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M3 as an economic indicator in the Eurozone

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Abstract

The aim of this paper is to analyse the influence of monetary aggregate on economic indicators in the Eurozone. Cointegration, this selected indicator monetary aggregate M3, is demonstrated in relation to the development of Harmonised Index of Consumer Prices (HICP), gross domestic product (GDP), commodity prices and credits using Granger causality. Quarterly data between the years 1996 and 2017 are included in the analysis. Because we did not confirm the long-term relationship of the selected indicators, we continue with Granger causality. We found causal relationships between monetary aggregate M3 and GDP, HICP, commodity prices and credits. In all cases, the selected indicators have the opposite effect in Granger causality too. We also cannot definitely evaluate the effectiveness of the European Central Bank's monetary policy and cannot confirm the use of monetary aggregate M3 as an economic indicator of future economic development in the Eurozone.

Keywords: Eurozone, GDP, Granger causality, HICP, M3, monetary aggregate.

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1. Introduction

The current banking system, the globalisation of the world economy, financial innovation and other factors make it difficult to predict relationships between changes in the amount of money in circulation and macroeconomic variables, which is something that can influence how central banks and other economic entities operate. When implementing monetary policy, central banks try to achieve set targets for regulating changes in the amount of money in circulation. Their aim is to achieve financial and price stability. In addition to these two basic goals, central banks can also set other targets, such as supporting economic growth, exchange rate stability for domestic currency or supporting employment, for example. One of the primary problems of monetary policy is the fact that there is no direct connection between the instruments used by a central bank and monetary policy goals. Central banks achieve their set targets through monetary policy instruments with the help of a transmission mechanism that is active via various monetary policy channels simultaneously. During the financial crisis, the ECB, as did other central banks, began to lower interest rates to achieve an inflation target, which was set at just below 2% Harmonised Index of Consumer Prices (HICP). Because lowering interest rates to 'technical zero' did not result in price level growth, the ECP also needed to consent to an unconventional monetary policy. The ECB chose quantitative easing as its unconventional tool; this began on 22 January 2015 and concerned the planned purchase of securities from the public and private sectors. The reason for dealing with this subject is the fact that central banks are currently conducting or have conducted unconventional monetary policy either via the previously implemented forms of currency intervention or by quantitative easing. Quantitative easing shows up as a large increase in the amount of money in the economy, which should logically be able to be seen in the growth of inflation and other economic variables. The goal of this paper is to investigate the long-term relationships between the M3 monetary aggregate and the HICP, gross domestic product (GDP), commodity prices and bank loans provided to the nonfinancial sector in the Eurozone countries for the years 1996–2017. The long-term relationships will be analysed using testing for Granger causality. Please do not alter the formatting and style layouts which have been set up in the template document. As indicated in the template, papers should be prepared in single column format suitable for direct printing onto A4 paper (8.3 in. × 11.7 in./210 mm × 297 mm). Do not number pages as page numbers will be added later in the publication process. Leave a line clear between paragraphs. Each paragraph is longer than two sentences. Your references should be written in according to the APA six style. Please omit the reference which is not used in your paper. We suggest you to use latest publications at the list of references.

2. The problem statement

Focusing on monetary policy's transmission mechanisms is one possible method for implementing monetary policy. As a part of the operative criteria, it is also possible to monitor certain components of monetary policy together with the monetary base; the money supply, in the form of a selected monetary aggregate, stands out as an intermediate criterion. When it comes to actually implementing monetary policy, the central bank must decide which monetary aggregate (i.e., the money supply) should have the main role. In this case, the central bank should make its decision according to the amount of influence they have on the given monetary aggregate's development, the availability and reliability of quantitative data on the development of the monetary aggregates' individual components, and the link between the monetary aggregate's development and the evolution of the monetary policy's final target.

A prerequisite for approving a monetary aggregate as an intermediate target for monetary policy is a stable relationship between monetary changes and subsequent changes in the price level. In recent years, changes in the financial markets have led to an unstable demand for money in various countries. The result of this unstable demand for money in various countries was that a certain number of central banks backed away from intermediate monetary policy targets in the form of monetary aggregates, and they implemented a new monetary policy regime—inflation targeting. As presented by Svensson (1997; 1999), inflation targeting is based on monetarism and the thesis that monetary policy should aim to maintain price stability. Baltensperger, Jordan and Savioz (2001) mentioned that during the 1970s, many central banks opted for monetary aggregates as intermediate targets. For this reason, monetary aggregates have become an important instrument for conducting monetary policy. The exact details of the individual targets' monetary strategy differ substantially in different countries. The German Bundesbank and the Swiss National Bank were the banks that used money supply targeting as an intermediate goal for the longest period of time. For both of these central banks, their monetary policy was very successful at achieving low inflation for more than 25 years after the collapse of the Bretton Woods system.

Baltensperger et al. (2001) analyse the relationship between the M3 monetary aggregate and inflation in Switzerland for the years 1978–1999. From this analysis, conducted using time series cointegration and an error correction model, they came to the conclusion that a relationship does exist between the M3 monetary aggregate and inflation. Other authors who have dealt with the relationship between M3 and inflation are Lutkepohl and Wolters (1998); they composed a small dynamic macroeconomic model investigating the dependence between interest rates, the growth of the M3 monetary aggregate, real growth and inflation. On the basis of cointegration analysis using quarterly data from Germany for 1976–1996, the authors come to the conclusion that the M3 monetary aggregate is an important indicator for controlling the inflation. The authors composed a vector error correction model for M3, GDP, inflation rate and interest spread. From these analyses, the influence of the money supply and inflation is not completely evident in Germany nor is the possibility of influencing inflation via the M3 monetary aggregate. In 1998, the ECB decided to reinforce the role of money as part of its implementation of monetary policy; this consisted of a more thorough analysis of monetary aggregates and providing other information for monetary policy decision making. The ECB's decision led to increasing interest by many authors who had previously dealt with the influence of monetary aggregates on the future price development. Gerlach and Svensoon (2003), Trecrosi and Vega (2002) and Nicoletti Altimari (2001) have investigated the relationship between the M3 monetary aggregate and inflation using a VAR model and Granger causality. Gottschalk, Van Zandweghe and Martinez Rico (2000) predict the influence of monetary aggregates using bivariate VAR models. King and Levine (1993) have dealt with the existence of a relationship between the M3 monetary aggregate and GDP; using sensitivity analysis, they show that the monetary aggregate influences economic growth for 80 of the world's countries from 1960 to 1989. Time series cointegration and an error correction model are used by Miller (1991) in his analysis of data for the USA for 1959–1987. The study which consists of 87 developed and developing countries adapted from Law and Singh (2014) provides a new evidence on the relationship between finance and economic growth using an innovative dynamic panel threshold technique. Their findings reveal that more finance is not necessarily good for economic growth and highlight that an 'optimal' level of financial development is more crucial in facilitating growth. Arnostova and Hurnik (2005) use VAR models for their analysis and try to evaluate the effect of an exogenous shock on monetary policy with their help. The results show that unexpectedly toughening monetary policy leads to a drop in economic performance, whereas prices remain the same for a longer period.

3. Data and methodology

3.1. Data

We conducted this analysis for the Eurozone on the variables of the M3 monetary aggregate, real GDP, HICP, bank loans provided to the private nonfinancial sector (hereinafter just 'loans') and the price of commodities (expressed using the Global Price Index of All Commodities). The time series that we have used encompass quarterly data for the period of the first quarter of 1996 through to the second quarter of 2017. This is a total of 86 observations. The data for GDP and M3 have been adjusted for seasonal influence but we used data that were not seasonally adjusted for HICP and the price of commodities. We obtained the quarterly data for HICP and the adjusted GDP data from Eurostat statistics (Eurostat, 2017a; 2017b). We obtained adjusted quarterly data for the M3 monetary aggregate from the OECD (2017). We derived the size of loans in the Eurozone countries from the statistics of the Bank for International Settlements (2017). We derived the price of commodities, i.e., the Global Price Index of All Commodities, reported by the International Monetary Fund, from the statistics of the Federal Reserve Bank of St. Louis (FRED, 2017). We conducted statistical analysis in the program Gretl 1.9.4 for econometric analysis. Table 1 presents a description of the variables used in the time series analysis.

Table 1. Description of the variables used for analysis

Variable abbreviation	Description of variable
M3_EA	The M3 monetary aggregate
GDP_EA	Gross domestic product in the Eurozone
HICP_EA	Inflation in the Eurozone
CRED_EA	Loans provided by banks to the nonfinancial sector in the Eurozone
COIN	Global Price Index for All Commodities

We conducted logarithmic transformation on the time series in order to obtain a log-normal distribution for the time series. The time series that has undergone logarithmic transformation is labelled l_M3_EA, l_ GDP_EA, etc. As part of the augmented Dickey–Fuller (ADF) tests and when testing for Granger causality, we worked with time series that we had differenced. We labelled the first differences of these time series d_l_M3_EA, d_l_GDP_EA, etc.

3.2. Methodology

To analyse the time series, we use the Engle–Granger (EG) test, which establishes whether or not there is a cointegration relationship between the time series under examination. Before starting this test, the model's prerequisites need to be met: the optimal lag length needs to be determined and the data being used needs to be stationary. The optimal lag length is determined using the Hannan–Quinn information criterion (HQC). We look for the lowest value for the information criterion; this is then used in the following steps (Cernohorsky, 2017). The time series' stationarity is determined using the ADF test. If the null hypothesis is not rejected, the time series is non-stationary. In the next step, we modify the time series using differencing and repeat the ADF test. If the difference between a time series modified this way is stationary, we proceed to conduct the actual EG test. We use Granger causality to observe the mutual relationships between the monitored variables. If the time series is not cointegrated, we test for Granger causality to determine if the causal ties between the variables show two-way causality. We have used the procedure presented in Cernohorska and Kula (2017) for the analyses mentioned.

First, the time series that has been presented here are always tested for optimal lag length. The lag length is determined according to where the lowest information criterion value is located. Lag lengths determined in this way are subsequently used in further testing. The appropriate criterion depends on the number of observations. As Liew (2004) and Gottschalk et al. (2000) state, it is appropriate to use the Akaike information criterion or its alternative, the Bayes information criterion, for determining optimal lag length when there is a low number of observations (lower than 60). We use the HQC when the best lag (used later in the subsequent tests) is always taken to be the lowest HQC value. The time lag between when a macroeconomic shock or other adverse condition is recognised by central banks and the government, and when a corrective action is put into place. The response lag may be short or long, depending on whether policymakers have a definite course of action or must deliberate on the right action to take (Mankiw, 2014).

$$\mathrm{HQC} = n * \ln\left(\mathrm{RSS} / n\right) + 2k\mathrm{cln} \tag{1}$$

The tests are conducted on the basis of the relationship between the values in Eq. (1), where RSS is residual sum of squares, *k* expresses the number of parameters, RSS/*n* denotes residual variance, *c* is the added constant and *n* is the number of observations (Arlt & Arltova, 2007).

Distinguishing between types of time series as stationary and non-stationary is very important when examining their relations, as the use of non-stationary time series could result in a situation which is referred to as apparent or senseless regression.

There are several statistical tests to determine the order of integration, known as unit root tests. Here, we have employed the probably most widely used of them, which is known by the name of its creators, the Dickey–Fuller test (hereinafter referred to as the ADF test). This test then is used to analyse whether the time series is of type I (0)—stationary or I (1)—non-stationary.

The analysis was conducted in the Gretl 1.9.4 program for econometric analysis; this program makes it possible to conduct an augmented Dickey–Fuller test for this case.

Three versions of the ADF test are commonly used for verifying hypotheses—one with a constant, one without a constant and one with both a constant and a trend. When testing, we used the assumption that the process listed below (Eq. (2)), where we test that *O* = 0 (the variable contains a unit root), takes the following form (Arlt & Arltova, 2007):

$$\Delta X_t = \left(\phi_1 - 1\right) X_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta X_{t-i} + e_t \qquad (2)$$

where X_t expresses the dependent variable, *p* lag and e_t the residual term. Deciding on the stationarity—or the non-stationary—of a time series will be conducted by evaluating the *p* values (the level of significance is in this paper always set at 0.05), which thus establishes whether the null hypothesis is rejected or accepted with 95% probability. For this test, this is formulated as follows:

H_0: the tested series is non-stationary (a unit root exists)

H_1: the tested series is stationary (a unit root does not exist)

Since non-stationarity can be assumed for the series analysed, and the said apparent regression cannot arise when using a stationary time series (the type I (0) series), the option is offered here to remove it by differencing (stationing) individual analysed series. However, research carried out by authors such as Banerjee and Newbold (1993) have demonstrated that this path cannot proceed because it will result in the loss of important information on long-term relationships between the properties of time series. For the analysis of unsteady relationships between series, the EG test (Engle & Granger, 1987), was therefore used, which is able to analyse cointegration of non-stationary time series according to the following hypotheses:

H_0: Test series is not cointegrated

H_1: Test series is cointegrated

Decisions on the relationship between time series are based on *p* values defined by the EG test. If the null hypothesis ($p > 0.05$) is not rejected, the time series will be identified as non-cointegrated—thus, for series between which there is no long-term relationship, or for series which contains no common element and examining them as a system is irrelevant since they have developed over the long term independently. Otherwise (in cases where $p < 0.05$) the time series will be identified as cointegrated; i.e., for series between which a long-term relationship can be demonstrated at a level of significance.

Very often VAR models are used to test mutual relationships between variables. The concept of causality, which was introduced by Granger (1969) and Sims (1972), is used in the econometric analysis. Whether the investigated variables are endogenous can be tracked in the simplified two-equation model. The reason for testing causal relationships (i.e., causality) according to Granger's definition is to determine whether certain variables' changes come before the changes of other variables. Which variable is the cause and which is the result is not determined. Granger (1969) proposed simple testing procedures for verifying the validity of the two conditions listed above, which are derived from the VAR models. When testing the hypotheses, the following apply:

H_0: the variable X_t does not Granger-cause the variable Y_t.

H_1: the variable X_t does Granger-cause the variable Y_t.

4. Results and findings

4.1. Testing for optimal lag length using the HQC

The first analysis investigates the influence of M3 monetary aggregate development on the development of the GDP, HICP, credits and commodity prices in the Eurozone. The model is based on the assumptions listed in Section 3. On the basis of the theoretical model, the first prerequisite before determining the time series' cointegration is the test verifying optimal lag length. The optimal lag length is determined using information criteria in a dynamic regression equation. The HQC were used for the dependent variable to determine optimal lag. It is necessary to test the time series for optimal lag before using the EG test, where the dependent variables are the value of GDP, HICP, credits and commodity price. Tables 2 and 3 list the values of the HIC criterion for six lag lengths (the lowest value is always shown in bold type). On the basis of the lowest value found for the information criterion, an optimal lag length of six is specified for the dependent variables of the GDP, HICP, credits and commodity price, which were determined for the HQC. This lag will be taken into consideration in the subsequent tests.

Table 2. Results of optimum lag for HQC for M3 and selected indicators—test with constant

Order of lag	l_GDP_EA	l_HICP_EA	l_CRED_EA	l_COIN_EA
1	−7.346893	−8.23022	−2.95907	−1.69455
2	−7.862530	−8.22756	−−2.9211	−1.79747
3	−7.821694	−8.20834	−2.88553	−1.81013
4	−7.783492	−8.22043	−2.86039	−1.76258
5	−7.75418	−8.35156	−2.82705	−1.72708
6	−7.714259	−8.33128	−2.8139	−1.69966

Table 3. Results of optimum lag for HQC for M3 and selected indicators—test with constant and trend

Order of lag	l_GDP_EA	l_HICP_EA	l_CRED_EA	l_COIN_EA
1	−7.34615	−8.20148	−3.05858	−1.6583
2	−7.82885	−8.19211	−3.02072	−1.76393
3	−7.78801	−8.1792	−2.98409	−1.76133
4	−7.74958	−8.18368	−2.95391	−1.72606
5	−7.72117	−8.335915	−2.93025	−1.69091
6	−7.68094	−8.30468	−2.90164	−1.66272

4.2. Verifying the stationarity of the time series—ADF test

Possible non-stationarity of data can lead to apparent regression; the difficulty with this lies mainly in the fact that using the least squares method would make it possible to obtain statistically significant parameter estimates of the regression function—even though the time series analysed do not relate to each other. For this reason, it is necessary to test the time series used here with the help of an augmented Dickey–Fuller test. The results of the ADF test for a unit root are shown in Table 4 (where all *p*-values for each parameter of the variables analysed are displayed successively).

Table 4. The results of the augmented ADF test for a unit root

Time series	Value of *p*—parameter	Evaluation of ADF test results	H_0
l_GDP_EA	0.3835	Time series non-stationary	Not refused
l_HICP_EA	0.6954	Time series non-stationary	Not refused
l_CRED_EA	0.4065	Time series non-stationary	Not refused
l_M3_EA	0.9425	Time series non-stationary	Not refused
l_COIN_EA	0.6386	Time series non-stationary	Not refused

As can be seen here, for time series with absolute values, all-time series at a significance level of 0.05 were marked as non-stationary. Non-stationarity of the time series means that illusory correlation could occur when conducting correlation analysis. Stationarity for all the time series was achieved only after they had been differenced; the time series is then integrated at the order of *I*(1) (Table 5).

Table 5. The results of the augmented ADF test for a unit root—first difference

Time series	Value of *p*—parameter	Evaluation of ADF test results	H_0
d_l_GDP_EA	0.01411	Time series stationary	Refused
d_l_HICP_EA	0.03171	Time series stationary	Refused
d_l_CRED_EA	1.549e-006	Time series stationary	Refused
d_l_M3_EA	0.01298	Time series stationary	Refused
d_l_COIN_EA	1.021e-005	Time series stationary	Refused

On the basis of these results (see Table 5), we proceeded to the cointegration test. We conducted the cointegration test using the EG test. For this test, it is necessary for the original time series to be non-stationary and to have the same order of integration.

4.3. Cointegration analysis—the Engle–Granger test

Cointegration relationships can be active in both directions. For this reason, it is necessary to conduct the cointegration test for all the dependent and independent variables on each other reciprocally, i.e., for M3 as an independent variable and GDP as a dependent variable, as well as for M3 as a dependent variable and GDP as an independent variable. The results of the EG test are depicted in Table 6. The first variable listed is the dependent variable and the second is the independent variable. As can be seen, the *p*-value of the parameter identified all pairs of time series as non-integrated at a significance level of 0.05; thus, for the series which has no relationship between them.

Table 6. The results of the Engel—Granger cointegration test

Time series	Value of *p*—parameter	Conclusion	H_0
l_M3_EA/l_HDP_EA	0.6088	No cointegration	Refused
l_HDP_EA/l_M3_EA	0.3980	No cointegration	Refused
l_M3_EA/l_HICP_EA	0.1964	No cointegration	Refused
l_HICP_EA/l_M3_EA	0.2318	No cointegration	Refused
l_M3_EA/l_CRED_EA	0.3877	No cointegration	Refused
l_CRED_EA/l_M3_EA	0.3944	No cointegration	Refused
l_M3_EA/l_COIN_EA	0.5810	No cointegration	Refused
l_COIN_EA/l_M3_EA	0.7312	No cointegration	Refused

4.4. Granger causality test

When testing for Granger causality, just as for cointegration, we must test the variables' two-way influence. For this reason, we test all dependent and independent variables for Granger causality in both directions. We conduct the testing using VAR models, where we use the longest possible time lag that can be interpreted economically. Therefore, we have allowed for a maximum lag of six quarters. For Granger causality, we test the model with a constant or with a constant and a trend corresponding to the results of the test for optimal lag length, i.e., the minimum HQC (4.1.) value. The results of Granger causality for M3 and GDP, HICP, the price of commodities and loans in the Eurozone countries are depicted in Tables 7–10. We have marked the significant coefficient at the relevant level of significance with a star—0.01 (***), 0.05 (**) and 0.1 (*). Regarding the results, only *p*-values less than 0.05 (i.e., ** and ***) are of interest to us.

Table 7. The results of the Granger causality test—M3 and GDP

M3_EA/GDP_EA	*p*-value		H_0	GDP_EA/M3_EA	*p*-value		H_0
d_l_GDP_EA_1	1.9E-07	***	Refused	d_l_M3_EA_1	2.2E-06	***	Refused
d_l_GDP_EA_2	0.9538		Not refused	d_l_M3_EA_2	0.5619		Not refused
d_l_GDP_EA_3	0.8647		Not refused	d_l_M3_EA_3	0.3649		Not refused
d_l_GDP_EA_4	0.3851		Not refused	d_l_M3_EA_4	0.0003	***	Refused
d_l_GDP_EA_5	0.7949		Not refused	d_l_M3_EA_5	0.0377	**	Refused
d_l_GDP_EA_6	0.6255		Not refused	d_l_M3_EA_6	0.7894		Not refused

Table 8. The results of the Granger causality test—M3 and HICP

M3_EA/HICP_EA	*p*-value		H_0	HICP_EA/M3_EA	*p*-value		H_0
d_l_HICP_EA_1	0.1248		Refused	d_l_M3_EA_1	5.2E-06	***	Refused
d_l_HICP_EA_2	0.8757		Refused	d_l_M3_EA_2	0.5889		Not refused
d_l_HICP_EA_3	0.3091		Not refused	d_l_M3_EA_3	0.3288		Not refused
d_l_HICP_EA_4	0.0005	***	Refused	d_l_M3_EA_4	0.0007	***	Refused
d_l_HICP_EA_5	0.3868		Not refused	d_l_M3_EA_5	0.0326	**	Refused
d_l_HICP_EA_6	0.1507		Not refused	d_l_M3_EA_6	0.7638		Not refused

Table 9. The results of the Granger causality test—M3 and credits

M3_EA/CRED_EA	p-value	H_0	CRED_EA/M3_EA	*p*-value		H_0
d_l_CRED_EA_1	0.9592	Not refused	d_l_M3_EA_1	2.0E-05	***	Refused
d_l_CRED_EA_2	0.5991	Not refused	d_l_M3_EA_2	0.6867		Not refused
d_l_CRED_EA_3	0.6397	Not refused	d_l_M3_EA_3	0.4002		Not refused
d_l_CRED_EA_4	0.1999	Not refused	d_l_M3_EA_4	0.002	***	Refused
d_l_CRED_EA_5	0.4173	Refused	d_l_M3_EA_5	0.0367	**	Refused
d_l_CRED_EA_6	0.105	Not refused	d_l_M3_EA_6	0.6778		Not refused

Table 10. The results of the Granger causality test—M3 and commodity prices

M3_EA/COIN_EA	*p*-value		H_0	COIN_EA/M3_EA	*p*-value		H_0
d_l_KOIN_EA_1	0.0006	***	Refused	d_l_M3_EA_1	3.62E-06	***	Refused
d_l_KOIN_EA_2	0.0694	*	Not refused	d_l_M3_EA_2	0.5993		Not refused
d_l_KOIN_EA_3	0.9202		Not refused	d_l_M3_EA_3	0.394		Not refused
d_l_KOIN_EA_4	0.5311		Not refused	d_l_M3_EA_4	0.0006	***	Refused
d_l_KOIN_EA_5	0.2143		Not refused	d_l_M3_EA_5	0.0544	*	Not refused
d_l_KOIN_EA_6	0.5069		Not refused	d_l_M3_EA_6	0.6701		Not refused

5. Conclusion

On the basis of the analyses, we have determined that all the time series examined are not cointegrated, i.e., there are no long-term relationships between them. Thus, we can state that the M3 monetary aggregate does not have an effect on even one of the economic values observed. Using Granger causality, we can state that the M3 variable Granger-causes GDP with a lag of one quarter.

We can also state that GDP Granger-causes M3 at 1, 4 and 5 lags. From the results of the M3 variable, we came to the conclusion that it Granger-causes HICP with a lag of four quarters. At the same time, we can state that the variable HICP Granger-causes M3 at 1, 4 and 5 lags. From the results of the M3 variable, we can state that it does not Granger-cause loans. At the same time, we concluded that the variable of loans does Granger-cause M3 at 1, 4 and 5 lags. In the wake of the results of the Eurozone countries, we found that the M3 variable Granger-causes the price of commodities with a time lag of one quarter. At the same time, we came to the conclusion that the price of commodities Granger-causes M3 at 1 and 4 lags. From the above, it follows that using the variables of GDP, HICP, loans and the price of commodities can improve our prediction of the development of M3, always using the time lags mentioned above.

From these conclusions, it follows that it is not possible to definitely prove the causality of the M3 monetary aggregate's influence on GDP, HICP, loans and the price of commodities in the Eurozone countries. Thus, we also cannot definitely evaluate the effectiveness of the European Central Bank's monetary policy and cannot confirm the use of monetary aggregate M3 as an economic indicator of future economic development in the Eurozone. The conclusions that were determined will be further processed as part of ensuing time series analysis because it will certainly be interesting to follow the economic impacts of other central banks' (un)conventional monetary policy over a longer time period. A further subject for investigation will be not merely testing the influence of the M3 monetary aggregate on economic variables but the attempt to find other exogenous variables (e.g., interest rates) that are able to affect the selected economic variables.

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