


# ANTI-INFLATION POLICY IN POLAND'S ECONOMY DURING THE PERIOD OF TRANSFORMATION AND INTEGRATION

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## Abstract

The aim of the article is to analyse the origin, course of inflation and scope of operation concerning the instruments of monetary and fiscal policy applied by the anti-inflation policy, as well as to evaluate their effectiveness for Poland's economy in the years 2000–2021. To measure the relationship between decisions in the area of stabilisation policy and inflation, the authors carried out an econometric analysis using the dynamic autoregressive model with distributed lags. The parameters of the model confirmed that among the applied tools of monetary and fiscal policies, an anti-inflation nature was found between the monetary policy instruments and prices, and also linking budget expenditures with price level. Changes in budget incomes, according to the obtained results, were not conducive to price stabilisation in our economy. Anti-inflationary policy was dominated by monetary policy instruments. The anti-inflationary significance of fiscal policy has been much smaller since the beginning of the transformation of the Polish economy. Its anti-inflationary role increased in the period of difficulties related to the COVID-19 pandemic, in particular at the time of a strong increase in budget spending in the environment of rising price level.

**Keywords:** inflation, fiscal policy, monetary policy, stabilization policy.

**JEL codes:** E30, E31, E52, E61, E62.

## Introduction

It is assumed that the main aim of stabilization activities implemented in contemporary economies is to stabilize the value of money. Anti-inflation policies conducted in the area of price stabilisation are most frequently implemented by means of the central bank's monetary policy tools or by using fiscal policy instruments. The aim of this article is to analyse the genesis and course of inflation, as well as the scope of operation concerning the monetary and fiscal policy instruments applied

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by the anti-inflation policy, as well as to empirically evaluate their effectiveness for Poland's economy in the years 2000–2021. The article consists of two parts. In the first one, we discuss the origin of inflation processes and the policies to combat price increases, implemented by the National Bank of Poland (NBP) and fiscal bodies. The second part comprises results of econometric analysis regarding the anti-inflation impact of the monetary and fiscal policy tools applied in Poland's economy in the years 2000–2021. The selection of the period for analyses was dictated by access to empirical data characterising the inflation processes as well as the applied instruments of monetary and fiscal policies.

## 1. Genesis of inflation in the economy of contemporary Poland

In the initial years of the transformation period, the situation of Poland's economy was extremely complicated. Deep, demand-side market imbalance, initiated structural changes, and political chaos led to a rapid rise of prices for goods and services. At the same time, it was the period when monetarist economics dominated. In such conditions, this theoretical school was approved in order to explain the origins of inflation in Poland. This hypothesis originating from Say's law of market and Hume's works gave rise to the quantity theory of money developed by Fisher (Schaal, 1996, p. 287). Fisher dually interpreted the market process as acts of purchase and sales. Their global volume, as assumed by the monetarists, was presented as a product concerning the quantity of goods and the average price level, or as the global indicator of transactions. This condition is a tautology because both of its aspects express the same magnitude, i.e. the monetary sum of commodity transactions. As the resource of money in circulation is shaped exogenously by the central bank, it is independent of the price level, quantity of goods on the market and velocity of money circulation. This velocity is constant because it is determined by the institutional system. The volume of goods is also constant (especially under the assumption that the factors of production are fully exploited). Thus, the dynamics of inflation (price growth) depend on the total quantity of money in the economy.

When the monetarist approach is accepted, one can say that the anti-inflation policy should limit money supply on the market. This means that the central bank should conduct a restrictive policy (difficult money policy) and that the state budget should exhibit a tendency towards generating a surplus.

In accordance with the literature on the subject, in the initial years of economic transformation in Poland, during the rapid growth of incomes and increasing role of trade unions, the Keynesian concept of inflation could also be observed. As specified by Keynes, in an economy where no immediate increase of supply is possible,

an increase in one ingredient of the final demand (e.g. state expenditures) may lead to the emergence of unsatisfied demand which, in the absence of administrative barriers, may result in higher prices and thus, higher revenues for companies and lower real incomes for employees. A natural reaction to the lower real incomes is pressure for wage increase, which with a wage-price elasticity greater than or equal to one, will make this process repeatable. If under demand-pull inflation the authorities do not increase the money supply, then, an increase in the velocity of its circulation will be responsible for the fact that the financing of economic processes will take place in the conditions of price increases caused by the excess of demand over supply. An additional interpretation of Keynes's concept was provided by Kaldor, who said that after World War II, the most important role was played by cost-push inflation (Drabowski, 1987, p. 76). This interpretation has several variations that differ from one another with regard to the significance of individual factors causing cost increase. The best known is wage-push inflation according to which, the increase of prices is caused by trade unions aiming to increase wages (Welfe, 1993, p. 18). Moreover, it is assumed that trade unions, trying to maintain the existing level of nominal wages, want to make sure that the share of employees in the increasing revenues of companies will be greater, due to a higher labour productivity. At the same time, they want to boost the position of their company, as compared to other forms, striving to achieve full employment and opposing attempts to reduce nominal wages.

## 2. Anti-inflation policy in Poland between 2000–2021

The beginnings of anti-inflation policy are linked with the process of transformation, and the implementation of that policy occurred in very difficult conditions. Changes introduced in the banking system at that time were not only of institutional nature, but also involved the shape of monetary policy, its goals, instruments and strategy (Przybylska-Kapuścińska, 2007, pp. 104–110). In the initial years of transformation, the main aim of the monetary policy was to strengthen the Polish money. This goal was concretised in the yearly assumptions of the monetary policy presented to the Sejm (Polish parliament) (Pietrzak, Polański, & Woźniak, 2003, p. 141). Achieving this objective was to be facilitated by the money supply control strategy. At that time, the central bank was heavily dependent on the government. According to the provisions of the Act on the NBP, the central bank was obliged to cooperate with the Sejm in the area of economic policy, being responsible for the correct functioning and development of the banking system. Moreover, the Act granted NBP an unlimited right to purchase Treasury securities, without specifying other forms of central bank lending to the government (Przybylska-Kapuścińska, 2007, p. 280). Breakthrough changes in

the shape of Polish monetary policy were introduced by 6 legal acts (Przybylska-Kapuścińska, 2007, p. 282):

- the Constitution of the Republic of Poland adopted on April 2, 1997 (Konstytucja RP z dnia 2.04.1997 r., Dz.U. 1997, nr 78 poz. 483);
- New act on the NBP of 29 August, 1997 (Ustawa z dnia 29 sierpnia 1997 r. o NBP, Dz.U. 2005, Nr 140 poz. 938);
- New Banking Law of August 29, 1997 (Prawo bankowe i ustawa o NBP z dnia 29 sierpnia 1997, Dz.U. 2005, Nr 140 poz. 939).

The Constitution of the Republic of Poland guaranteed independence of the central bank by giving it an exclusive right to emit money. Moreover, it established a new body, the Monetary Policy Council (MPC) and prohibited the NBP from the financing of budget deficit. According to the provisions of the Act on the NBP, binding until now, the aim of the NBP is still to maintain a stable level of prices. However, the strategy to achieve this aim is different. Since 1999, the NBP has started to use a direct inflation targeting strategy (DIT), which has been more and more frequently used worldwide from the beginning of the 1990s. The inflation target adopted in Poland has not been changed since the beginning of 2004 and it amounts to 2.5%, with a possible deviation of  $\pm 1$  percentage point (NBP). Adoption of this strategy was suitable in view of Poland's integration with the European Union (EU) and its accession to the Eurozone in the future.

When using the DIT strategy, the monetary policy is focused on setting the level of short-term interest rates (optimal from the viewpoint of future inflation processes), which further determine the volume of credit demand, lending activity as well as money supply, and not directly controlling the chosen monetary aggregate (by shaping the monetary base, and the subsequent multiplier process). This goal is achieved by open market operations which are the most important instrument of the contemporary monetary policy, and by which, the central bank absorbs or provides liquid funds to commercial banks via specific instruments with predetermined yields and maturities.

On May 1, 2004, Poland joined the EU. As mentioned earlier, this decision paved the way for and implied Poland's obligation to participate in the subsequent stage of integration, i.e. membership in the Economic and Monetary Union. Since that moment, Poland has had the status of a country with derogation, which means that the NBP is a member of the ESCB (European System of Central Banks), nevertheless, it has no right to participate in the decision-making process or in creating the common monetary policy in the Euro area. This situation implies an obligation to meet the Maastricht nominal convergence criteria. These criteria are defined as monetary (inflation, long-term interest rate, exchange rate stability) and fiscal criteria (public finance sector deficit, public debt). At the same time, independence of the central bank should be ensured (Sobol, 2008, pp. 184–209). One

of the important monetary criteria is the high degree of price stability, which means that inflation should not be greater than 1.5 percentage points as compared to the average rate of inflation, measured by the harmonised index of prices for consumer goods in 3 of the EU countries with the lowest inflation. Another nominal requirement to be met by a given country before joining the Euro area is the long-term interest rate criterion. This condition is fulfilled when the average annual interest rate in the long-term (usually ten-year) treasury, bonded within 1 year before the assessment, does not exceed by more than 2.2 percentage points of the average interest rate in 3 of the EU countries with the lowest inflation rate. The exchange rate criterion is related to participation in the ERM II monetary mechanism for a minimum period of 2 years. In order to recognise the exchange rate as constant, the fluctuation parity of a country's currency in relation to the Euro, should be kept within the band of  $\pm 15$  percentage points, with no devaluation events taking place, which means that no "serious tensions" can occur on the currency market within that period. The fiscal requirements assume that public finances must be healthy, i.e. the budget deficit cannot exceed 3% of the GDP and the public debt cannot be higher than 60% of the GDP. At the same time, Poland is obliged to adapt its legislation concerning the NBP's operations to ESCB requirements and to harmonise its monetary policy instruments with those used by the ECB. As results from the empirical analyses conducted so far, the degree of convergence between those tools is relatively high (Sobol, 2008, pp. 197–209).

The year 2007 witnessed an outbreak of the world financial crisis which led to a recession in the Euro area, and the negative consequences of which were also experienced by the Polish economy. The recession in Poland's business activity meant a gradual slowdown of the GDP growth dynamics. In that period, stabilisation activities were undertaken, with the main role played by the Plan for Stabilisation and Growth prepared in 2008 (Plan Stabilności i Rozwoju, 2008). The chief goal of the monetary policy conducted in the years 2008–2009 was to increase liquidity of the banking system. Apart from this, on 14 October 2008, the NBP introduced the so-called Confidence Package (2008). Nevertheless, the anti-crisis measures from the area of monetary policy did not play any important part in the process of stabilising the actual sphere of Poland's economy. They were mainly aimed at calming down the banking sector and facilitating access to credit money. Thus, the Package was a kind of supplement to the main stabilisation measures resulting from the fiscal policy.

The second group of macroeconomic stabilisation policy tools and, *eo ipso*, anti-inflation policy, comprises fiscal instruments. In a somewhat narrowed sense, those instruments include (Owsiak, 2005, p. 561):

- budget expenses for the purchase of goods and services;
- dynamics and structure of transfer expenses;
- changes in the area of tax policy.

A public spending policy plays a significant stabilising role, because it directly determines changes in demand, not only for consumers, but also for investment goods. Indirectly, it may also influence the dynamics of their prices. The changes in consumer demand are conditioned by personal and social expenses or transfers. The demand for investment goods is shaped by material budget expenditures and subventions. Public revenues mainly depend on tax policy. They exert indirect influence on consumer incomes through the introduction of additional tax burdens or exemptions, and through changes in tax rates on the consumer goods, e.g. VAT or excise tax. The fiscal bodies may also influence the demand for investment goods through their tax policies. Investment bonuses and funds are important instruments in this area (Teichmann, 1988, pp. 247–251).

When implementing the anti-inflation policy, the state bodies should make an effort to limit public spending and increase revenues in order to reduce the size of budget deficit and generate a budget surplus. This should result in a decrease of money supply on the market and thus, be the factor restricting the dynamics of price increases.

Changes in the budget system introduced since the beginning of the 1990s were one of fairly important components of the transformation process in Poland's economy. Indirect discretionary taxes were introduced in the emerging system. Among them, the most significant role was played by the tax on goods and services (VAT) and excise tax. The group of taxes exhibiting the characteristics of automatic tools was dominated by direct taxes, with income taxes on individuals (PIT) and those on legal persons (CIT) being the most important. The VAT tax is of key importance for shaping the public revenues in Poland, fulfilling, at the same time, a stabilising function in the area of demand for goods and services. Poland's accession to the EU in 2004 implied a necessity to reconstruct the VAT tax. This is why on May 1, 2004, a new act on the VAT came into force, including the Sixth VAT directive used in the EU (Act of January 23, 2004 on excise tax, *Ustawa z dnia 23 stycznia 2004 r. o podatku akcyzowym*. Dz.U 2004, Nr 29 poz. 257). After May 1, 2003, 36 amendments to the VAT act were introduced.

The excise tax introduced in Poland in 1993 is paid when purchasing specific goods. First of all, it exerts impact on prices and must be paid irrespectively of other taxes (Act of January 8, 1993 on VAT and excise, *Ustawa z dnia 8 stycznia 1993 r. o podatku VAT i podatku akcyzowym*, Dz.U. 1993, Nr 18 poz. 82). The rates of those taxes are flexible and the right to establish them belongs to the Ministry of Finance, which sets percentage or quota rates by regulations). As a consequence of Poland's accession to the EU, the excise tax system had to be changed (Act of 23 January 2004 on excise duty).

In the period of transforming Poland's economy, not only the system of indirect but also direct taxes was constructed, among which the most important role was played by income tax on individuals (PIT) and income tax on legal entities (CIT) introduced in the years 1991–1992 (Act of 26 July, 1991 about income tax on

natural persons, Ustawa z dnia 26 lipca 1991 r. o podatku dochodowym od osób fizycznych, Dz.U. 1991, Nr 80 poz. 350; Act of February 15, 1992, referring to income tax on legal persons, Ustawa z dnia 15 lutego 1992 r. o podatku dochodowym od osób prawnych oraz o zmianie ustaw regulujących zasady opodatkowania, Dz.U. 1992, Nr 21 poz. 86).

Personal income tax is characterised by universality of subjects as well as objects, and the introduction of that tax enables realisation of non-fiscal goals. Its rates have changed over time (Owsiak, 2005, pp. 683–700). The years 1992–1993 witnessed a mildly progressive 3-stage tax scale, which amounted to 20%, 30% and 40% for individuals from specified income groups. In 1994, the amount of that tax was higher because its rates went up to 21%, 33% and 45%, which increased its progressiveness. In 1997, the rates were lowered to the level of 20%, 32% and 44%, but they varied compared to those from 1992. Since 2009, Poland's economy has had only 2 rates of personal income tax, amounting to 18% and 32%, and in 2019, the so-called solidarity tax was introduced. The solidarity tax is paid by those who derive a yearly income exceeding PLN 1,000,000 and its rate is 4% of the excess amount. The personal income tax reform was connected with its specific role in the economic system.

In the years 1992–1996, the basic corporate income tax rate amounted to 40% and in 1997, it was reduced to 38%, being linear in nature. In 1998, that rate was lowered to 36% and in following years, further reductions were made. In 1999, the basic corporate income tax amounted to 34% and in subsequent periods—to 30%. In the years 2001–2002, that rate equalled 28% and in the following year, 27%. This process lasted until 2004, when the rate was dramatically reduced to 19%. For the small taxpayers, it was changed again in 2019.

The presented remarks concerning changes in the area of central taxes justify the statement that in the conditions of recurrent crisis phenomena in Poland's public finances, the introduced adjustments aimed, above all, at reducing the budget deficit and the public debt.

The undertaken actions were focused on budget expenditures and less attention was paid to improving the effects of tax revenues. The structure of budget spending was dominated by the realisation of social and political aims, with much less attention shifted towards economic stabilisation activities.

An essential factor having impact on macro-economic stabilisation, and thus inflation-related processes in Poland's economy, has been COVID-19 pandemic. It started at the end of December 2019 in Wuhan and rapidly spread across the globe. The first cases appeared in Poland at the beginning of March 2020. The disease has multi-aspect consequences which play a specific role in the sphere of economy. This is why stabilisation programmes defined as “anti-crisis shields” and the so-called financial package were introduced in Poland. Their chief aim is to stabilise the economy by employment protection, guarantee employee safety and enhance financial liquidity of companies. The total financial

outlays are expected to reach approximately PLN 212 bln, with the government cash component of PLN 67 bln, liquidity component of approximately PLN 75 bln, and the NBP liquidity package of approximately PLN 70 bln (Ustawa z dnia 31 marca 2021 r. poz. 568).

As individual companies received this version of the shield with some distrust, especially as regards organisation, forms and size of assistance and cash benefits, on 8 April, 2020, the government prepared and the Sejm passed anti-crisis shield 2.0, followed by shield 3.0 (May 2020) and 4.0 (June 2020). The frameworks of stabilisation activities also include the financial shield, which is part of the anti-crisis shields and is provided by the Polish Development Fund and targeted at micro-firms, small businesses, medium-size and large enterprises. This project is expected to offer nearly PLN 100 bln, out of which the majority of the PLN 60 bln are non-returnable funds.

During the so-called second coronavirus wave, Poland adopted other stabilisation solutions, i.e. the sectoral shield of the Ministry of Economic Development, Labour and Technology, anti-crisis shields 5.0 (September 2020), 6.0 (December 2020) and 7.0 implemented on February 28, 2021. Moreover, in January 2021, the PDF (Polish Development Fund) approved financial shield 2.0 to support 38 branches of the economy with funds totalling PLN 35 bln. Those solutions, targeted mainly at micro firms and small businesses, introduced (among others) exemptions from paying social security contributions, additional one-off standstill benefits and PLN 5,000 as a subsidy for those entities. The regulations increased the number of economic branches which had access to the financial support of the state.

Due to the on-going coronavirus pandemic, on February 28, 2021, a subsequent shield: 8.0 came into force. It was targeted at companies of specific branches, hit by pandemic-related restrictions. That shield was a prolongation and extension of shield 7.0 and covered the following forms of aid:

- benefits for job protection;
- reassumed standstill benefits;
- subsidies to cover running costs of business operations;
- exemptions from paying social security contributions.

On April 26, 2021, the next shield: 9.0 was implemented, extending the state aid over 16 new branches. Moreover, since May 4, 2021, exemptions from contributions for March and April had been allowed. That regulation also included benefits for job protection and subsidies to cover the running costs of business operations.

One of the consequences of the COVID-19 pandemic in Poland was intensification of the inflation-related phenomena. On 25 November 2021, the Polish government decided to implement the so-called anti-inflation shield, the aim of which was to curb the dynamics of rising prices for fuels, energy and food. The fiscal activities planned in that area were as follows:



- from 20 December, 2021, the excise tax on fuels is to be lowered for the period of 5 months. Moreover, from January 2022 the tax on retail sales of fuels and the emission fee will also be reduced for a period of 5 months;
- the government will reduce the VAT for natural gas from 23% to 8% and change the excise tax on electric power for households; from March 2022 the VAT for electric energy will drop from 23% to 5%;
- the Polish government wanted to reduce the VAT for food to 0% but the European Commission did not accept this decision. Therefore, the government decided to introduce another form of social benefit called the "food allowance" for a period of 1 year.

In those conditions, the NBP made a decision to raise percentage rates as of 4 November, 2021. Currently the rates are as follows: reference rate 1.75%, *lombard* (pawnshop) rate 2.25% and deposit rate 1.25% per year.

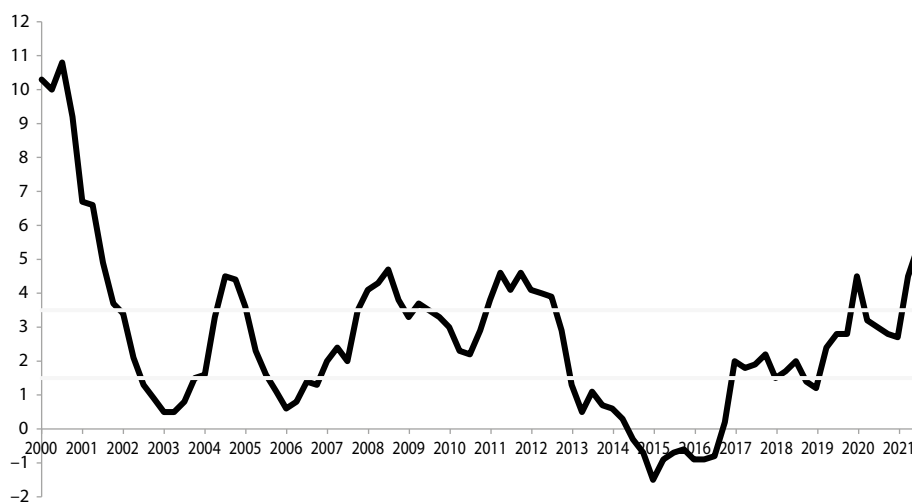
As results from the analysis of all stabilisation programmes introduced in the period of the pandemic, their aim was to prevent the rapid growth of unemployment, curb the dynamics of decline in disposable incomes of consumers, especially those losing their jobs, to improve the liquidity of companies and reduce of the number of bankruptcies. Those activities should result in a slowdown in the rate of GDP decline. No other stabilisation goals were set, especially as regards inflation, state budget results or macro-economic equilibrium in foreign relationships.

The programmes are dominated by fiscal instruments, mainly covering the increase in expenditures on subsidies and consumer transfers, investment activities in the public sector, and health protection, especially to fight the coronavirus. This means that in those activities, much less attention was paid to the budget income sphere, which in consequence, leads to a rapid growth of budget deficit in relation to the GDP and an increase in public debt. The monetary policy conducted in the period of the pandemic mainly included lower interest rates for commercial banks and thus, lower interest rates for their lending and deposit operations. Moreover, facilitations in loan repayments were introduced, such as the extension of loan repayment periods and the loan guarantee system. Therefore, it may be stated that those activities did not restrict inflation processes but, to the contrary, they were a factor stimulating the dynamics of price growth.

As shown by the first assessments, the introduced anti-inflation measures may cause a drop in inflation within a short period, because the dynamics of the VAT and excise tax for electricity and gas could reduce it (Ogórek & Bryła, 2021, pp. 16, 17). Implementation of the food shield tax in the amount of PLN 5 bln, in turn, could lead to increased demand and wage pressures, which will accelerate inflation. Pro-inflation effects may also result from the implementation of *Polski Ład* (the Polish Deal). On the other hand, a delayed reaction to the climbing inflation on the part of the central bank may be unable to restrain the growth of wages and social benefits, which could reinforce inflation and therefore, make its control difficult in the long-run.

### 3. Empirical analysis regarding the role of anti-inflationary policy instruments in Poland between 2000–2021

In Figure 1, it is demonstrated how the inflation processes developed in Poland's economy in the years 2000–2021 compares to the NBP inflation target (1.5%–3%). A rough analysis proves that the inflation target was not always reached. Inflation slipped out of the allowed fluctuation band adopted by the NBP.



**Figure 1. Development of inflation in Poland over the quarter I 2000—quarter III 2021 period, derived from the CPI on a quarterly basis (analogical period of the previous year = 100) compared to the NBP inflation target**

Source: Authors' own calculations based on data from the Central Statistical Office.

The research covered 87 quarters. More detailed data analysis showed that during 54 quarters, the CPI inflation index reached values outside the inflation target; more precisely, for 26 quarters, it was above that level, and for 28 quarters, it was below the target, with 9 quarters of deflation observed in Poland. This means that in the analysed period, the NBP effectiveness in inflation targeting reached the level of 62%.

On the basis of econometric analysis, at the next stage of research, an attempt was made to assess the role of monetary and fiscal policy instruments in restricting inflation in Poland's economy.

Out of the available time series showing measurable effects in the area of price stability and reflecting anti-inflation policy measures (including monetary and

fiscal policies), the following data for the quarter I 2000-quarter III 2021 period were used in the analysis:

- index of price dynamics for consumer goods and services CPI calculated in quarterly terms (analogical period of the previous year = 100);
- NBP reference rate indicating changes in the yield on the NBP cash vouchers issued within the framework of open market operations (data presented in %, on a quarterly basis, according to the state at the end of the period);
- money supply dynamics index M3 calculated on a quarterly basis (analogical period of the previous year = 100)<sup>1</sup>;
- budget incomes (data in millions PLN, presented on a quarterly basis, according to the state at the end of the period);
- budget expenditures (data in millions PLN, calculated on a quarterly basis, according to the state at the end of the period).

All the data were collected from the base of the Central Statistical Office (GUS).

An econometric analysis of the time series should be based upon correctly prepared empirical data. Due to this fact, the source material, broken down into quarters, was subject to decomposition. From the initial series of data, (i.e. CPI inflation dynamics indices, M3 money supply dynamics indices, budget nominal incomes and expenditures), seasonal and random fluctuations were removed by means of the TRAMO/SEATS procedure, applied and recommended by Eurostat. As regards the variable characterising open-market operations, i.e. reference rate, no decomposition was necessary due to the specific nature of this variable, which is shaped administratively by the central bank (Kruszka, 2002, pp. 135–136). The next step of the research was to check whether the time series were stationary.

The stochastic process  $\{x_t\}$ , which generates dynamic numerical data, is stationary, when after a change at the beginning of the process  $\{x_t\}$  from  $x_1$  to  $x_m$ , the mean, variance and auto-covariances of the process  $\{x_{t+m}\}$ , are the same as those in the process  $\{x_t\}$ . Non-stationarity of the variables means that it is impossible to perform reliable econometric modelling (conclusion formulating, forecasting) because significance tests of the explanatory variables are based, among others, on the assumption of time series' stationarity. The stationarity of the series was examined by means of the ADF (Augmented Dickey-Fuller test), with the level of significance set at 0.05. In some cases, the test results dictated a necessity to

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<sup>1</sup> This choice was justified by research conducted by the European Monetary Institute, replaced in 1998 by the ECB). According to the results of those studies, narrow aggregates are easier to control by short-term nominal interest rates, however, they are volatile and thus, difficult to use in forecasting the future level of prices. As for wide money aggregates, it was found that, on the one hand, they are more difficult to monitor over a short period but, on the other, they possess more informative content, useful in forecasting the price level in the medium-term; besides, they were regarded as more stable (Szelağ, 2003, p. 25).

assume the null hypothesis and regard certain series as non-stationary. Due to this fact, the initial data were replaced with the first<sup>2</sup> or subsequent differences in their expressions to remove non-stationarity and conduct the ADF test again. The results of the ADF tests for the accepted series are presented in Table 1.

**Table 1. Results of ADF test for the studied time series in Poland during the quarter I 2000—quarter III 2021 period**

Variable	Designation of variable in model	ADF with trend and constant	ADF with constant	Conclusion
CPI	CPI	p = 0.4244	P = 0.08888	Non-stationary series
	dCPI (y)	p = 0.00605	p = 0.001585	Stationary series
Reference rate	STOPAR (s)	p = 0.03716	p = 0.01074	Stationary series
M3 Money supply index	M3	p = 0.2968	p = 0.1541	Non-stationary series
	d_M3(m)	p = 0.000957	p = 7.89e-005	Stationary series
Budget incomes	DOCH	p = 0.9504	p = 0.9973	Non-stationary series
	d_DOCH	p = 0.6569	p = 0.482	Non-stationary series
	d_d_DOCH	p = 0.2555	p = 0.086	Non-stationary series
	d_d_d_DOCH (d)	p = 8.832e-010	p = 1.203e-010	Stationary series
Budget expenditures	WYD	p = 0.5494	p = 0.89	Non-stationary series
	d_WYD	p = 0.7212	p = 0.3935	Non-stationary series
	d_d_WYD (w)	p = 0.004348	p = 0.0003684	Stationary series

Source: Authors' own calculations based on the results of the Gretl programme.

The assessment of impact exerted by the stabilisation policy on macro-economic variables is ambiguous, due to various interdependencies between the decisions of authorities and the course of economic processes. A full image of those dependencies would require construction of the structural macro-econometric model in order to identify which part of changes in basic macro-economic categories results from the impact of the stabilisation policy (Kokoszczński, 2004, p. 180).<sup>3</sup> For both technical and methodological reasons, the construction of such models is not easy, therefore, in contemporary analyses (especially of the monetary policy impact on the economy), researchers use the methodology of multi-equation modelling, applying vector auto-regression models (VAR) in order to estimate the functions of response to the nominal impulse.<sup>4</sup> In this article, the authors made an attempt to measure the relationship between decisions in the area of stabilisation policy and inflation, using the dynamic autoregressive model with distributed lags—ADL.

<sup>2</sup> Differences assume the following form:  $\Delta x_t = x_t - x_{t-1}$ ; where:  $x_t$  is the value of variable in period  $t$ , whereas  $x_{t-1}$  is the value of the variable in the earlier period.

<sup>3</sup> For more on structural models as an instrument to analyze monetary policy, see (Kokoszczński, 2004, pp. 191–195).

<sup>4</sup> This model was proposed by Sims (1980). For more on the methodology of VAR models, see also: Charemza and Deadman (1997, Ch. 6).

This was justified by the authors' wish to find and analyse direct correlations between the chosen pairs of variables, with the omission of all indirect effects resulting each time from mutual links between both economic categories. When modelling the relationships between monetary and fiscal policies and inflation, an assumption was made that the explained variables' level, i.e. changes in CPI inflation index, depend on the current values of the explained variables and on their values from previous periods. Such a response to policy changes needs time, if all of the economic adjustments finally leading to price changes are to take place. As regards the monetary policy effects, in the subject-literature, it is shown that, usually, the maximum response of the most significant economic categories to changes in the monetary policy becomes visible in the medium-term, i.e. with a lag of 1–2 years (Noga, 2008, p. 66; Blanchard, 2011, p. 156). Therefore, an assumption was made that the level of the explained variable could depend on the values of the monetary and fiscal variables lagged by a maximum of 8 quarters.<sup>5</sup> Moreover, the level of the explained variable in the current period was considered to be dependent on their values in the previous period.<sup>6</sup> Adding the lags of the dependent variable to the model makes it possible to obtain considerable inertia of many economic phenomena and to obtain better measures of the estimated models' fit. This part of the econometric analysis was based on the ADL model for many variables:

$$y_t = \sum_{i=0} \alpha_1 s_{t-i} + \sum_{i=0} \alpha_2 m_{t-i} + \sum_{i=0} \alpha_3 d_{t-i} + \sum_{i=0} \alpha_4 w_{t-i} + \sum_{j=1} \beta y_{t-j} + \mu + \varepsilon_t$$

where:

$y$  – the explained variable, i.e. change of CPI inflation index;

$s_{t-i}$ ,  $m_{t-i}$ ,  $d_{t-i}$ ,  $w_{t-i}$  – explanatory variables and their lags (i.e. reference rate, money supply, budget incomes and expenditures);

$\alpha_1$ ,  $\alpha_2$ ,  $\alpha_3$ ,  $\alpha_4$  – regression parameters with the explanatory variables and their lags:  $s$ ,  $m$ ,  $d$ ,  $w$ ;

$y_{t-j}$  – lags of the explained variable;

$\beta$  – regression parameter with lags of the explained variable;

$\mu$  – free expression in the model;

$\varepsilon_t$  – residual component.

An application of the ADL-type model facilitates conducting multiplier analysis which allows to describe the short- and medium-term impact of a given exogenous variable on a given endogenous variable (Kozłowska & Szczepkowska-Flis,

<sup>5</sup> A lagged variable is understood as the one whose impact may become visible after a lag of 1–8 quarters. Therefore, it was assumed that the explained variable's current value ( $y_t$ ) could have been influenced by the past values of explanatory variables from the previous period (from 1 ( $x_{t-1}$ ) – + 8 ( $x_{t-8}$ ) quarters).

<sup>6</sup> The explained variable's lags, analogous to the explanatory variables, were introduced in the models.

2010, p. 212). An effect of change in a given  $x$  for the current changes  $y$  is reflected by the short-term multiplier:  $m_k = \alpha$ , where:  $\alpha$  is a parameter standing at a given  $x$ . If the change of  $x$  persists in the subsequent periods, its impact on variable  $y$  is described by the long-term multiplier:  $m_d = \sum \alpha / (1 - \sum \beta)$ , which defines the force and direction of a long-term relationship between the analyzed variables (Welfe, 2009, p. 203; Kozłowska & Szczepkowska-Flis, 2010, p. 212). As this research is focused on the analysis of those effects of monetary policy which could appear with a maximum lag of 8 quarters, the long-term multiplier was defined as the medium-term multiplier.

The estimation of regression coefficients was conducted by means of the Classical Least Squares method (CLS). An evaluation of diagnostic usefulness regarding the estimated models was based on determining the  $R^2$  coefficient. Using the Student's  $t$ -test, statistical significance of parameters of the models was determined at the level of significance equalling  $p = 0.05$ . The normality of distribution concerning the residual component was verified via the Doornik-Hansen test. The verification of auto-correlation with regard to the residual component and its heteroscedasticity were omitted because the model was estimated along with the standard error resistance option. The results of the model's estimation are presented in Table 2.

**Table 2. Estimation of the ADL model for inflation in Poland**

Explained variable: d_CPI	CLS estimation, observations used 2002:4–2021:3 ( $N = 76$ ), standard error HAC			
Explanatory variables	Regression parameters: $\alpha$ and $\beta$	Standard error	Student's $t$	Value of $p$
STOPAr_4	-0.116108	0.0354792	-3.273	0.0017
STOPAr_8	0.0765809	0.0245177	3.123	0.0027
d_M3_3	0.0925023	0.0218156	4.240	< 0.0001
d_d_d_DOCH_5	8.29672e-05	1.60111e-05	5.182	< 0.0001
d_d_WYD	0.000100220	3.85972e-05	2.597	0.0117
d_d_WYD_8	0.000129214	4.29451e-05	3.009	0.0038
d_CPI_1	1.09728	0.0857813	12.79	< 0.0001
d_CPI_2	-0.914434	0.127974	-7.145	< 0.0001
d_CPI_3	0.676828	0.136580	4.956	< 0.0001
d_CPI_4	-0.737523	0.107132	-6.884	< 0.0001
d_CPI_5	0.570351	0.0930785	6.128	< 0.0001
d_CPI_6	-0.187002	0.0881063	-2.122	0.0377
const	0.0981218	0.0740922	1.324	0.1902
Determination coef. $R$ -squared	0.762623	Corr. $R$ -squared		0.717409
$F(12, 63)$	45.43580	Value of $p$ for test $F$		2.29e-26
Test for normality of residuals distribution, $H_0$ : random component demonstrates normal distribution; test statistics: Chi-square (2) = 2.00476 with $p$ -value = 0.367005.				

Source: Authors' own calculations based on the results from the Gretl programme.

The results of estimations revealed a statistically significant relationship between monetary and fiscal variables, as well as the level of prices. Although the results allowed to indicated significant links between the most important instruments of monetary and fiscal policies as well as inflation, defining the role of stabilisation policy in the process of price stabilisation in Poland requires an answer to the question as to whether the changes introduced in the area of economic policy really exerted an anti-inflationary effect. Parameters of the estimated model were used in an attempt to assess the nature of relations between the variables from the area of stabilisation policy and inflation processes. Values of short- and medium-term multipliers were calculated for the individual variables, which proved to be statistically significant in the model (Table 3).

**Table 3. Short- and medium-term multipliers for the variables explaining inflation processes in Poland in the quarter I 2000–quarter III 2021 period**

Explanatory variable	Short-term multiplier	Medium-term multiplier
Reference rate	0	-0.0799334681496461
Money supply M3	0	0.19
Budget incomes	0	1.677799797775531e-4
Budget expenditures	0.000100220	4.639716885743175e-4

Source: Authors' own calculations.

Taking the direction of relations between the reference rate and the explained variable into account, it can be concluded that the interest rate policy-making was conducive to stabilising prices in Poland. A negative value of the medium-term multiplier means that raising (lowering) the reference rate resulted in a decrease (increase) of the price level. In other words, the relationship between those economic categories was negative. On the other hand, as shown by the estimated model, the direction of the impact regarding changes in money supply on changes in the CPI index was positive: an increase (decrease) in money supply entailed an increase (decrease) of CPI. Therefore, it seems that from the viewpoint of price stabilisation in Poland, the NBP's monetary policy direction was adequate. In the case of both variables, the values of medium-term multipliers are relatively small, which indicates that the relationship between the analysed economic categories is rather weak. This most likely results from the fact that the level of prices does not entirely depend on the central bank's policy. However, such a situation may also occur when under conditions of increasing inflation, the central bank raises interest rates by those less than required due to the rate of inflation, and vice versa. When comparing these results with the conclusions drawn from Figure 1, it may be presumed that, in some periods, the NBP policy was indeed not strong enough, i.e. the increases or decreases of interest rates turned out to be too low, a consequence of which was slipping of the CPI index outside the inflation target. As regards the

monetary variables, the values of short-term multipliers were equal to 0, which seems to be in agreement with the expectations. As mentioned before, the effects of the central bank's decisions become visible with a long delay.

The value of short-term multiplier for budget incomes also equalled 0. This means that there was no statistically significant relationship between the change in budget incomes and the current level of prices. The value of the medium-term multiplier for that variable turned out to be low and positive. This means that the growth of incomes in the budget was a signal of the growth in price dynamics (and vice versa) in Poland's economy. Therefore, it is possible to conclude that an application of such an instrument did not have anti-inflation characteristics. In the case of fiscal expenditures, both short- and medium-term multipliers reached non-zero, positive values. This indicates that the effects of the government's spending policy are noticeable the most quickly and they persist in the medium-term. The direction of the relationship is in agreement with expectations, i.e. an increase in expenditures was accompanied by an increase in price dynamics (and vice versa).

Thus, the parameters of the model confirmed the stabilising nature of the relationship between monetary variables and budget expenditures in the Polish economy.

## Conclusions

The genesis of inflation processes in Poland was interpreted in various ways because, at that time, some explanations were based on monetarist economics (quantity theory of money), while others resulted from Keynesian economics (demand-pull or cost-push inflation). The anti-inflation policy conducted in Poland over the past years was characterised by certain volatility. In the first years of transformation, it played a very important role, but in the period of Poland's integration with the EU, it became of lesser importance and effectiveness. The activities undertaken in this area were dominated by monetary policy instruments, the role of which was relatively significant, especially after the establishment of the Monetary Policy Council. From the beginning of Poland's economic transformation, anti-inflation significance of the fiscal policy was much smaller. Its anti-inflation role increased in the period of difficulties related to COVID-19 pandemic, especially during the rapid growth of budget expenditures due to the escalating level of prices. These conclusions correspond with the results obtained from the econometric analysis conducted for Poland's economy. This analysis allows to indicate that among the applied tools of monetary and fiscal policies, an anti-inflation nature of the relationship was found between both of the monetary policy instruments and prices, and also linking budget expenditures with price level. Changes in budget incomes, in line with the obtained results, were not conducive to price stabilisation in our economy.



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