



INFLUENCE OF A FINANCIAL CRISIS AND THE COVID-19 PANDEMIC ON PRICES OF CEREALS IN POLAND

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JEL Classification: Q13, Q14, Q17.

Key words: cereals, crisis, price.

Abstract

This article raises the question of the impact of global crises on the grain price market. Prices of wheat, rye, barley, oat and cereal mixture as well as maize were submitted to analysis. The aim of the study was to determine the influence of a financial crisis and the COVID-19 pandemic on prices of cereals in Poland. Two research hypotheses were put forth. The first one assumed that prices of cereals increased due to the 2007-2009 financial crisis. The second research hypothesis was that the COVID-19 pandemic caused fluctuations on the cereal price market. To verify these hypotheses, an analysis was completed using data from the GUS Central Statistical Office (Statistics Poland). In addition, relevant references from the fields of economics and agriculture were reviewed. Based on this study, it has been concluded that both the 2007-2009 financial crisis and the COVID-19 pandemic had significant effects on prices of cereals in Poland.

How to cite: Krajewski, Ł., Witkowska-Dąbrowska, M., & de Jesus, I.M. (2022). Influence of a Financial Crisis and the COVID-19 Pandemic on Prices of Cereals in Poland. *Olsztyn Economic Journal*, 17(1), 71-82. <https://doi.org/10.31648/oiej.8654>

WPLYW KRYZYSU FINANSOWEGO ORAZ PANDEMII COVID-19 NA CENY ZBÓŻ W POLSCE

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Kody JEL: Q13, Q14, Q17.

Słowa kluczowe: zboża, kryzys, cena.

Abstrakt

W opracowaniu przedstawiono rolę jaką odgrywają poważne kryzysy światowe na rynku cen zbóż. Badanie przeprowadzono na przykładzie cen pszenicy, żyta, jęczmienia, owsa i mieszanki zbożowej oraz kukurydzy. Celem badań była ocena wpływu kryzysu finansowego oraz pandemii COVID-19 na poziom cen zbóż w Polsce. W nawiązaniu do celu badania postawiono dwie hipotezy badawcze. Hipoteza pierwsza zakładała, że w wyniku pojawienia się kryzysu finansowego z lat 2007-2009 ceny zbóż wzrosły. W drugiej hipotezie badawczej założono, że pod wpływem pandemii COVID-19 doszło do wahań cen na rynku zbóż. W celu weryfikacji hipotez badawczych przeprowadzono analizę badawczą z wykorzystaniem danych Głównego Urzędu Statystycznego, przeanalizowano też literaturę fachową w dziedzinie ekonomii oraz rolnictwa. Na podstawie przeprowadzonych badań stwierdzono, że zarówno kryzys finansowy z lat 2007-2009, jak i pandemia COVID-19, wywarły istotny wpływ na ceny zbóż w Polsce.

Introduction

Cereals are among the most popular crops, grown in almost every country in the world. Cereal production has a fundamental meaning for the Polish and for global economies. Each year, the situation on the cereal markets, both international and national ones, is slightly different. This concerns for example prices of grains, which are affected by a variety of factors. Over the past several years, there have been two serious crises: a financial crisis in 2007-2009 and the COVID-19 pandemic in 2020-2021. Both of these recessions have had an impact on the socio-economic situation all over the world, and on many sectors of economy, including the agricultural sector and the cereal market. The aim of this study was to evaluate the effect of the mentioned financial crisis and

the COVID-19 pandemic on the level of prices for cereals in Poland. The study results are expected to provide a better insight into the mechanisms active on the cereal price markets, specific characteristics of crises, and their consequences in economy.

Research Methodology

Two research hypotheses were put forth in connection with the research objective. The first hypothesis H1 was that the financial crisis in 2007-2009 caused an increase in the prices of grains. The second hypothesis, H2, maintained that the COVID-19 pandemic led to fluctuations on the cereal market.

Statistical methods were employed to process the data. Analysis of the level of prices for particular cereals and an analysis of the dynamics of price changes (an index with the variable base) were conducted with the help of statistical inference methods. Data for analyses were obtained from the Local Data Bank of the GUS Central Statistical Office in Poland. The time scope of the study spanned the years 2004-2021. The analysis involved prices of the basic cereals such as wheat, rye, barley, oat and cereal mixture as well as maize.

The Role of the Financial Crisis and COVID-19 Pandemic in Shaping the Situation in Economy and Prices of Cereals

Szajner (2015, p. 9) reports that there have been many fluctuations in the production of cereals on the international market in the past decades. The second half of the 20th century was a time when there was an evident increase in the production of commodity grains, such as maize and wheat, which dominate the international trade. This was a consequence of the development of cultivation technologies, the emergence of new cultivars characterised by more abundant yields, expansion of the cultivated area and more intensive production. On the other hand, such fodder cereals as rye and oat recorded decreases in production. These were mainly due to unfavourable weather conditions. Since 2003, mainly in the European Union member countries, there has been a decline in the number of farms producing cereals. The main reason was that a large number of small farms (up to 1 ha) gradually ceased to grow cereal crops. Step by step, however, the number of farms with around 30 ha of farmland increased. And these are the farms that are economically the strongest. The EU countries with the highest number of farms with over 30 ha of farmland are France, Germany and Spain. Agriculture is a sector of the national economy which produces and provides bare necessities (Bak & Szalkowska, 2020, p. 240).

According to the forecasts made by the European Commission, the demand for cereals will grow continually in the following years. As suggested (Baer-Nawrocka

& Kiryluk-Dryjska, 2015, p. 617, 618), this will be a consequence of using some cereals as raw material for production of biofuels, which play an increasingly important role, and the growing demand for fodder cereals used mostly in animal production. In 2000-2015, the wheat harvest increased by about 8.5 million tons annually. The harvested yields of fodder cereals increased even more rapidly, by about 22 million tons each year.

Prices and especially differences in prices, have a substantial influence on trade and on consumers' behaviour. A change in the prices of agricultural products entails changes in prices of food products. According to (Zaród, 2017, p. 298), the factors that shape prices of agricultural and food products can be divided into cyclical and structural ones. The cyclical factors include currency exchange rates and weather conditions. The structural factors are, for example, sown area, yield, export, import and consumption. Prices in agriculture are characterised by high fluctuations because the agricultural sector is more sensitive to changes in the economic cycles than other sectors of the national economy. Causes of changes in the prices of agricultural and food products, including prices of cereals, should be primarily sought in demand-supply relationships. The quoted article (Zaród, 2017, p. 299) discusses also the so-called 'other factors'. They determine prices in agriculture, but some are difficult to describe in quantitative terms. Among these factors, the cyclic and structural (also referred to as 'short-term') ones are emphasised. The structural factors include:

- the growth in the global population of people; the human population reached 7.7 billion in 2021, and is estimated to increase to 8.5 billion in 2030 (Hertel, 2022);

- high economic growth rates in developing countries, as the people's income grows, in such countries as Brazil, China, Mexico and Indonesia for example, so does the demand for food, which results in increased prices for agricultural products;

- changes in nutrition models in developing countries;

- a small increase in food production in the past twenty years;

- emergence of new markets, above all the markets of biofuels; development of alternative sources of energy results in a greater demand for certain plant products, such as cereals, sugar, plant oils; according to forecasts, production of biofuels is going to increase continually;

- an inadequate system of food distribution.

Among the cyclic (short-term) factors, there are:

- weather anomalies and extreme events, which have influence on the trade of agricultural and food products and reduce the agricultural production in the world; the most common are droughts and torrential rains;

- changes in currency exchange rates;

- economic fluctuations in prices of crude oil; according to a study completed by (Baffes & Dennis, 2013, p. 10), crude oil prices are among the most significant factors influencing changes in prices of agricultural products;

– short-term decisions made in the scope of trade and economic policies employing such instruments as export subsidies, duties and tariff quotas; examples of such restrictions in recent years, which were expected to control prices on internal markets, are a ban on export of cereals imposed by Russia, Serbia and Kazakhstan.

Apart from the factors mentioned above, there are also socio-cultural conditions, such as patterns developed in people's consumption expenses, and systems of preferences, likes or values, which influence the behaviour of potential consumers (Zaród, 2017, p. 300).

Agriculture is an important sector in any economy. In many European Union countries, agriculture receives support from public sources in order to improve its efficiency and stability (Popescu & Iscudor, 2017, p. 185). Crises can affect agriculture directly and indirectly. Direct effects are a consequence of changes which occur in the national economy of a given country, mainly due to a decrease in the country's GDP. The volume of agricultural production is closely associated with the population of a given country. A financial crisis, which is conducive to the general population's decreasing income, contributes to a decrease in prices of agricultural products.

According to Daszkowska (2008, p. 3, 4), incidents on financial markets also affected the markets of cereal grains. The depreciation of the US dollar, which began in the fourth quarter of 2007, took its toll on prices of agricultural crops. The markets connected directly with the agricultural sector became destabilised. Many countries that were food exporters reacted vehemently to the soaring prices and tightened their export policy. Some countries, such as China and India, imposed a ban on rice export.

Sapa (2017, p. 95) claims that the financial crisis was one of the most significant contributors to the sudden growth in prices of agricultural products, and therefore discussions were resumed on the necessity to liberalise the trade in agricultural products.

A considerable decrease in prices of agricultural products was observed all over the world in the second half of 2008. This concerned for example cereals, plant oils and dairy products. According to Parlińska and Wielechowski (2009, p. 152-163), it was the financial crisis and its consequences that caused the above situation. This was mainly because the financial crisis largely excluded cash flows on the markets of derivatives associated with the agricultural produce markets. As indicated by Pepliński (2010, p. 193), it can be concluded that prices of agricultural products, including cereals, responded to the financial crisis. According to Siche (2020, p. 4), the COVID-19 pandemic had a strong impact on the agricultural economy. The quoted author maintains that the pandemic threatened food security. Lal (2020, p. 1) claims that the COVID-19 pandemic disrupted the food supply chain. Also Szajner (2020, p. 73) concluded that the lockdowns and restrictions imposed due to the COVID-19 outbreak caused an economic recession, which affected all sectors, including the agricultural and food sector.

The agricultural sector makes a significant contribution to the GDP, and provides a large number of jobs, including ones in the food manufacturing sector, services and production of agricultural machinery and chemicals. It also generates a positive balance in foreign trade. However, the situation was different as regards retail prices of food products, which tended to increase in April 2020 relative to March that year. The increase in retail prices of food products meant that food became more expensive compared to other goods and services. The products whose prices grew the highest were potatoes, sugar, cereal products, meat and meat products. Only prices for butter and plant oils decreased (Szajner, 2020, p. 79). According to Elleby (2020, p. 12), it was the COVID-19 pandemic that caused the increase in prices of food products in many countries. Quoting the information provided by the Polish Economic Institute (2020, p. 5), it can be concluded that closing Poland's borders due to the coronavirus outbreak led to the shortage of seasonal workers, who until then used to come from other countries, and this together with the recent drought will most probably translate into higher prices for food in Poland.

The pandemic also had an evident effect on the consumption of cereals. The demand for cereal commodities increased because they are the products that are to a large extent relatively inexpensive and can be easily stored. Moreover, the demand for ethanol increased, as it is used for production of disinfectants (Brewin, 2021, p. 3). The increasing demand for flour and other cereal products resulted in the increasing prices of cereals. Some countries, for example Ukraine and Russia, responded to this development and lifted the restrictions on export in order to protect own market and citizens, which also stimulated the prices. In the spring 2020, due to the disruptions in supply chains induced by the COVID-19 pandemic, the supply of grain for purchase was limited. However, the situation improved as early as in May 2020 (Szajner, 2020, p. 80, 81).

The COVID-19 pandemic may greatly raise the number of people worldwide who will be struck by famine. A significant obstacle to international trade that arose during the pandemic was consisted of restriction on transport of cereals and plant oils (Polski Instytut Ekonomiczny, 2020, p. 4).

Changes in Prices of Cereals on the Polish Market in 2007-2009, 2020-2021

The average price of wheat in 2004-2006 was approximately PLN 43 per 1 decitonne (dt). The crisis on global markets that occurred in 2007 made the price of this cereal soar to PLN 70.7 in that year (Fig. 1).

In the following two years of the crisis, there was a gradual decrease in the price of this product, which may have been a result of the preventive measures taken on the global markets. Yet, the price of this cereal was still higher than

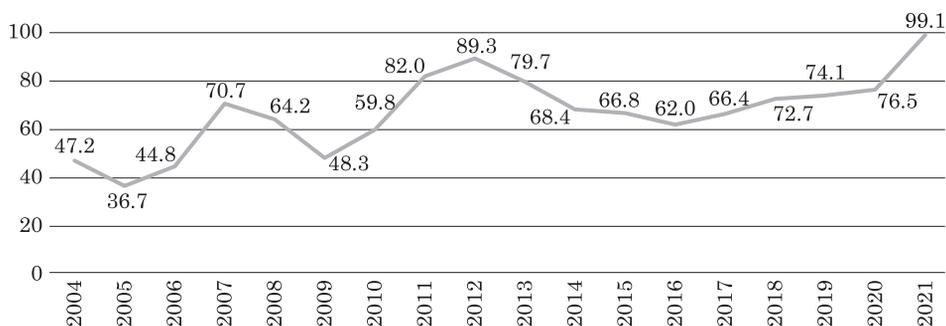


Fig. 1. Prices of wheat in PLN per 1 dt (2004-2021)

Source: the authors, based on the GUS data.

before the outbreak of the financial crisis. The COVID-19 pandemic also affected prices of cereals. The first year of the pandemic (2020) meant a small increase in the price of wheat, by just PLN 2.4 per dt, but the next year witnessed a sharp rise of PLN 22.6 per dt.

The diagram in Figure 2 illustrates changes in rye prices induced by the financial crisis and the COVID-19 pandemic as well as during these crises.

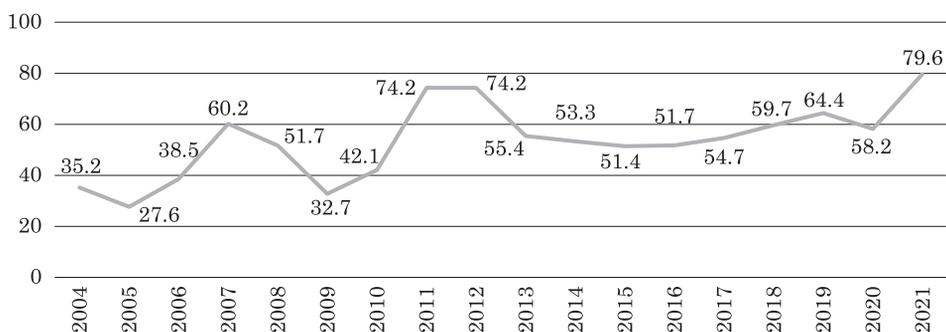


Fig. 2. Prices of rye in PLN per 1 dt (2004-2021)

Source: the authors, based on the GUS data.

The average price of rye in 2004-2006 was around PLN 34 per 1 dt. The crash on global markets in 2007 caused a drastic increase in the price of this cereal up to PLN 60.2 in that year. In the two consecutive years of the financial crisis, there was a gradual deceleration of the decrease in rye prices, which may have been a result of the preventive measures implemented on the global markets. The COVID-19 pandemic also had an impact on prices of rye. In 2020, prices of this cereal, unlike those of wheat, slightly decreased (by PLN 6.2 per 1 dt), but then increased rapidly in the following year (by PLN 21.4 per dt). As regards barley, its average price in 2004-2006 was approximately PLN 42 per 1 dt (Fig. 3).

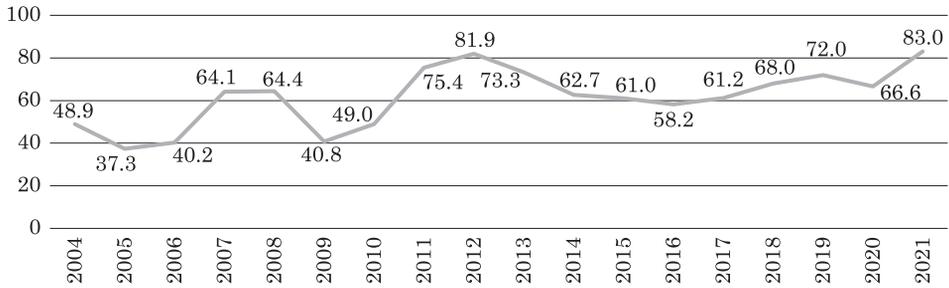


Fig. 3. Prices of barley in PLN per 1 dt (2004-2021)

Source: the authors, based on the GUS data.

The crash on the global markets in 2007 led to the prices of this cereal increase drastically to PLN 64.1 in the same year. Barley is the only cereal among the analysed species which in the second year of the financial crisis (2008) recorded higher rather than lower prices. The COVID-19 pandemic also affected the recorded prices of barley. The first year of the pandemic (2020) meant that the prices of barley, like those of rye, decreased slightly, by PLN 5.4 per 1 dt, while the second year witnessed a considerable rise in barley prices, which were by PLN 16.4 higher.

With respect to oat and cereal mixture, their average price in 2004-2006 ranged around PLN 33 per 1 dt. The crash on the global markets in 2007 resulted in the prices of these types of cereals increasing considerably, up to PLN 52.8 in that year (Fig. 4).



Fig. 4. Prices of oat and cereal mixture in PLN per 1 dt (2004-2021)

Source: the authors, based on the GUS data.

The prices were decreasing gradually in the two subsequent years of the crisis, which may have been a result of the preventive measures implemented on the world markets (Zielonka, Przybysz, Kobzhassarov & Witkowska-Dąbrowska, 2021, p. 298). The COVID-19 pandemic, same as in the case of rye and barley, induced a slight decrease in the prices of oat and cereal mixture by PLN 4.9.

In 2021, the price of these cereal products followed the same course of changes as the prices of the other analysed cereals. As for maize, its average price in 2004-2006 was PLN 41 per 1 dt. The year 2007 witnessed a rapid increase in prices of maize, up to PLN 64.4 (Fig. 5).

Considering the impact of the COVID-19 pandemic, it resulted in analogous fluctuations on the wheat market as described above. The first year of the pandemic (2020) marked a slight increase by just PLN 1.7 per 1 dt, but the following year meant a rapid rise, same as in maize prices, which in this case reached PLN 20.4.

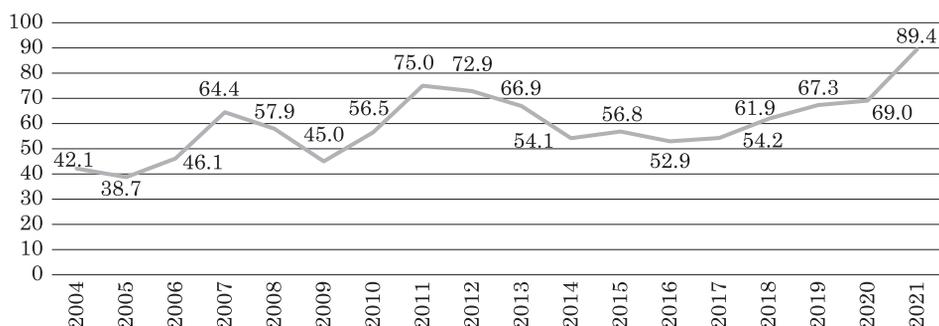


Fig. 5. Prices of maize in PLN per 1 dt (2004-2021)

Source: the authors, based on the GUS data.

Year-to-year per cent changes in prices for the five most popular cereals analysed in this study, i.e. wheat, rye, barley, oat and maize, as well as cereal mixture, were determined during the financial crisis and COVID-19 pandemic. For wheat, its price in the first year of the financial crisis (2007) increased by as much as 58% relative to the previous year. In the following two years (2008, 2009), there was a systematic decrease in wheat prices. The situation looked different during the crisis triggered by the COVID-19 pandemic. In the first year (2020), the price of wheat increased only minimally, by 3% in relations to the price in the previous year. However, in the next year (2021), wheat prices rose by an average of around 30%.

Prices of maize followed a very similar course of changes. In 2007, there was a rapid increase in maize prices, which reached 40%. In the subsequent years, recorded prices of maize decreased systematically. When the COVID-19 pandemic broke out, prices of maize responded the same as prices of wheat. There was only a small increase in prices of maize in year 2020 (just 2%), but this was followed by maize prices increasing by as much as 30% in year 2021. As regards the other four cereals (rye, barley, oat and cereal mixtures), their prices changed somewhat differently. For each of the four cereals mentioned above, their prices decreased in the first year of the pandemic (2020). However, in the

Table 1

Chain dynamics of changes in prices of cereals (index with the variable base)

Year	Wheat	Rye	Barley	Oat and cereal mixtures	Maize
2004	100	100	100	100	100
2005	78	79	76	78	92
2006	122	139	108	120	119
2007	158	156	159	152	140
2008	91	86	100	95	90
2009	75	63	63	61	78
2010	124	129	120	111	126
2011	137	176	154	188	133
2012	109	100	109	101	97
2013	89	75	90	81	92
2014	86	96	85	96	81
2015	98	96	97	96	105
2016	93	101	95	106	93
2017	107	106	105	100	102
2018	109	109	111	113	114
2019	102	108	106	112	109
2020	103	90	93	93	102
2021	130	137	125	110	130

Source: the authors.

second year of the pandemic and during the entire financial crisis before, the response of these four cereals resembled that of wheat and maize, namely their prices rose rapidly. Meanwhile, maize was the cereal crop which recorded the smallest increase in the average price among the six analysed cereals at the onset of the financial crisis in 2007. It reached 40% compared to the preceding year. The highest per cent increase in cereal prices during the COVID-19 pandemic was recorded for rye, at 37%, while the prices of oat and cereal mixture increased the least, by 10%.

Summary

The aim of this study was to determine whether prices of cereals changed under the impact of a financial crisis and the COVID-19 pandemic. The first research hypothesis stating that the financial crisis in 2007-2009 caused an increase in the prices of cereals was confirmed by the determined changes in prices of all the six cereals submitted to our analysis. In each case, the same

pattern of changes repeated, namely there was a rapid increase in the price of every cereal crop in 2007, which marked the onset of the financial crisis. According to the second research hypothesis, the COVID-19 pandemic resulted in fluctuations in the prices recorded on the market of cereals. In this case, not all the analysed cereals supported this presumption. The increasing trend that had continued systematically since 2015/16 was halted for prices of four of the six analysed cereals in the first year of the pandemic (2020), but a rapid increase in cereal prices was noted in the next year (2021). This pattern was determined for prices of rye, barley, oat and cereal mixture. As for the other two cereals, that is wheat and maize, their prices continued to increase in both years of the pandemic. However, attention should be drawn to the fact that prices of wheat and maize rose considerably in the second year, same as prices of the other four cereals.

Recapitulating, the impact of global crises, such as the financial crisis in 2007-2009 or the COVID-19 pandemic, influence prices of cereals on the Polish market.

Translated by Jolanta Idźkowska

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