



The impact of economic and health crisis on the value, performance and price shares of Athens Stock Exchange listed companies

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ABSTRACT

In recent years, in Europe and around the world, there have been several public-economic disturbances that cause global health and economic crises. These crises have been shown to affect stock markets internationally, causing a significant drop in share prices in almost all industries. The purpose of this thesis was to investigate whether health and financial crises affect the index of the Athens Stock Exchange and the various sectors in the Athens Stock Exchange. Essentially, the objectives of the thesis were to investigate whether the financial crisis of 2008, the health crisis of Covid-19 and the crisis caused by the war between Russia and Ukraine affected the Athens Stock Exchange in general. For this purpose, data was collected for the period 2006 – 2023 for the general index of the Athens Stock Exchange as well as for seven of its sectors (telecommunications sector, industrial products and services sector, technology sector, the food sector, banking sector, construction sector, consumer products and services sector). The findings from the analysis of the data showed that all three crises faced by Greece in the last 15 years had a significant effect on the prices of the general index of the Athens Stock Exchange and also on the prices of the seven indices of the individual sectors of the Athens Stock Exchange. Essentially, the findings showed that immediately after each crisis, the behavior of the indicators changed substantially, as a drop in prices was recorded, which leveled off after a few months. On the contrary, the findings did not confirm that any health or financial crisis can bring a certain profit or loss to an investor, as it emerged that the daily performance of the general index of the Athens Stock Exchange as well as the daily performance of the individual sectors of the Athens Stock Exchange do not differ significantly before and after every crisis (this essentially confirms the so-called Efficient Market Theory (EMH)).

Keywords:

Economic crisis, Health crisis, Athens Stock Exchange

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Chapter 1. Introduction

In 2008, the global financial crisis started from the USA, which hit Greece in 2009, with dramatic consequences for businesses, and for the global economy in general (Grout & Zalewska, 2016). Moreover, humanity in 2020 faced one of the biggest health crises in its recent history with the onset of Covid-19 affecting the way society operates and by extension international trade and the financial system (Akhtaruzzaman et al., 2021). From 2021 onwards where states began to remove restrictions on the movement of citizens, the economies of states have seen a rise that is also a consequence of the end of a crisis. The financially unstable state of the global economy was followed by Russia's invasion of Ukraine in February 2022, bringing turmoil to the global international order and trade trying to recover from the previous crisis (Ahmed et al., 2022; Lei et al., 2021). First studies examine investor overreaction in financial markets and the resulting reversal. Several of the most recent investigations shift the interest from the simple study of the phenomena of overreaction and underreaction, to more complex studies, such as for example the study of the economy of an entire country in combination with various variables, but also in the combination of these phenomena with other psychological- cognitive errors. In general, these studies find evidence of overreaction and underreaction in the stock market in both the short and long run (Tamakoshi & Hamori, 2011; Vasileiou, 2014). Financial markets include purchases of government bonds, stocks, foreign exchange rates and credit default swaps. An economic or health crisis can lead to significant losses in financial assets and increased volatility in global markets. Researchers have focused on the impact of these crises on stock indices, stock returns and financial risk and uncertainty with the majority of them finding a negative effect of the pandemic on stock indices and stock returns, as well as an increase in risk and uncertainty of financial markets (Apostolakis et al., 2021; Chatjuthamard et al., 2021; Choi, 2021; Li et al., 2021; Morales & Andréosso-O'Callaghan, 2021; Samitas et al., 2022; Umar et al., 2023; Vieito et al., 2015).

The purpose of this thesis is to investigate whether health and financial crises affect the index of the Athens Stock Exchange and the various sectors in the Athens Stock Exchange. Essentially, the objectives of the thesis is to investigate whether the financial crisis of 2008, the health crisis of Covid-19 and the crisis caused by the war between Russia and Ukraine affected the Greek Stock Market in general and some individual sectors of the

stock market such as the telecommunications sector, industrial products and services sector, the technology sector, the food sector, the banking sector, the construction sector, consumer products and services sector.

Until now, the literature has documented the impact of various health and economic crises on stock market indices of various countries. In Greece, until now, some research has been carried out that evaluates the behavior of the stock market under the health or the economic crises as a whole. In addition, most researches are content to investigate the general indices of the stock markets and do not investigate how crises (health and financial) affect individual sectors and branches of the stock market. In addition, the war between Russia and Ukraine is a fairly recent event and its effects on the stock markets of various countries are not known. So it is important to investigate the impact these crises had on the Greek Stock Market. This thesis combines the Greek Stock Market reaction under several crisis. The results of the research will contribute to the understanding of how these crises affect the Stock Market in Greece while also providing a better understanding of which sectors are most affected by a health or financial crisis.

In order to fulfill the purpose of the thesis, research was carried out using secondary data for the general index of the Athens Stock Exchange and the seven individual sectors already mentioned. The secondary data were obtained from the website www.capital.gr and concern the daily values of the indices in the period 2006-2023. In addition, based on the daily values of the indices, the daily returns of the indices were also calculated and analyzed.

A key limitation of the study carried out is that data was collected on the aggregate indices of the Athens Stock Exchange and their returns, but no analysis was made on specific companies by sector. This may result in drawing a general conclusion for the majority of companies in an industry, but there may be companies that deviate from the rest of the same industry.

The thesis consists of the following chapters: The first chapter is the introduction, the second chapter presents the conceptual framework regarding the health and economic crises and how these crises affected the economic and financial sector in Greece. The third chapter presents and discusses findings from the literature regarding how the financial crisis of 2008, the Covid-19 pandemic and the war between Russia and Ukraine affected various stock markets internationally. The fourth chapter presents the research methodology (research strategy, data collection, data analysis strategy) while the fifth chapter presents

and analyzes the results obtained from the data analysis through the EViews software. Finally, the sixth chapter contains a summary and concluding remarks.

Chapter 2. Economic and Health Crises

2.1. Global Financial Crises

The 20th century was marked by a large number of economic crises and it would be important to report and study whether there are correlations between each economic crisis. The first major crisis of the previous century was of course the great "crash" of Wall Street in October '29. Black Tuesday, as it was called, plunged both the US and the world economy into the Great Depression of the 1930s and condemned an entire generation to financial disgrace. Tens of thousands of companies went bankrupt, while investments and savings were wiped out in a short period of time. Notably, by mid-1932, American stocks had lost ninety percent of their value, while it took more than twenty years for the Dow Jones index to recover to pre-1929 levels, real estate prices a drop of over sixty percent (Nicholas & Scherbina, 2012). At the same time, the unemployed in America exceeded ten million and the domestic product fell by thirty percent. Internationally, we had a significant drop in trade, a reduction in profits and tax revenues as well as severe deflation. But the effects were not only economic as in many countries a shift towards nationalism was observed (Schularick & Taylor, 2012). The crisis of 1929 was the biggest that the world economy had experienced until the financial crisis of 2008, while according to many it contributed to the start of the Second World War.

After the Second World War the world economy experienced steady growth in the following decades. However, the 1970s were marked by the first oil crisis. More specifically, it began in October 1973, when OPEC2 members declared an oil embargo. OPEC at that time controlled over 50% of international oil production. By the end of this situation in March 1974 the price of oil had risen from \$3.65 per barrel to \$11.65 (Brémond et al., 2012). This unprecedented situation triggered both the attack and the outbreak of war by Egypt and Syria against Israel while also creating tension in the relations between the NATO countries. The negotiation took some time but the embargo was finally lifted in the spring of 1974. The biggest economic effects were seen in Europe as it was very dependent on Arab oil. In 1979, the second oil crisis occurred in the wake of the Iranian revolution. The price of a barrel rose from 15 dollars at the end of 1978 to 40 dollars at the end of 1979 (Baumeister & Kilian, 2016). In 1980, after the Iraqi invasion of Iran, the production of oil in Iran almost stopped and the production in Iraq decreased significantly. After 1980, the

price of oil began to decline, peaking in 1986 where the drop in prices reached 46%. This development is mainly due to a decrease in demand but also to an overproduction of oil which resulted in a rift between the OPEC countries (Bordo & Meissner, 2012).

The 1980s were marked by the crash of 1987 which saw a sharp decline in US stock prices in late October 1987. Although again the decline came from the US, it affected every other major stock market. This fall was preceded by an unprecedented rise with the Dow Jones index tripling in just five years. Black Monday for the US stock market occurred on October 22, 1987, when the Dow Jones fell 508 points (22.6%), the largest single-day drop in its history. It is estimated that more than \$500 billion was lost (Ang & Boyer, 2009). The rapid decline was attributed to two main factors: speculation in the futures market on the Chicago Stock Exchange and the automated programs of then-newly introduced computers. The panic quickly spread throughout the world's stock markets (the English FTSE index fell by twenty-five percent in 2 days) and was magnified by the press reports of the time, which immediately after "Black Monday" began to draw parallels between of the crashes of 1929 and 1987. Many expected a great depression to follow, as in the 1930s. In practice, however, the markets did not take long to recover. Despite the fact that prices of the shares in the US decreased by about 2% consumption remained unchanged (Benzoni et al., 2011). The Dow Jones index had made up its lost ground in just two years. One of the positive effects of Black Monday was that it led the regulatory authorities to introduce intervention mechanisms that would stop trading in cases of panic, protecting the economy to some extent (Ang & Boyer, 2009). The notable difference between Black Monday and the crash of '29 is that the American economy of the 1980s was stronger and more resilient. The intervention of the government and the central bank of the USA, which strengthened the market with significant amounts of liquidity, were also critical.

The new century began with an unprecedented economic crisis, that of 2008. Before its onset, the international economy presented a significant period of growth accompanied by low prices of the shares. During this period, the largest economies and especially the US became recipients of capital from developing and oil-producing countries, whose investors were looking for reliable investment solutions in developed countries. The oversupply of these funds led to the need to invest them, with the result that America's financial institutions were led into a sharp competition to attract investors. The result of this credit expansion in America was also the strong increase in real estate prices, due to the large increase in mortgages. Lending institutions made loans higher than the cost of the home, underestimated borrowers' ability to repay, underestimated risk, and made loans even

to households with poor credit or bad credit history (Spiegel, 2011). Another important part was the securitization of loans. Securitization is a way of transferring loans from the books of commercial and savings banks to the books of other financial institutions. A loan is replaced by the intermediary organization with cash equivalents that are invested by the credit institution for new loans, which are transferred to the intermediary organization that replaces the mortgage loan with cash. The grants that are thus transferred to the intermediary organization are financed by own funds and the issuance of own bonds. The institutions that had issued the corporate subordinated bonds were able to convince the rating agencies to rate the bonds backed by the subordinated loan securitization very highly. In practice, the risk contained in the loans had been transmitted to owners of investment fund units all over the planet. As real estate prices remained high, bankruptcies did not affect CDS's, since even if a borrower defaulted, the sale of the mortgaged property covered the entire loan. The amount of mortgage loans at that time was several trillion dollars (Kotz, 2009). The housing bubble was unprecedented. In 2006, however, prices began to fall, the drop in 2007 reaching fifteen percent. Delinquencies and defaults on mortgage payments increased and property prices worsened. Those involved tried to reduce their position in complex and securitized products with exposure to loans, while the buying interest decreased significantly with a direct consequence that very few transactions were carried out and at prices significantly lower than the previous prices. Credit institutions that had exposure to these securities suffered heavy losses. Falling prices and rating downgrades had forced many institutions to sell assets to reduce leverage and risk on their books, putting downward pressure on prices. In June 2007, two hedge funds of the investment firm Bears Stearns that had a high exposure to securitized securities collapsed, with the result that international rating agencies immediately made a significant reduction in the solvency of their issuers.

On September 15, 2008, Lehman Brothers, which at that time was the 4th largest investment bank in the USA, declared bankruptcy, which caused panic in the global financial system. Lehman Brothers until 2006, had about 700 billion dollars in assets, of which only 25 billion dollars were its own capital³. Its assets were mostly long-term and its liabilities short-term, financed by borrowing tens to hundreds of billions of dollars in the short-term repos market. In 2005 and 2006 Lehman was the largest issuer of securities based on high-risk mortgages (subprime mortgages). But the collapse of Bear Stearns in mid-March 2008 dramatically changed Lehman's situation. In particular, its shares, which

were selling at \$62.19 on January 2, 2008, fell by 19%, the day after the collapse of Bear Stearns (Onaran, 2008).

The crisis of 2008 was the biggest global financial crisis since the crash of 29'. Of course, in the crisis of 29' the reduction of GDP and price levels was more important, as was the financial destruction of households, due to deflation and the accumulated debt of households and businesses that were not serviced. At that time there was no guarantee of bank deposits so the panic was even greater. The fiscal policy of 29' was restrictive compared to the recent economic crisis which was expansionary. Finally, the crisis of 29' was transmitted internationally over a period of years, while the crisis of 2008 spread rapidly due to the globalization of the economy and the use of new technologies. (Acemoğlu, 2009)

2.2 The Recent Debt Crisis in Greece

In 2001, Greece entered the Eurozone, managing to reach certain limits for macroeconomic variables (the deficit had to be below three percent of the gross domestic product, the debt not to be greater than sixty percent of the gross domestic product, etc.) . Also, in the previous years of joining the eurozone, Greece achieved a primary surplus after many years and limited inflation to a rate of less than three percent. However, it should be noted that the correctness of the statistical data recording the deficits of our country for the period before joining the Eurozone is questioned, as their later reassessment by Eurostat showed that Greece did not meet the criteria for its entry into the Eurozone. eurozone. After the adoption of the euro, our country was developing in a stable and safe economic environment without a large exchange rate risk and having an increase in the gross domestic product in the decade of the 2000s, low inflation and unemployment of the order of ten percent, while also having access to international financing purchases was easy and low-interest (Katsanidou & Otjes, 2015).

Unfortunately, our country did not manage to take full advantage of this favorable environment, as the competitiveness of the economy did not improve, but an increase in imports and a deficit in the trade balance were observed. These resulted in the deficit rising to ten percent of the gross domestic product by 2008 while the debt had exceeded the gross domestic product (Rady, 2012).

The global financial crisis that broke out in 2008 further worsened the economy with credit institutions facing liquidity problems and the continuous downgrading of the

country's credit rating by rating agencies. Greek bond spreads rose to 139 basis points. The markets at that time stopped lending to Greece and the EU together with the IMF granted Greece a 110 billion euro loan in May 2010 for 3 years. The economic program of the IMF was not terrible as the measures of the convention implemented were beyond unsustainable and inefficient. More specifically, Greece pledged to reduce the deficit to 3 percent of GDP by 2014, with detailed quarterly targets. The country's compliance with the program was monitored by officials of the International Monetary Fund, the European Commission, and the European Central Bank (Ardagna & Caselli, 2014).

A forced consequence of the above was the signing of the second memorandum as the first program did not improve the situation. Public debt had risen to 329 billion euros in 2011, although it was expected to decrease to 307 billion euros. The new memorandum concerned loan funds amounting to 130 billion euros together with the partial relief of the debt through a reduction in the value of the Greek bonds that were already in circulation (P.S.I.). The main problem with this option was that most holders of Greek bonds were Greek credit institutions, Greek insurance funds and Greek citizens. All of the above faced huge problems as part of their assets were lost overnight (Arghyrou, 2015).

The Greek economy did not improve and the situation worsened by the outflow of deposits in 2015, as well as the closure of banks and Capital Controls resulting in the signing of a new memorandum in November 2016 with new fiscal measures such as reforms in the health sector, social insurance and the opening of professions (Vlachou, 2021).

2.3 Covid-19 Health Crisis

A pneumonia of unknown origin and cause, affecting the upper respiratory system, appeared in December 2019 in China, in the city of Wuhan, a fact that was announced by the World Health Organization on December 31 of the same year. Very soon the disease spread from city to city and by the beginning of the following month 41 cases were confirmed, treated in hospitals in the country. At the same time, it was established that the infections were due to a strain of a new coronavirus, SARS-CoV-2, with the disease being called COVID-19 (Huang et.al., 2020; Zenker & Kock, 2020). After recording 7,834 confirmed cases and 170 deaths from the virus worldwide the World Health Organization declared a public health emergency of international concern on January 30, which included recommendations to governments to implement public health measures. health, such as

testing and isolating affected individuals and tracing and isolating their contact networks. These steps were taken in part as a result of the work of epidemiologists after earlier outbreaks of infectious diseases. However, only a small number of countries heeded this warning (Zenker & Kock, 2020).

By early March 2020, Europe had become the center of the global pandemic before in April, the United States became the most infected region in terms of the number of cases infected with COVID-19. On March 11, 2020, the World Health Organization declared the disease COVID-19 a pandemic. From 31 December 2019 to 15 July 2021, 187,509,874 cases of COVID-19 have been reported (according to the applicable case definitions and testing strategies in affected countries), including 4,043,003 deaths (Dehkordi et al., 2020).

Despite efforts made in China to contain the transmission of the virus, it spread in a very short time to more than 110 countries, with approximately 100,000 cases recorded (Alam & Parveen, 2021; Chen et. al., 2020). Thus, three months after the first case was recorded, on March 11, 2020, the World Health Organization (WHO) classified COVID-19 as a global pandemic (WHO, 2020a). By the end of March and despite the various restrictions that had been imposed, COVID-19 had affected over 200 countries worldwide, with the total number of cases reaching approximately 500,000 (WHO, 2020b).

Almost simultaneously, most countries took measures to limit the spread of the pandemic, such as closing borders, general lockdowns, imposing quarantines, implementing social distancing and wearing masks, and closing schools and various businesses (Abraham et al., 2020). Additional restrictions were placed on services related to tourism, such as the occupancy and operation of various accommodations, the realization of cruises, the organization of conferences and other cultural events, the closure of museums and multi-venues, but also the cancellation or postponement of events, concerts and of international sports activities (e.g. the Olympic games in Tokyo), thus annihilating for a long time the tourist activity (Gössling et. al., 2020; Neuburger & Egger, 2021).

With the appearance and spread of the pandemic wave, the EU took immediate measures to protect the countries, aiming to control the transmission of this threatening disease. Smooth cooperation between its member states has begun, aiming to protect the health and well-being of EU citizens. EU member states are responsible for the organization and provision of health services and medical care (Forman & Mossialos, 2021). However, it is worth noting that the EU's role in health policy is complementary to each nation's policies. The EU's public health policies and actions have as its main priorities the protection and promotion of the health of EU citizens. In addition, assisting the

modernization of health infrastructure, strengthening the efficiency of health systems in Europe, but also of measures of preparedness and immediate intervention in cases of emergencies against health (Brooks & Geyer, 2020).

2.4. The Recent Health Crisis in Greece

On February 26, 2020, the first confirmed case of Covid-19 was recorded, while on March 12, 2020, the first death was recorded. The Greek government, in an effort to limit the spread of the virus, took a set of preventive measures from March 10 to May 4, 2020, a move that placed Greece among the countries with the lowest daily numbers of cases and deaths among several countries in Europe. . In case of finding a person with the symptoms of Covid-19, for reasons of public health protection and limiting the spread of the new disease, according to Official Gazette A/42/25.2.2020, the mandatory clinical assessment of these people and their limitation was proposed if they were positive for the virus (Iliopoulos, 2021).

On March 10, educational institutions of all levels were closed with the implementation of emergency distance teaching (distance modern and asynchronous education) and a special purpose leave was established for working parents. Since then, the measures have been gradually intensified: teleworking has been implemented where possible, citizen movements have been restricted, gatherings and social events have been banned (Kousi, Mitsi & Simos, 2020). Based on ministerial decisions, the operation of places of education, sports, entertainment (restaurants, shopping centers, retail stores), as well as places of art and culture was suspended, to be followed by the prohibition of performing religious functions in places of worship. Official Gazette 986/B/22-3-2020 announced the restriction of citizens' movement with specific exceptions related to vital, personal and professional needs that could not be met in any other way.

The emergence of the covid-19 pandemic, in February 2020, affected the economic activity of the country, as it happened with all the economies of the countries of the planet. But Greece was more vulnerable than other European Union countries to the economic impact of the COVID-19 pandemic crisis due to the greater exposure of the country's GDP to tourism and transport. The Labor Institute of G.S.E.E. in the March 2021 issue of *Inemirosi* magazine, presented the recorded data on the effects of the pandemic on Greek businesses. In the country, in March 2020, due to the pandemic, 205,984 businesses were suspended due to the pandemic, i.e. 14.6% of the total 1,415,370 businesses in the Greek

economy that employed 1,063,098 people, a percentage of 25.4% of a total of 4,178,199 employed (G.S.E.E., 2021). The analysis of the data of the Hellenic Statistical Authority (ELSTAT) showed that revenues from tourism and catering took a big hit, while exports of goods and services decreased by 21.7%. More specifically, in the tourism industry there were reductions of around 78% in the receipts of the first half of 2020 compared to the corresponding period of 2019. Between July and September 2020 occupancy levels in hotels averaged 23% per month (as opposed to 71% in 2019, during the same period) and the employment index in the tourism sector, fell by 35.9% in the second quarter of 2020 (compared to the corresponding quarter of 2019), while wages and wages in the sector fell by 69.7%. In the catering industry, the turnover of all businesses in the second quarter of 2020 was 593 million euros, a decrease of 59% compared to the second quarter of 2019, where they had risen to 1.4 billion euros (ELSTAT, 2021). In Greece, where after a decade of recession, since 2017 the country's Gross Domestic Product (GDP) had started to show positive growth, according to ELSTAT data, it has declined by 8.2% i.e. in numerical terms 15.1 billion euros (from 183.6 billion euros in 2019 to 168.5 billion euros). This reduction was higher than the average of the Eurozone members who had a recession of 6.8% (ELSTAT, 2021).

The total revenues of listed companies shrank by almost 6 billion euros (-21.4%) in the first half of 2020, compared to the corresponding period of 2019. The largest decline, in absolute terms, was recorded in the Industry sector (3.5 billion euros), with the Services sector following (1.5 billion euros). This drop was expected as the Industry and Services sectors were among the sectors of the Greek economy that were directly affected by the pandemic. All sectors, with the exception of Trade and Infrastructure, were deeply affected by the pandemic crisis, showing significant losses. In total, during the first half of 2020, listed companies reported pre-tax losses of €321 million. As with revenue, Industry had the largest drop in profitability exceeding €1 billion, with Services following again with losses of around €400 million. The need for liquidity in the economy due to the pandemic measures increased the net borrowing of companies. The net borrowing of all listed companies increased by 850 million euros. The Infrastructure sector managed to reduce its net debt by 540 million euros. Most debt exposures, after the first wave of the pandemic, appeared in the Services (+ €351m) and Industry (+ €681m) sectors, while Tourism did not increase overall net debt levels (PWC, 2021).

2.5. Impact of Crises

The effects of economic crises are many and different from country to country in terms of their intensity and duration. Liquidity is limited throughout the economy as there is a decrease in liquidity and profits in companies, while banks also reduce lending by tightening the creditworthiness criteria of their customers. Borrowing rates rise because the outbreak of a crisis in a country makes it financially unreliable while the financing needs increase with a direct result in consequences both the increase of the requested prices of the shares and the refusal of the markets to lend without other collateral. Investments are minimized as households and investors do not trust their funds in their country. The bad economic situation creates uncertainty about the future and worsens the climate in all sectors of economic activity, while there is also a feeling of fear about a possible bankruptcy and default on the part of the state (Furceri & Zdzienicka, 2010).

The direct result is to reduce economic activity and increase unemployment since companies cannot respond to the new economic conditions, resulting in the reduction of workers or their complete closure, leaving a large portion of the population without work. Confidence in institutions, banks and governments is reduced within the country by the citizens with a direct result political unrest. In some countries, an effort is being made to increase government revenue in order to repay loans, by increasing taxes and at the same time reducing civil servants' salaries and pensions while reducing government spending in other areas such as health, education, security. All of the above contribute to an uncertain economic environment where people do not consume and are afraid to invest resulting in a decrease in productive activity and exports (Luchtenberg, & Vu, 2015).

Each crisis goes through several stages, initially the pre-crisis stage where essentially the whole situation of the economy takes shape while there are some initial signs (eg a drop in real estate prices in the US shortly before the global crisis of 2008 or the swelling of deficits before the Greek debt crisis), the manifestation of the crisis where we now have a clear recession, the response phase where governments take measures to normalize the crisis and finally the recovery phase where the economy normalizes and recovers (Aloui et al., 2011). The crisis of 2008 compared to the crisis of 1929 had some important differences. In the crisis of 1929 the decline in GDP and the price level was much greater, as was the economic destruction of households, mainly due to deflation and accumulated corporate and household debt that would not be repaid. Also, there was no deposit guarantee. Fiscal policy in 1929 was restrictive compared to 2008 which was

expansionary. The 1929 crash shocked the planet with time lags, while the 2008 crisis spread rapidly due to the globalization of the economy, and mostly damaged the portfolios of high-income investors (Shostya, 2014).

Chapter 3. Literature Review on Stock Market Crises

3.1. Economic Crises and Stock Market

In the context of the analysis of asymmetric information, a financial crisis is defined as the disorganization of financial markets, in which adverse choices and moral hazard problems are significantly aggravated, so that financial markets are not able to efficiently supply capital to productive investment opportunities. This fact makes it difficult for the market to function effectively and leads to a sharp contraction of economic activity (Mishkin, 1992). Financial crises can be distinguished according to their origin, their size and the causes that cause them. Regarding the origin, economic crises are distinguished into monetary, banking, public debt, balance of payments and inflationary crises. Depending on their intensity, the crises are divided into systemic, international and crises of the wider economy. Finally, depending on the causes that cause financial crises, they are categorized into (Racickas & Vasiliauskaite, 2012):

- Crises caused by macroeconomic policies.
- Crises from financial panics.
- Crisis produced by moral hazard.
- Seizures from disordered/convulsive actions.
- Crises from speculative attacks on the currency.
- Crisis from speculative bubbles.
- Crashes from the collapse of inflated asset prices.

The macroeconomic and financial consequences of crises are usually severe and show several common characteristics between the different types of crises. Despite the fact that different types of crises show different consequences, they show similarities in terms of the consequences they have on macroeconomic variables. A common feature is large losses in output, but also in other macroeconomic variables such as consumption, investment and industrial production (Racickas & Vasiliauskaite, 2012).

Usually, a financial crisis is followed by a series of events, such as rising interest rates and uncertainty and a decline in the stock market. The above leads to the worsening of adverse choices and moral hazard problems and the reduction of overall economic activity. The adverse effects on choices and economic activity are further exacerbated by

the crisis of the financial system, while when the economic crisis also turns into a debt or inflation crisis, a reduction in the price level is observed (Mishkin, 1992).

The initiation of the financial crisis by the US housing market led to the financial crisis in 2007-2008. In particular, between the third quarter of 2006 and the fourth quarter of 2008, approximately 780,000 jobs were eliminated in the United States, while other countries also experienced significant losses in industry employment. For example, in Spain, the property market began to collapse in mid-2007, leading to the loss of around 500,000 construction jobs in 2008, while the UK saw a cumulative loss of 100,000 jobs.

The financial crisis that started in the USA in 2007 it had multiple negative effects on a large number of states and for this reason it was classified as international. This crisis overall affected not only the global economy, but also a large part of human activity (Grout & Zalewska, 2016). According to Samsi et al. (2019), one of the characteristics of the 2007 financial crisis was that, although it started as a financial crisis, it directly and quickly affected the real economy. The weakening of the real economy, in turn, made the situation in the financial system even worse. Thus, with the outbreak of the international financial crisis, the global economy entered a vicious cycle of recession and contraction. Of course, it should be mentioned that the economy of each state, depending on its particularities, was affected by the international financial crisis to a different degree and in a different way. The same research claims that the global economy, due to the international financial crisis, suffered the following important consequences, in measurable quantities (Srivastava et al., 2015).

With the onset of the economic crisis that hit most of Europe in 2009, which fragmented the European economy to a very large extent, the European Commission started the debate on a topic that could lead to major changes in the European economy: the creation of a European Capital Union (CMU) by 2019 (Liao et al., 2019). The European Union (EU) still has fragmented national capital markets, which developed unevenly and at different rates with little cross-border investment. In addition, EU member states still operate under different financial services legislation. Each Member State still has different rules on taxation, corporate governance and insolvency proceedings, while the implementation of the UCITS Directive differs between some Member States (Humphrey et al., 2011)

The European Commission took note of the situation and published on 18 February 2015 a Green Paper (public consultation) proposing a framework initiative for the integration of national capital markets in Europe. Beyond a single legislative proposal, the

CMU includes several interconnected legislative and non-legislative initiatives aimed at boosting growth and jobs in the EU and increasing the role of capital markets in financing the economy. For this reason, the Commission has made it clear that it wants the CMU to cover all 28 EU Member States (Quaglia et al., 2016).

International stock markets were slow to react to the coming frenzy. In the second half of 2007, when the interbank market and the bond markets were under enormous pressure, in the stock markets investors took for granted the theory of the decoupling of the economies, that is, the crisis will be limited to the USA. and will not affect other countries. But, starting in January 2008, the stock markets started a downward trend for about 15 months. Their decline in the current recession turned out to be much greater than the corresponding declines in previous recessions (Figure 1). In fact, the decline of companies in the financial sector - the sector responsible for the crisis - was much greater than the rest of the sectors.

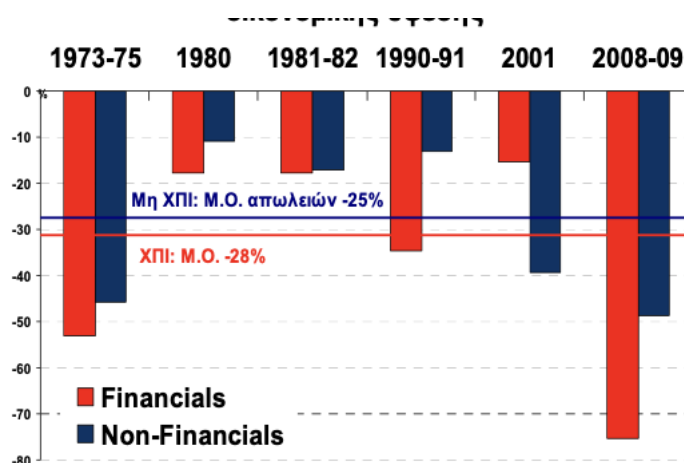


Figure 1. Stock returns in times of economic recession

(Source: Thomson Financial Datastream)¹

3.2. Health Crises and Stock Market

In relation to stock markets, relatively soon after the outbreak of the pandemic, the period February (late) – March 2020 saw intense and often unprecedented volatility in the global stock market. The early outbreak of the coronavirus initially led to an increase in financial market risk in China (Al-Awadhi et al., 2020), which soon spread to Europe and the USA

¹ The 6 periods in the chart correspond to the last 6 periods of recession in the US, according to the NBER's definition of a recession. The bars describe the cumulative loss rates from high to low over the time period, which starts one year before the recession and ends at the end of the recession.

(Akhtaruzzaman et al., 2021). During the COVID-19 era in general, the value of stocks fell for most of the stock market indices as people avoided risk and started selling their financial assets and this resulted in financial markets becoming extremely unpredictable. markets (Bai et al., 2021). The degree of unpredictability varies from country to country, depending on media coverage, health care preparedness for infectious diseases, and government fiscal policy (Das et al., 2020), monetary policy, and health care pharmaceutical policies (World Bank, 2020).

More specifically, according to research by Baker et.al. (2020), within 22 days from the end of February to the end of March in 2020, 18 “jumps” occurred in the market – recording a historical record for corresponding time periods in the past. The S&P 500 index (covering the largest US companies listed on the NASQAD and NYSE stock exchanges) fell 33% at the end of March and rose 30% in April, with negative returns. Similarly, the Dow Jones Industrial Average (DJIA) fell nearly 10% in mid-March and shortly thereafter rose about 20%.

An interesting study was carried out by Klose and Tillman (2020) in the period from 17/2/2020 to 24/4/2020, which examines the reaction of 29 European markets/countries to the fiscal and monetary policy measures taken by the respective governments. For each country, they use the representative stock market index and ten-year government bond yield. They base their research on 3 hypotheses: a) When markets perceive the received stimulus packages as effective, stock prices will rise, b) when investors discount the future fiscal burden then bond yields will rise, and c) if markets estimate that some fiscal policy measures will lead to a recovery of the economy, bond yields may decrease. In general, their results indicate the positive effect of certain policy measures on the stability of financial markets. Also, they conclude that after the first announcement of policy measures, stock prices fall, while the opposite happens in subsequent announcements. In addition, they report market sensitivity to the number of confirmed cases. Finally, they conclude that monetary policy measures can support the economy of the European markets.

Mishra et al. (2020) investigated the impact of COVID-19 on the Indian financial market and found negative stock returns for all stock indices during the COVID-19 outbreak. Haroon and Rizvi (2020), using a sample of 23 emerging markets, found that a decreasing (increasing) number of confirmed coronavirus cases was associated with increasing (deteriorating) liquidity in financial markets. They also showed that the slight slope of the curve of confirmed cases helps improve investor confidence. Additionally, they observed high volatility during periods of government curfews. In a study by Ashraf (2020)

of 64 countries from January 22, 2020 to April 17, 2020, it was found that the number of confirmed cases of COVID-19 has a greater negative effect on stock market returns compared to the number of deaths due to the virus. Additionally, another firm-level analysis by Mazur et al. (2020), showed that some sectors such as natural gas, food, healthcare and software recorded positive returns, while oil, real estate, entertainment and hospitality sectors recorded negative returns during the pandemic .

Finally, it is worth noting that during the previous major pandemic caused by SARS in 2003, the impact on the stock markets of places that were severely affected during the pandemic period (China, Hong Kong, Canada, Indonesia, Vietnam, Singapore, etc.) , was rather negligible, with the exception of some minor effects on the Chinese and Vietnamese markets (Nippani & Waster, 2004; Orhun, 2021). Coming back to today, in conclusion, the spread of panic after the outbreak of the COVID-19 disease initially resulted in extreme volatility in financial markets (Baek et al., 2020; Baker et al., 2020; Zhang et al., 2020). However, soon the sudden and large drop in the stock market was seen as an opportunity by many investors, resulting in the markets returning to normal levels of stability (Acharya et al., 2021; Dubey, 2020).

3.3. Russian-Ukrainian War and Stock Market

According to the European Central Bank (ECB, 2022), the war caused by Russia's invasion of Ukraine caused turmoil that not only affected Europe but also the entire global banking system, causing an inflation that was particularly felt in the European Continent. This resulted in the banking sector tightening the financing conditions and reduced liquidity in the Eurozone, thus making it difficult for businesses and the development of the economy. This finding is in full agreement with the view of Rigobon and Sack (2005) that geopolitical events such as wars or the rise of terrorism affect stock prices and the banking system. According to Kiesel and Kolaric (2023), the greatest consequences of these disturbances are noted in the regions closest to the conflict, as in our case, Europe. These consequences are not caused by the risk of the spread of war but by the disruptions observed in the supply chain. So European countries due to their proximity to Ukraine and the trade lines that have been established with both Russia and Ukraine, have had their financial system affected more than other areas of the world.

According to Omar et al. (2017), war creates crises not only at the humanitarian level but also in the financial system. One of the main causes of the economic crisis is the

lack of goods (such as oil, foodstuffs and minerals) which leads to a shortage of these products in the market resulting in an increase in transport prices and in general an increase in inflation, as observed in European countries after the invasion of Ukraine. In the literature there are several examples according to which researchers have dealt with the effects of war on the economy at the international level. So Kumari et al. (2022) investigated the stock market effects of the conflicts between China and India while Fernandez Serrano and Angosto (2022) did similar research investigating the Ukraine war. According to the researches of Batten et al. (2022), there is an interconnection between product prices and specifically the price of oil and markets. So in the research they did they suggested that oil prices significantly affect the stock markets of the BRIC countries (Brazil, Russia, India and China). Therefore, the war in Ukraine, which, as mentioned, shot up oil prices and had an influence on the markets of these countries.

The report of the American Central bank (USBank, 2023), estimates that the effect of the war on the American economy will be significant as the war affects the entire globe mainly due to energy. This takes into account the fact that Russia is a producer country of one tenth of the global scale. On the other hand, he points out that the biggest impact of the war remains on the European continent, which imported a quarter of its energy from Russia. According to the American Central bank, America remains more economically fortified than Europe but the American economy may be affected as there are many of its companies that operate in the European area.

In order to examine the global banking and financial environment, emphasis should be placed on the indicators of 2022, bearing in mind that until April 2023 the war that started at the end of February 2022 is still ongoing. The following chart shows the changes in bank cross-border claims on a global scale.

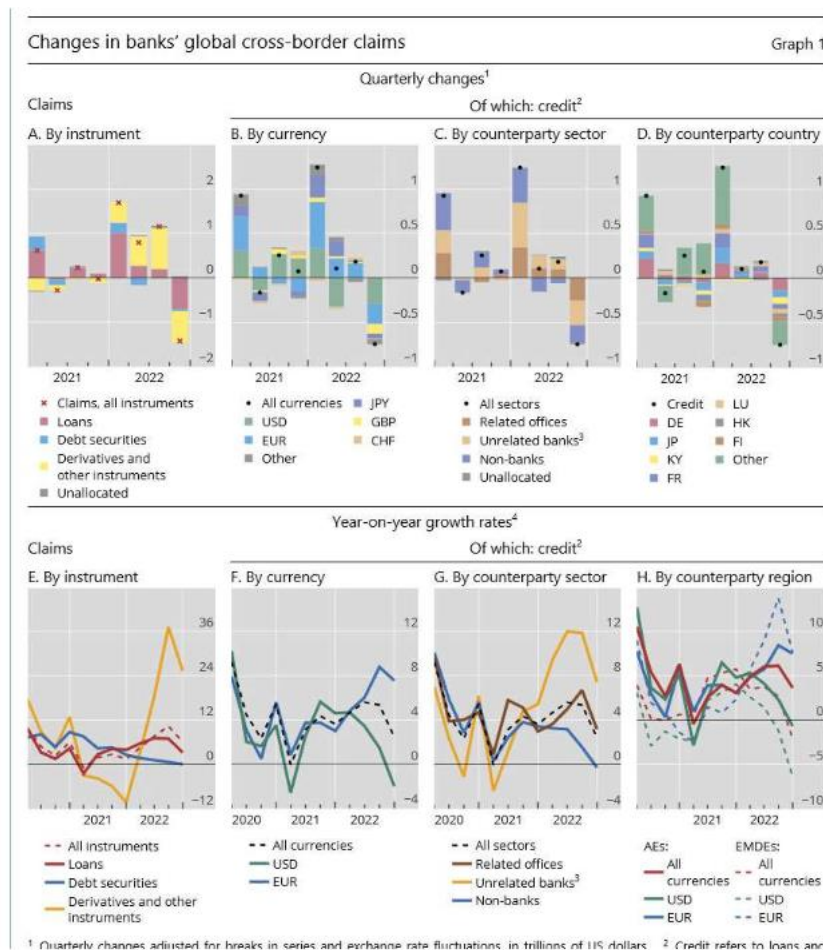


Figure 2. The changes in the cross-border claims of banks worldwide (comparison 2021 and 2022)







(Source: bis.org)

From Figure 2 we see that there was a significant decrease in cross-border claims in the last quarter of 2022 compared to the previous year of almost \$1.5 trillion (Chart A in Figure 2 above). The first line of the above Chart 11 essentially shows the changes that have taken place between the two years, while the charts on the bottom line show the growth rates in relation to investments, currencies and transactions between sectors and countries. From the charts above it is evident that there was a problem with cross-border transactions in all currencies internationally (Column B of Figure 2). The last quarter of 2022 generally sees the largest deviations although one would expect the fluctuations to be more pronounced in the second quarter of the year due to the war in Ukraine. In order to better study the effect of the war on the international financial system, it is necessary to examine the exposure of international banks to Russia.

In order to better investigate the effects on the financial system, the economic indicators that affect the development of the countries will be investigated. This war of

Russia is a geopolitical disturbance different from other cases as geopolitical changes affect banking stability (Phan et al., 2022). The instability in the environment creates a decrease in the liquidity provided by the banks for the reason that there is a disharmony in the provided information that is channeled to the banks with the final result that the banks are not able to distinguish the solvency of the lenders. This essentially leads to banks ultimately raising lending rates to protect themselves from investment risk. This view in conjunction with the view of the investment climate where the stability of banks is directly affected by changes in investor behaviors results in the financial system being dependent on several parameters (Sheifer & Vishny, 2010). So from the moment that trade and the investment climate are negatively affected by geopolitical developments, it follows that this makes banks more sensitive and unstable. In order to examine the influence of the investment climate and then examine how this affects the banking system, the official indicators used by investors for the European Union region will be analyzed. One such indicator is the “Sentix Investor Confidence”; where essentially after surveys of various investors (usually in the order of 2500 investors) it is determined how optimistic or pessimistic investors are about the future of the economy. In order to do the analysis correctly and to see the effects on the economy, the above indicators will be compared with different reports of the months before and after the Russian invasion of Ukraine. The first month is that of January 2022 as hostilities in Ukraine began at the end of February. From Figure 3 we conclude that stability in the economy had begun to return in the month before the war began after the turmoil caused by the pandemic. Europe had growth prospects except for Eastern Europe which was more stable while the rest of the world with the exception of the stagnation of South America was on the same trajectory (Figure, 3).

Current economic regimes* of countries /regions in focus:

Region / country	Regime	Region / country	Regime
 Eurozone	Boom	 USA	Boom
 Germany	Boom	 Japan	Boom
 Switzerland	Boom	Asia ex-Japan	Boom
 Austria	Boom	Latin America	Stabilization
Eastern Europe	Stagnation	Global Aggregate	Boom







* The regimes – ranging from recession to boom – are derived from the sentix Economic Indices according to the principle of the “economy clock” (see annotation on penultimate page). They reflect investors’ perceptions of different economies. These perceptions are the basis for investors’ behaviour, i.e. their asset allocation, and are thus relevant for financial markets. They are historically close to actual economic activities but need not necessarily be identical.

Figure 3. The economic outlook in January 2022

(Source: Sentix, 2022)

Accordingly, in March of the same year, the Ukraine war began to affect Europe more due to the proximity and economic anomalies created by the negative effects on the continent's supply chain. Although the United States was not affected as much, it saw a decline in its economic outlook as did the Asian region (Figure 4).

Current economic regimes* of countries /regions in focus:

Region / country	Regime	Region / country	Regime
 Eurozone	Downturn	 USA	Cooling down
 Germany	Downturn	 Japan	Downturn
 Switzerland	Downturn	Asia ex-Japan	Cooling down
 Austria	Downturn	Latin America	Downturn
Eastern Europe	Recession	Global Aggregate	Downturn







* The regimes – ranging from recession to boom – are derived from the sentix Economic Indices according to the principle of the “economy clock” (see annotation on penultimate page). They reflect investors’ perceptions of different economies. These perceptions are the basis for investors’ behaviour, i.e. their asset allocation, and are thus relevant for financial markets. They are historically close to actual economic activities but need not necessarily be identical.

Figure 4. The economic outlook in March 2022

(Source: Sentix, 2022)

As reported by Sentix (2022), the indicators for the economy were at particularly low levels in September 2022, as can be seen from the Figure 5, as countries were either in recession or in economic decline. September was chosen due to the fact that at that point the economic indicators were at their lowest levels, similar to May 2020 due to the then outbreak of the pandemic on a global scale. Europe remained in recession despite the time that had passed since the start of the war.

Current economic regimes* of countries /regions in focus:

Region / country	Regime	Region / country	Regime
 Eurozone	Recession	 USA	Downturn
 Germany	Recession	 Japan	Downturn
 Switzerland	Downturn	Asia ex-Japan	Recession
 Austria	Downturn	Latin America	Recession
Eastern Europe	Recession	Global Aggregate	Recession







* The regimes – ranging from recession to boom – are derived from the sentix Economic Indices according to the principle of the “economy clock” (see annotation on penultimate page). They reflect investors’ perceptions of different economies. These perceptions are the basis for investors’ behaviour, i.e. their asset allocation, and are thus relevant for financial markets. They are historically close to actual economic activities but need not necessarily be identical.

Figure 5. The economic outlook in September 2022

(Source: Sentix, 2022)

The latest estimate for the economy comes in April 2023. In this chart it appears that the Eurozone is emerging from recession but without stabilizing its economy yet. The United States is still on a downward trajectory while Asia (excluding Japan) appears to be on an upward trajectory. The general global index has now been upgraded from recession in September 2022 to stability with estimates speaking of a reversal of the current climate and future recovery of the economy (Figure 6).

Current economic regimes* of countries /regions in focus:

Region / country	Regime	Region / country	Regime
 Eurozone	Downturn	 USA	Downturn
 Germany	Downturn	 Japan	Stagnation
 Switzerland	Downturn	Asia ex-Japan	Upturn
 Austria	Downturn	Latin America	Downturn
Eastern Europe	Recession	Global Aggregate	Stagnation

* The regimes – ranging from recession to boom – are derived from the sentix Economic Indices according to the principle of the “economy clock” (see annotation on penultimate page). They reflect investors’ perceptions of different economies. These perceptions are the basis for investors’ behaviour, i.e. their asset allocation, and are thus relevant for financial markets. They are historically close to actual economic activities but need not necessarily be identical.

Figure 6. The economic outlook in April 2023

(Source: Sentix, 2022)

The correlation of stock prices with energy prices so that investors can make the right decisions has been presented in the past (Peng, et al., 2020) and has a direct impact on this particular conflict where energy prices marked a significant rising Peng, et al. (2020), suggested that there is a high correlation between stocks and energy price, especially during periods of turbulence. The effects on both stock, energy and gold prices have significant fluctuations in times of crisis (Bouri et al. 2021). In addition, the same researchers suggested by researching the period of the pandemic that the prices of stocks, oil, gold, currencies and funds have a direct correlation with each other. This negative effect on stock prices is due to several factors including investor fear and the uncertain future in view of a lack of economic stability (Duxbury et al., 2020). The war in Ukraine which actually started at the end of February 2022, caused a drop in the individual indices of the stock market as shown in the Figure 7.

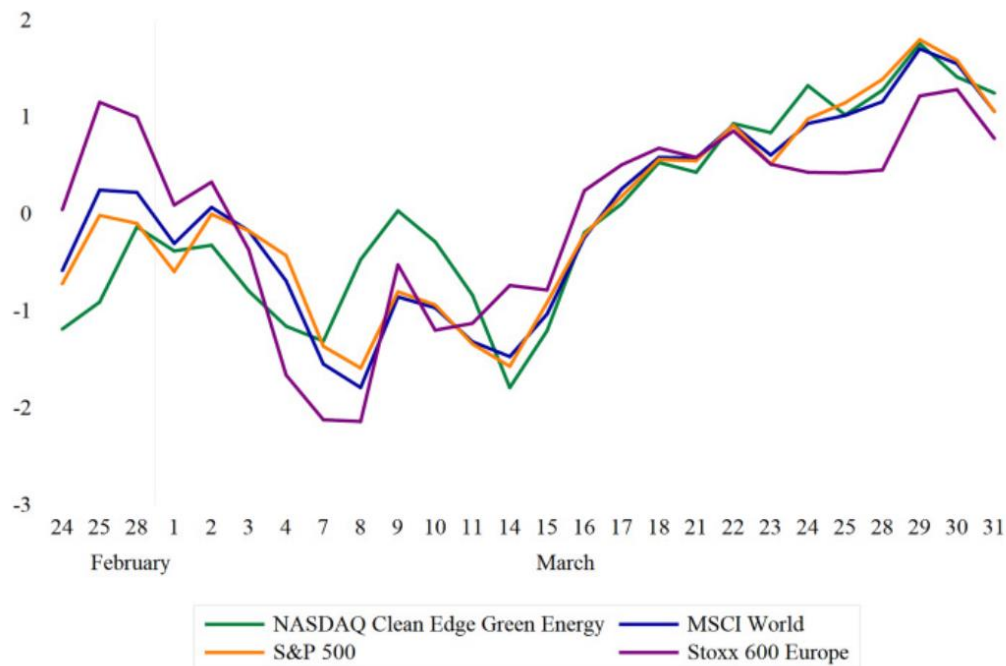


Figure 7. The fluctuation of stock market indices in February and March 2022

(Source: Izzeldin et al., 2023)

The long-term effects of the war have not yet been seen in the global economy. According to Izzeldin et al. (2023) and Ahmed et al. (2022), stock indexes as well as economies are dramatically affected when there are geopolitical upheavals and historical events. Comparing various historical data in their research they suggested that the effect of war on the stock markets was immediate in the case of Russia and Ukraine as opposed to other events where a reasonable period of time passed for the markets to react (Izzeldin et al., 2023). Before the invasion of Russian troops and despite the build-up of forces seen on the border with Ukraine, the markets did not react as they considered the possibility of the invasion unlikely. Although the effects on the economy were immediate and significant when the war began in Ukraine, investors and the banking system took belated measures to deal with the negative dimensions created by underestimating the extent of the events. Ultimately all the developments led the banks to downgrade their growth rates (JP Morgan, 2022).

The stock markets of the countries are directly connected to the economy of the states, their financial institutions as well as the influences they receive from the external

environment, such as a war conflict or a global economic recession. According to the results of the research by Kumari et al. (2022) on the effects of the war in Ukraine on the European stock markets, found that there were different reactions to them depending on the proximity of the countries to the war zone. In particular, the countries of Eastern Europe, the Balkans, Germany and Italy were more affected by the war than the countries further away, such as Portugal, Spain, the Netherlands and Sweden. At the start of the war, the countries whose stock market was first affected were the countries that were closest to the conflict, such as Slovakia, Hungary and Poland (Yousaf et al., 2022). Of course, this was not a panacea as there were also countries such as Ireland and France whose stock markets were significantly affected, which are not close to the conflict and were an exception to the above finding.

Therefore, the reasons that affected the European stock markets are not purely geographical. The country's sanctions played a big role as many investors felt that there would be a decline in trade due to the disruption of the product exchange chain between the countries, subsequently creating a negative impact on both stock markets and financial institutions. This according to Kumari et al. (2022) was expected as investors even upon hearing of sanctions from the European Union towards Russia, remained cautious as in order to invest, they had to know in advance the influence these would have sanctions in the long term on countries' economies.

In addition, the stock markets and by extension the financial institutions of the countries were affected depending on the degree to which these countries were involved in the Ukraine war and the degree of exposure their businesses had to these countries (Sun et al., 2022). According to the same researchers, the economic and service sectors were the ones most affected by the war in relation to all others followed by the industrial sector which was affected to a lesser extent. In the stock market according to Kumari et al. (2022), the significant decrease in exports to Russia negatively affected European stock markets and the economies of countries that had significant exports to Russia.

According to Wu et al. (2023), the effect of the war in Ukraine on the stock markets of the countries and especially of Europe depends on the degree of intensity of the war. In periods where the intensity is relatively low, the stock markets rebound, while in periods where there is an increase in intensity, a decrease in their general indices is observed. The effects on the stock markets and in the banking sector, according to the same researchers, are observed in the countries mainly of NATO, whose fluctuations in their stock markets have a lot in common with the fluctuations of the war in Ukraine.

Chapter 4. Methodology

4.1. Research Strategy

The purpose of this research was to investigate whether the 2008 economic crisis and the health crisis of the Covid-19 pandemic significantly affected the companies active in the Athens Stock Exchange. The data analysis was carried out in the EViews software, defining as a minimum level of statistical significance in each statistical test the value $\alpha=0.05$ corresponding to a confidence level of at least 95%.

4.2. Data Collection Procedure

For the purpose of present thesis, the closing prices of shares of companies from different sectors were drawn from the Athens Stock Exchange (such as the telecommunications sector, industrial products and services sector, the technology sector, the food sector, the banking sector, the construction sector, consumer products and services sector). In addition, to the closing prices of shares from different sector, the effect of the financial crisis of 2008 and the health crisis of the Covid-19 pandemic on the general index of the Athens Stock Exchange was studied. The data for the closing prices of the shares but of the general index of the Athens Stock Exchange were obtained from the website www.capital.gr Prices were drawn for the time period 2006-2023.

4.3. Data Analysis

4.3.1 Descriptive Statistics

In order to describe the behavior of closing prices of the shares in countries, descriptive indicators such as the mean value, the value deviation, the median value and the quartiles (first and third) were used both in the entire period 2002-2023 and in the sub-periods 2002-October 2008 (start of economic crisis) and October 2008 – December 2019 (start of covid-19 pandemic). In addition, the existence of a trend or seasonality in the closing prices of the shares series was graphically depicted through suitable illustrations.

4.3.2. Stationarity Control

In the first stage, it is necessary to investigate the condition of the stationarity of the prices of the shares time series. If the existence of stationarity is confirmed, it means that the time series we are studying is stationary (that is, it has a constant mean value in the period 2006-2023) and therefore was not affected by any crisis that intervened in this period. Conversely, non-stationarity is an indication that the mean value of the time series is not stable in the period 2006-2023, and possibly this is due to some condition (eg pandemic) that intervened in the period 2006-2023. The analysis was performed using the ADF (Augmented Dickey-Fuller), DF (Dickey-Fuller GLS) test for both the constant (intercept) and in terms of constant and trend (intercept + trend). For this purpose in the ADF test the null hypothesis was tested (Dimeli, 2003) H0: There is a unit root (so the time series is not stationary) against the alternative hypothesis H1: There is no unit root (so the time series is stationary).

4.3.3 Time Series Break Point Check

As mentioned above, October 2008 (start of economic crisis), December 2019 (start of covid-19 pandemic) and February 2022 (start of Russian Ukrainian war) was defined as the break-point of the time series. The investigation of whether this point is indeed a break-point was investigated using the Chow (1960) test. The Chow test is a structural discontinuity test introduced by Gregory Chow (1960). A brief review of the Chow test methodology is also given by Lee (2008). The Chow test is constructed in a way that assumes a linear model, given the type of data examined, and also assumes that the cutoff point is known. The next step is to split the data set into a model with z observations preceding the breakpoint, and a model with m observations after the breakpoint. The three models have the following form:

$$Y = X\beta + u \quad u \sim (0, \sigma^2) \quad (3.1)$$

$$Y_z = X_z\beta_z + u_z \quad u_z \sim (0, \sigma_z^2) \quad (3.2)$$

$$Y_m = X_m\beta_m + u_m \quad u_m \sim (0, \sigma_m^2) \quad (3.3)$$

Where u , u_z and u_m are the errors which must be independent and equal with mean 0 and common variance σ^2 , σ_z^2 and σ_m^2 respectively. The null hypothesis tested is $H_0: \beta_z = \beta_m$ against the alternative hypothesis $H_1: \beta_z \neq \beta_m$. Rejection of H_0 is an indication of heterogeneity between the periods. The null hypothesis is tested using the statistical test:

$$F = \frac{\frac{SSE - SSE_z - SSE_m}{J}}{\frac{SSE_z + SSE_m}{n_z + n_m - 2K}} \quad (3.4)$$

where SSE the sum of the squares of the errors for each of the three models (aggregate model, model z and model m), J the number of parameters we want to check (here j=1, we check the coefficient β) and K the number of the set of parameters and n the sample size in each regression. The null hypothesis is rejected when $F > F(J, n_z + n_m - 2K)$.

4.3.4 Comparison of Average Stock Returns between Periods

In order to investigate whether there is a statistically significant difference in the average performance of the stocks and the general index of the Athens Stock Exchange between the periods (comparison before the financial crisis – after the financial crisis, comparison before the pandemic – after the pandemic) the statistical criterion t-test for independent samples was used. The null hypothesis tested is H0: There is no significant difference between periods ($\mu_1 = \mu_2$). The alternative hypothesis tested is H1: There is significant difference between periods ($\mu_1 \neq \mu_2$)

4.3.5 Causality Analysis

The purpose of the specific analysis is to examine the possible influence of some indexes on some other indexes. This is not the main purpose of this thesis, but it can give some useful conclusions about whether some indexes affect some other indexes in a period characterized by several health and economic crises. The test is used to investigate whether there is a significant causal relationship (causality) between the development of the indicators. The confirmation of significant causality between two indicators based on the Granger causality test shows the existence of a significant short-term relationship between two stocks (short-term relationship). The Granger causality test is based on a standard F-test that seeks to determine whether changes in one index cause changes in another index. A variable X is said to Granger cause the variable Y if past values of X can predict the current value of Y. A simple model of causality takes the form:

$$y_t = \beta_1 y_{t-1} + \beta_2 y_{t-2} + \dots + \beta_k y_{t-k} + a_1 x_{t-1} + a_2 x_{t-2} + \dots + a_q x_{t-q} + u_t \quad (3.5)$$

If all the α -coefficients at lagged values of X are significant in this equation, then X is Granger-causal to Y. If X Granger-causes Y and not vice versa, it is called unidirectional

causality. If the causality is bidirectional, then this is called bidirectional causality (Brooks, 2008). After estimating the VAR, restrictions are imposed and the following hypotheses are tested in a Granger causality test null hypothesis $H_0: \alpha_1 = \alpha_2 = \dots = \alpha_q = 0$ against alternative hypothesis $H_1: \text{At least one } \alpha_i \neq 0$.

4.3.6 Cointegration Analysis

Johansen's cointegration test is a way to determine if three or more time series (indices) have a common change/trend. More specifically, it assesses the validity of a cointegration relationship using a maximum likelihood estimation approach. The confirmation of cointegration is an indication of long-term balance between the indicators (long-term relationship). The Johansen method belongs to the category of system of equations methods based on VAR models. Let be the VAR model (in which for convenience we omit the constant term) with m variables which we assume to be either simultaneously integrated of the first order or to be of order zero. In our case, the control was based on the trace criterion. With this criterion we have the following null hypothesis (Kirchgassner et al., 2007) H_0 : there are r cointegration vectors ($h = 0$) and the alternative and alternative hypothesis H_1 : there are $r + 1$ cointegration vectors ($h \geq 1$). Thus acceptance of H_0 for $r = 0$ indicates the termination of the process. Otherwise we continue for $r \leq 1, r \leq 2, \dots$ up to the value r for which we accept H_0 . In this particular case we considered the case up to $r \leq 1$. Rejection of the null hypothesis in this case indicates higher order cointegration (above 2) (Shumway et al., 2006).

Chapter 5. Results and Analysis

5.1 Presentation of Results

5.1.1. Descriptive Statistics

In the first section of the results chapter, are presented the findings of the descriptive analysis for the value of the indicators in the seven categories (telecommunications sector, industrial products and services sector, technology sector, food sector, banking sector, construction sector, consumer products and services sector) as well for the price of the general index of the Athens Stock Exchange. In addition, the descriptive findings are given regarding the daily returns of the seven indices as well as the return of the general index of the Athens Stock Exchange

The data for the index of companies in the consumer products and services sector show that in the period 2006-2023 the index had an increase in the period 2006-2008 while it showed a significant recession in the period 2008-2012 (four years after the start of the economic crisis). From 2012 until the end of 2023 the index of the consumer products and services sector had an increasing trend, with the largest increase observed in the period 2021-2023 (Figure 8).

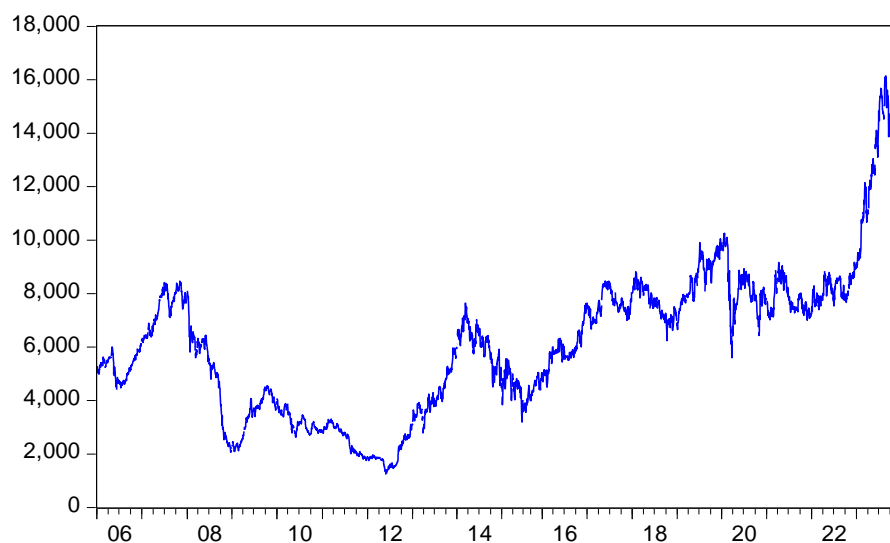


Figure 8 Consumer products and services index for period 2006-2023

(source: own calculations)

In Figure 9 the daily return of the consumer products and services index are presented. The results indicate that there are fluctuations in the daily return, however the mean daily return of consumer products and services index is 0.

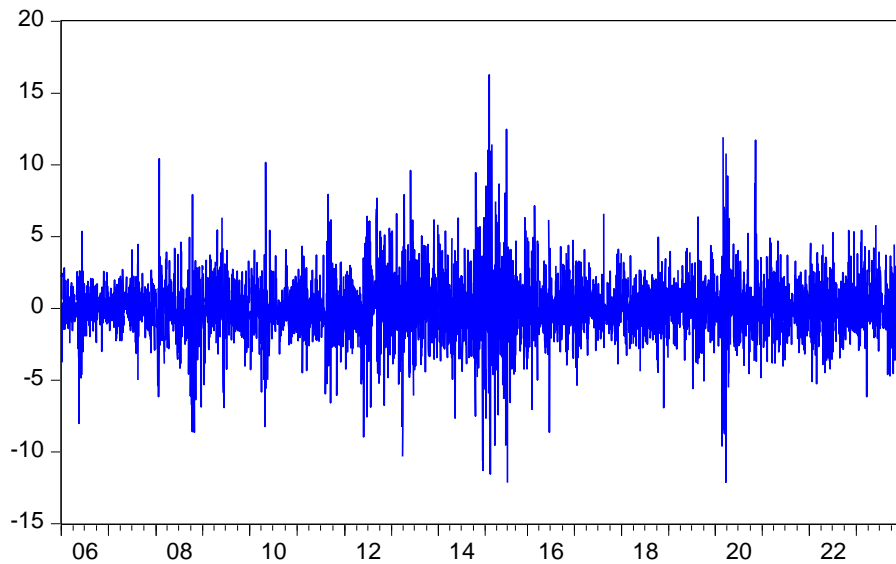


Figure 9. Consumer products and services index daily return for period 2006-2023

(source: own calculations)

The data for the index of companies in the construction sector show that in the period 2006-2012 the index showed a significant decrease while from 2012 to 2023 it shows a slight upward trend (Figure 10).

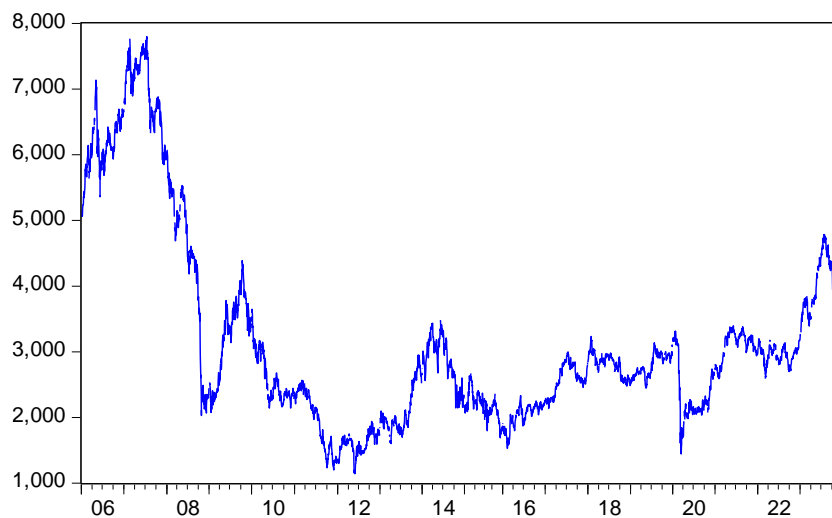


Figure 10. Construction index for period 2006-2023

(source: own calculations)

In Figure 11 the daily return of construction sector index are presented. The results indicate that the mean daily return of construction index is 0 (no trend is recorded in the daily performance in this sector).

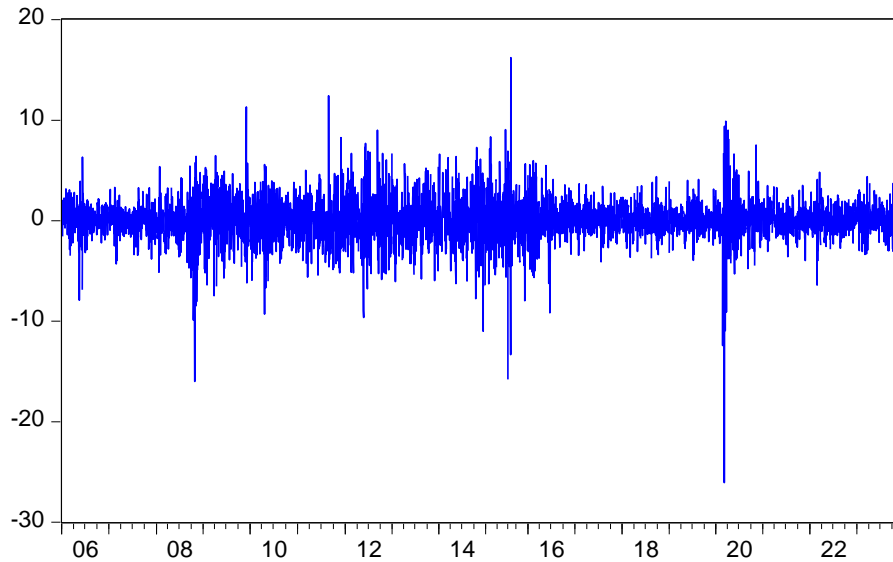


Figure 11. Construction sector index daily return for period 2006-2023

(source: own calculations)

The findings show that the index concerning the banking sector has seen a very large drop since the beginning of 2008 (start of the financial crisis) and which continued until 2012. From 2012 to 2023 there is a stabilization of the index in the banking sector (Figure 12).

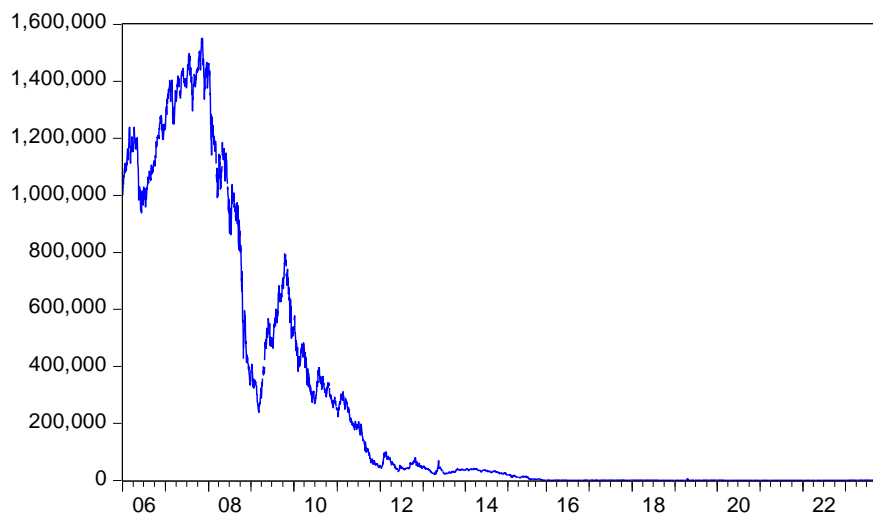


Figure 12. Banking index for period 2006-2023

(source: own calculations)

As for the previous indices, the average daily return in the banking sector index was 0, with significant fluctuations recorded in the period 2011-2016. From Figure 13 it is evident that there was no period with clearly positive or negative daily returns in the banking industry in the period 2006-2023.

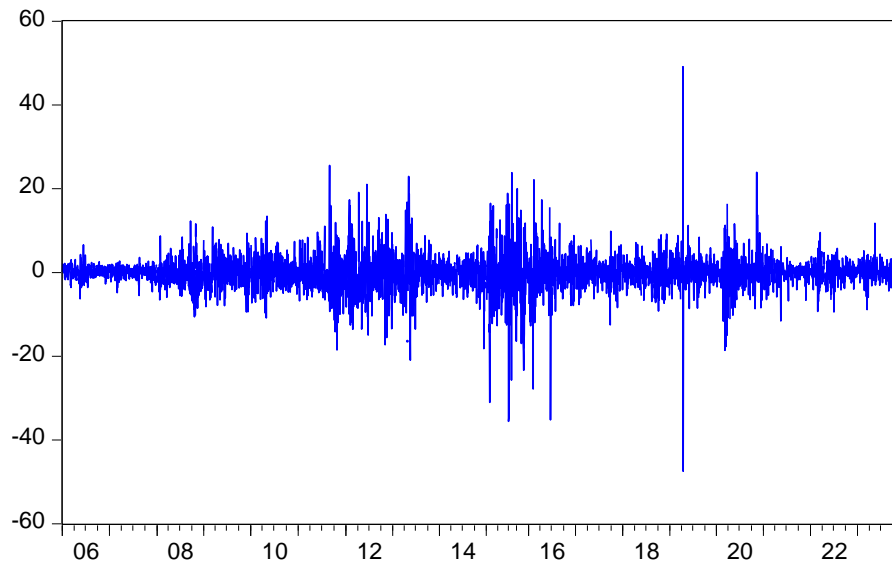


Figure 13. Banking sector index daily return for period 2006-2023

(source: own calculations)

Unlike the other indices, in the food sector the index does not record a significant trend within the period 2006-2023. The findings show that in the food sector the index had significant ups and downs per period. The most significant decrease in the index is recorded at the beginning of 2008 (where the economic crisis in Greece began. Also, a significant drop in the index is recorded at the end of 2019-beginning of 2020 (where the Covid-19 pandemic began). Finally, a significant drop of the index is recorded at the beginning of 2022 (where the Russia-Ukraine war started).

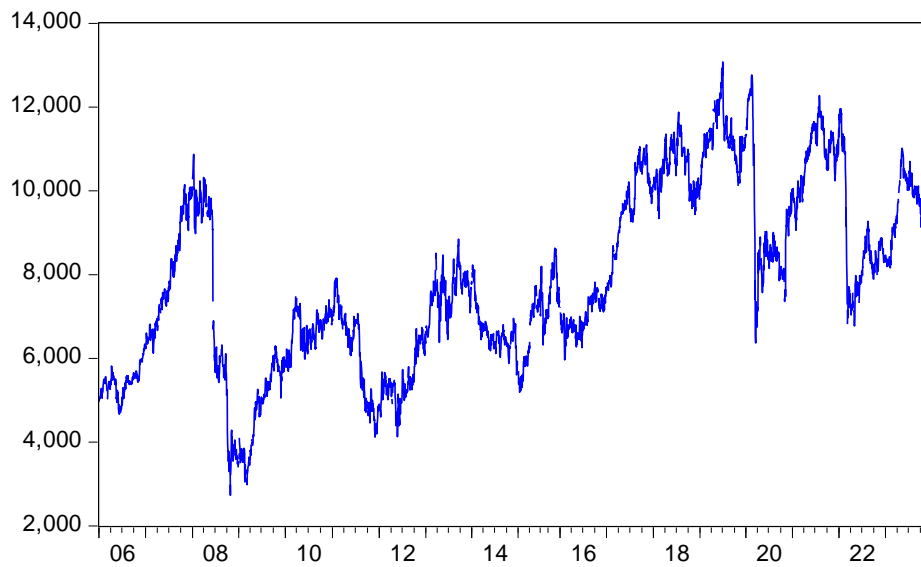


Figure 14. Food index for period 2006-2023

(source: own calculations)

In Figure 15 the daily return of food sector index are presented. The results indicate that the mean daily return in the food sector is 0 in period 2006-2023 (no trend is recorded in the daily return in this case).

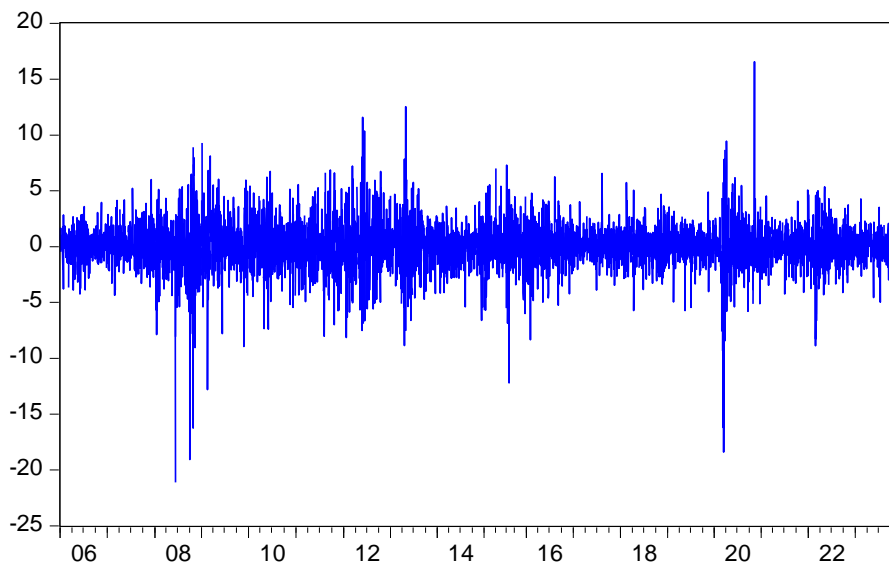


Figure 15. Food sector index daily return for period 2006-2023

(source: own calculations)

The findings show that the index for technology sector has seen a very large drop in the period 2006 – 2010. From 2010 onwards a stability is recorded while from the beginning of 2020 onwards there is a clear upward trend (which is probably also linked to the pandemic Covid-19 and the changes it brought about in the use of technological means) (Figure 16).

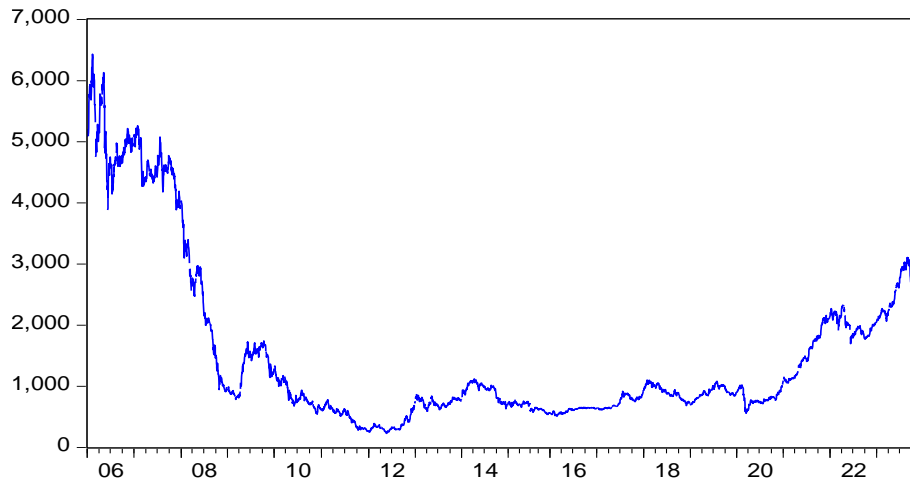


Figure 16. Technology index for period 2006-2023

(source: own calculations)

The average daily return of technology sector index was 0, with significant fluctuations recorded in the period 2006-2023. From Figure 17 we can see that there was no period with clearly positive or negative daily returns in the period 2006-2023.

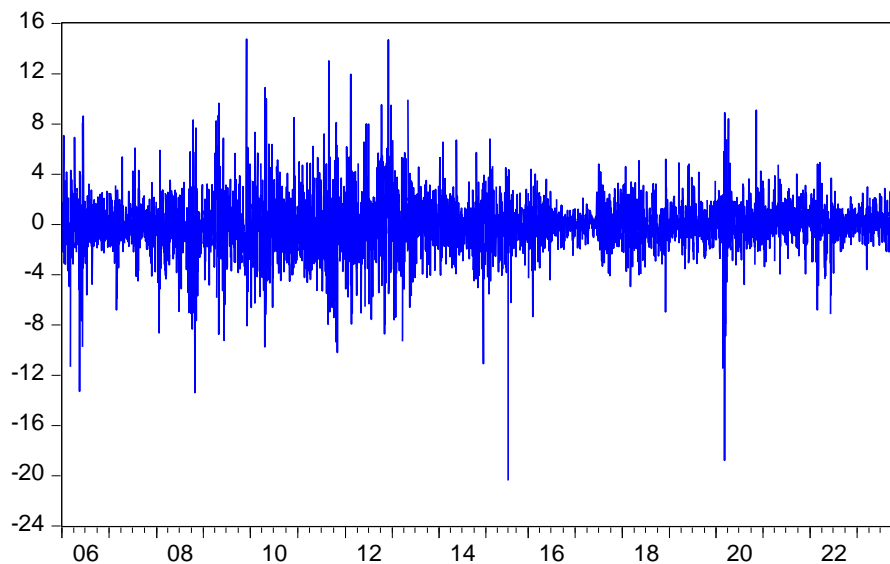


Figure 17. Technology sector index daily return for period 2006-2023

(source: own calculations)

The data for the industrial sector index show that in the period 2018-2012 (after economic crisis) the index showed a significant decrease while from 2012 to 2020 showed a stability while from 2020 to 2023 a significant increase was recorded (Figure 18).

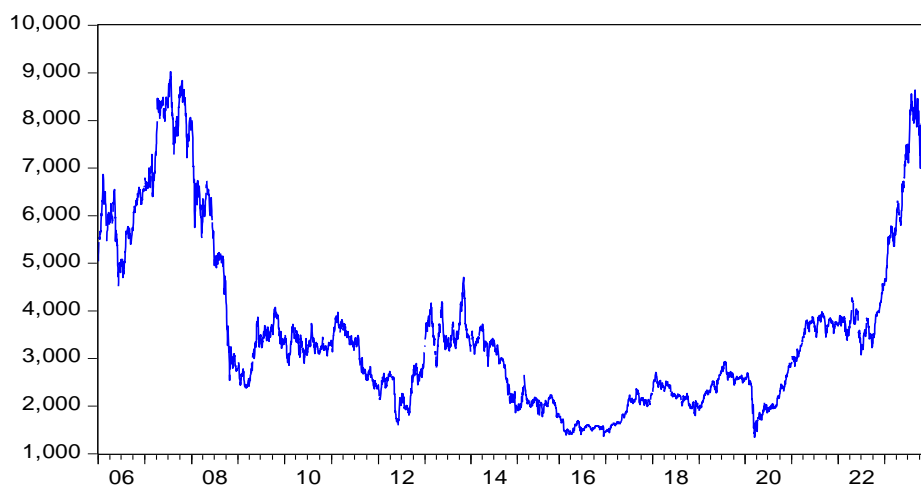


Figure 18. Industrial index for period 2006-2023

(source: own calculations)

The average daily return in the industrial sector index was 0, with significant fluctuations recorded in the period 2006-2023. From Figure 19 we can see that there was no period with clearly positive or negative daily returns in the period 2006-2023.

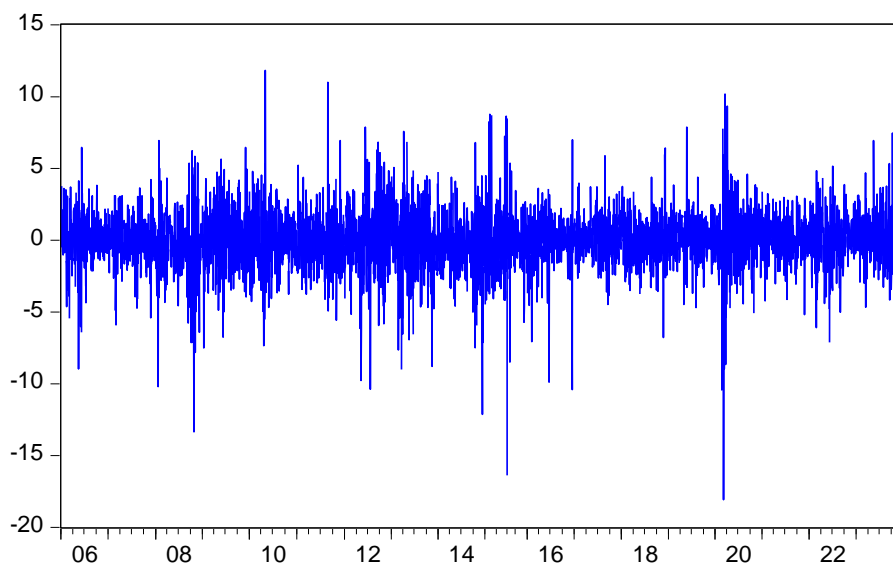


Figure 19. Industrial index daily return for period 2006-2023

(source: own calculations)

The findings show that the index for telecommunication sector has seen a very large drop in the period 2008 – 2012 (after economic crisis). From 2012 onwards a small but steady upward trend was recorded (Figure 20).



Figure 20. Telecommunications index for period 2006-2023

(source: own calculations)

In Figure 21 the daily return of telecommunication sector index are presented. The results indicate that the mean daily return in the telecommunication index is 0 in period 2006-2023 (no trend is recorded in the daily return in this index).

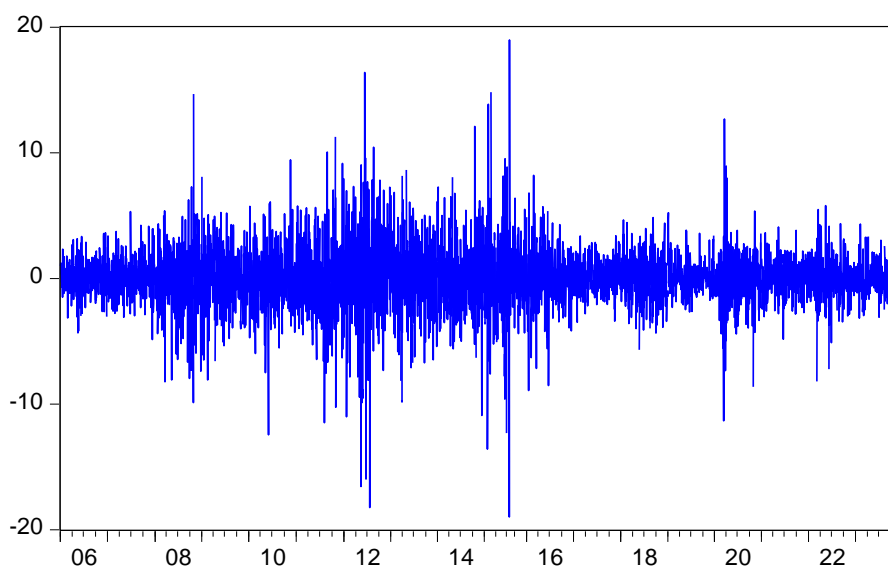


Figure 21. Telecommunications index daily return for period 2006-2023

(source: own calculations)

In Figure 22 the results about the general index of the Athens Stock Exchange are presented. The findings show that the index has seen a very large drop since the beginning of 2008 (start of the financial crisis) and which continued until 2012. From 2012 to 2023 there is a stabilization of the general index.

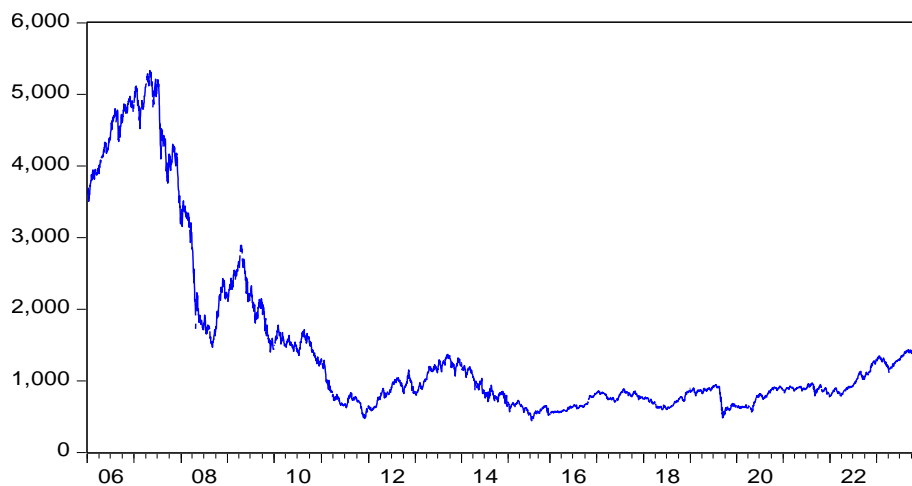


Figure 22. General index for period 2006-2023

(source: own calculations)

Finally, the results showed that the average daily return for the general index of the Athens Stock Exchange is close to 0, with positive and negative daily returns recorded per day (Figure 23).

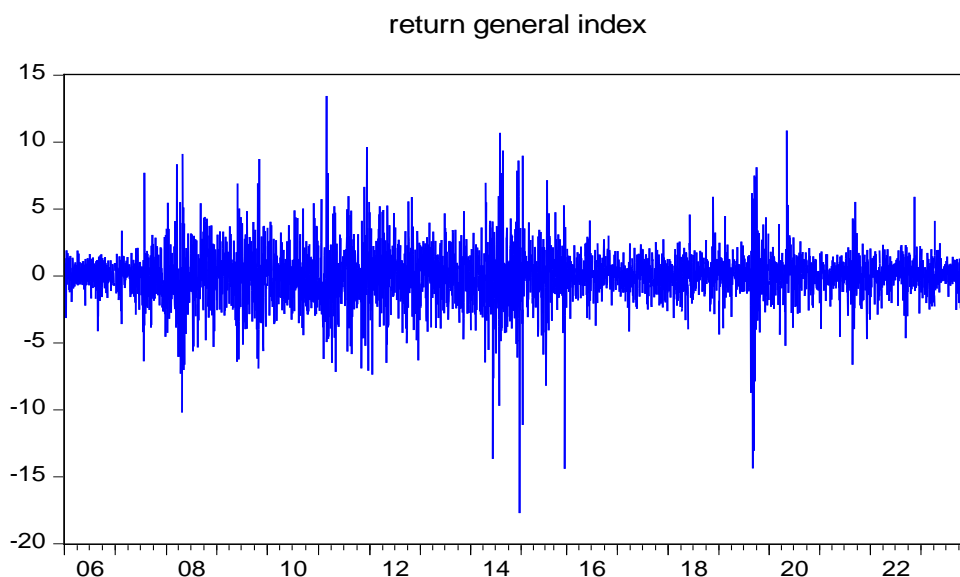


Figure 23. General index daily return for period 2006-2023

(source: own calculations)

In summary, the descriptive data for the seven sectors and the general index of the Athens Stock Exchange are presented in Table 1. The results show that for all indicators there is a very high variability, which is probably due to the fact that the data concerned a fairly long period in which all three crises are involved (financial crisis, Covid-19 pandemic, Russia-Ukraine war). Indicatively, we observe that for the general index in the period 2006-2023 an average value of 1455.543 (SD = 1199.661) is recorded with a range of values from 440.88 to 5334.5. Similar findings emerge for all seven indicators for the sectors studied (high volatility, wide range of values).

Table 1. Descriptive statistics for the closing prices of the selected indices for period 2006-2023

	General index	Banking	Construction	Consumer products	Food	Industrial products	Technology	Telecommunications
Mean	1455.543	259344.1	3157.749	6151.203	7843.534	3571.274	1521.668	3222.883
Median	907.9000	22342.00	2764.430	6214.810	7477.700	3184.610	904.1100	3066.360
Maximum	5334.500	1551614.0	7794.370	16155.32	13078.74	9028.340	6431.750	7202.490
Minimum	440.8800	234.9700	1141.830	1239.860	2728.020	1344.860	230.1500	311.0400
Std. Dev.	1199.661	438722.0	1459.427	2758.380	2157.624	1811.648	1351.050	1402.175
Skewness	1.890136	1.633384	1.461328	0.664209	0.187050	1.262005	1.678942	0.457423
Kurtosis	5.393817	4.198212	4.367487	3.967749	2.117589	3.748546	4.781155	2.992310
Jarque-Bera	3708.023	2242.407	1928.378	500.2910	170.1325	1283.670	2675.871	155.0199
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	4445	4445	4445	4445	4445	4445	4445	4445

5.1.2. Time Series Stationarity

The purpose of the analysis is to examine whether an index or index performance has a significant trend or if they are stationary. If the existence of stationarity is confirmed, it means that the time series we are studying is stationary (that is, it has a constant mean value in the period 2006-2023) and therefore was not affected by any crisis that intervened in this period. Conversely, non-stationarity is an indication that the mean value of the time series is not stable in the period 2006-2023, and possibly this is due to some condition (eg pandemic) that intervened in the period 2006-2023.

The findings obtained from the ADF (Augmented Dickey-Fuller) test regarding the stationarity of the time series concerning the index prices and index returns for the period 2006-2023 are presented in the next section of chapter. In Table 2 and 3 below are given the analytical results of the ADF criterion for checking the stationarity of the general index. From the analysis it is observed that the stationarity of the general index is not verified as based on the findings the null hypothesis (existence of a unit root) cannot be rejected (Table 2: $t = -1.802$, $p = 0.3796$).

Table 2. ADF results for general index during the period 2006-2023

Null Hypothesis: GENERAL_INDEX has a unit root
 Exogenous: Constant
 Lag Length: 1 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.802689	0.3796
Test critical values:		
1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

On the contrary, it turns out that the stationarity of the general index daily return is verified, as based on the findings, the null hypothesis (existence of a unit root) can be rejected (Table 3: $t = -62.91$, $p = 0.0001$).

Table 3. ADF results for general index daily return during the period 2006-2023

Null Hypothesis: GENERAL INDEX has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-62.91	0.0001
Test critical values:		
1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-62.91582	0.0001
Test critical values:		
1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for checking the stationarity of the banking sector index are presented in Table 4. From the analysis it was observed that the stationarity of the banking sector index is not verified as based on the findings the null hypothesis (existence of a unit root) cannot be rejected ($t = -1.586$, $p = 0.4896$).

Table 4. ADF results for banking sector index and return of banking sector during the period 2006-2023

Null Hypothesis: BANKING has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.586086	0.4896
Test critical values:		
1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for checking the stationarity of the banking sector index daily return are presented in Table 5. The stationarity of the banking sector index daily return is verified, as based on the findings, the null hypothesis (existence of a unit root) can be rejected ($t = -62.69$, $p = 0.0001$).

Table 5. ADF results for banking sector index daily return during the period 2006-2023

Null Hypothesis: BANKING SECTOR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-62.69697	0.0001
Test critical values:		
1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for checking the stationarity of the food sector index are presented in Table 6. The stationarity of the food sector index is not verified as based on the findings the null hypothesis cannot be rejected ($t = -2.392$, $p = 0.1441$).

Table 6. ADF results for food sector index during the period 2006-2023

Null Hypothesis: FOOD has a unit root
 Exogenous: Constant
 Lag Length: 1 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.391704	0.1441
Test critical values: 1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for checking the stationarity of the food sector index daily return are presented in Table 7. The stationarity of the food sector index daily return is verified, as the null hypothesis can be rejected ($t = -69.56$, $p = 0.0001$).

Table 7. ADF results for food sector index daily return during the period 2006-2023

Null Hypothesis: FOOD SECTOR has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-69.56074	0.0001
Test critical values: 1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for the stationarity of the industrial sector index are presented in Table 8. The stationarity of the industrial sector index is not verified as based on the findings the null hypothesis cannot be rejected ($t = -0.463$, $p = 0.8959$).

Table 8. ADF results for industrial sector index during the period 2006-2023

Null Hypothesis: INDUSTRIAL_PRODUCTS_AND_ has a unit root
 Exogenous: Constant
 Lag Length: 1 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
<hr/>			
Augmented Dickey-Fuller test statistic		-0.462544	0.8959
Test critical values:	1% level	-3.431638	
	5% level	-2.861994	
	10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

On the contrary, the stationarity of industrial sector index daily return is verified, as the null hypothesis can be rejected (Table 9: $t = -63.98$, $p = 0.0001$).

Table 9. ADF results for industrial products index daily return during the period 2006-2023

Null Hypothesis: RETURN_IN has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
<hr/>			
Augmented Dickey-Fuller test statistic		-63.98112	0.0001
Test critical values:	1% level	-3.431638	
	5% level	-2.861994	
	10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for the stationarity of the telecommunication sector index are presented in Table 10. The stationarity of the telecommunication sector index is not verified ($t = -1.845$, $p = 0.351$).

Table 10. ADF results for telecommunication sector index during the period 2006-2023

Null Hypothesis: TELECOMMUNICATIONS has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
<hr/>			
Augmented Dickey-Fuller test statistic		-1.844641	0.3591
Test critical values:	1% level	-3.431638	
	5% level	-2.861994	
	10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for the stationarity of the telecommunication sector index daily return are presented in Table 11. The results show that the stationarity of the telecommunication sector index daily return is verified ($t = -64.04$, $p = 0.0001$). This means that the telecommunication sector index daily return is stable throughout the period (ie its mean value does not have a significant increase or decrease from period to period).

Table 11. ADF results for telecommunication sector index daily return during the period 2006-2023

Null Hypothesis: TELECOMMUNICATION SECTOR has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-64.04333	0.0001
Test critical values:		
1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for the stationarity of the technology sector index are presented in Table 12. The results show that the time series of the technology sector index is not stationary ($t = -2.3795$, $p = 0.1475$). This finding shows that the technology sector index has a significant trend (downward) in the period 2006-2023.

Table 12. ADF results for technology sector index during the period 2006-2023

Null Hypothesis: TECHNOLOGY has a unit root
 Exogenous: Constant
 Lag Length: 2 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.379924	0.1475
Test critical values:		
1% level	-3.431639	
5% level	-2.861995	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for the stationarity of the technology sector index daily return are presented in Table 13. The results show that the time series of the technology sector index daily return is verified ($t = -65.57$, $p = 0.0001$). Essentially, this

finding shows that the technology sector index daily return has a constant trend throughout the period (as we saw from the previous diagram, the average value of the technology sector index daily return is 0).

Table 13. ADF results for technology sector index daily return during the period 2006-2023

Null Hypothesis: TECHNOLOGY SECTOR has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-65.56952	0.0001
Test critical values:		
1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for the stationarity of the construction sector index are presented in Table 14. The stationarity of the construction sector index is not verified ($t = -1.401$, $p = 0.5835$) while the stationarity of the daily performance of the construction sector is verified ($t = -67.19$, $p = 0.0001$).

Table 14. ADF results for construction sector index during the period 2006-2023

Null Hypothesis: CONSTRUCTION has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.400793	0.5835
Test critical values:		
1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for the stationarity of the construction sector index daily return are presented in Table 15. The stationarity of the construction sector index daily return is verified ($t = -67.19$, $p = 0.0001$).

Table 15. ADF results for construction sector index daily return during the period 2006-2023

Null Hypothesis: CONSUMER PRODUCTS AND SERVICE has a unit root
 Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-67.18731	0.0001
Test critical values:		
1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

The results of the ADF criterion for the stationarity of the consumer products sector index are presented in Table 16. The stationarity of the consumer products sector index is not verified ($t = -0.289$, $p = 0.9241$).

Table 16. ADF results for consumer products sector index during the period 2006-2023

Null Hypothesis: CONSUMER_PRODUCTS_AND_SE has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.289334	0.9241
Test critical values:		
1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

Finally, the results of the ADF criterion for the stationarity of the consumer products sector index daily return are presented in Table 17. Results indicate that timeseries of consumer products sector index daily return is stationary ($t = -63.95$, $p = 0.0001$).

Table 17. ADF results for consumer products sector index daily during the period 2006-2023

Null Hypothesis: CONSUMER_PRODUCTS_AND_SERVICE has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-63.94773	0.0001
Test critical values:		
1% level	-3.431638	
5% level	-2.861994	
10% level	-2.567055	

*MacKinnon (1996) one-sided p-values.

From the findings of the stationarity test, it follows that the time series corresponding to the indices are non-stationary while the time series corresponding to the daily returns of the indices are stationary. This shows that in the period 2006-2023 there were events that significantly affected both the general price index of the Athens Stock Exchange and the indices for the studied sectors. But these events did not affect the daily return of these indices.

5.1.3. Time Series Break Point

The next analysis was carried out to examine whether there is significant variation in the behavior of the indicators and their returns at three points in time: the financial crisis of 2008, the Covid-19 pandemic and the Ukraine-Russia war in 2022. The investigation of the hypothesis that the time series of the indicators diverges at those points (breakpoints) was carried out using the Chow's statistical test at 5% significance level. Table 18 presents the results of the General Index value and the General Index return.

The results for the General Index of the Athens Stock Exchange show that the definition of the breakpoints of the time series was correct in case of financial crisis (Table 18: $p = 0.000$), Covid-19 pandemic (Table 19: $p = 0.000$) and Ukraine-Russia war (Table 20: $p = 0.000$). So it can be concluded that the General Index of the Athens Stock Exchange market changed after October 2008 to a statistically significant degree compared to the immediately preceding period (2006-2008). In addition, the general index of the Athens Stock Exchange market diverged after the start of the pandemic compared to before and it diverged significantly after the start of the Ukraine-Russia war compared to before.

Table 18. Chow Breakpoint Test for general index: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	4584.587	Prob. F(2,4441)	0.0000
Log likelihood ratio	4978.124	Prob. Chi-Square(2)	0.0000
Wald Statistic	9169.173	Prob. Chi-Square(2)	0.0000

Table 19. Chow Breakpoint Test for general index: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019

Null Hypothesis: No breaks at specified breakpoints
 Varying regressors: All equation variables
 Equation Sample: 1/02/2006 12/15/2023

F-statistic	2314.635	Prob. F(2,4441)	0.0000
Log likelihood ratio	3174.274	Prob. Chi-Square(2)	0.0000
Wald Statistic	4629.270	Prob. Chi-Square(2)	0.0000

Table 20. Chow Breakpoint Test for general index: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022
 Null Hypothesis: No breaks at specified breakpoints
 Varying regressors: All equation variables
 Equation Sample: 1/02/2006 12/15/2023

F-statistic	1789.042	Prob. F(2,4441)	0.0000
Log likelihood ratio	2626.749	Prob. Chi-Square(2)	0.0000
Wald Statistic	3578.085	Prob. Chi-Square(2)	0.0000

On the contrary, the findings showed that financial crisis (Table 21: $p = 0.3290$), Covid-19 pandemic (Table 22: $p = 0.1518$) and Ukraine-Russia war (Table 23: $p = 0.2238$) did not significantly affect the general index daily returns. These results show that these crises affected the price of the general index of the Athens Stock Exchange, but not its daily return.

Table 21. Chow Breakpoint Test for general index daily return: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008
 Null Hypothesis: No breaks at specified breakpoints
 Varying regressors: All equation variables
 Equation Sample: 1/03/2006 12/15/2023

F-statistic	1.111880	Prob. F(2,4440)	0.3290
Log likelihood ratio	2.225206	Prob. Chi-Square(2)	0.3287
Wald Statistic	2.223760	Prob. Chi-Square(2)	0.3289

Table 22. Chow Breakpoint Test for general index daily return: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019
 Null Hypothesis: No breaks at specified breakpoints
 Varying regressors: All equation variables
 Equation Sample: 1/03/2006 12/15/2023

F-statistic	1.885667	Prob. F(2,4440)	0.1518
Log likelihood ratio	3.773130	Prob. Chi-Square(2)	0.1516
Wald Statistic	3.771334	Prob. Chi-Square(2)	0.1517

Table 23. Chow Breakpoint Test for general index daily return: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	1.497659	Prob. F(2,4440)	0.2238
Log likelihood ratio	2.997005	Prob. Chi-Square(2)	0.2235
Wald Statistic	2.995317	Prob. Chi-Square(2)	0.2237

The results for the banking sector index show that the definition of the breakpoints of the time series was correct in case of financial crisis (Table 24: $p = 0.000$), Covid-19 pandemic (Table 25: $p = 0.000$) and Ukraine-Russia war (Table 26: $p = 0.000$). So it can be concluded that the banking sector index changed after October 2008 to a statistically significant degree compared to the immediately preceding period (2006-2008). In addition, the banking sector index diverged after the start of the pandemic compared to before and it diverged significantly after the start of the Ukraine-Russia war compared to before.

Table 24. Chow Breakpoint Test for banking sector index: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	285.1328	Prob. F(2,4441)	0.0000
Log likelihood ratio	536.9957	Prob. Chi-Square(2)	0.0000
Wald Statistic	570.2656	Prob. Chi-Square(2)	0.0000

Table 25. Chow Breakpoint Test for banking sector index: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	430.8534	Prob. F(2,4441)	0.0000
Log likelihood ratio	788.2666	Prob. Chi-Square(2)	0.0000
Wald Statistic	861.7068	Prob. Chi-Square(2)	0.0000

Table 26. Chow Breakpoint Test for banking sector index: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			

Equation Sample: 1/02/2006 12/15/2023

F-statistic	319.0087	Prob. F(2,4441)	0.0000
Log likelihood ratio	596.6889	Prob. Chi-Square(2)	0.0000
Wald Statistic	638.0173	Prob. Chi-Square(2)	0.0000

On the contrary, the findings showed that financial crisis (Table 27: $p = 0.4218$), Covid-19 pandemic (Table 28: $p = 0.0736$) and Ukraine-Russia war (Table 29: $p = 0.2697$) did not significantly affect the banking sector index daily returns. These results show that these crises affected the price of the banking sector index, but not its daily return.

Table 27. Chow Breakpoint Test for banking sector index daily return: between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008
 Null Hypothesis: No breaks at specified breakpoints
 Varying regressors: All equation variables
 Equation Sample: 1/03/2006 12/15/2023

F-statistic	0.863300	Prob. F(2,4440)	0.4218
Log likelihood ratio	1.727820	Prob. Chi-Square(2)	0.4215
Wald Statistic	1.726601	Prob. Chi-Square(2)	0.4218

Table 28. Chow Breakpoint Test for banking sector index daily return: between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019
 Null Hypothesis: No breaks at specified breakpoints
 Varying regressors: All equation variables
 Equation Sample: 1/03/2006 12/15/2023

F-statistic	2.610930	Prob. F(2,4440)	0.0736
Log likelihood ratio	5.223493	Prob. Chi-Square(2)	0.0734
Wald Statistic	5.221859	Prob. Chi-Square(2)	0.0735

Table 29. Chow Breakpoint Test for banking sector index daily return: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022
 Null Hypothesis: No breaks at specified breakpoints
 Varying regressors: All equation variables
 Equation Sample: 1/03/2006 12/15/2023

F-statistic	1.310949	Prob. F(2,4440)	0.2697
Log likelihood ratio	2.623486	Prob. Chi-Square(2)	0.2694
Wald Statistic	2.621898	Prob. Chi-Square(2)	0.2696

The results for the food sector index show that the definition of the breakpoints of the time series was correct in case of financial crisis (Table 30: $p = 0.000$), Covid-19

pandemic (Table 31: $p = 0.000$) and Ukraine-Russia war (Table 32: $p = 0.000$). So it can be concluded that the food sector index changed after October 2008 to a statistically significant degree compared to the immediately preceding period (2006-2008). In addition, the food sector index diverged after the start of the pandemic compared to before and it diverged significantly after the start of the Ukraine-Russia war compared to before .

Table 30. Chow Breakpoint Test for food sector index: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	72.71063	Prob. F(2,4441)	0.0000
Log likelihood ratio	143.2199	Prob. Chi-Square(2)	0.0000
Wald Statistic	145.4213	Prob. Chi-Square(2)	0.0000

Table 31. Chow Breakpoint Test for food sector index: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	908.9790	Prob. F(2,4441)	0.0000
Log likelihood ratio	1525.231	Prob. Chi-Square(2)	0.0000
Wald Statistic	1817.958	Prob. Chi-Square(2)	0.0000

Table 32. Chow Breakpoint Test for food sector index: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	93.26383	Prob. F(2,4441)	0.0000
Log likelihood ratio	182.8814	Prob. Chi-Square(2)	0.0000
Wald Statistic	186.5277	Prob. Chi-Square(2)	0.0000

On the contrary, the findings showed that financial crisis (Table 33: $p = 0.2709$), Covid-19 pandemic (Table 34: $p = 0.6305$) and Ukraine-Russia war (Table 35: $p = 0.9233$) did not significantly affect the food sector index daily returns. These results show that these crises affected the price of the food sector index, but not its daily return.

Table 33. Chow Breakpoint Test for food sector index daily return: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	1.306562	Prob. F(2,4440)	0.2709
Log likelihood ratio	2.614709	Prob. Chi-Square(2)	0.2705
Wald Statistic	2.613124	Prob. Chi-Square(2)	0.2707

Table 34. Chow Breakpoint Test for food sector index daily return: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.461306	Prob. F(2,4440)	0.6305
Log likelihood ratio	0.923347	Prob. Chi-Square(2)	0.6302
Wald Statistic	0.922612	Prob. Chi-Square(2)	0.6305

Table 35. Chow Breakpoint Test for food sector index daily return: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.079816	Prob. F(2,4440)	0.9233
Log likelihood ratio	0.159773	Prob. Chi-Square(2)	0.9232
Wald Statistic	0.159632	Prob. Chi-Square(2)	0.9233

The results for the technology sector index show that the definition of the breakpoints of the time series was correct in case of financial crisis (Table 36: $p = 0.000$), Covid-19 pandemic (Table 37: $p = 0.000$) and Ukraine-Russia war (Table 38: $p = 0.000$). So it can be concluded that the technology sector index changed after October 2008 to a statistically significant degree compared to the immediately preceding period (2006-2008). In addition, the technology sector index diverged after the start of the pandemic compared to before and it diverged significantly after the start of the Ukraine-Russia war compared to before .

Table 36. Chow Breakpoint Test for technology sector index: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	512.8017	Prob. F(2,4441)	0.0000
Log likelihood ratio	923.5728	Prob. Chi-Square(2)	0.0000
Wald Statistic	1025.603	Prob. Chi-Square(2)	0.0000

Table 37. Chow Breakpoint Test for technology sector index: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	1328.985	Prob. F(2,4441)	0.0000
Log likelihood ratio	2085.016	Prob. Chi-Square(2)	0.0000
Wald Statistic	2657.970	Prob. Chi-Square(2)	0.0000

Table 38. Chow Breakpoint Test for technology sector index: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	1187.122	Prob. F(2,4441)	0.0000
Log likelihood ratio	1903.715	Prob. Chi-Square(2)	0.0000
Wald Statistic	2374.244	Prob. Chi-Square(2)	0.0000

On the contrary, the findings showed that financial crisis (Table 39: $p = 0.8457$), Covid-19 pandemic (Table 40: $p = 0.0702$) and Ukraine-Russia war (Table 41: $p = 0.5548$) did not significantly affect the technology sector index daily returns. These results show that these crises affected the price of the technology sector index, but not its daily return.

Table 39. Chow Breakpoint Test for technology sector index daily return: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.167562	Prob. F(2,4440)	0.8457
Log likelihood ratio	0.335413	Prob. Chi-Square(2)	0.8456
Wald Statistic	0.335123	Prob. Chi-Square(2)	0.8457

Table 40. Chow Breakpoint Test for technology sector index daily return: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	2.658378	Prob. F(2,4440)	0.0702
Log likelihood ratio	5.318362	Prob. Chi-Square(2)	0.0700
Wald Statistic	5.316756	Prob. Chi-Square(2)	0.0701

Table 41. Chow Breakpoint Test for technology sector index daily return: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.589141	Prob. F(2,4440)	0.5548
Log likelihood ratio	1.179187	Prob. Chi-Square(2)	0.5546
Wald Statistic	1.178282	Prob. Chi-Square(2)	0.5548

The results for the telecommunication sector index show that the definition of the breakpoints of the time series was correct in case of financial crisis (Table 42: $p = 0.000$), Covid-19 pandemic (Table 43: $p = 0.000$) and Ukraine-Russia war (Table 44: $p = 0.000$). So it can be concluded that the telecommunication sector index changed after October 2008 to a statistically significant degree compared to the immediately preceding period (2006-2008). In addition, the telecommunication sector index diverged after the start of the pandemic compared to before and it diverged significantly after the start of the Ukraine-Russia war compared to before .

Table 42. Chow Breakpoint Test for telecommunication sector index: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	53.24101	Prob. F(2,4441)	0.0000
Log likelihood ratio	105.3203	Prob. Chi-Square(2)	0.0000
Wald Statistic	106.4820	Prob. Chi-Square(2)	0.0000

Table 43. Chow Breakpoint Test for telecommunication sector index: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	1834.266	Prob. F(2,4441)	0.0000
Log likelihood ratio	2676.604	Prob. Chi-Square(2)	0.0000
Wald Statistic	3668.533	Prob. Chi-Square(2)	0.0000

Table 44. Chow Breakpoint Test for telecommunication sector index: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	625.8769	Prob. F(2,4441)	0.0000
Log likelihood ratio	1103.758	Prob. Chi-Square(2)	0.0000
Wald Statistic	1251.754	Prob. Chi-Square(2)	0.0000

On the contrary, the findings showed that financial crisis (Table 45: $p = 0.4218$), Covid-19 pandemic (Table 46: $p = 0.0736$) and Ukraine-Russia war (Table 47: $p = 0.2697$) did not significantly affect the telecommunication sector index daily returns. These results show that these crises affected the price of the telecommunication sector index, but not its daily return.

Table 45. Chow Breakpoint Test for telecommunication sector index daily return: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.236353	Prob. F(2,4440)	0.7895
Log likelihood ratio	0.473107	Prob. Chi-Square(2)	0.7893
Wald Statistic	0.472706	Prob. Chi-Square(2)	0.7895

Table 46. Chow Breakpoint Test for telecommunication sector index daily return: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.112218	Prob. F(2,4440)	0.8939
Log likelihood ratio	0.224633	Prob. Chi-Square(2)	0.8938
Wald Statistic	0.224436	Prob. Chi-Square(2)	0.8938

Table 47. Chow Breakpoint Test for telecommunication sector index daily return: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.189882	Prob. F(2,4440)	0.8271
Log likelihood ratio	0.380089	Prob. Chi-Square(2)	0.8269
Wald Statistic	0.379763	Prob. Chi-Square(2)	0.8271

The results for the consumer products sector index show that the definition of the breakpoints of the time series was correct in case of financial crisis (Table 48: $p = 0.000$), Covid-19 pandemic (Table 49: $p = 0.000$) and Ukraine-Russia war (Table 50: $p = 0.000$). So it can be concluded that the consumer products sector index changed after October 2008 to a statistically significant degree compared to the immediately preceding period (2006-2008). In addition, the consumer products sector index diverged after the start of the pandemic compared to before and it diverged significantly after the start of the Ukraine-Russia war compared to before .

Table 48. Chow Breakpoint Test for consumer products sector index: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	46.65573	Prob. F(2,4441)	0.0000
Log likelihood ratio	92.42786	Prob. Chi-Square(2)	0.0000
Wald Statistic	93.31147	Prob. Chi-Square(2)	0.0000

Table 49. Chow Breakpoint Test for consumer products sector index: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	2741.265	Prob. F(2,4441)	0.0000
Log likelihood ratio	3573.910	Prob. Chi-Square(2)	0.0000
Wald Statistic	5482.531	Prob. Chi-Square(2)	0.0000

Table 50. Chow Breakpoint Test for consumer products sector index: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	1459.621	Prob. F(2,4441)	0.0000
Log likelihood ratio	2245.673	Prob. Chi-Square(2)	0.0000
Wald Statistic	2919.243	Prob. Chi-Square(2)	0.0000

On the contrary, the findings showed that financial crisis (Table 51: $p = 0.7463$), Covid-19 pandemic (Table 52: $p = 0.8438$) and Ukraine-Russia war (Table 53: $p = 0.3768$) did not significantly affect the consumer products sector index daily returns. These results show that these crises affected the price of the consumer products sector index, but not its daily return.

Table 51. Chow Breakpoint Test for consumer products sector index daily returns: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.292610	Prob. F(2,4440)	0.7463
Log likelihood ratio	0.585709	Prob. Chi-Square(2)	0.7461
Wald Statistic	0.585220	Prob. Chi-Square(2)	0.7463

Table 52. Chow Breakpoint Test for consumer products sector index daily returns: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.169792	Prob. F(2,4440)	0.8438
Log likelihood ratio	0.339877	Prob. Chi-Square(2)	0.8437
Wald Statistic	0.339584	Prob. Chi-Square(2)	0.8438

Table 53. Chow Breakpoint Test for consumer products sector index daily returns: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.976254	Prob. F(2,4440)	0.3768

Log likelihood ratio	1.953837	Prob. Chi-Square(2)	0.3765
Wald Statistic	1.952508	Prob. Chi-Square(2)	0.3767

The results for the industrial sector index show that the definition of the breakpoints of the time series was correct in case of financial crisis (Table 54: $p = 0.000$), Covid-19 pandemic (Table 55: $p = 0.000$) and Ukraine-Russia war (Table 56: $p = 0.000$). So it can be concluded that the industrial sector index changed after October 2008 to a statistically significant degree compared to the immediately preceding period (2006-2008). In addition, the industrial sector index diverged after the start of the pandemic compared to before and it diverged significantly after the start of the Ukraine-Russia war compared to before .

Table 54. Chow Breakpoint Test for industrial sector index: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	54.85573	Prob. F(2,4441)	0.0000
Log likelihood ratio	108.4758	Prob. Chi-Square(2)	0.0000
Wald Statistic	109.7115	Prob. Chi-Square(2)	0.0000

Table 55. Chow Breakpoint Test for industrial sector index: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	2098.562	Prob. F(2,4441)	0.0000
Log likelihood ratio	2957.284	Prob. Chi-Square(2)	0.0000
Wald Statistic	4197.123	Prob. Chi-Square(2)	0.0000

Table 56. Chow Breakpoint Test for industrial sector index: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	2195.196	Prob. F(2,4441)	0.0000
Log likelihood ratio	3055.640	Prob. Chi-Square(2)	0.0000
Wald Statistic	4390.393	Prob. Chi-Square(2)	0.0000

On the contrary, the findings showed that financial crisis (Table 57: $p = 0.7463$), Covid-19 pandemic (Table 58: $p = 0.8438$) and Ukraine-Russia war (Table 59: $p = 0.3768$) did not significantly affect the industrial sector index daily returns. These results show that these crises affected the price of the industrial sector index, but not its daily return.

Table 57. Chow Breakpoint Test for industrial sector index daily returns: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.292610	Prob. F(2,4440)	0.7463
Log likelihood ratio	0.585709	Prob. Chi-Square(2)	0.7461
Wald Statistic	0.585220	Prob. Chi-Square(2)	0.7463

Table 58. Chow Breakpoint Test for industrial sector index daily returns: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.169792	Prob. F(2,4440)	0.8438
Log likelihood ratio	0.339877	Prob. Chi-Square(2)	0.8437
Wald Statistic	0.339584	Prob. Chi-Square(2)	0.8438

Table 59. Chow Breakpoint Test for industrial sector index daily returns: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			
F-statistic	0.976254	Prob. F(2,4440)	0.3768
Log likelihood ratio	1.953837	Prob. Chi-Square(2)	0.3765
Wald Statistic	1.952508	Prob. Chi-Square(2)	0.3767

The results for the construction sector index show that the definition of the breakpoints of the time series was correct in case of financial crisis (Table 60: $p = 0.000$), Covid-19 pandemic (Table 61: $p = 0.000$) and Ukraine-Russia war (Table 62: $p = 0.000$). So it can be concluded that the construction sector index changed after October 2008 to a statistically significant degree compared to the immediately preceding period (2006-2008). In addition, the construction sector index diverged after the start of the pandemic compared

to before and it diverged significantly after the start of the Ukraine-Russia war compared to before .

Table 60. Chow Breakpoint Test for construction sector index: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	74.12168	Prob. F(2,4441)	0.0000
Log likelihood ratio	145.9542	Prob. Chi-Square(2)	0.0000
Wald Statistic	148.2434	Prob. Chi-Square(2)	0.0000

Table 61. Chow Breakpoint Test for construction sector index: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	605.8076	Prob. F(2,4441)	0.0000
Log likelihood ratio	1072.306	Prob. Chi-Square(2)	0.0000
Wald Statistic	1211.615	Prob. Chi-Square(2)	0.0000

Table 62. Chow Breakpoint Test for construction sector index: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/02/2006 12/15/2023			
F-statistic	420.2019	Prob. F(2,4441)	0.0000
Log likelihood ratio	770.3735	Prob. Chi-Square(2)	0.0000
Wald Statistic	840.4039	Prob. Chi-Square(2)	0.0000

On the contrary, the findings showed that financial crisis (Table 63: $p = 0.9208$), Covid-19 pandemic (Table 64: $p = 0.5564$) and Ukraine-Russia war (Table 65: $p = 0.4930$) did not significantly affect the construction sector index daily returns. These results show that these crises affected the price of the construction sector index, but not its daily return.

Table 63. Chow Breakpoint Test for construction sector index: comparison between pre and post economic crisis period

Chow Breakpoint Test: 1/10/2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1/03/2006 12/15/2023			

F-statistic	0.082508	Prob. F(2,4440)	0.9208
Log likelihood ratio	0.165162	Prob. Chi-Square(2)	0.9207
Wald Statistic	0.165016	Prob. Chi-Square(2)	0.9208

Table 64. Chow Breakpoint Test for construction sector index daily returns: comparison between pre and post Covid-19 period

Chow Breakpoint Test: 2/12/2019
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1/03/2006 12/15/2023

F-statistic	0.586407	Prob. F(2,4440)	0.5564
Log likelihood ratio	1.173716	Prob. Chi-Square(2)	0.5561
Wald Statistic	1.172815	Prob. Chi-Square(2)	0.5563

Table 65. Chow Breakpoint Test for construction sector index daily returns: comparison between pre and post Russian-Ukrainian war period

Chow Breakpoint Test: 1/03/2022
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1/03/2006 12/15/2023

F-statistic	0.707366	Prob. F(2,4440)	0.4930
Log likelihood ratio	1.415781	Prob. Chi-Square(2)	0.4927
Wald Statistic	1.414732	Prob. Chi-Square(2)	0.4929

5.1.4. Comparison of Average Stock Returns between Periods

Then it was investigated whether the average performance of the indicators differed significantly before and after the three crises (financial crisis, Covid-19 pandemic and Ukraine-Russia war). For this reason, the t-test for independent samples was applied to the data.

The analysis showed that the average general index daily return before the financial crisis of 2008 was -0.105%, while after the financial crisis of 2008 it was -0.006% (Table 66). The t-test shows that there is no statistically significant difference in the average daily return of the general index after the financial crisis compared to before ($t = 1.249$, $p = 0.0216$).

Table 66. T-test results for comparison of general index daily return before and after economic crisis of 2008

Test for Equality of Means of GENERAL INDEX
Date: Time: 14:32

Sample (adjusted): 1/03/2006 12/15/2023
 Included observations: 4444 after adjustments

Method	df	Value	Probability
t-test	4442	1.249379	0.2116
Satterthwaite-Welch t-test*	1000.157	1.324081	0.1858
Anova F-test	(1, 4442)	1.560947	0.2116
Welch F-test*	(1, 1000.16)	1.753191	0.1858

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	5.767524	5.767524
Within	4442	16412.69	3.694888
Total	4443	16418.46	3.695355

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	3760	-0.005599	1.945474	0.031727
Before	684	-0.105429	1.788758	0.068395
All	4444	-0.020964	1.922331	0.028836

The analysis showed that the average return of the general index before the Covid-19 pandemic was -0.001% while after the Covid-19 pandemic it was -0.091% (Table 67). The t-test shows that there is no statistically significant difference in the average return of the general index after the Covid-19 pandemic compared to before ($t = 1.288$, $p = 0.1978$).

Table 67. T-test results for comparison of general index daily return before and after covid-19 crisis

Method	df	Value	Probability
t-test	4442	1.288097	0.1978
Satterthwaite-Welch t-test*	1536.433	1.273233	0.2031
Anova F-test	(1, 4442)	1.659194	0.1978
Welch F-test*	(1, 1536.43)	1.621122	0.2031

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
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Between	1	6.130399	6.130399
Within	4442	16412.33	3.694806
Total	4443	16418.46	3.695355

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
Before	3470	-0.001287	1.913367	0.032481
After	974	-0.091068	1.953312	0.062588
All	4444	-0.020964	1.922331	0.028836

The analysis showed that the average return of the general index before the Russia-Ukraine war was -0.035%, while after the war it was 0.105% (Table 68). The t-test shows that there is no statistically significant difference in the average return of the general index after the Russia-Ukraine war compared to before ($t = 1.502$, $p = 0.1330$).

Table 68. T-test results for comparison of general index daily return before and after Russian-Ukrainian war

Method	df	Value	Probability
t-test	4442	1.502512	0.1330
Satterthwaite-Welch t-test*	935.5315	2.441414	0.0148
Anova F-test	(1, 4442)	2.257542	0.1330
Welch F-test*	(1, 935.532)	5.960502	0.0148

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	8.340058	8.340058
Within	4442	16410.12	3.694309
Total	4443	16418.46	3.695355

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	468	0.105305	1.045516	0.048329
Before	3976	-0.035827	1.999977	0.031718
All	4444	-0.020964	1.922331	0.028836

The analysis showed that the average banking sector index daily return before the financial crisis of 2008 was -0.032%, while after the financial crisis of 2008 it was -0.1764% (Table 69). The t-test shows that there is no statistically significant difference in the average banking sector index daily return after the financial crisis compared to before ($t = -0.822$, $p = 0.4109$).

Table 69. T-test results for comparison of banking sector index daily return before and after economic crisis of 2008

Test for Equality of Means of BANKING SECTOR				
Date: Time: 14:33				
Sample (adjusted): 1/03/2006 12/15/2023				
Included observations: 4444 after adjustments				
Method	df	Value	Probability	
t-test	4442	-0.822374	0.4109	
Satterthwaite-Welch t-test*	2393.635	-1.402053	0.1610	
Anova F-test	(1, 4442)	0.676299	0.4109	
Welch F-test*	(1, 2393.63)	1.965752	0.1610	
*Test allows for unequal cell variances				
Analysis of Variance				
Source of Variation	df	Sum of Sq.	Mean Sq.	
Between	1	12.04039	12.04039	
Within	4442	79082.58	17.80337	
Total	4443	79094.62	17.80207	
Category Statistics				
PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	3760	-0.176367	4.516306	0.073653
Before	684	-0.032127	1.878511	0.071827
All	4444	-0.154166	4.219251	0.063292

The analysis showed that the average banking sector index daily return before the Covid-19 pandemic was -0.0581% while after the Covid-19 pandemic it was -0.1811% (Table 70). The t-test shows that there is no statistically significant difference in the average banking sector index daily return after the Covid-19 pandemic compared to before ($t = -0.803$, $p = 0.4219$).

Table 70.T-test results for comparison of banking sector index daily return before and after covid-19 crisis

Test for Equality of Means of BANKING SECTOR				
Date: Time: 14:33				
Sample (adjusted): 1/03/2006 12/15/2023				
Included observations: 4444 after adjustments				
Method	df	Value	Probability	
t-test	4442	-0.803288	0.4219	
Satterthwaite-Welch t-test*	2889.684	-1.092305	0.2748	
Anova F-test	(1, 4442)	0.645272	0.4219	
Welch F-test*	(1, 2889.68)	1.193131	0.2748	
*Test allows for unequal cell variances				
Analysis of Variance				
Source of Variation	df	Sum of Sq.	Mean Sq.	
Between	1	11.48810	11.48810	
Within	4442	79083.13	17.80350	
Total	4443	79094.62	17.80207	
Category Statistics				
PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
Before	3470	-0.181103	4.581595	0.077777
After	974	-0.058199	2.537553	0.081308
All	4444	-0.154166	4.219251	0.063292

The analysis showed that the average banking sector index daily return before the Russia-Ukraine war was -0.1835%, while after the war it was 0.0952% (Table 71). The t-test shows that there is no statistically significant difference in the average banking sector index daily return after the Russia-Ukraine war compared to before ($t = 1.352$, $p = 0.1766$).

Table 71.T-test results for comparison of banking sector index daily return before and after Russian-Ukrainian war

Test for Equality of Means of BANKING SECTOR			
Date: Time: 14:34			
Sample (adjusted): 1/03/2006 12/15/2023			
Included observations: 4444 after adjustments			
Method	df	Value	Probability
t-test	4442	1.351601	0.1766
Satterthwaite-Welch t-test*	901.5019	2.146738	0.0321
Anova F-test	(1, 4442)	1.826826	0.1766
Welch F-test*	(1, 901.502)	4.608486	0.0321

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	32.51524	32.51524
Within	4442	79062.10	17.79876
Total	4443	79094.62	17.80207

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	468	0.095154	2.371199	0.109609
Before	3976	-0.183513	4.385119	0.069544
All	4444	-0.154166	4.219251	0.063292

The analysis showed that the average consumer product sector index daily return before the financial crisis of 2008 was -0.038%, while after the financial crisis of 2008 it was 0.0344% (Table 72). The t-test shows that there is no statistically significant difference in the average return of the consumer product sector index after the financial crisis compared to before ($t = 0.798$, $p = 0.4248$).

Table 72. T-test results for comparison of consumer products sector index daily return before and after economic crisis of 2008

Test for Equality of Means of RETURN_CON

Date: Time: 14:55

Sample (adjusted): 1/03/2006 12/15/2023

Included observations: 4444 after adjustments

Method	df	Value	Probability
t-test	4442	0.798143	0.4248
Satterthwaite-Welch t-test*	1260.022	1.019989	0.3079
Anova F-test	(1, 4442)	0.637033	0.4248
Welch F-test*	(1, 1260.02)	1.040378	0.3079

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	3.001063	3.001063
Within	4442	20926.27	4.711001
Total	4443	20929.27	4.710617

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	3760	0.034458	2.261997	0.036889
Before	684	-0.037553	1.574340	0.060196
All	4444	0.023375	2.170395	0.032558

The analysis showed that the average return of the consumer products sector index before the Covid-19 pandemic was 0.0366% while after the Covid-19 pandemic it was -0.0239 % (Table 73). The t-test shows that there is no statistically significant difference in the average return of the consumer products sector index after the Covid-19 pandemic compared to before ($t = 0.769$, $p = 0.4417$).

Table 73. T-test results for comparison of consumer products sector index daily return before and after covid-19 crisis

Method	df	Value	Probability
t-test	4442	0.769367	0.4417
Satterthwaite-Welch t-test*	1909.169	0.870549	0.3841
Anova F-test	(1, 4442)	0.591926	0.4417
Welch F-test*	(1, 1909.17)	0.757856	0.3841

*Test allows for unequal cell variances

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	2.788591	2.788591
Within	4442	20926.48	4.711049
Total	4443	20929.27	4.710617

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
Before	3470	0.036646	2.261245	0.038387
After	974	-0.023907	1.810295	0.058006
All	4444	0.023375	2.170395	0.032558

The analysis showed that the average return of the consumer products sector index before the Russia-Ukraine war was 0.0105 %, while after the war it was 0.1326% (Table

74). The t-test shows that there is no statistically significant difference in the average return of consumer products sector index after the Russia-Ukraine war compared to before ($t = 1.151$, $p = 0.2497$).

Table 74. T-test results for comparison of consumer index sector daily products return before and after Russian-Ukrainian war

Test for Equality of Means of RETURN_CON				
Date: Time: 14:56				
Sample (adjusted): 1/03/2006 12/15/2023				
Included observations: 4444 after adjustments				
Method	df	Value	Probability	
t-test	4442	1.151220	0.2497	
Satterthwaite-Welch t-test*	643.6818	1.348761	0.1779	
Anova F-test	(1, 4442)	1.325308	0.2497	
Welch F-test*	(1, 643.682)	1.819156	0.1779	
*Test allows for unequal cell variances				
Analysis of Variance				
Source of Variation	df	Sum of Sq.	Mean Sq.	
Between	1	6.242558	6.242558	
Within	4442	20923.03	4.710272	
Total	4443	20929.27	4.710617	
Category Statistics				
PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	468	0.132618	1.805828	0.083474
Before	3976	0.010516	2.209194	0.035036
All	4444	0.023375	2.170395	0.032558

The analysis showed that the average return of the construction sector index before the financial crisis of 2008 was -0.040%, while after the financial crisis of 2008 it was 0.0069% (Table 75). The t-test indicate that there is no statistically significant difference in the average return of the construction sector index after the financial crisis compared to before ($t = 0.540$, $p = 0.5145$).

Table 75. T-test results for comparison of construction sector index daily return before and after economic crisis of 2008

Test for Equality of Means of RET_CONST				
Date: Time: 14:57				

Sample (adjusted): 1/03/2006 12/15/2023
 Included observations: 4444 after adjustments

Method	df	Value
t-test	4442	0.540016
Satterthwaite-Welch t-test*	1316.134	0.709303
Anova F-test	(1, 4442)	0.291618
Welch F-test*	(1, 1316.13)	0.503111

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.
Between	1	1.316089
Within	4442	20047.03
Total	4443	20048.34

Category Statistics

PERIOD	Count	Mean	Std. Dev.
After	3760	0.006865	2.221352
Before	684	-0.040823	1.481261
All	4444	-0.000475	2.124228

The analysis showed that the average return of the construction sector index before the Covid-19 pandemic was 0.0114% while after the Covid-19 pandemic it was -0.043% (Table 76). The t-test shows that there is no statistically significant difference in the average return of the construction sector index after the Covid-19 pandemic compared to before ($t = 0.704$, $p = 0.4813$).

Table 76. T-test results for comparison of construction sector index daily return before and after covid-19 crisis

Method	df	Value	Probability
t-test	4442	0.704262	0.4813
Satterthwaite-Welch t-test*	1648.618	0.730819	0.4650
Anova F-test	(1, 4442)	0.495985	0.4813
Welch F-test*	(1, 1648.62)	0.534096	0.4650

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	2.238309	2.238309
Within	4442	20046.10	4.512856
Total	4443	20048.34	4.512344

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
Before	3470	0.011415	2.153698	0.036561
After	974	-0.042835	2.016236	0.064604
All	4444	-0.000475	2.124228	0.031865

The analysis showed that the average return of the construction sector index before the Russia-Ukraine war was -0.0133 %, while after the war it was 0.1090% (Table 77). The t-test shows that there is no statistically significant difference in the average return of construction sector index after the Russia-Ukraine war compared to before ($t = 1.179$, $p = 0.2382$).

Table 77.T-test results for comparison of construction sector index daily return before and after Russian-Ukrainian war

Method	df	Value	Probability
t-test	4442	1.179599	0.2382
Satterthwaite-Welch t-test*	819.6327	1.754759	0.0797
Anova F-test	(1, 4442)	1.391455	0.2382
Welch F-test*	(1, 819.633)	3.079181	0.0797

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	6.278168	6.278168
Within	4442	20042.07	4.511946
Total	4443	20048.34	4.512344

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	468	0.109080	1.307309	0.060430
Before	3976	-0.013370	2.200282	0.034894

All	4444	-0.000475	2.124228	0.031865
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The analysis showed that the average return of the food sector index before the financial crisis of 2008 was 0.0064 %, while after the financial crisis of 2008 it was 0.0173% (Table 78). The t-test indicate that there is no statistically significant difference in the average return of the food sector index after the financial crisis compared to before ($t = 0.120$, $p = 0.9045$).

Table 78. T-test results for comparison of food sector index daily return before and after economic crisis of 2008

Test for Equality of Means of FOOD SECTOR				
Sample (adjusted): 1/03/2006 12/15/2023				
Included observations: 4444 after adjustments				
Method	df	Value	Probability	
t-test	4442	0.120045	0.9045	
Satterthwaite-Welch t-test*	1017.603	0.129445	0.8970	
Anova F-test	(1, 4442)	0.014411	0.9045	
Welch F-test*	(1, 1017.6)	0.016756	0.8970	
*Test allows for unequal cell variances				
Analysis of Variance				
Source of Variation	df	Sum of Sq.	Mean Sq.	
Between	1	0.068432	0.068432	
Within	4442	21093.53	4.748657	
Total	4443	21093.60	4.747603	
Category Statistics				
PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	3760	0.017317	2.212750	0.036086
Before	684	0.006443	1.984007	0.075860
All	4444	0.015643	2.178900	0.032685

The analysis showed that the average return of the food sector index before the Covid-19 pandemic was 0.0177% while after the Covid-19 pandemic it was 0.0083% (Table 79). The t-test shows that there is no statistically significant difference in the average return of the food sector index after the Covid-19 pandemic compared to before ($t = 0.119$, $p = 0.9049$).

Table 79. T-test results for comparison of food sector index daily return before and after covid-19 crisis

Test for Equality of Means of FOOD SECTOR			
Sample (adjusted): 1/03/2006 12/15/2023			
Included observations: 4444 after adjustments			
Method	df	Value	Probability
t-test	4442	0.119534	0.9049
Satterthwaite-Welch t-test*	1399.435	0.109699	0.9127
Anova F-test	(1, 4442)	0.014288	0.9049
Welch F-test*	(1, 1399.43)	0.012034	0.9127

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	0.067851	0.067851
Within	4442	21093.53	4.748657
Total	4443	21093.60	4.747603

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
Before	3470	0.017713	2.098036	0.035616
After	974	0.008268	2.446517	0.078391
All	4444	0.015643	2.178900	0.032685

The analysis showed that the average return of the food sector index before the Russia-Ukraine war was 0.0202 %, while after the war it was -0.0238 % (Table 80). The t-test shows that there is no statistically significant difference in the average return of food sector index after the Russia-Ukraine war compared to before ($t = -0.414$, $p = 0.6786$).

Table 80. T-test results for comparison of food sector index daily return before and after Russian-Ukrainian war

Test for Equality of Means of FOOD SECTOR			
Sample (adjusted): 1/03/2006 12/15/2023			
Included observations: 4444 after adjustments			
Method	df	Value	Probability
t-test	4442	-0.414408	0.6786
Satterthwaite-Welch t-test*	665.8636	-0.506776	0.6125
Anova F-test	(1, 4442)	0.171734	0.6786
Welch F-test*	(1, 665.864)	0.256822	0.6125

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	0.815479	0.815479
Within	4442	21092.79	4.748488
Total	4443	21093.60	4.747603

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	468	-0.023841	1.722043	0.079601
Before	3976	0.020291	2.226650	0.035313
All	4444	0.015643	2.178900	0.032685

The analysis showed that the average return of the industrial sector index before the financial crisis of 2008 was -0.0274 %, while after the financial crisis of 2008 it was 0.0182% (Table 81). The t-test indicate that there is no statistically significant difference in the average return of the industrial sector index after the financial crisis compared to before ($t = 0.531$, $p = 0.5955$).

Table 81. T-test results for comparison of industrial sector index daily return before and after economic crisis of 2008

Method	df	Value	Probability
t-test	4442	0.530905	0.5955
Satterthwaite-Welch t-test*	1045.355	0.587326	0.5571
Anova F-test	(1, 4442)	0.281860	0.5955
Welch F-test*	(1, 1045.36)	0.344952	0.5571

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	1.205434	1.205434
Within	4442	18997.14	4.276708
Total	4443	18998.34	4.276017

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
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After	3760	0.018237	2.109604	0.034404
Before	684	-0.027402	1.822252	0.069676
All	4444	0.011212	2.067853	0.031019

The analysis showed that the average return of the industrial sector index before the Covid-19 pandemic was 0.0265% while after the Covid-19 pandemic it was -0.0433 % (Table 82). The t-test shows that there is no statistically significant difference in the average return of the industrial sector index after the Covid-19 pandemic compared to before ($t = 0.931$, $p = 0.3517$).

Table 82. T-test results for comparison of industrial sector index daily return before and after covid-19 crisis

Method	df	Value	Probability
t-test	4442	0.931383	0.3517
Satterthwaite-Welch t-test*	1551.519	0.927175	0.3540
Anova F-test	(1, 4442)	0.867474	0.3517
Welch F-test*	(1, 1551.52)	0.859653	0.3540

*Test allows for unequal cell variances

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	3.709445	3.709445
Within	4442	18994.63	4.276144
Total	4443	18998.34	4.276017

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
Before	3470	0.026519	2.064213	0.035042
After	974	-0.043320	2.080921	0.066677
All	4444	0.011212	2.067853	0.031019

The analysis showed that the average return of the industrial sector index before the Russia-Ukraine war was -0.0073 %, while after the war it was 0.1685 % (Table 83). The t-test shows that there is no statistically significant difference in the average return of industrial sector index after the Russia-Ukraine war compared to before ($t = 1.739$, $p = 0.0820$).

Table 83.T-test results for comparison of industrial sector index daily return before and after Russian-Ukrainian war

Test for Equality of Means of RETURN_IN				
Sample (adjusted): 1/03/2006 12/15/2023				
Included observations: 4444 after adjustments				
Method	df	Value	Probability	
t-test	4442	1.739608	0.0820	
Satterthwaite-Welch t-test*	626.1996	1.961613	0.0503	
Anova F-test	(1, 4442)	3.026238	0.0820	
Welch F-test*	(1, 626.2)	3.847927	0.0503	
*Test allows for unequal cell variances				
Analysis of Variance				
Source of Variation	df	Sum of Sq.	Mean Sq.	
Between	1	12.93434	12.93434	
Within	4442	18985.41	4.274067	
Total	4443	18998.34	4.276017	
Category Statistics				
PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	468	0.168460	1.799902	0.083200
Before	3976	-0.007297	2.096568	0.033250
All	4444	0.011212	2.067853	0.031019

The analysis showed that the average return of the technology sector index before the financial crisis of 2008 was -0.1788 %, while after the financial crisis of 2008 it was 0.0197% (Table 84). The t-test indicate that there is statistically significant difference in the average return of the technology sector index after the financial crisis compared to before ($t = 2.135$, $p = 0.0328$). After financial crisis of 2008 the return of technology sector is significant higher compared to the period before.

Table 84.T-test results for comparison of technology sector index daily return before and after economic crisis of 2008

Test for Equality of Means of TECHNOLOGY SECTOR			
Sample (adjusted): 1/03/2006 12/15/2023			
Included observations: 4444 after adjustments			
Method	df	Value	Probability

t-test	4442	2.135053	0.0328
Satterthwaite-Welch t-test*	970.0824	2.190576	0.0287
Anova F-test	(1, 4442)	4.558451	0.0328
Welch F-test*	(1, 970.082)	4.798622	0.0287

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	22.81547	22.81547
Within	4442	22232.62	5.005093
Total	4443	22255.44	5.009101

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	3760	0.019720	2.249606	0.036687
Before	684	-0.178835	2.167694	0.082884
All	4444	-0.010841	2.238102	0.033573

The analysis showed that the average return of the technology sector index before the Covid-19 pandemic was -0.154% while after the Covid-19 pandemic it was 0.0293% (Table 85). The t-test shows that there is statistically significant difference in the average return of the technology sector index after the Covid-19 pandemic compared to before ($t = 2.260$, $p = 0.0239$). After Covid-19 the return of technology sector index is significant higher compared to the period before.

Table 85.T-test results for comparison of technology sector daily return before and after covid-19 crisis

Method	df	Value	Probability
t-test	4442	2.260303	0.0239
Satterthwaite-Welch t-test*	1468.113	2.158298	0.0311
Anova F-test	(1, 4442)	5.108971	0.0239
Welch F-test*	(1, 1468.11)	4.658252	0.0311

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
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Between	1	25.56771	25.56771
Within	4442	22229.87	5.004473
Total	4443	22255.44	5.009101

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
Before	3470	0.029345	2.194464	0.037253
After	974	-0.154008	2.382772	0.076349
All	4444	-0.010841	2.238102	0.033573

The analysis showed that the average return of the technology sector index before the Russia-Ukraine war was -0.0211 %, while after the war it was 0.0776 % (Table 86). The t-test shows that there is no statistically significant difference in the average return of technology sector index after the Russia-Ukraine war compared to before ($t = 0.898$, $p = 0.3691$).

Table 86. T-test results for comparison of technology sector index daily return before and after Russian-Ukrainian war

Method	df	Value	Probability
t-test	4442	0.898238	0.3691
Satterthwaite-Welch t-test*	830.4911	1.349276	0.1776
Anova F-test	(1, 4442)	0.806831	0.3691
Welch F-test*	(1, 830.491)	1.820546	0.1776

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	4.041674	4.041674
Within	4442	22251.39	5.009319
Total	4443	22255.44	5.009101

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	468	0.077060	1.359412	0.062839
Before	3976	-0.021187	2.319639	0.036787
All	4444	-0.010841	2.238102	0.033573

The analysis showed that the average return of the telecommunication sector index before the financial crisis of 2008 was -0.0523 %, while after the financial crisis of 2008 it was 0.0011% (Table 87). The t-test indicate that there is no statistically significant difference in the average return of the telecommunication sector index after the financial crisis compared to before ($t = 0.514$, $p = 0.6072$).

Table 87. T-test results for comparison of telecommunication sector index daily return before and after economic crisis of 2008

Test for Equality of Means of TELECOMMUNICATION SECTOR
Sample (adjusted): 1/03/2006 12/15/2023
Included observations: 4444 after adjustments

Method	df	Value	Probability
t-test	4442	0.514050	0.6072
Satterthwaite-Welch t-test*	1287.848	0.666181	0.5054
Anova F-test	(1, 4442)	0.264247	0.6072
Welch F-test*	(1, 1287.85)	0.443797	0.5054

*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	1.651950	1.651950
Within	4442	27769.28	6.251527
Total	4443	27770.93	6.250491

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	3760	0.001109	2.610219	0.042568
Before	684	-0.052319	1.777647	0.067970
All	4444	-0.007115	2.500098	0.037503

The analysis showed that the average return of the telecommunication sector index before the Covid-19 pandemic was -0.0576% while after the Covid-19 pandemic it was 0.0071% (Table 88). The t-test shows that there is no statistically significant difference in the average return of the telecommunication sector index after the Covid-19 pandemic compared to before ($t = 0.714$, $p = 0.4749$).

Table 88.T-test results for comparison of telecommunication sector index daily return before and after covid-19 crisis

Test for Equality of Means of TELECOMMUNICATION SECTOR				
Sample (adjusted): 1/03/2006 12/15/2023				
Included observations: 4444 after adjustments				
Method	df	Value	Probability	
t-test	4442	0.714532	0.4749	
Satterthwaite-Welch t-test*	1853.320	0.795518	0.4264	
Anova F-test	(1, 4442)	0.510556	0.4749	
Welch F-test*	(1, 1853.32)	0.632849	0.4264	
*Test allows for unequal cell variances				
Analysis of Variance				
Source of Variation	df	Sum of Sq.	Mean Sq.	
Between	1	3.191575	3.191575	
Within	4442	27767.74	6.251180	
Total	4443	27770.93	6.250491	
Category Statistics				
PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
Before	3470	0.007083	2.592719	0.044014
After	974	-0.057697	2.138200	0.068512
All	4444	-0.007115	2.500098	0.037503

The analysis showed that the average return of the telecommunication sector index before the Russia-Ukraine war was -0.0613 %, while after the war it was 0.0007 % (Table 89). The t-test shows that there is no statistically significant difference in the average return of telecommunication sector index after the Russia-Ukraine war compared to before ($t = -0.496$, $p = 0.6196$).

Table 89.T-test results for comparison of telecommunication sector index daily return before and after Russian-Ukrainian war

Test for Equality of Means of TELECOMMUNICATION SECTOR			
Sample (adjusted): 1/03/2006 12/15/2023			
Included observations: 4444 after adjustments			
Method	df	Value	Probability
t-test	4442	-0.496501	0.6196
Satterthwaite-Welch t-test*	791.4645	-0.718859	0.4724
Anova F-test	(1, 4442)	0.246513	0.6196

Welch F-test*	(1, 791.464)	0.516758	0.4724
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*Test allows for unequal cell variances

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	1.541089	1.541089
Within	4442	27769.39	6.251552
Total	4443	27770.93	6.250491

Category Statistics

PERIOD	Count	Mean	Std. Dev.	Std. Err. of Mean
After	468	-0.061393	1.595671	0.073760
Before	3976	-0.000726	2.585899	0.041010
All	4444	-0.007115	2.500098	0.037503

The results of the analysis based on the comparison of the average return before and after the financial crisis showed that a significant difference was recorded only in the technology sector. The findings showed that after financial crisis of 2008 the return of technology sector is significantly higher compared to the period before. The results of the analysis based on the comparison of the average return before and after the covid-19 pandemic showed that a significant difference was recorded only in the technology sector. The findings showed that after Covid-19 the return of technology sector index is significantly higher compared to the period before. Finally, no statistically significant difference was recorded in the performance of the indicators after the Russo-Ukraine war compared to the pre-war period.

5.1.5. Granger Causality Analysis

The purpose of the specific analysis was to examine the possible influence of some indexes on some other indexes. This is not the main purpose of this thesis but it can give some useful conclusions about whether some indexes affect some other indexes in a period characterized by several health and economic crises. The findings obtained from the Granger causality test are presented (Table 90). The results showed that there are quite significant relationships between the indicators. In more detail, it emerged that the consumer products and service sector index significantly affects the banking sector index

($F = 262.647$, $p < 0.001$) and vice versa, the banking sector index significantly affects the index of consumer products and services sector ($F = 5.386$, $p = 0.0046$). In addition, it emerged that the food sector index ($F = 79.134$, $p < 0.0001$), industrial products sector index ($F = 349.28$, $p < 0.0001$), technology sector index ($F = 405.21$, $p < 0.0001$), telecommunication sector index ($F = 318.111$, $p < 0.0001$) and construction sector index ($F = 338.863$, $p < 0.0001$) affect the banking sector index. Moreover, results indicate that general index affects significantly the consumer products and services sector index ($F = 5.863$, $p = 0.0029$) while telecommunication sector index affects significantly the construction sector index ($F = 8.968$, $p = 0.0001$), food sector index ($F = 10.623$, $p < 0.0001$), industrial product index ($F = 3.286$, $p = 0.0375$) and consumer products and services index ($F = 3.286$, $p = 0.0375$). Also, construction sector index affects significantly the food sector index ($F = 5.2162$, $p = 0.0055$) and technology sector index ($F = 4.1953$, $p < 0.0151$).

Table 90. Granger causality results for different sectors of the Athens Stock Exchange

Pairwise Granger Causality Tests			
Sample: 1/02/2006 12/15/2023			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
CONSUMER PRODUCTS AND SERVICE does not Granger Cause BANKING SECTOR	4442	262.647	2E-108
BANKING SECTOR does not Granger Cause CONSUMER PRODUCTS AND SERVICE		5.38577	0.0046
FOOD SECTOR does not Granger Cause BANKING SECTOR	4442	79.1340	2.E-34
BANKING SECTOR does not Granger Cause FOOD SECTOR		0.28180	0.7544
GENERAL INDEX does not Granger Cause BANKING SECTOR	4442	2.54386	0.0787
BANKING SECTOR does not Granger Cause GENERAL INDEX		1.99627	0.1360
INDUSTRIAL PRODUCTS AND SERVICES SECTOR does not Granger Cause BANKING SECTOR	4442	349.284	1E-141
BANKING SECTOR does not Granger Cause INDUSTRIAL PRODUCTS AND SERVICES SECTOR		1.63530	0.1950
TECHNOLOGY SECTOR does not Granger Cause BANKING SECTOR	4442	405.214	2E-162
BANKING SECTOR does not Granger Cause TECHNOLOGY SECTOR		0.56748	0.5670
TELECOMMUNICATION SECTOR does not Granger Cause BANKING SECTOR	4442	318.111	8E-130
BANKING SECTOR does not Granger Cause TELECOMMUNICATION SECTOR		1.15474	0.3152
CONSTRUCTION SECTOR does not Granger Cause BANKING SECTOR	4442	333.863	9E-136
BANKING SECTOR does not Granger Cause RET_CONST		0.56883	0.5662
FOOD SECTOR does not Granger Cause CONSUMER PRODUCTS AND SERVICE	4442	2.85520	0.0577

CONSUMER PRODUCTS AND SERVICE does not Granger Cause FOOD SECTOR	1.21111	0.2980	
GENERAL INDEX does not Granger Cause CONSUMER PRODUCTS AND SERVICE	4442	5.86278	0.0029
CONSUMER PRODUCTS AND SERVICE does not Granger Cause GENERAL INDEX	1.42469	0.2407	
INDUSTRIAL PRODUCTS AND SERVICES SECTOR does not Granger Cause CONSTRUCTION SECTOR	4442	1.96812	0.1398
CONSUMER PRODUCTS AND SERVICE does not Granger Cause INDUSTRIAL PRODUCTS AND SERVICES SECTOR	2.44196	0.0871	
TECHNOLOGY SECTOR does not Granger Cause CONSTRUCTION SECTOR	4442	1.36301	0.2560
CONSUMER PRODUCTS AND SERVICE does not Granger Cause TECHNOLOGY SECTOR	0.23120	0.7936	
TELECOMMUNICATION SECTOR does not Granger Cause CONSTRUCTION SECTOR	4442	8.96813	0.0001
CONSUMER PRODUCTS AND SERVICE does not Granger Cause TELECOMMUNICATION SECTOR	1.48820	0.2259	
CONSTRUCTION SECTOR does not Granger Cause CONSUMER PRODUCTS AND SERVICE	4442	2.69958	0.0673
CONSUMER PRODUCTS AND SERVICE does not Granger Cause RET_CONST	1.88495	0.1520	
GENERAL INDEX does not Granger Cause FOOD SECTOR	4442	1.57915	0.2063
FOOD SECTOR does not Granger Cause GENERAL INDEX	2.94559	0.0527	
INDUSTRIAL PRODUCTS AND SERVICES SECTOR does not Granger Cause FOOD SECTOR	4442	1.73271	0.1769
FOOD SECTOR does not Granger Cause INDUSTRIAL PRODUCTS AND SERVICES SECTOR	1.89805	0.1500	
TECHNOLOGY SECTOR does not Granger Cause FOOD SECTOR	4442	3.27385	0.0380
FOOD SECTOR does not Granger Cause TECHNOLOGY SECTOR	1.61869	0.1983	
TELECOMMUNICATION SECTOR does not Granger Cause FOOD SECTOR	4442	10.6231	2.E-05
FOOD SECTOR does not Granger Cause TELECOMMUNICATION SECTOR	0.37093	0.6901	
CONSTRUCTION SECTOR does not Granger Cause FOOD SECTOR	4442	5.21624	0.0055
FOOD SECTOR does not Granger Cause CONSTRUCTION SECTOR	2.70619	0.0669	
INDUSTRIAL PRODUCTS AND SERVICES SECTOR does not Granger Cause GENERAL INDEX	4442	1.93815	0.1441
GENERAL INDEX does not Granger Cause INDUSTRIAL PRODUCTS AND SERVICES SECTOR	1.15749	0.3144	
TECHNOLOGY SECTOR does not Granger Cause GENERAL INDEX	4442	0.19582	0.8222
GENERAL INDEX does not Granger Cause TECHNOLOGY SECTOR	1.48260	0.2272	
TELECOMMUNICATION SECTOR does not Granger Cause GENERAL INDEX	4442	0.70286	0.4952
GENERAL INDEX does not Granger Cause TELECOMMUNICATION SECTOR	0.21540	0.8062	
CONSTRUCTION SECTOR does not Granger Cause GENERAL INDEX	4442	0.40568	0.6666
GENERAL INDEX does not Granger Cause RET_CONST	0.38864	0.6780	
TECHNOLOGY SECTOR does not Granger Cause INDUSTRIAL PRODUCTS AND SERVICES SECTOR	4442	0.17362	0.8406
INDUSTRIAL PRODUCTS AND SERVICES SECTOR does not Granger Cause TECHNOLOGY SECTOR	2.63115	0.0721	

TELECOMMUNICATION SECTOR does not Granger Cause INDUSTRIAL PRODUCTS AND SERVICES SECTOR	4442	4.59620	0.0101
INDUSTRIAL PRODUCTS AND SERVICES SECTOR does not Granger Cause TELECOMMUNICATION SECTOR		1.99436	0.1362
CONSTRUCTION SECTOR does not Granger Cause INDUSTRIAL PRODUCTS AND SERVICES SECTOR	4442	2.19499	0.1115
INDUSTRIAL PRODUCTS AND SERVICES SECTOR does not Granger Cause RET_CONST		1.01717	0.3617
TELECOMMUNICATION SECTOR does not Granger Cause TECHNOLOGY SECTOR	4442	2.07809	0.1253
TECHNOLOGY SECTOR does not Granger Cause TELECOMMUNICATION SECTOR		0.80215	0.4484
CONSTRUCTION SECTOR does not Granger Cause TECHNOLOGY SECTOR	4442	4.19525	0.0151
TECHNOLOGY SECTOR does not Granger Cause RET_CONST		0.61772	0.5392
CONSTRUCTION SECTOR does not Granger Cause TELECOMMUNICATION SECTOR	4442	2.49626	0.0825
TELECOMMUNICATION SECTOR does not Granger Cause RET_CONST		3.28550	0.0375

The findings of the analysis show that consumer products and service sector index significantly affect banking sector index. Also, the banking sector index significantly affects the consumer products and services sector index. Moreover, the food sector index significantly affects the banking sector index and industrial products sector index significantly affects the banking sector index. Furthermore, the technology sector index significantly affects banking sector index. Results show that the telecommunication sector index significantly affects banking sector index, construction sector index, food sector index, industrial product index and consumer products and services index. Finally, the construction sector index significantly affects banking sector index, food sector index and technology sector index.

5.1.6. Cointegration Analysis

Finally, it was checked whether there is cointegration between the indicators studied in this work and the results are presented in detail in Table 91. The analysis showed that we can reject the null hypothesis which claims that there are no cointegration vectors (Max-Eigen Statistic=1057.43 > 52.36, p=0.002). Similarly, the analysis showed that we can reject the null hypothesis that there are at most 7 cointegration vectors (Max-Eigen Statistic =700.71>3.81, p=0.0000). Based on these findings, it follows that for all indicators there is a significant cointegration relationship described by at least seven cointegration vectors.

This result shows the existence of a long-term equilibrium relationship between the seven indices and the general index of the Athens Stock Exchange.

Table 91. Johansen's cointegration test for different sectors of the Athens Stock Exchange

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.211965	1057.428	52.36261	0.0001
At most 1 *	0.201614	999.4979	46.23142	0.0001
At most 2 *	0.192039	946.5809	40.07757	0.0001
At most 3 *	0.182460	894.2590	33.87687	0.0001
At most 4 *	0.175953	859.0701	27.58434	0.0001
At most 5 *	0.168477	818.9776	21.13162	0.0001
At most 6 *	0.159548	771.5667	14.26460	0.0001
At most 7 *	0.146025	700.7110	3.841466	0.0000

Max-eigenvalue test indicates 8 cointegrating eqn(s) at the 0.05 level

5.2 . Analysis and Discussion of Results

The purpose of the thesis was to investigate whether the health and financial crises caused in the last 20 years had a significant effect on the Athens Stock Exchange and its individual sectors. According to the literature, a health or economic crisis can cause a significant deterioration in the prices of a stock market (Acharya et al., 2021; Apostolakis et al., 2021; Baek et al., 2021; Ferrández-Serrano & Angosto-Fernández, 2022; Kiesel & Kolaric et al., 2023) while this is not confirmed for the returns that can be achieved in a period of economic crisis (Vasileiou et al., 2020). That is, the literature shows that a health or economic crisis has a negative effect on stock prices but does not affect the probability of an investor achieving a profit margin even in a crisis (Aloui et al., 2011).

Based on these results, it is emerged that the financial crisis of 2008, the Covid-19 pandemic and the crisis caused by the war between Russia and Ukraine affected the general index of the Athens Stock Exchange significantly but did not affect significantly the daily index performance (ie the percentage change from day to day). The results showed that after each crisis, a significant decrease in the general index is recorded, but its average daily performance remains unchanged. Similar results were recorded for and for the indices of the individual sectors of the Athens Stock Exchange (telecommunications sector, industrial products and services sector, technology sector, the food sector, banking sector, construction sector, consumer products and services sector). These findings are logical as

they are in accordance with the theory of market efficiency, which states that it is not possible to make a certain profit (that is, for a sector to have a constant positive return) from the announcement of a crisis. Therefore, according to the Efficient Market Theory (EMH), it is argued that the current prices of securities fully and at any moment in time, in an immediate and accurate manner, reflect all available information provided to the market (including future events that are expected at the market). This is a consequence of the competition between the vast amount of rational investors, who try to maximize their expected utility, using information to estimate future prices (Fama et al., 1969; Vasileiou et al., 2020).

Chapter 6. Conclusion

The purpose of this thesis was to investigate whether health and financial crises affect the index of the Athens Stock Exchange and the various sectors in the Athens Stock Exchange. The results of this thesis showed that the economic crisis of 2008 had a significant impact on the Athens Stock Exchange and the seven sectors studied (telecommunications sector, industrial products and services sector, technology sector, the food sector, banking sector, construction sector, consumer products and services sector) at the index level. On the contrary results indicate that the economic crisis of 2008 did not significantly affect the daily return of the general index and the daily return of the seven sectors. Additionally, results showed that the Covid-19 pandemic had a significant impact on the indices of Athens Stock Exchange and the seven sectors studied. On the contrary results indicate that the Covid-19 pandemic did not significantly affect the daily return of the general index and the daily return of the seven sectors. Finally, the results showed that the war between Ukraine and Russia had a significant impact on the indexes of Athens Stock Exchange and the seven sectors studied. On the contrary results indicate that war between Ukraine and Russia did not significantly affect the daily return of the general index and the daily return of the seven sectors. Essentially, the findings of the research showed that immediately after the occurrence of each crisis, a significant difference was recorded in the time series of the indices (a significant decrease in their price) but no significant difference was recorded in the daily returns of the indices.

This research was carried out only with secondary data that capture the daily prices and daily returns of the general index of the Athens Stock Exchange as well as its different sectors. The research did not include data concerning the financial statements of individual companies. but this is beyond the scope of this study.

For a deeper understanding of the impact that the health and financial crises have on the Stock Market in Greece, it is proposed to carry out future research that will target all the listed companies from which accounting data will be drawn. We can extend this research in other markets such as all Europe or parts of it with US Market or Canadian market since these crisis were global.

References

- Abraham, V., Bremser, K., Carreno, M., Crowley-Cyr, L., & Moreno, M. (2020). Exploring the consequences of COVID-19 on tourist behaviors: perceived travel risk, animosity and intentions to travel. *Tourism Review, ahead-of-print* (ahead-of-print).
<https://doi.org/10.1108/tr-07-2020-0344>
- Acemoğlu, D. (2009). The Crisis of 2008: Structural Lessons for and from Economics. *Equilibri, 1*, 29–44.
<https://doi.org/10.1406/29607>
- Acharya, V. V., Engle, R. F., & Steffen, S. (2021). *Why did bank stocks crash during COVID-19?*
<https://doi.org/10.3386/w28559>
- Ahmed, S., Hasan, M. M., & Kamal, M. R. (2022). Russia–Ukraine crisis: The effects on the European stock market. *European Financial Management, 29*(4), 1078–1118.
<https://doi.org/10.1111/eufm.12386>
- Akhtaruzzaman, M., Boubaker, S., & Sensoy, A. (2021), Financial contagion during COVID–19 crisis, *Finance Research Letters, 38*, 101604.
- Al-Awadhi, A. M., Alsaifi, K., Al-Awadhi, A., & Alhammedi, S. (2020), Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns, *Journal of behavioral and experimental finance, 27*, 100326.
- Alam, M., & Parveen, R. (2021). COVID-19 AND TOURISM. *International Journal of Advanced Research, 9*(4), 788–804.
<https://doi.org/10.21474/ijar01/12766>
- Aloui, R., Aïssa, M. S. B., & Nguyen, D. K. (2011). Global financial crisis, extreme interdependences, and contagion effects: The role of economic structure? *Journal of Banking and Finance, 35*(1), 130–141.
<https://doi.org/10.1016/j.jbankfin.2010.07.021>
- Ang, J. S., & Boyer, C. M. (2009). Has the 1987 crash changed the psyche of the stock market? *Review of Accounting and Finance, 8*(2), 138–154.
<https://doi.org/10.1108/14757700910959484>
- Apostolakis, G., Floros, C., Gkillas, K., & Wohar, M. E. (2021). Political uncertainty, COVID-19 pandemic and stock market volatility transmission. *Journal of International Financial Markets, Institutions and Money, 74*, 101383.

<https://doi.org/10.1016/j.intfin.2021.101383>

- Ardagna, S., & Caselli, F. (2014). The Political Economy of the Greek Debt Crisis: A Tale of Two Bailouts. *American Economic Journal: Macroeconomics*, 6(4), 291- 323.
- Arghyrou, M. G. (2015). The global financial crisis in Greece: its background causes, escalation and prospects for recovery. In *Edward Elgar Publishing eBooks*.
<https://doi.org/10.4337/9781784718961.00016>
- Ashraf, B. N. (2020), Stock markets' reaction to COVID-19: Cases or fatalities?, *Research in International Business and Finance*, 54, 101249.
- Baek, S., Mohanty, S., & Glambsky, M. (2020). COVID-19 and stock market volatility: An industry level analysis. *Finance Research Letters*, 37, 101748.
<https://doi.org/10.1016/j.frl.2020.101748>
- Bai, L., Wei, Y., Wei, G., Li, X., & Zhang, S. (2021), Infectious disease pandemic and permanent volatility of international stock markets: A long-term perspective, *Finance research letters*, 40, 101709.
- Baker S. Bloom N., Davis S., Kost K., Sammon M., Viratyosin T. (2020). The Unprecedented Stock Market Impact of Covid-19. National Bureau of Economic Research, No. 26945,
<https://www.nber.org/papers/w26945>, 1-24
- Baker, S. R., Bloom, N., Davis, S. J., Kost, K. J., Sammon, M., & Viratyosin, T. (2020). The unprecedented stock market reaction to COVID-19. *The Review of Asset Pricing Studies*, 10(4), 742–758.
<https://doi.org/10.1093/rapstu/raaa008>
- Baumeister, C., & Kilian, L. (2016). Forty years of oil price fluctuations: Why the price of oil may still surprise us. *Journal of Economic Perspectives*, 30(1), 139–160.
<https://doi.org/10.1257/jep.30.1.139>
- Benzoni, L., Collin-Dufresne, P., & Goldstein, R. S. (2011). Explaining asset pricing puzzles associated with the 1987 market crash. *Journal of Financial Economics*, 101(3), 552–573.
<https://doi.org/10.1016/j.jfineco.2011.01.008>
- Bordo, M. D., & Meissner, C. M. (2012). Does inequality lead to a financial crisis? *Journal of International Money and Finance*, 31(8), 2147–2161.
<https://doi.org/10.1016/j.jimonfin.2012.05.006>
- Bouri, E., Lei, X., Jalkh, N., Xu, Y., & Zhang, H. (2021). Spillovers in higher moments and jumps across US stock and strategic commodity markets. *Resources Policy*, 72, 102060.

<https://doi.org/10.1016/j.resourpol.2021.102060>

Brémond, V., Hache, E., & Mignon, V. (2012). Does OPEC still exist as a cartel? An empirical investigation. *Energy Economics*, 34(1), 125–131.

<https://doi.org/10.1016/j.eneco.2011.03.010>

Brooks, E., & Geyer, R. (2020). The development of EU health policy and the Covid-19 pandemic: trends and implications. *Revue D'intégration Européenne/Journal of European Integration*, 42(8), 1057–1076.

<https://doi.org/10.1080/07036337.2020.1853718>

Chatjuthamard, P., Jindahra, P., Sarajoti, P., & Treepongkaruna, S. (2021). The effect of COVID-19 on the global stock market. *Accounting & Finance*, 61(3), 4923–4953.

<https://doi.org/10.1111/acfi.12838>

Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., Qiu, Y., Wang, J., Liu, Y., Wei, Y., Xia, J., Yu, T., Zhang, X., & Zhang, L. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet*, 395(10223), 507–513.

[https://doi.org/10.1016/s0140-6736\(20\)30211-7](https://doi.org/10.1016/s0140-6736(20)30211-7)

Choi, S. Y. (2021). Analysis of stock market efficiency during crisis periods in the US stock market: Differences between the global financial crisis and COVID-19 pandemic. *Physica A: Statistical Mechanics and Its Applications*, 574, 125988.

<https://doi.org/10.1016/j.physa.2021.125988>

Das, A., Dash, D. P., & Sethi, N. (2020), Innovation, corruption, and economic growth in emerging Asia, *Buletin Ekonomi Moneter Dan Perbankan*, 23(3), 347-364.

Dehkordi, A. H., Alizadeh, M., Derakhshan, P., Babazadeh, P., & Jahandideh, A. (2020). Understanding epidemic data and statistics: A case study of COVID-19. *Journal of Medical Virology*, 92(7), 868–882.

<https://doi.org/10.1002/jmv.25885>

Dubey, S. (2020), Mobile Trading Spikes as Retail Investors Flock to Equity Markets, Available at:

<https://www.bloomberquint.com/markets/mobile-trading-spikes-as-retail-investors-flock-to-equity-markets>

Duxbury, D., Gärling, T., Gamble, A., & Klass, V. (2020). How emotions influence behavior in financial markets: a conceptual analysis and emotion-based account of buy-sell preferences. *European Journal of Finance*, 26(14), 1417–1438.

<https://doi.org/10.1080/1351847x.2020.1742758>

- ELSTAT (2021). Greek Economy. [online] www.statistics.gr. Available at: https://www.statistics.gr/documents/20181/17120175/greek_economy
- Fama, E. F., Fisher, L., Jensen, M. C., & Roll, R. (1969). The adjustment of stock prices to new information. *International Economic Review*, 10(1), 1.
<https://doi.org/10.2307/2525569>
- Ferrández-Serrano, V., & Angosto-Fernández, P. L. (2022). A Russian carol: impact and dependence on global equity markets during the Ukraine invasion. *Journal of Economic Studies*, 50(7), 1399–1412.
<https://doi.org/10.1108/jes-06-2022-0364>
- Forman, R., & Mossialos, E. (2021). The EU response to COVID-19: From reactive policies to Strategic Decision-Making. *Journal of Common Market Studies*, 59(S1), 56–68.
<https://doi.org/10.1111/jcms.13259>
- Furceri, D., & Zdzienicka, A. (2010). The real effect of financial crises in the European transition economies1. *Economics of Transition*, 19(1), 1–25.
<https://doi.org/10.1111/j.1468-0351.2010.00395.x>
- G.S.E.E. (2021). The effects of the COVID-19 pandemic in terms of changes in turnover in the Greek economy - Institute of Labor - Vocational Training Center G.S.E.E. [online] Inegsee.gr. Available at <https://www.inegsee.gr/ekdosi/i-epiptosis-tis-pandimias-covid-19-se-orous-metavolis-tou-kyklou-ergasion-stin-elliniki-ikonomia>
- Gössling, S., Scott, D., & Hall, C. M. (2020). Pandemics, tourism and global change: a rapid assessment of COVID-19. *Journal of Sustainable Tourism*, 29(1), 1–20.
<https://doi.org/10.1080/09669582.2020.1758708>
- Grout, P. A., & Zalewska, A. (2016). Stock market risk in the financial crisis. *International Review of Financial Analysis*, 46, 326–345.
<https://doi.org/10.1016/j.irfa.2015.11.012>
- Grout, P. A., & Zalewska, A. (2016). Stock market risk in the financial crisis. *International Review of Financial Analysis (Online)/International Review of Financial Analysis*, 46, 326–345.
<https://doi.org/10.1016/j.irfa.2015.11.012>
- Haron, O., & Rizvi, S. A. R. (2020). COVID-19: Media coverage and financial markets behavior-A sectoral inquiry. *Journal of behavioral and experimental finance*, 27, 100343.
<https://doi.org/10.1016/j.jbef.2020.100343>

- Hill, H. (2000). Indonesia: The Strange and sudden death of a Tiger economy. *Oxford Development Studies*, 28(2), 117–139.
<https://doi.org/10.1080/713688310>
- Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., Zhang, L., Fan, G., Xu, J., Gu, X., Cheng, Z., Yu, T., Xia, J., Wei, Y., Wu, W., Xie, X., Yin, W., Li, H., Liu, M., . . . Cao, B. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*, 395(10223), 497–506.
[https://doi.org/10.1016/s0140-6736\(20\)30183-5](https://doi.org/10.1016/s0140-6736(20)30183-5)
- Humphrey, C., Kausar, A., Loft, A., & Woods, M. (2011). Regulating Audit beyond the Crisis: A Critical Discussion of the EU Green Paper. *European Accounting Review*, 20(3), 431–457.
<https://doi.org/10.1080/09638180.2011.597201>
- Iliopoulos D. C. (2021). COVID-19: A Greek Perspective. *Journal of cardiac surgery*, 36(5), 1637–1640.
<https://doi.org/10.1111/jocs.15027>
- Izzeldin, M., Muradoğlu, G., Pappas, V., Petropoulou, A., & Sivaprasad, S. (2023). The impact of the Russian-Ukrainian war on global financial markets. *International Review of Financial Analysis*, 87, 102598.
<https://doi.org/10.1016/j.irfa.2023.102598>
- JP Morgan (2022) “The Russia-Ukraine crisis: What does it mean for markets? Available at: <https://www.jpmorgan.com/insights/research/russia-ukraine-crisis-market-impact>
- Katsanidou, A., & Otjes, S. (2015). How the European debt crisis reshaped national political space: The case of Greece. *European Union Politics*, 17(2), 262–284.
<https://doi.org/10.1177/1465116515616196>
- Khan, S., & Park, K. W. (2009). Contagion in the stock markets: The Asian financial crisis revisited. *Journal of Asian Economics*, 20(5), 561–569.
<https://doi.org/10.1016/j.asieco.2009.07.001>
- Kiesel, F., & Kolaric, S. (2023). Should I stay or should I go? Stock market reactions to companies’ decisions in the wake of the Russia-Ukraine conflict. *Journal of International Financial Markets, Institutions & Money*, 89, 101862.
<https://doi.org/10.1016/j.intfin.2023.101862>
- Klose, J., & Tillmann, P. (2021), COVID-19 and Financial Markets: A Panel analysis for European countries, *Jahrbücher Für Nationalökonomie Und Statistik*, 241(3), 297–347.

- Kotz, D. (2009). The financial and economic Crisis of 2008: a systemic crisis of neoliberal capitalism. *Review of Radical Political Economics*, 41(3), 305–317.
<https://doi.org/10.1177/0486613409335093>
- Kousi, T., Mitsi, L.-C., & Simos, J. (2020). The Early Stage of COVID-19 Outbreak in Greece: A Review of the National Response and the Socioeconomic Impact. *International Journal of Environmental Research and Public Health*, 18,
<https://doi.org/10.3390/ijerph18010322>
- Kumari, V., Pandey, D. K., Kumar, S., & Xu, E. (2022). What do border disputes cost? Evidence from an emerging market. *International Journal of Emerging Markets*.
<https://doi.org/10.1108/ijem-06-2022-0918>
- Lei, L., Aziz, G., Sarwar, S., Waheed, R., & Tiwari, A. K. (2023). Spillover and portfolio analysis for oil and stock market: A new insight across financial crisis, COVID-19 and Russian-Ukraine war. *Resources Policy*, 85, 103645.
<https://doi.org/10.1016/j.resourpol.2023.103645>
- Li, W., Chien, F., Kamran, H. W., Aldeehani, T. M., Sadiq, M., Nguyen, V. C., & Taghizadeh-Hesary, F. (2021). The nexus between COVID-19 fear and stock market volatility. *Ekonomiska Istrazivanja-economic Research*, 35(1), 1765–1785.
<https://doi.org/10.1080/1331677x.2021.1914125>
- Liao, T. L., Tsai, L., Ke, M., Chiang, Y., & Hsu, C. (2019). Financial crisis and market efficiency: evidence from European stock markets. *European Journal of Finance*, 25(13), 1194–1210.
<https://doi.org/10.1080/1351847x.2019.1584579>
- Luchtenberg, K. F., & Vu, Q. V. (2015). The 2008 financial crisis: Stock market contagion and its determinants. *Research in International Business and Finance*, 33, 178–203.
<https://doi.org/10.1016/j.ribaf.2014.09.007>
- Mazur, M., Dang, M., & Vega, M. (2021). COVID-19 and the march 2020 stock market crash. Evidence from S&P1500. *Finance Research Letters*, 38, 101690.
<https://doi.org/10.1016/j.frl.2020.101690>
- Mishkin, F. S. (1992). Anatomy of a Financial Crisis. *Journal of Evolutionary Economics*, 2, 115-130.
- Mishra, A. K., Rath, B. N., & Dash, A. K. (2020). Does the Indian financial market nosedive because of the COVID-19 outbreak, in comparison to after demonetisation and the GST?, *Emerging Markets Finance and Trade*, 56(10), 2162-2180.

- Morales, L., & Andréosso-O'Callaghan, B. (2012). The current global financial crisis: Do Asian stock markets show contagion or interdependence effects? *Journal of Asian Economics*, 23(6), 616–626.
<https://doi.org/10.1016/j.asieco.2012.09.002>
- Neuburger, L., & Egger, R. (2020). Travel risk perception and travel behaviour during the COVID-19 pandemic 2020: a case study of the DACH region. *Current Issues in Tourism*, 24(7), 1003–1016.
<https://doi.org/10.1080/13683500.2020.1803807>
- Nicholas, T., & Scherbina, A. (2012). Real estate prices during the Roaring Twenties and the Great Depression. *Real Estate Economics*, 41(2), 278–309.
<https://doi.org/10.1111/j.1540-6229.2012.00346.x>
- Nippani S., & Washer K. (2004). SARS: a non-event for affected countries' stock markets? *Applied Financial Economics*, 14, doi:
<http://dx.doi.org/10.1080/0960310042000310579>, 1105–1110
- Omar, A. M., Wisniewski, T. P., & Nolte, S. (2017). Diversifying away the risk of war and cross-border political crisis. *Energy Economics*, 64, 494–510.
<https://doi.org/10.1016/j.eneco.2016.02.015>
- Onaran, Y. (2008). Lehman on the brink, Bloomberg Markets, September, pp.56–64
- Orhun, E. (2021). The impact of COVID-19 global health crisis on stock markets and understanding the cross-country effects. *Pacific Accounting Review*, 33(1), 142–159.
<https://doi.org/10.1108/par-07-2020-0096>
- Peng, Q., Wen, F., & Gong, X. (2020). Time-dependent intrinsic correlation analysis of crude oil and the US dollar based on CEEMDAN. *International Journal of Finance & Economics/International Journal of Finance and Economics*, 26(1), 834–848.
<https://doi.org/10.1002/ijfe.1823>
- Phan, D. H. B., Tran, V. T., & Iyke, B. N. (2022). Geopolitical risk and bank stability. *Finance Research Letters*, 46, 102453. <https://doi.org/10.1016/j.frl.2021.102453>
- PWC (2021). The response of the Greek companies to the pandemic. Available at:
<https://www.pwc.com/gr/en/publications/greek-thought-leadership/the-response-of-the-greek-companies-to-covid-19.html>
- Quaglia, L., Howarth, D., & Liebe, M. (2016). The political economy of European Capital Markets Union. *Journal of Common Market Studies*, 54(S1), 185–203.
<https://doi.org/10.1111/jcms.12429>

- Racickas, E., & Vasiliauskaite, A. (2012). Classification of Financial Crises and their Occurrence Frequency in Global Financial Markets. *Socialiniai tyrimai / Social Research*, 4 (29), 32-44.
- Rady, D. M. (2012). Greece Debt Crisis: causes, implications and policy options. *Academy of Accounting and Financial Studies Journal*, 87.
<https://www.questia.com/library/journal/1G1-331080124/greece-debt-crisis-causes-implications-and-policy>
- Rigobon, R., & Sack, B. (2005). The effects of war risk on US financial markets. *Journal of Banking & Finance*, 29(7), 1769–1789.
<https://doi.org/10.1016/j.jbankfin.2004.06.040>
- Samitas, A., Kampouris, I., & Polyzos, S. (2022). Covid-19 pandemic and spillover effects in stock markets: A financial network approach. *International Review of Financial Analysis*, 80, 102005.
<https://doi.org/10.1016/j.irfa.2021.102005>
- Samsi, S. M., Cheok, C. K., & Yusof, Z. (2019). Financial Crisis, Stock Market and Economic Growth: Evidence from ASEAN-5. *Journal of Southeast Asian Economies*, 36(1), 37–56.
<https://doi.org/10.1355/ae36-1e>
- Schularick, M., & Taylor, A. M. (2012). Credit Booms gone Bust: Monetary policy, leverage cycles, and Financial Crises, 1870–2008. *The American Economic Review*, 102(2), 1029–1061.
<https://doi.org/10.1257/aer.102.2.1029>
- Shleifer, A., & Vishny, R. W. (2010). Unstable banking. *Journal of Financial Economics*, 97(3), 306–318.
<https://doi.org/10.1016/j.jfineco.2009.10.007>
- Shostya, A. (2014). The effect of the global financial crisis on transition economies. *Atlantic Economic Journal*, 42(3), 317–332.
<https://doi.org/10.1007/s11293-014-9418-2>
- Spiegel, M. (2011). The Academic Analysis of the 2008 Financial Crisis: Round 1. *The Review of Financial Studies*, 24(6), 1773–1781.
<https://doi.org/10.1093/rfs/hhr040>
- Srivastava, A., Bhatia, S., & Gupta, P. (2015). Financial Crisis and Stock Market Integration: An analysis of select Economies. *Global Business Review*, 16(6), 1127–1142.
<https://doi.org/10.1177/0972150915604519>.

- Sun, M., Song, H., & Zhang, C. (2022). The Effects of 2022 Russian Invasion of Ukraine on Global Stock Markets: An event Study approach. *Social Science Research Network*.
<https://doi.org/10.2139/ssrn.4051987>
- Tamakoshi, G., & Hamori, S. (2011). Transmission of stock prices amongst European countries before and during the Greek sovereign debt crisis. *Economics Bulletin*, 31(4), 3339–3353.
<http://accessecon.com/Pubs/EB/2011/Volume31/EB-11-V31-I4-P305.pdf>
- Uddin, M., Chowdhury, A., Anderson, K., & Chaudhuri, K. (2021). The effect of COVID – 19 pandemic on global stock market volatility: Can economic strength help to manage the uncertainty? *Journal of Business Research*, 128, 31–44.
<https://doi.org/10.1016/j.jbusres.2021.01.061>
- Umar, Z., Bossman, A., Choi, S., & Vo, X. V. (2023). Are short stocks susceptible to geopolitical shocks? Time-Frequency evidence from the Russian-Ukrainian conflict. *Finance Research Letters*, 52, 103388.
<https://doi.org/10.1016/j.frl.2022.103388>
- Vasileiou, E. (2014). Turn Of the Month Effect and Financial Crisis: A new explanation from the Greek Stock Market (2002-2012). *DOAJ (DOAJ: Directory of Open Access Journals)*.
<https://doaj.org/article/b40e461be48f479e913c41f8a1bb7371>
- Vasileiou, E., Samitas, A., Karagiannaki, M., & Dandu, J. (2020). Health risk and the efficient market hypothesis in the time of COVID-19. *International Review of Applied Economics*, 35(2), 210–223.
<https://doi.org/10.1080/02692171.2020.1864299>
- Vieito, J. P., Wong, W., & Zhu, Z. (2015). Could the global financial crisis improve the performance of the G7 stocks markets? *Applied Economics*, 48(12), 1066–1080.
<https://doi.org/10.1080/00036846.2015.1093083>
- Vlachou, A. (2021). The economic crisis of Greece and transformations initiated by the memoranda. *Science & Society*, 85(3), 412–421.
<https://doi.org/10.1521/isis.2021.85.3.412>
- WHO. (2020a). Director-General’s opening remarks at the media briefing on COVID- 19 - 11 March 2020. Retrieved from
<https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>

- WHO. (2020b). Coronavirus disease 2019 (COVID-19) situation report – 67. Retrieved from https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200327-sitrep-67-covid-19.pdf?sfvrsn=b65f68eb_4.
- World Bank, (2020), *Global economic prospects, June 2020*, The World Bank.
- Wu, F., Zhan, X., Zhou, J., & Wang, M. (2023). Stock market volatility and Russia–Ukraine conflict. *Finance Research Letters*, 55, 103919.
<https://doi.org/10.1016/j.frl.2023.103919>
- Yousaf, I., Patel, R., & Yarovaya, L. (2022). The reaction of G20+ stock markets to the Russia–Ukraine conflict “black-swan” event: Evidence from event study approach. *Journal of Behavioural and Experimental Finance*, 35, 100723.
<https://doi.org/10.1016/j.jbef.2022.100723>
- Zenker, S., & Kock, F. (2020). The coronavirus pandemic – A critical discussion of a tourism research agenda. *Tourism Management*, 81, 104164.
<https://doi.org/10.1016/j.tourman.2020.104164>
- Zhang, D., Hu, M., & Ji, Q. (2020), Financial markets under the global pandemic of Covid- 19, *Finance Research Letters*, 101528.