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Security of the development of the construction industry in conditions of macroeconomic market uncertainty

Bezpieczeństwo rozwoju branży budowlanej w warunkach makroekonomicznej niepewności rynkowej

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Abstract. The economic situation in Poland at the beginning of 2020 was marked by the expected and forecast economic slowdown. In the conditions of uncertainty in the functioning of the organization in the first half of 2020, factors that allowed for increasing the stability and security of production processes and minimizing risk, especially in relation to supply chains, played an important role. The aim of the article is to identify and analyze problems related to the safe functioning of construction industry organizations in conditions of market uncertainty. The following research problem was posed in the work: what econometric determinants can influence demand and inflation processes in market conditions? While conducting the research, the following hypothesis was formulated and verified: construction is an indicator of mechanisms and factors stimulating the development and restrictions on the market in the last few years, which may teach the need to select appropriate macroeconomic and management tools on a global scale to manage one's own organization. The research used statistical methods, comparative analysis, index analysis, ECM model, direct observation of production processes and company activities. The proposed model has been verified and empirically tested in market conditions. The presented material is the result of empirical research in the construction industry operating on the global market as a capital group, including in Poland. The issues examined included, among others: elements such as: analysis of the investment market, unemployment rates, factors influencing the economic situation, analysis of GDP determinants in Poland, inflation processes affecting the stability of the construction industry, including its

logistics processes. Without the ability to research market trends, analyze development directions, factors determining development or stagnation, it is not possible to achieve success in the construction industry.
Keywords: risk, construction, security, macroeconomics, sector stability, ECM model

Abstrakt. W warunkach niepewności funkcjonowania organizacji, która nastąpiła w I połowie 2020 roku, istotną rolę odgrywały czynniki pozwalające na zwiększenie stabilności i bezpieczeństwa procesów wytwórczych oraz minimalizacja ryzyka. Celem artykułu jest identyfikacja i analiza problemów związanych z bezpiecznym funkcjonowaniem organizacji branży budowlanej w warunkach niepewności rynkowej. W pracy postawiono następujący problem badawczy: jakie determinanty ekonometryczne mogą wpływać na popyt oraz na procesy inflacyjne w warunkach rynkowych? Prowadząc badania postawiono i zweryfikowano następującą hipotezę: budownictwo jest wyznacznikiem mechanizmów i czynników stymulujących rozwój i ograniczenia na rynku w ostatnich kilku latach, które mogą uczyć konieczności dobierania odpowiednich narzędzi makroekonomicznych w skali globalnej i zarządczej do kierowania własną organizacją. W badaniach zastosowano metody statystyczne, analizę porównawczą, analizę indeksową, model ECM, bezpośrednią obserwację procesów produkcyjnych i działalności przedsiębiorstwa. Zaproponowany model został zweryfikowany i przetestowany empirycznie w warunkach rynkowych.
Przedstawiony materiał jest wynikiem badań empirycznych w branży budowlanej prowadzącej swoją działalność na rynku globalnym jako grupa kapitałowa, w tym na terenie Polski. Nisza badawcza objęła zagadnienia takie elementy jak: analiza rynku inwestycyjnego, stopy bezrobocia, czynniki wpływające na koniunkturę gospodarczą, analiza determinantów PKB w Polsce, procesy inflacyjne uderzające w stabilność branży budowlanej. Bez możliwości badania trendów na rynku, analizy kierunków rozwoju, czynników determinujących rozwój lub stagnację, nie jest możliwe odnoszenie sukcesów w branży budowlanej.
Słowa kluczowe: ryzyko, budownictwo, bezpieczeństwo, makroekonomia, stabilność sektora, model ECM

Introduction

Construction is one of the most important branches of the economy, which is associated with market development and care for the natural environment, including reporting the results of the national inventory of annual emissions of harmful pollutants (Chłopek, Dębski, Szczepański, 2018, p. 7). It is of fundamental importance for the national labour market, employing approximately 8% (Kazimierczak, 2021) of those employed in the economy. At present, striving to ensure an appropriate level of security of manufacturing processes is associated with drawing conclusions from unstable threats for the industry in 2020-2022 and striving to seek opportunities to improve the efficiency of activities. The context presented below regarding the trends in the functioning of the construction market in the years 2000-2018 allowed for the formulation of the following research objective. The aim of the conducted research was to identify and analyze problems related to the safe functioning of construction industry organizations in conditions of market uncertainty in relation to macroeconomic conditions, in econometric terms. Paying attention to the mechanisms and diagnosis of the economic situation, factors stimulating development and limitations in the industry in recent years, which can fundamentally teach the need to select appropriate macroeconomic and management tools on a global scale to manage your own organization, including its logistics processes. Achieving the research goal involved the following research questions: – Did the trends and dynamics of development in the construction industry market from previous years affect the

resilience of the organization and clients from the pandemic perspective? – How can the applied econometric methods support analytics and decision-making as to the manner and directions of the organization's operation on the construction industry market in conditions of market uncertainty, risk, irregularities and supply chain disruptions? Obtaining answers to the indicated questions allows for the verification of the research thesis: Identification and analysis of significant factors influencing the economic situation in the industry as well as knowledge and the possibility of using econometric models may have an impact on reducing the risk or ensuring the safety of the functioning of organizations and customers in the construction industry in the long term. Many theoretical and empirical research methods were used in the research. In the theoretical part, a study of the subject literature, normative and legal documents of the construction industry and other industry documents was carried out. In the empirical part, the following methods were used: statistical methods, comparative analysis, index analysis, ECM model, direct observation of production processes and company activities, as well as inference and generalization based on the collected data.

Literature review

Research in this area was carried out with the use of many source materials: literature, reports, statistical data, econometric models, letters and other scientific publications as well as normative and legal documents. The used industry literature was divided into primary materials, resulting from direct participation in analytical processes in the construction industry, and secondary materials, the collection of which required making them available by others in the organization. These included: statistical materials, protocols, reports, notes, letters, and other analyzes and assessments in the area of macroeconomics and market research. The article cites older works, referring to the source. These are Nobel Prize winners' publications.

The economic situation in Poland at the beginning of 2020 was marked by the expected and projected economic slowdown. The economy has been developing dynamically since the previous crisis of 2008-2009 and many factors indicated that it would cool down in the coming quarters.

In the third quarter of 2018, the unemployment rate reached the value of approx. 5%, which is the estimated value of natural unemployment. The dynamics of investments, characterized by a cycle of about 8-10 quarters, also indicated that at the beginning of 2020 their phase may change to a downward phase. Figure 1 shows the dynamics of investments in the industry in question in the years 2000-2018 in order to capture the trends.

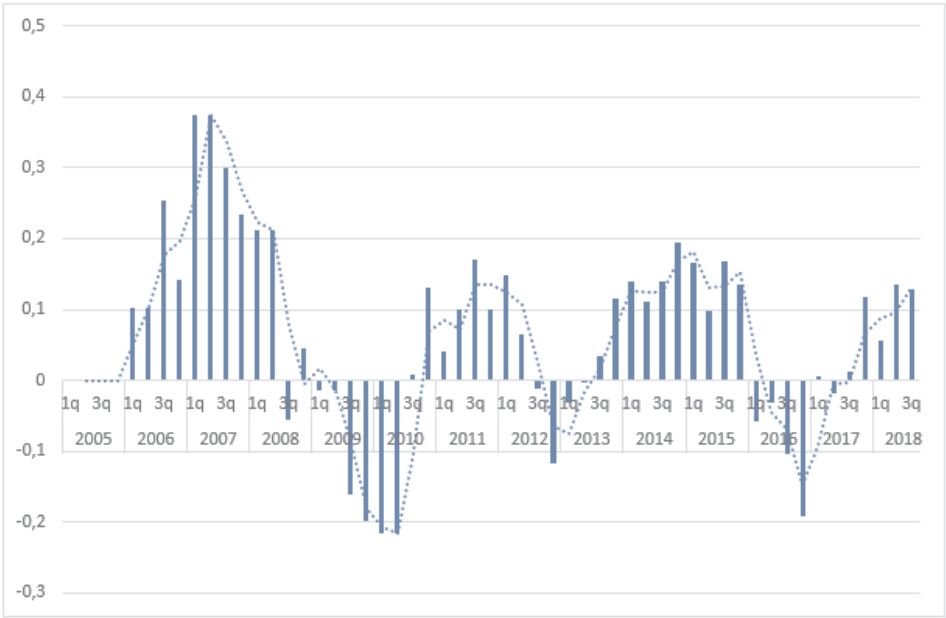

Fig. 1. Investment dynamics (y/y in per cent - fixed prices) in the construction industry in 2000-2018

Source: Own study

In addition, broadly understood public sector expenditure was supported with EU funds. Domestic demand showed a strong upward, linear trend driven by consumption. All this meant that both GDP and sold production of industry and construction production achieved a year-on-year stable growth. At the same time, many factors indicated growing imbalances in the economy, which resulted in a slowdown in the achieved growth rate.

In 2019, these factors began to grow stronger, and their importance made the trend change inevitable.

All factors causing changes in the level of GDP in 2019 can be divided into 3 groups:

1. impulses of slowdown - factors that caused a decrease in the growth rate,
2. slowdown accelerators - factors that accelerated changes, but were not their cause,
3. growth stabilizers - factors that contributed to maintaining a higher rate of economic growth.

The most important elements from each of the presented groups are presented in Table 1.

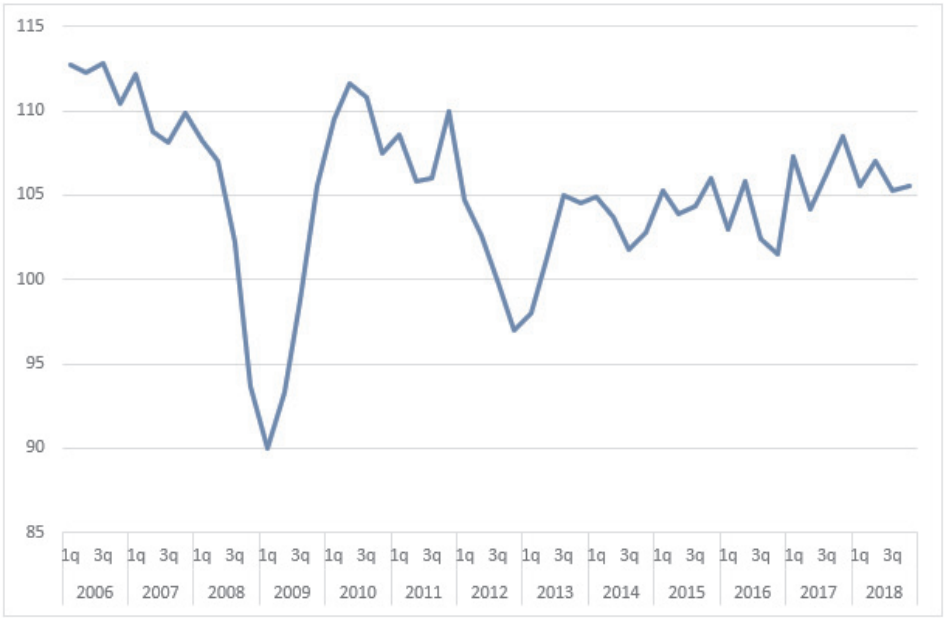

Fig. 2. The dynamics of production sold- (y/y) in the construction industry in 2000-2018
Source: Own study

Table 1. Selected factors influencing the economic situation in Poland.

Slowdown pulses:	Slow akcceletarors:	Growth stabilizers:
1. reduction of exports due to the deterioration of the global economic situation	1. consumption financing structure - high share of consumer loans	1. consumption
2. negative cycle of investment dynamics	2. growing budget expenditures, without stable and sustainable income	2. EU perspective - EU funds
3. costs of production	3. large amount of money on the market (lack of flexibility of monetary policy)	3. stability of sold production

Source: Own study

Analysis of GDP determinants in Poland - ECM model

In order to identify the determinants of GDP development in Poland in the pre-pandemic period, the expenditure methodology of calculating GDP was used and a cause-and-effect model was built, which also took into account the monetary

policy of the central bank. Co-integration analysis is a way of examining long-term relationships between processes (. Engle, Granger 1987; Pesaran, M.H., Shin, Y. (1996); Charemza, Deadman 1997;; Granger, C.W.J., Yau, R., Francis, N. (2003), Ribba, A. (2006), Gabriel, V.J., Sangduan, P. (2010), Granger, C.W.J. (2010), Ferreira, P. (2011), Baussola, M., Carvelli, G. (2023)).

The cointegration model can be formulated as the relation:

$$y_t = \alpha_1 x_t + \eta_t \tag{1}$$

gdzie: y_t i x_t are non-stationary processes in vriance *I(1)*, and η_t is a stationary residual process *I(0)*. Equation 1 is a long-term relation with a cointegrating vector $[1, -\alpha_1]$. Engle i Granger presented a two-stage cointegration testing method (Engle, Granger 1987):

1. Testing the degree of integration of variables specified in a given model. If there are two variables in a long-run relationship, they must have the same degree of integration. If there are more variables in equation 1, the degree of integration of the dependent variable cannot be higher than any of the explanatory variables. If there are explanatory variables with a degree of integration higher than the explanatory variable, their number must be at least two.
2. Next, we test the stationarity of the residuals of equation 1. If the residuals are stationary, then equation 1 is a cointegrating equation describing a long-term relationship.

Co-integration indicates the existence of a permanent, unchanging relationship between two or more integrated processes.

An important special case occurs when the variables x_t, y_t are *CI(1,1)* and have a cointegrating vector equal to *[α1, -1],* so that the deviations of yt from its long-run path are stationary - *I(0).* This case can be described by a model for the first increments, including an error correction mechanism (Engle, Granger 1987, Mills, T.C. (1996), Charemza, Deadman, 1997; Glasure, Y.U., Lee, A.-R. (1998), Welfe, 2013):

$$\Delta y_t = \beta_1 \cdot \Delta x_t + \beta_2 \left(y_{t-1} - \alpha_1 x_{t-1} \right) + \varepsilon_t \tag{2}$$

In equation 2 all processes are stationary - *I(0).* If *β2* is negative, then the term next to this parameter is called the error correction mechanism.

Parameters standing next to increments *(β1)* inform about short-term adjustments in time *t* to the equilibrium state in period *t-1*. The *β2* parameter informs about the rate of return to the equilibrium state, which is determined by the cointegrating relation through the *α1* parameter. In the error correction analysis, an important element is the negativity of the *β2* parameter, because only such a relation ensures reaching the equilibrium level from period to period. It is worth noting that the short-term relationship is represented by increments, while the long-term

relationship is represented by lagging levels of the variables. A property of the ECM model is the fact that the state of equilibrium occurs in the period preceding the study period. In the current period, only the speed of adjustment to this state is estimated.

Model 2 is a combination of a short-term relationship resulting from imbalance and a long-term relationship contained in the error correction mechanism, which can be treated as a kind of trend component. Co-integrating relations occur more often on the macroeconomic scale than on the microeconomic scale, which is why it is often used to describe cause-and-effect relationships in the entire economy. A broader review of the ECM model is included in the work (Pinshi, 2020). In the case of the described expenditure method of calculating GDP, taking into account the monetary aggregate M1, the model will have the general form described by formulas 3 and 4. The specification of the model was based on the modeling of dynamic congruent models (Talaga, L., Zieliński, Z. (1986), Doornik, J.A., Hendry, D.F. (2015)), in which natural logarithms of variables were used.

Long-term model:

$$B(u)GDP_t = A_1(u)C_t + A_2(u)I_t + A_3(u)G_t + A_4(u)Ex_t + A_5(u)Im_t + \\ + A_6(u)M1_t + P_t + S_t + \varepsilon_t$$

where:

$$ECM_t = GDP_t - \left(\frac{A_1(u)}{B(u)}C_t + \frac{A_2(u)}{B(u)}I_t + \frac{A_3(u)}{B(u)}G_t + \frac{A_4(u)}{B(u)}Ex_t + \right. \\ \left. + \frac{A_5(u)}{B(u)}Im_t + \frac{A_6(u)}{B(u)}M1_t + \frac{P_t}{B(u)} + \frac{S_t}{B(u)} \right)$$

Short term model:

$$B(u)\cdot GDP_t = A_1(u)\cdot C_t + A_2(u)\cdot I_t + A_3(u)\cdot G_t + A_4(u)\cdot Ex_t + A_5(u)\cdot Im_t + \\ + A_6(u)\cdot M1_t + P_t + S_t + ECM_{t-1} + \eta_t$$

GDP - PKB
C- consumption
I – investments
G – budget expenses
Ex – export
Im – import
M1 – monetary aggregate m1
P – trend process
S – seasonal process

The model was built on a sample of quarterly data from the period 2002:01 - 2018:03. All variables are expressed in constant prices (CPI inflation was used as the deflator).

The estimated models are presented in tables 2 and 3.

Table 2. ECM 2 model after estimation

Model 2				
KMNK estimation, observation used 2003:1-2018:3 (N = 63)				
Dependent variable (Y): l_PKB				
	factor	Standard error	t-Stud.	value p
Const	1.34465	0.494394	2.72	0.0088
Time	-0.00303632	0.000720947	-4.212	9.67E-05
sq1	-0.025234	0.00348478	-7.241	1.67E-09
sq2	-0.0295819	0.00418242	-7.073	3.14E-09
sq3	-0.0117967	0.00271663	-4.342	6.24E-05
l_consumption_1	0.297572	0.0708091	4.202	9.97E-05
l_Export	0.154248	0.0349494	4.413	4.91E-05
l_M1_2	0.20564	0.0245819	8.365	2.55E-11
l_PKB_4	0.267896	0.0718099	3.731	0.0005
Arith.mean of the depend.variable	12.7182	Stand. deviat. of the depend.variable	0.254371	
Sum of squared residuals	0.006553	Standard error of residuals	0.011016	
Coefficient of determin. R-square	0.998367	Corrected R-square	0.998125	
F(8, 54)	4125.711	Value p for the test F	2.29E-72	
Log. credibillity	199.4936	Crit. inform. Akaike'a	-380.987	
Crit. bayes. Schwarza	-361.6989	Crit. Hannana-Quinna	-373.401	
Autocorrelation of residuals - rho1	0.213298	Statistic Durbina-Watsona	1.516096	

Table 3. Model ECM 2.1 after estimation

Model 2.1				
KMNK estimation, observation used 2007:2-2018:3 (N = 46)				
Dependent variable (Y): d_l_PKB				
	factor	Standard error	t-Stud	value p
const	-0.00395244	0.00289365	-1.366	0.1807
d_l_Consumption	0.304498	0.0997442	3.053	0.0043
d_l_Inwestments_8	-0.0360603	0.0142814	-2.525	0.0163
d_l_Expenses_1	0.0237088	0.0115791	2.048	0.0482
d_l_Export	0.329612	0.0462942	7.12	2.68E-08
d_l_Imoprt	-0.239997	0.0504629	-4.756	3.35E-05
d_l_Imoprt_5	-0.105747	0.0367578	-2.877	0.0068
m2ecm_1	-0.332643	0.0702643	-4.734	3.57E-05
sq1	-0.206298	0.0157332	-13.11	4.56E-15
sq2	0.0384742	0.00748136	5.143	1.04E-05
sq3	0.0177823	0.0028787	6.177	4.51E-07

Arith.mean of the depend. variable	0.013076	Stand. deviat. of the depend. variable	0.100363
Sum of squared residuals	0.001494	Standard error of residuals	0.006534
Coefficient of derermin R-square	0.996703	Corrected R-square	0.995761
F(10, 35)	1058.162	Value p for the test F	2.41E-40
Log. credibillity	172.4276	Crit. inform. Akaike'a	-322.8551
Crit. bayes. Schwarza	-302.7401	Crti. Hannana-Quinna	-315.3199
Autocorrelation of residuals - rho1	-0.15031	Statistic Durbina-Watsona	2.213797

Source: Own study

The first model shows that three factors have a statistically significant impact on GDP changes in the long run: consumption, exports, the amount of money in the economy calculated with the M1 aggregate and the autoregressive value of PBK from 4 quarters ago. In total, they account for about 92.5% of the volatility of GDP value fluctuations in constant prices. However, the impact of individual explanatory variables is different, which results from the values of the evaluation of model

parameters. Consumption from the previous quarter has the greatest impact on the value of GDP in the long term and amounts to approx. 29.8%. In second place is the autoregressive process which has a positive impact on GDP changes in approx. 26.8%. Similarly, money supply (M1) and exports have a positive impact on the dependent variable in approx. 20.6% and 15.4%, respectively.

In the short term, consumption is also the most important determinant of GDP, with the parameter estimated at approx. 30.4%. Therefore, it is the most important factor of GDP growth in Poland over the last 20 years. A characteristic observation is the fact that in the long-term and short-term relationship models, state investment and expenditure have a very small impact on GDP. They are statistically significant only in the short-term model and their impact does not exceed +/- 3%. However, it should be noted that statistically significant investments are delayed by 8 quarters and government spending by one. The two-year period of investment impact can be explained by their nature, or it can also be assumed for further analysis that this variable is a kind of substitutive variable, i.e. the model does not include any significant variable, which is closely correlated with it (Kufel, 2002).

In the short term, the money supply is statistically insignificant, while foreign trade, in particular export, plays a significant role. In general, the trade described by model 2.1 is almost neutral overall. However, these changes are unevenly distributed over time. Export has a positive and immediate impact (parameter assessment - 0.33%). The impact of imports is negative and long-term and reaches 5 quarters. Model 2 describes the long-term path of GDP growth. Model 3 describes the short-term deviations as deviations from the long-term path, the ECM variable contained in it informs how quickly the short-term deviation returns to the long-term path. The value of the parameter at the level of -0.33 means that it takes about 3 quarters to reach the long-term path

Classic econometric models assume that phenomena are described using equations of functions depending on certain, isolated factors (Grzelak, 2019, p. 94). The model described above has been verified in practice in the form of GDP forecasts in the first two quarters of 2020, after the introduction of restrictions caused by the COVID-19 pandemic. Forecasts and their implementation are presented in Chart 3 (Internal document of Erbud, 2020).

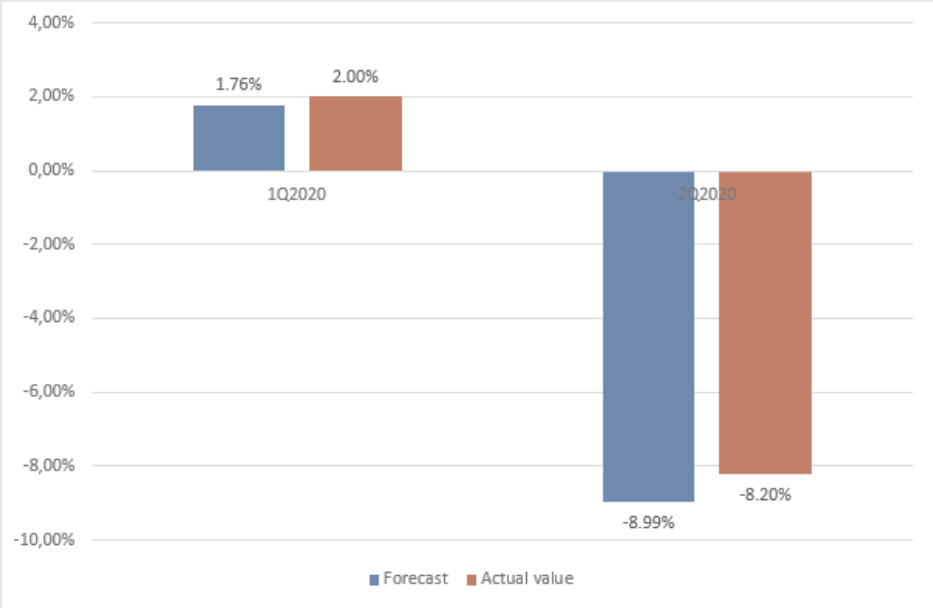

Fig. 3. Chande forecasts PKB (y/y)
Source: Own study

Inflationary processes

The security of the development of the construction industry in macroeconomic conditions should be understood as a combination of price stability of the operating conditions of enterprises and the forecast for GDP growth. In the case of price stability, it can be observed that there is a negative correlation between the dynamics of construction production and the consumer price level indicators CPI, and in particular producer price level indicators PPI. The appropriate correlation coefficients for CPI and PPI delayed by 24 months (average investment preparation time)) and the dynamics of construction production are: -6% and -15% (Budownictwo, GUS 2023). Therefore, increased inflation has a negative impact on the development of the construction industry. The second important factor is the expected GDP growth.

As indicated by the above model, the main determinants of GDP growth were consumption factors. The increase in consumption, which was also stimulated by social transfers from the state budget combined with unemployment at the level of the natural rate in the economy, causes intensification of inflationary processes. Bearing in mind the various causes of inflation, several periods with different orientations on the mechanism of its formation can be distinguished. If we assume

that the factor influencing the level of prices from the side of costs is the producer inflation index expressed as the producer price index (PPI), the factor influencing the level of prices from the side of demand is the inflation index excluding food and energy prices (core inflation) and the factor influencing the level of prices due to the quantitative theory of money, its quantity is measured with the M1 aggregate and the NBP reference interest rate, then the correlation and causality of the CPI can be measured. Figures 4 - 5 present various types of inflation and monetary policy instruments of the central bank.

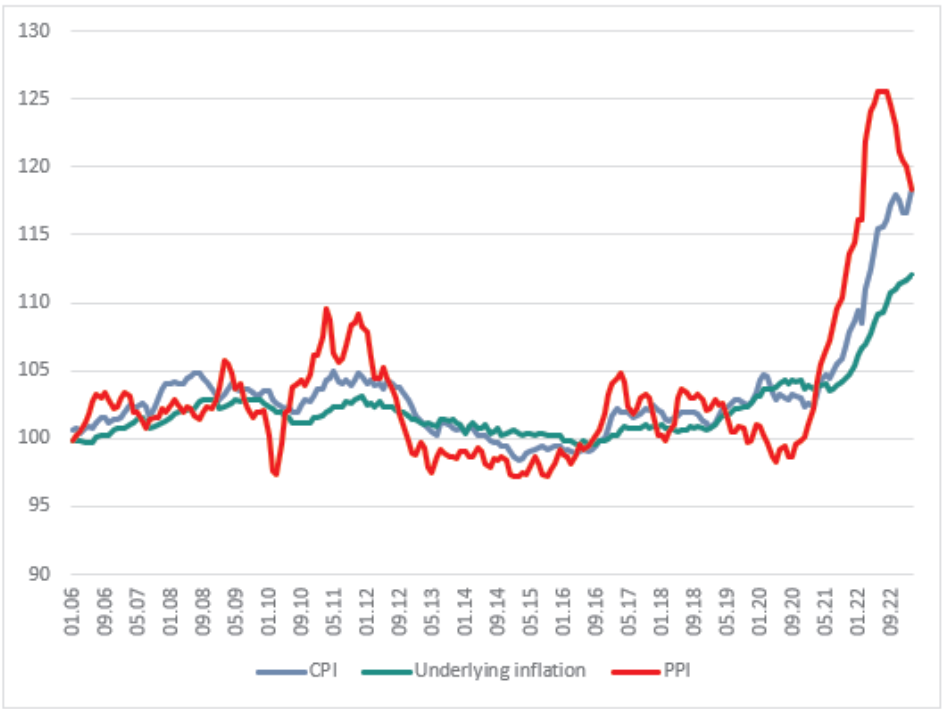

Fig. 4. Types of inflation and the mechanism of its formation - monetary policy
Source: Own study

Analyzing Figure 5 presenting the monetary policy of the central bank, three periods can be distinguished. The first one, until around the end of 2014, with unchanged dynamics of money supply growth and with a reference rate above 2%. In the second period, 2015-2018, the interest rate was 1.5%, but with a higher dynamics of money supply growth. The third period since 2019 is characterized

by an even higher dynamics of growth of the M1 aggregate, and since March 2020 (pandemic period) this dynamics has even exploded. This period is manifested by very low interest rates - the reference rate reaches 0.1%.

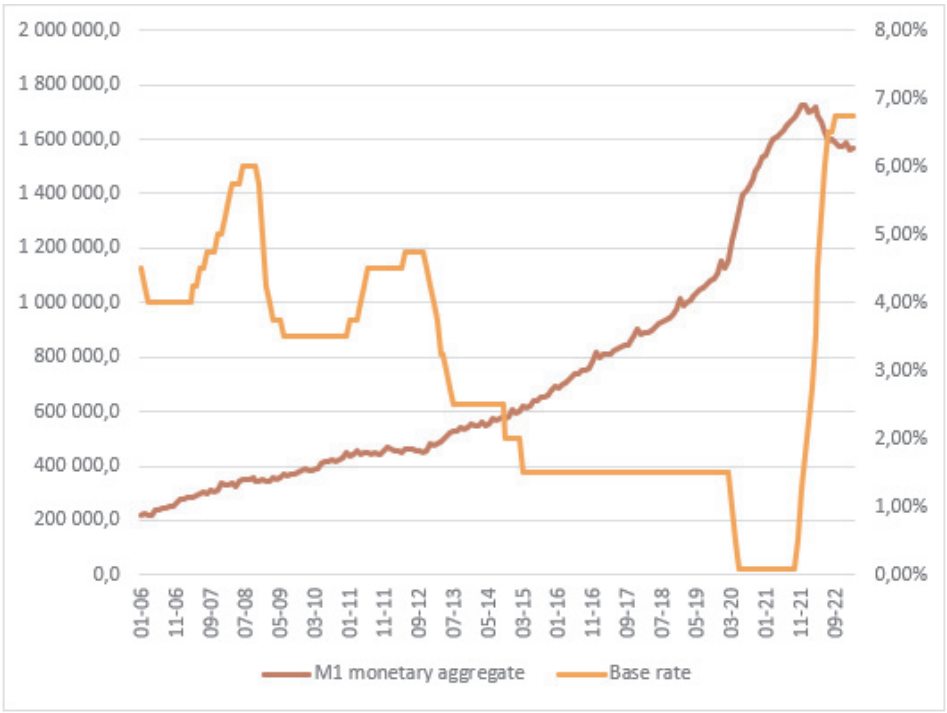

Fig. 5. Types of inflation and the mechanism of its formation - monetary policy
Source: Own study

The breakdown of the causes of the CPI is also correlated with the monetary policy pursued. Inflation measured with the CPI index is intertwined with its components in the form of core and producer inflation. The phase angle, which is part of the spectral analysis (Talaga, Zieliński 1986, Marczak, M., Beissinger, T. (2013), Marczak, M., Gómez, V. (2017)), measures the difference in phase between the individual cyclic components of the stochastic processes studied, i.e. it indicates the process Yt being ahead of the Xt process for the given frequency ω (cf. Talaga, Zieliński, 1986, p. 32-33). By analyzing the phase angle for individual components with the inflation process, it is possible to determine its causality in individual frequencies or, in other words, periods of impact.

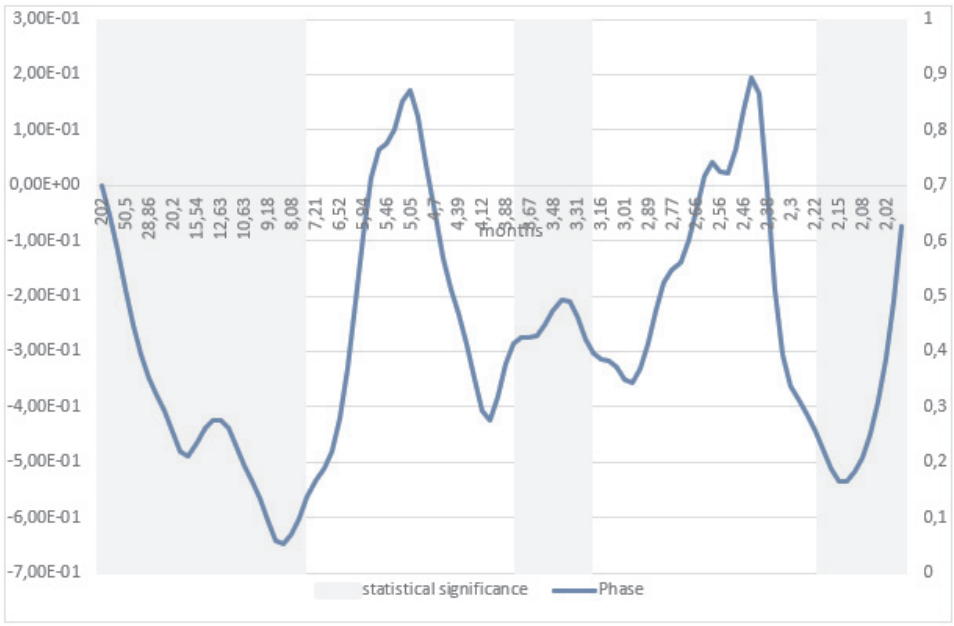

Fig. 6. Phase angle between core inflation and CPI
Source: Own study

From the analysis of Chart 6, it is possible to determine whether the core inflation index is ahead of the inflation index measured as CPI and in what periods of time. Negative values of the chart indicate the leading nature of core inflation, and thus its causal nature. In all statistically significant periods, core inflation and the analyzed period of time were the cause of the CPI. It had a statistically significant impact over a long period (several years), a year (12 months), a quarter (3 months) and short-term fluctuations (2 months).

Figure 7 shows that inflation was the source of producer inflation, and the statistically significant frequencies indicate that the impact period ranges from long-term impact to half a year or even 4 months. PPI overtaking has not obtained statistically significant results, but it is also visible in the short term. It is highly probable that the PPI vs. CPI lead observed in Chart 5 since the beginning of 2020 is not yet observable in spectral analysis.

Since 2019, there are several factors that affect the level of inflation. First of all, high consumption together with a good economic situation in the world, resulting in an increase in exports, increase the core inflation index, which is the reason for the increase in the CPI index. In addition, the increase in the growth of money supply stimulates the quantitative nature of the increase in inflation, but also in the national income (this mechanism is presented by the above models).

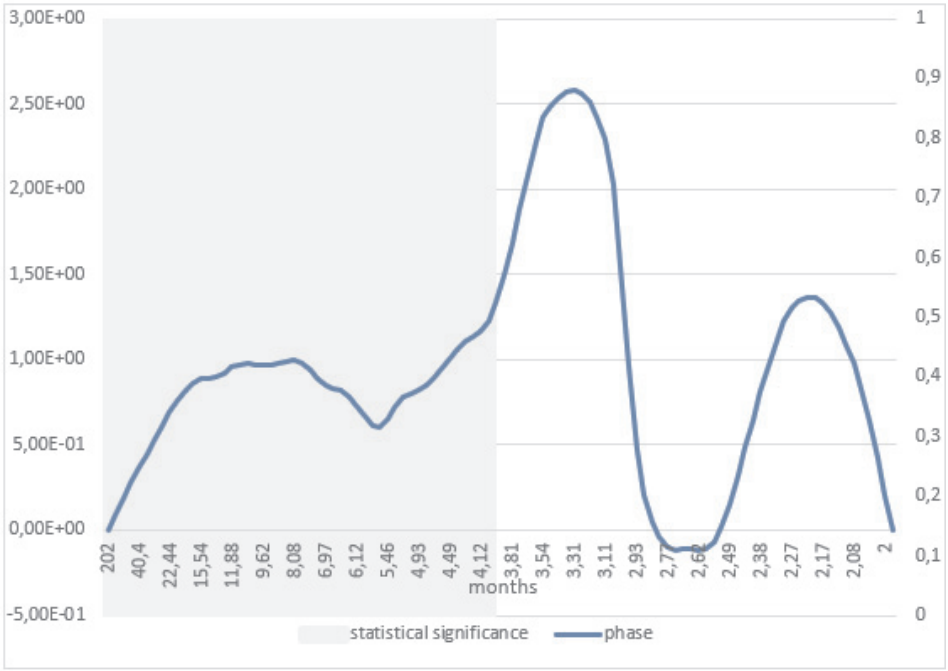

Fig. 7. Phase angle between producer inflation - producer price of industry (PPI) and CPI
Source: Own study

The year 2020 causes a decline in GDP caused by the closure of the economy, also bringing an unprecedented relaxation of monetary policy in Poland. The nominal demand generated in this way fuels the inflationary process. An additional shock is the outbreak of war in Ukraine, which accelerates the already visible from the fourth quarter of 2020 producer inflation, which causes a strong increase in production costs due to the partial closure of foreign markets and the supply problem caused by the outbreak of the COVID-19 pandemic.

It can be said that at that time the changes in inflation levels were adversely affected by all the factors shaping it: an increase in costs, demand with stabilization, and even a decrease in GDP, and an increase in the amount of money on the market.

As shown in models 3 and 4, the main determinants of GDP growth in Poland were consumption, trade (especially exports in the long term) and money supply. Accordingly, the NBP interest rate cut in the first weeks of the COVID-19 pandemic should be re-examined. This reduction was intended to stimulate demand through a transmission mechanism affecting both consumption and investment spending. However, in terms of capital spending, the high risk associated with uncertainty about the functioning of the markets at the time of their closure made them unlikely to be stimulated. The reduction in interest rates combined with the extensive

anti-crisis shield generated by the state, which primarily caused the freezing of the labor market, resulted in a rapid recovery of consumer demand and even its bloom in a deferred form. Chart 8 showing the dynamics of retail sales of goods compared to the average of 2015 shows that consumption recorded a regress only in the first two quarters (this is in line with the forecast presented above. Moreover, in the first quarter of 2020 a regression occurred only in March, and compared to the same period in the previous year, a high comparative base from before the pandemic resulted in a longer recovery in demand dynamics. This means that consumption, relatively high considering the existing conditions, additionally stimulated by the record-low cost of credit and high cash inflow to the economy, also met with a record-low unemployment rate (Figure 9). This triggered a serious inflationary impulse (Kalecki, 2015, p. 45), which was also reflected in the construction market.

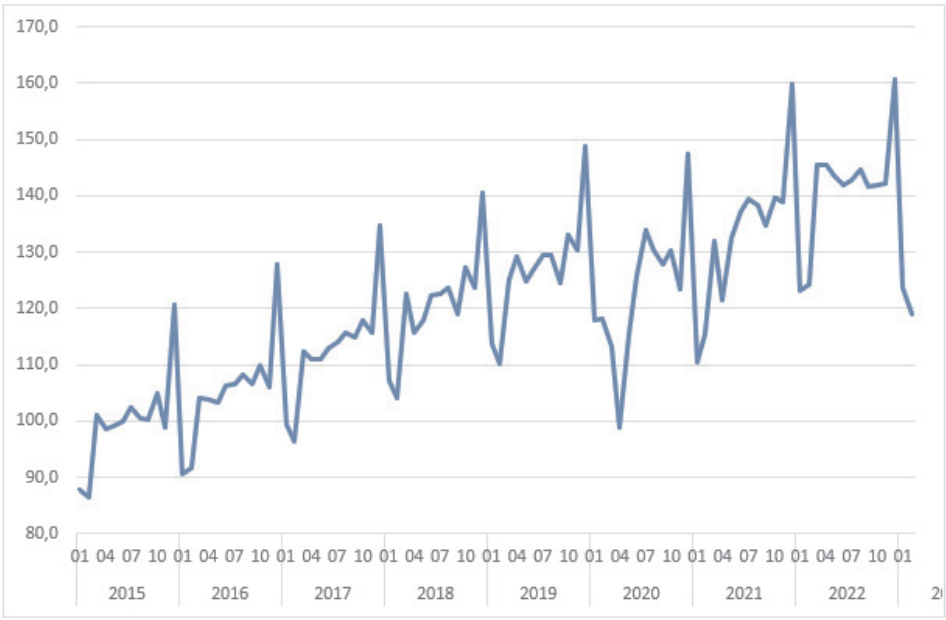

Fig. 8. The dynamics of retail sales of goods compared to the 2015 average
Source: Own study

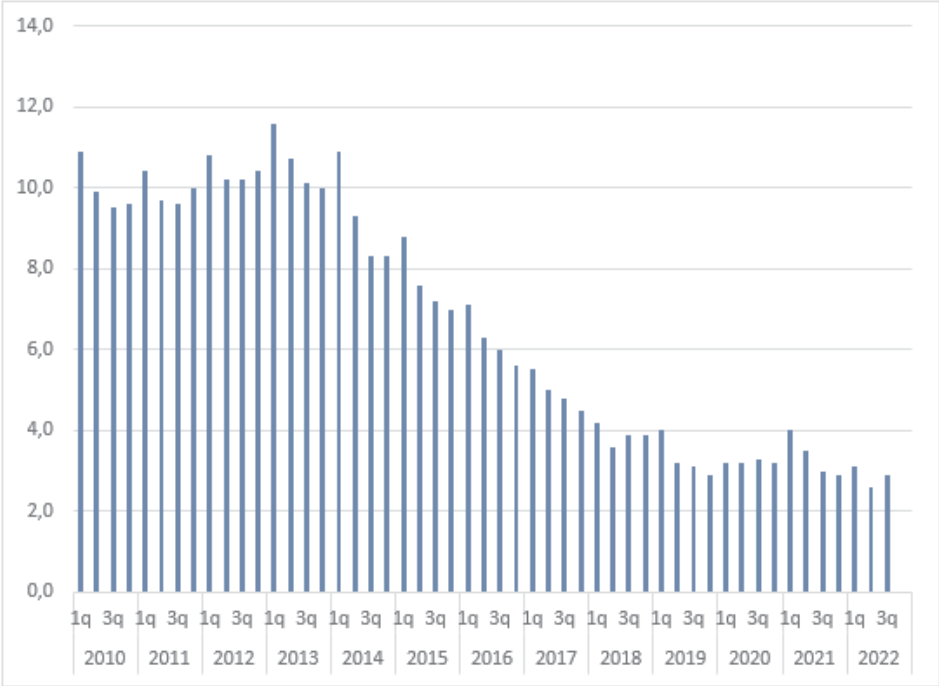

Fig. 9. Unemployment rate according to BAE
Source: Own study

Analyzing the data on the number of dwellings for which permits have been issued or for which a construction project has been notified (construction permits), it can be noticed that despite the dynamic growth since the beginning of 2013, i.e. after the end of perturbations related to the crisis started in 2008, this dynamics was accelerated at the beginning of 2020. The data related to the number of apartments whose construction has begun is similar. Bearing in mind that the investment multiplier in the economy shows high values in construction, it can be expected that this impulse was a derivative of further demand stimulation (Figure 8). However, all this encountered global logistic problems caused by the pandemic, which translated into a reduction in the supply of materials and semi-finished products, and generally goods and services on the market. The consequence of this was a sharp increase in the PPI at the end of 2020. The outbreak of war in Ukraine at the end of February 2022 and the resulting crisis in raw materials (in particular energy) only drastically deepened the described processes.

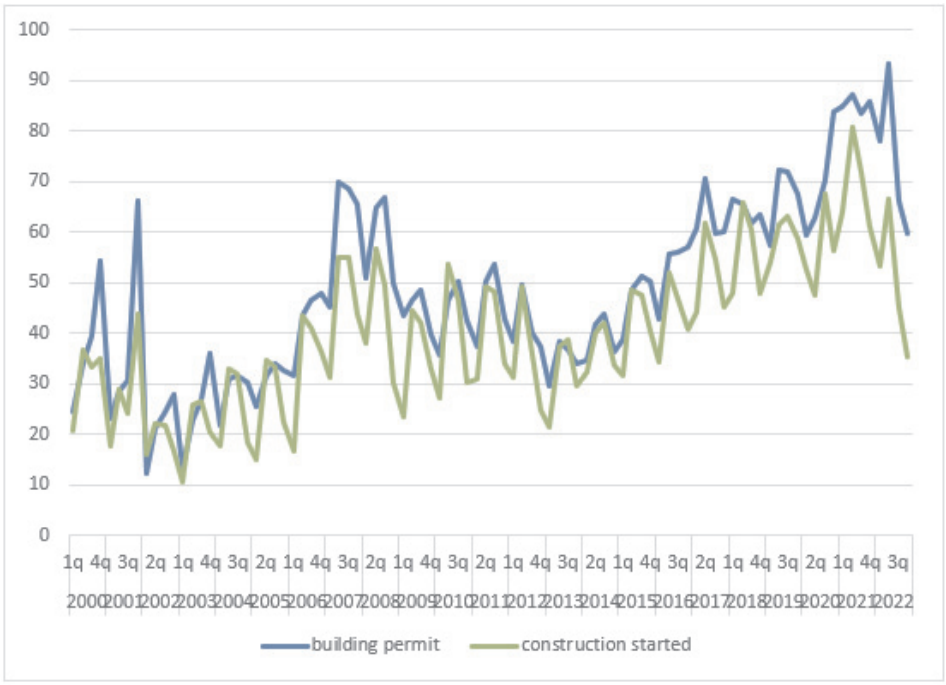

Fig. 8. Planned and commenced number of flats in 2000-2022 (in the thousand)
Source: Own study

Conclusions

Safety in the construction industry is very important. The implementation of construction processes is always burdened with a significant risk, especially for the course of investment and construction processes. The construction industry is not only a direct creator of GDP, employment or tax revenue, but also an important source of demand and a flywheel for other industries.

The article analyzes the basic values and trends in the construction industry in recent years, as well as the dynamics and approximation of their importance in the macroeconomic scale. The influence of construction, e.g. housing, on other economic sectors was pointed out. Using models, we show the total value of the additional demand created by housing construction. The basic impulses indicating the upcoming cooling of the economy at the end of 2019 were: the deterioration of the economic situation in the main export directions, the phase of the investment dynamics cycle and high production costs. In the conditions of uncertainty in the functioning of the organization that occurred in the first half of 2020 (signs of a slowdown on the

market and the impact of the pandemic), an important role was played by factors allowing to increase the stability and security of production processes and to minimize the risk, especially with regard to the threats associated with breaking chains supplies. Crisis situations may be caused by internal determinants, resulting, for example, from incorrect management (Kalbarczyk-Guzek, 2020, p. 8). Attention was paid to macroeconomic mechanisms and diagnosis of the economic situation, factors stimulating development and limitations in the industry in recent years, with particular attention to factors leading to a slowdown in the achieved growth rate. The industry encountered global problems, including logistic ones, which translated into a reduction in the supply of materials and semi-finished products, as well as goods and services in general, on the construction market, in relations functioning in supply chains. The assessment of environmental life cycle assessment (LCA) in terms of monitoring the state of greenhouse gases, regulated emissions and energy has become a challenge (Szumska, Pawełczyk, Pistek, 2019, p. 78).

The researched issues included, among others: elements such as: analysis of the investment market, unemployment rate, factors influencing the economic situation, analysis of GDP determinants in Poland, inflation processes affecting the stability of the construction industry, including its logistics processes. Without the ability to study market trends, analyze development directions, factors determining development or stagnation, without the ability to navigate it and draw conclusions in a specific time perspective, it is not possible to be successful in the construction industry. It is important to be able to use and interpret the obtained macroeconomic and industry data in a preventive perspective in order to protect investments against undesirable phenomena or at least minimize the effects of these phenomena. Construction is a kind of barometer of the economic growth forecast. Therefore, an important aspect is the study of the determinants of GDP growth and inflation as the basis for the stable and safe development of the construction industry.

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