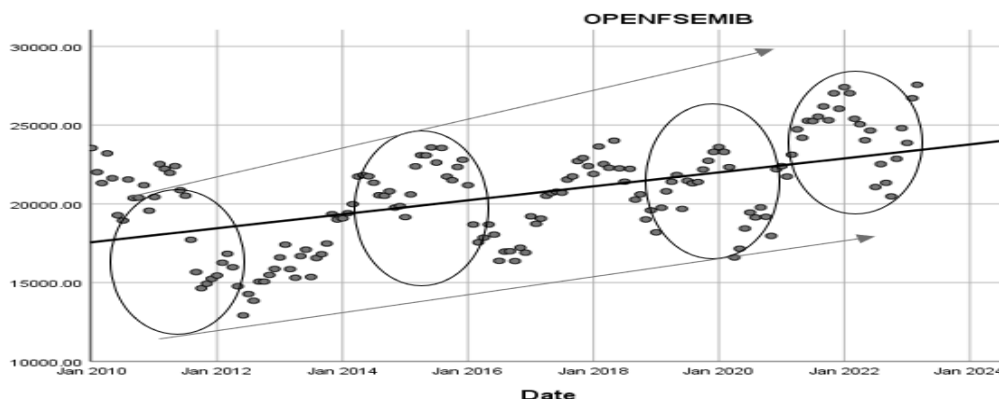


Source: Elaborated by the authors according to (MarketWatch, 2023b).

The analysis of the distributions of the errors from the trend line for the Italian stock indices shown in Figure 8 reveals that the moments 2010-2012, 2020-2021 and 2022

corresponding to the three major catastrophic events of the European economy destabilized the evolution of the stock index creating deviations from the linear distribution pattern in a degressive manner but overall the evolution of the index coincided with the evolution of the growth rate of the Italian economy (Figure 9). The period 2014-2016 represents a strong recovery period for the Italian economy, a period that contributes to the increase in the amplitude of the normal variation from the trend curve.

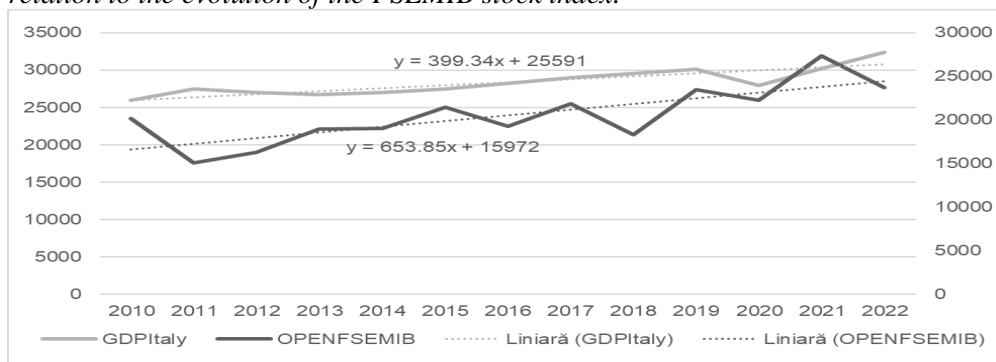
Figure 8. Dynamics of the regression variable of the Italian stock exchange indicator after the design of the econometric model.



Source: Elaborated by authors.

From Figure 9 It follows that, as a result of overcoming economic crises, the Italian stock market tends to return relatively quickly to pre-crisis values, which demonstrates the working H3 hypothesis.

Figure 9. The trend evolution of the GDP Italia macroeconomic indicator in relation to the evolution of the FSEMIB stock index.

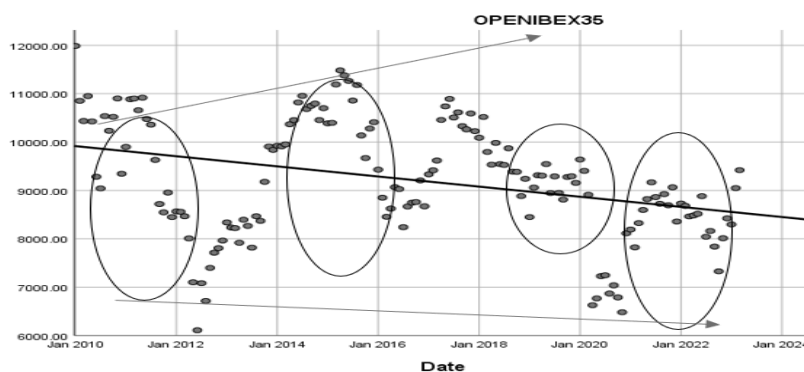


Source: Elaborated by the authors according to (MarketWatch, 2023c).

The analysis of the distributions of the errors from the trend line in the case of the Spanish stock market indices shown in Figure 10 reveals that the moments 2010-2012, 2020-2021 and 2022 corresponding to the three major catastrophic events of the European economy destabilized the evolution of the stock market index creating deviations from the linear distribution pattern in a degressive manner but overall the evolution of the index coincided with the evolution of the growth rate of the Spanish economy (Figure 11).

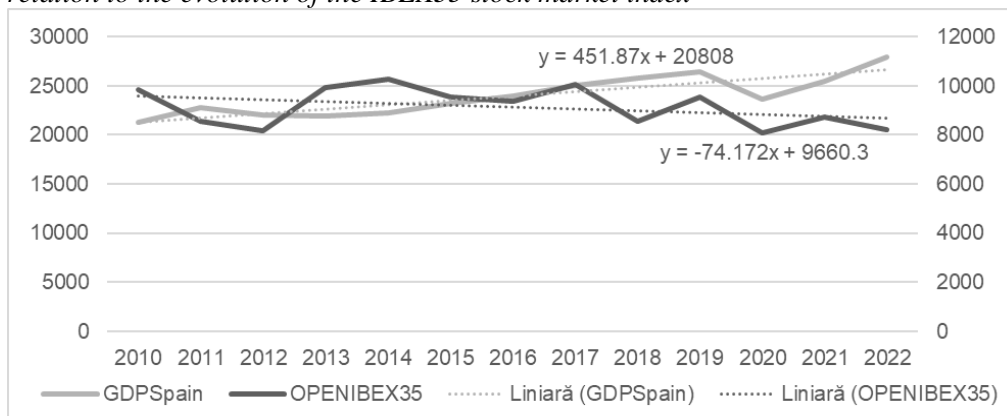
The period 2014-2016 represents a strong recovery period for the Spanish economy, a period that contributes to the increase in the amplitude of the normal variation from the trend curve.

Figure 10. Dynamics of the regression variable of the Italian stock exchange indicator after the design of the econometric model.



Source: Elaborated by authors.

Figure 11. The trend evolution of the GDP Spain macroeconomic indicator in relation to the evolution of the IBEX35 stock market index



Source: Elaborated by the authors according to (MarketWatch, 2023d).

Figure 11 shows that, as a result of overcoming economic crises, the Spanish stock market tends to return relatively quickly to pre-crisis values, which demonstrates the working H3 hypothesis.

The analysis presented has highlighted the direct link between stock market indices and the GDP economic deflator in 5 EU Member States whose economies are on an upward growth path. At the same time, the analysis has highlighted the main vulnerabilities of the stock market that generate financial volatility of stock prices under conditions of financial stress. These vulnerabilities indicate the dependence of financial markets on a stable and sustainable macroeconomic development climate.

5. Conclusions, Proposals, Recommendations

The study carried out has achieved the proposed research objectives in the sense that the main stock market deceleration patterns were determined based on the literature review based on the study of the impact of economic crises.

The authors consolidated the databases of the main European stock market indices (French, Dutch, German, Italian and Spanish stock markets), on the basis of which they determined the economic and financial stock market deceleration model based on the study of the correlative distribution of the evolution of the European stock market indices.

Dissemination of the model results allowed to demonstrate the working hypotheses, namely: under conditions of economic stress stock market prices tend to increase their amplitude of variation by at least the value of economic intensity of the shock; due to the impact of long-term economic development the stock market indices' developments have predominantly upward trend and following the overcoming of economic crises stock markets tend to return to pre-crisis values within a time horizon that depends on the security of the macroeconomic climate.

The limits of the study consist of the relatively small number of analysed stock market indicators and the limited number of macroeconomic indicators considered to consolidate stock market developments in relation to the analysed macroeconomic conditions.

The authors intend to develop this study in the future and to introduce more stock indices in order to increase the accuracy of the results.

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