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MONEY SUPPLY GROWTH AND INFLATION – THE MONETARY POLICY STRATEGY OF THE EUROPEAN CENTRAL BANK[1]

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Abstract

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The main aim of this article is to find out whether there is a significant relationship between money supply growth and inflation in the Eurozone. For this reason, the monetary policy strategy of the European Central Bank (ECB) has been evaluated. Since the establishment of the ECB in January 1999 to May 2003 the ECB‘s monetary policy strategy consisted of three main elements: a quantitative definition of price stability, a prominent role for money in the assessment of risks to price stability (aggregate M3 as a reference value), and a broadly based assessment of the outlook for price developments. Nevertheless, since May 2003 M3 or any other monetary aggregate has lost its prominent role in the ECB‘s strategy. Therefore the nowadays ECB‘s monetary policy strategy consists of a quantitative definition of the primary objective of price stability and an analytical framework based on two pillars – economic analysis and monetary analysis. These two pillars are used by the ECB‘s Governing Council in the overall assessment of risks to price stability and in monetary policy decisions.
The empirical part of this article is based on time series correlation between money supply growth and inflation in selected member countries of the Economic and Monetary Union (EMU - Eurozone) during the period 1995–2005. The time series are divided into two parts. The first part covers data for selected member countries of the European Union from 1995 till 1998, i.e. before the establishment of the EMU. Whereas the second part includes data for the whole Eurozone since its official start in 1999 to 2005. The time series are adjusted by SARIMA models.

growth rate of the money stock, inflation, ECB, monetarism, time series correlation

The Treaty establishing the European Community (Article 105) defines *“The primary objective of the ESCB shall be to maintain price stability. Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Community with a view to contributing to the achievement of the objectives of the Community as laid down in Article 2.”* Article 2 describes secondary objectives as *“harmonious, balanced and sustainable development of economic activities, a high*

1 It is revised version of the paper, which was presented on 60th International Atlantic Economic Conference, New York, /USA/, 6.–9. October 2005

2 The results introduced in the article are outcomes of the research intent No. MSM 6215648904, thematic area “Macroeconomic and microeconomic performance of the Czech economy, and the Czech government’s economical-political measures in the context of the integrated European market.” The holder of the research intent is Mendel University of Agriculture and Forestry Brno, Faculty of Business and Economics. Both authors are the members of the research team.

level of employment and of social protection, equality between men and women, sustainable and non-inflationary growth, a high degree of competitiveness and convergence of economic performance, a high level of protection and improvement of the quality of the environment, the raising of the standard of living and quality of life, and economic and social cohesion and solidarity among Member States." The primary objective of the European System of Central Banks (ESCB) is determined on the basis of growth of Harmonized Index of Consumer Prices (HICP) below 2% annually. The ECB interprets this primary objective as a target range of inflation of 0% to 2% (De Grauwe, 2005, pp. 185).

The common monetary policy is based on two pillars. The first one, called economic analysis, identifies short to medium-term risks to price stability and makes projections of key macroeconomic indicators. The second one is associated with monetary analysis. The monetary analysis is based on the presumption that money supply growth and inflation are in the medium to long run closely related. The monetary aggregate M3 is used by the ECB as a 'reference value'[3]:

$$\Delta M = \Delta YR + \Delta P - \Delta V,$$

where ΔM is the money supply growth rate, ΔP is the inflation, ΔYR is the real GDP growth and ΔV is the velocity of money. The derivation of the inflation is defined as the HICP for the euro area below 2% p.a. The assumption of 2–2,5% p.a. was made for the potential GDP growth for the euro area and for the velocity of circulation of M3 in the range of 0,5–1% p.a. The estimation is based on complex money demand models. In order to assess monetary developments, the Governing Council has announced a reference value for the growth of the broad monetary aggregate M3. This reference value refers to the rate of M3 growth that is deemed to be compatible with price stability over the medium term. The reference value is derived in a manner that is consistent with and serves the achievement of the Governing Council's definition of price stability on the basis of medium-term assumptions regarding trend in real GDP growth and the trend in the velocity of circulation of M3. Substantial or prolonged deviations of M3 growth from the reference value would, under normal circumstances, signal risks to price stability over the medium term. However, monetary policy does not react mechanically to deviations of M3 growth from the reference value. At present, this reference value is 4.5% (ECB, 2004, pp. 64)[4].

The macroeconomic theory states, that when the growth of money supply results in the situation that the quantity of money supplied is maintained in excess of the quantity demanded, then the necessary sufficient condition for inflation will exist. But there is no significance**,** that only growth of the money supply influences the inflation. The existence of many factors affecting money supply and demand on one side and common monetary policy of the ECB itself which also affects the monetary base in the EMU creates considerable problem with identification of causality between both variables. On the other hand, various articles and empirical studies identifying the existence of relationship between money supply growth and inflation were published**.** The ECB states, that there exists *"stable relationship between nominal money balances and prices in the euro area in the medium to long term."* (ECB, 2004, pp. 63). Taylor quotes, that higher money supply growth is associated with higher inflation. This relation he identified for Germany, United Kingdom, Italy, France, Canada, United States and Japan during the period 1973–1991 (Taylor, J. B., 2004, pp. 565). The analysis based on the data provided by IMF (International Monetary Fund) for 15 countries during years 1980–1985 proved also the interdependence between inflation and money supply growth changes (Black, T., Daniel, D.; 1998, pp. 423). Similar results are also provided by Paul De Grauwe in his study which covers a 30-years period and more than 100 countries. His results confirm a significant correlation between the two above-mentioned variables. However, this correlation is already impossible to identify in countries with low inflation (5% and less). Given phenomenon can be explained by the existence of spurious regression caused by noise in the data. Moreover, it is assumed, that the noise in data is higher for low-inflation countries than for high-inflation ones.

On the basis of above mentioned finding's the authors deal with the question, if the monetary analysis is a relevant pillar of the ECB's common monetary policy. The aim of this article is neither the detailed analysis of supply and demand side of monetary policy, nor the analysis of impact of common monetary policy on inflation or the analysis of inflation itself. The aim is to find out whether there is a relationship between money supply growth and inflation in selected member states of EU and Eurozone. Empirical analysis therefore tests

3 The ECB highlights that the money supply figure would not be considered as a target, but rather as a 'reference value'

4 On 8 May 2003, after four years experience conducting monetary policy, the Council of ECB has announced a significant change in its monetary policy strategy. The revised strategy contains two important alterations. First, there has been a change in the definition of price stability that leaves it both more precise and more relaxed. Second, the special importance of money growth in appraising the danger to price stability has been abandoned (Sibert, 2003).

a hypothesis of time series correlation between two variables – money supply growth and inflation.

METHODS AND DATA

Data entering the analysis are divided into two subperiods. The period 1995 till 1998 encompass the data for individual member countries of EMU[5]. Since January 1999 the data are aggregated for the Eurozone as a whole. Empirical analysis uses monthly percentage growth of the monetary aggregate M3, from Eurostat database in millions of national currency or euro (for Eurozone countries). Authors use seasonally adjusted data, to separate seasonal information from the time series. To measure inflation, the harmonized indices of consumer prices (monthly rate of change), will be used.

Econometrics offers three methods for analyzing relation between two time series - regression, correlation and cointegration analysis. To identify various lags between the time series the authors use correlation analysis.

However, time series correlation covers the problem of spurious regression. This problem arises if both time series involved exhibit strong drift (trend in most cases) then the high correlation coefficient is observed due to the presence of the drift of the trend and not as a result of interdependence between these two time series (Guajarati, 1995; pp. 709 or Hindls, 2000; pp. 163). The principal reason for spurious regressions existence in this empirical analysis is the noise. *"In a low-inflation environment where inflation is only a few percent a year, the observed differences in the money supply growth numbers contain mostly noise, and say little about differences in monetary policies (the signal)."* (De Grauwe, 2005; pp. 194). The source of non-stationarity could be also growth of the GDP, changes in money supply and demand, inflation pressures, changes in expectations about future inflation, asymmetries in the monetary transmission mechanism among EMU member countries etc.

The basic precondition for application of the time series correlation analysis is the stationarity of time series. The stationarity supposes a stochastic process with the constant mean and variance over time and also anticipates that the value of covariance between two time periods depends only on the distance or lag between the two time periods and not on the actual time for which the covariance is calculated. To explain the stationarity of the time series let Y_t be a stochastic time series with following characteristics:

$$E(Y_t) = \mu$$
$$\text{var}(Y_t) = E(Y_t - \mu)^2 = \sigma^2$$
$$\gamma_k = E[(Y_t - \mu)(Y_{t+k} - \mu)],$$

where γ_k (the covariance at lag $\underline{k}$) is the covariance between the values of Y_t and Y_{t+k}, that is, between two Y values $\underline{k}$ period apart.

To test the spurious regressions existence, the authors chose the Dickey-Fuller test of the stationarity. It is based on the test of the unit roots ($\underline{p}$) in time series (Bierens, 1999; pp. 1):

$$Y_t = \rho Y_t - 1 + u_t,$$

where the u_t is stochastic error. If we actually find that $p = 1$, then we can say that the stochastic variable Y_t has a unit root. A time series that has a unit root is known as a random walk. The augmented Dickey-Fuller test (ADF test) is used in these three forms, where $\delta = (\rho - 1)$:

$$\Delta Y_t = \delta Y_{t-1} + u_t$$
$$\Delta Y_t = \beta 1 + \delta Y_{t-1} + u_t$$
$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + u_t.$$

The parameters of the ADF test are selected according to the Akaike, Hannan-Quinn and Schwarz information criteria (Bierens, 2004; pp. 1–6).

The reduction of the drifts and trends from time series will be made with the processes SARIMA[6] (p, d, q) $(P, D, Q)_s$, where θ represents a constant term: [7]

$$Y_t = \theta + \alpha_1 Y_{t-1} + \beta_0 u_t + \beta_1 u_{t-1}.$$

5 For the years 1995–1998 comparable data were available only for Belgium, France, Netherlands, Italy, Germany, Ireland, Spain, Austria and Finland. There are no comparable data for Luxembourg and Portugal. In the case of Greece, there is no assurance that the data presented by the Greek Statistical Office are credible.

6 There are often filtering techniques used for identification and elimination of spurious correlations and noises. Application of the filtering techniques is related to the following problems. "Different filtering techniques lead to different facts about macroeconomic time series. The fact that economists use a large number of filters to extract the 'cyclical' and 'trend' components of time series simply means that these concepts do not have unique meaning among them. Alternative filters provide different windows through which economists can examine their models and data" (Burnside, 1998). Canova points out the sensitivity of economic indicators to the choice of the filter (Canova, 1999). Filters' application often reduces the number of observations. Filters tend to blur sharp changes that may reflect economic fundamentals. Loss of the information is very important impact.

7 Used statistical methods in this article were presented and discussed at the workshop „Perspectives in modern statistical inference III" in Mikulov, 2005.

The correlograms of ACF a PACF will help to identify the appropriate model (Arlt, Arltová, 1997; pp. 91–192). The correlation analysis using the Pearson Product-Moment Correlation (r) to show the degree of linear relationship between two variables $\hat{u}_1$ and $\hat{u}_2$:

$$r = \frac{SS_{\hat{u}_1\hat{u}_2}}{\sqrt{SS_{\hat{u}_1\hat{u}_1} SS_{\hat{u}_2\hat{u}_2}}},$$

where $SS_{\hat{u}_1\hat{u}_1}$, $SS_{\hat{u}_2\hat{u}_2}$ and $SS_{\hat{u}_1\hat{u}_2}$ are the sums of squares of the distances between the values and its means (McClave, 1988; pp. 514). The hypothesis about the correlation coefficient is tested at the 10% significance level. The simple linear model of the lag is used in the empirical analysis.

RESULTS

Tables I–IV summarize calculated results for individual member states of the Eurozone in the period of years 1995–1998 and for the whole Eurozone in period 1999–2005. Table I shows the augmented Dickey-Fuller test results. The null hypothesis, that there is a unit root, is rejected in favor of alternate hypothesis at the 10% significance level. Only the time series of Belgium is stationary. In the other time series the processes of SARIMA have to be identified.

I: *Augmented Dickey-Fuller test (ADF) of the Time Series Stationary*

Time series	Number of observation	ADF1		ADF2		ADF3	
		t	p-value	t	p-value	t	p-value
Belgium M3	47	–1.864	0.06	–3.254	0.02	–3.299	0.07
Belgium HICP	47	–3.000	0.00	–3.935	0.00	–4.140	0.01
Germany M3	47	0.291	0.76	–0.976	0.76	–1.164	0.92
Germany HICP	47	–2.314	0.02	–2.820	0.06	–2.915	0.16
Spain M3	47	–1.527	0.11	–2.265	0.18	–2.709	0.23
Spain HICP	47	–1.504	0.12	–2.548	0.11	–2.849	0.18
France M3	47	–2.132	0.03	–2.190	0.21	–2.280	0.44
France HICP	47	–1.297	0.18	–1.426	0.57	–2.770	0.21
Ireland M3	47	–0.506	0.49	–3.384	0.01	–3.292	0.07
Ireland HICP	47	–1.293	0.18	–2.365	0.15	–2.330	0.41
Netherlands M3	47	–1.620	0.10	–3.079	0.03	–3.245	0.08
Netherlands HICP	47	–1.178	0.21	–2.504	0.12	–2.412	0.37
Austria M3	47	0.008	0.68	–0.793	0.82	0.845	1.00
Austria HICP	47	–1.504	0.12	–0.703	0.84	2.048	0.57
Finland M3	47	–2.518	0.01	–2.669	0.08	–2.675	0.25
Finland HICP	47	–3.025	0.00	–3.569	0.01	–3.483	0.04
Eurozone M3 ***	79	–0.049	0.66	–2.081	0.25	–2.054	0.57
Eurozone HICP ***	79	–0.179	0.62	–3.014	0.04	–3.202	0.08

* p-value is defined as the lowest significance level at which null hypothesis can be rejected
** source: own calculation, software Easy Regression International
*** the last two rows expose the time series in the period 1999–2005 for the whole Eurozone.

There are results of processes SARIMA and augmented Dickey Fuller test of the residuals in Table II. The residuals are stationary and could be used for time series correlation analysis.

Correlation analysis identified time lags while testing influence of monetary base M3 on inflation. It can imply the fact that central banks are reacting on growing inflation by reducing M3 monetary base growth. Inflation itself is not known in current month, but with certain time lag.[8] The delay can be also influenced by reaction ability of central banks to change money supply growth.

8 The first estimations of monthly HICP are known immediately after the lapse of reference period. The index itself is ECB at disposal 15 days after the end of reference period (ECB, 2004; pp. 14).

II: *Augmented Dickey-Fuller test (ADF) of the Residuals*

Time series	Model SARIMA (p,d,q)(P,D,Q)s	ADF1		ADF2		ADF3	
		t	p-value	t	p-value	t	p-value
Germany M3	$(1,1,0)(1,0,1)_{12}$	–4.254	0.00	–4.437	0.00	–4.337	0.00
Germany HICP	$(0,0,0)(1,0,0)_{12}$	–3.568	0.00	–3.515	0.01	–4.047	0.01
Spain M3	$(2,1,2)(0,0,0)_{0}$	–3.130	0.00	–3.458	0.01	–4.346	0.00
Spain HICP	$(1,0,0)(0,0,0)_{0}$	–2.373	0.02	–3.672	0.00	–3.819	0.02
France M3	$(1,1,0)(1,0,0)_{12}$	–4.721	0.00	–4.657	0.00	–4.700	0.00
France HICP	$(1,1,0)(0,0,0)_{0}$	–3.224	0.00	–3.274	0.02	–3.227	0.08
Ireland M3	$(0,1,2)(0,0,0)_{0}$	–3.334	0.00	–3.223	0.02	–3.125	0.09
Ireland HICP	$(0,0,0)(1,0,0)_{12}$	–4.025	0.00	–3.993	0.00	–3.967	0.01
Netherlands M3	$(0,0,0)(1,0,0)_{12}$	–2.935	0.00	–3.435	0.01	–3.457	0.04
Netherlands HICP	$(0,0,0)(1,0,1)_{12}$	–3.767	0.00	–3.720	0.00	–3.679	0.02
Austria M3	$(0,0,0)(1,0,1)_{12}$	–3.509	0.00	–3.469	0.01	–3.363	0.06
Austria HICP	$(0,1,0)(1,0,0)_{12}$	–1.879	0.05	–3.474	0.01	–3.404	0.05
Finland M3	$(0,0,0)(1,0,1)_{12}$	–3.351	0.00	–3.322	0.02	–3.288	0.07
Finland HICP	$(0,0,0)(1,0,0)_{12}$	–3.650	0.00	–3.709	0.00	–3,786	0.02
Eurozone M3	$(0,0,0)(1,0,1)_{12}$	–4.132	0.00	–4.147	0.00	–4.215	0.00
Eurozone HICP	$(1,1,0)(1,0,0)_{12}$	–4.105	0.00	–4.125	0.00	–4.093	0.01

* p-value is defined as the lowest significance level at which null hypothesis can be rejected
** source: own calculation, software Easy Regression International

The correlation coefficients in Table III are supplemented with the p-value which indicates the lowest significance level at which a null hypothesis (if the correlation coefficient is zero, the time series are not correlated) can be rejected. Order of lag is quoted in months and represents such a time series lag, which would have in consequence statistically important correlation. Positive order corresponds with the lag of impact of monetary supply change on inflation (max. 12 months lag is tested).[9] Only positive correlations are consistent with the aim of empirical analysis.

Only in case of Finland there was not found any correlation between money supply growth and inflation. In case of Germany, Ireland, Netherlands and Eurozone the statistically significant correlation was identified with a lag of 6 to 12 months. In the case of Belgium, Spain, France, Austria we could also talk about the statistically important correlation, nevertheless 1 to 2 months lag between time series doesn‘t fully correspond with the expected impact of money supply growth on inflation. The answer to the identified discrepancy can be found in the following table IV.

Table IV shows statistically important negative correlations by inverse time series lag. Germany, Spain, France and Eurozone are proving a negative correlation between inflation and successive change of money supply growth. It is supposable, that central banks of the mentioned countries, including ECB, react to the increase of price level by reduction of money supply. The consequence of these policies is an influence of future inflation expectations by economic agents and accordingly relatively flexible impact on the price level. The relation between the reduction of money supply and inflation tensions is mutual (Table III).

On the basis of results represented in Table IV we could state hypothesis that the central banks, including ECB, react to the increasing inflation by their monetary policy, respectively by the reduction of the money supply.

The results showing positive statistically important correlation in case of Eurozone with 1 month lag and negative correlation without lag are illustrated in Graph I.

9 „The delay between money aggregates and inflation was estimated in EU member states before the Eurozone formation for 6 to 9 months“ (Jílek, J., 2004; pp. 422).

III: *Time Series Correlations of the Residuals**

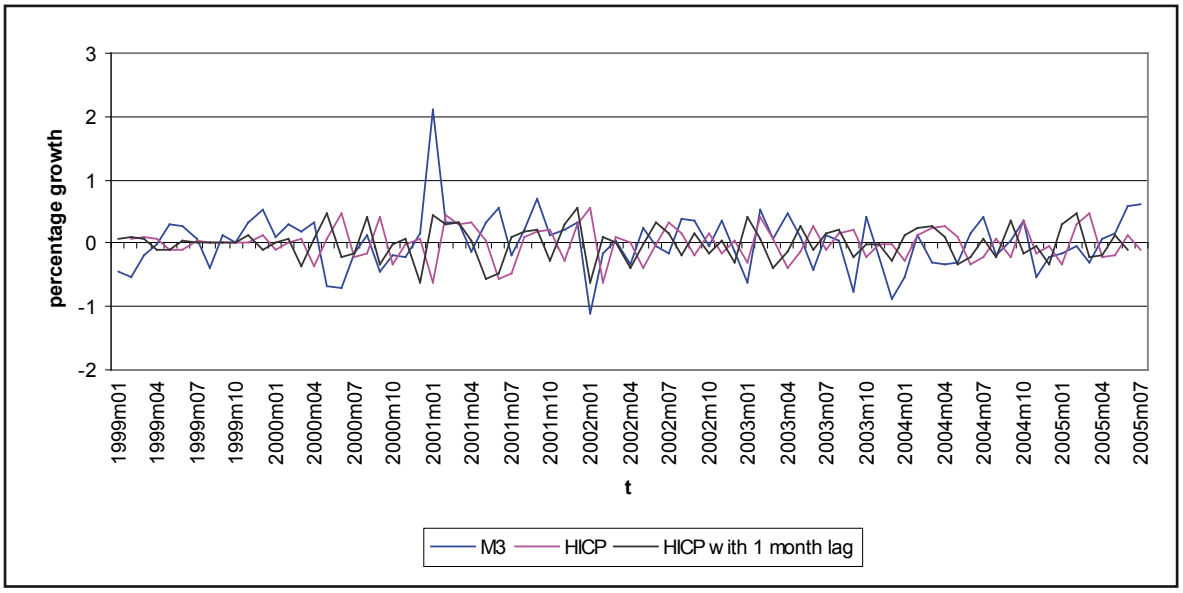
Country or region	Correlation coefficient	p-value	lag
Belgium	0.2482	0.0963	1
Germany	0.3423	0.0213	1
	0.3384	0.0467	11
Spain	0.3428	0.0197	0
France	0.2807	0.0649	2
Ireland	0.2995	0.0805	11
Netherlands	0.2728	0.0844	6
Austria	0.2963	0.0455	1
Finland	-	-	-
Eurozone	0.2076	0.0682	1
	0.3908	0.0011	12

* time series of the Belgium are the sourced observations
** p-value below 0.1 indicate statistically significant non-zero correlations at the 90% confidence level. hypothesis can be rejected
*** source: own calculation, software Statgraphics Plus version 5.1

IV: *Time Series Negative Correlations of the Residuals**

Country or region	Correlation coefficient	p-value	lag
Belgium	-	-	-
Germany	–0.4331	0.0026	–1
	–0.4943	0.0022	–11
Spain	–0.3851	0.0082	–1
France	–0.3067	0.0455	–3
	–0.3693	0.0245	–9
Ireland	-	-	-
Netherlands	–0.3129	0.0631	–11
Austria	-	-	-
Finland	–0.3426	0.0408	–11
Eurozone	–0.3063	0.0064	0
	–0.2141	0.0651	–3

* time series of the Belgium are the sourced observations
** p-value below 0.1 indicate statistically significant non-zero correlations at the 90% confidence level. hypothesis can be rejected
*** source: own calculation, software Statgraphics Plus version 5.1



1: *Money supply growth and inflation in Eurozone (1999–2005)*
Source: Eurostat, own calculation, software Statgraphics Plus version 5.1

DISCUSSION

The methodology used in the empirical analysis (time series correlation analysis) refuses or confirms the strength of the relation between money supply growth and inflation. The results can not be directly identified with causal relations[10]. However the authors suppose that if the trend and drift will be removed from time series, the time-series became stationary, and inside the time series only short-term deviations (shocks) remain. If we identify these shocks simultaneously (using the lags) in both time series, we can say that these time series are mutually related. Used methodology is drawn directly on data, it is not based on the regressive analysis of quantitative equation of money and it does not identify the single but the mutual relation between variables. The mutual relation better corresponds to the real relationship between both variables and it can systematically analyze the lag between the time series better. In the real economies we can find more complicated types of lags between time series. This article simply considers only linear constant lag. Another problem is that the reaction of the price level to the increase of money supply can change in time. The analysis of reaction capacity of the national central banks on the inflation was not the aim of the article.

The money supply growth targeting is the basic principle of the neoclassical monetary theory. Beginning late 80s, several countries began introducing inflation target regimes with explicit quantitative inflation targets. The collapse of the previously stable relationship between the money supply growth and inflation was caused by the impact of exogenous factors (Issing, 1997; pp. 78). The theory says that the change in inflation is directly proportional to the changes in money supply under assumption of constant level of final production and velocity of money. The quantitative theory of money admits the influence of changes in money supply not only on the inflation, but partially also on the development of the real GDP growth. The assumption of constant velocity of money or at least its easy predictability became unrealistic. The reason is particularly the openness of the economies and development of financial innovations. They both can fasten the velocity of money and change less liquid assets to high-liquid ones and the establishing of alternative deposit implements.

Anne Sibert states *"Assigning a prominent role to M3 and providing a reference value for it is only reasonable if there is a consistent relationship between this variable and inflation. Unfortunately, the relationship between M3, or any other measure of money, and inflation is highly unstable. This leaves a central bank that is primarily concerned with price stability and that wants to target or provide a reference value for a monetary aggregate with three choices. It can constantly revise its monetary target; it can sacrifice price stability; or, it can repeatedly miss its monetary target. The ECB chose the third alternative, regularly exceeding M3 growth of 4-1/2 percent. This made M3 a poor signal of monetary policy and did not promote the Council's goal of being transparent and accountable."* (Sibert, 2003; pp. 4).

Svensson summarizes insufficiencies and problems of monetary growth targeting, as the instrument of monetary policy. Inflation targeting appears to be a commitment to a systematic and rational monetary policy to a greater extent than any other monetary policy regime so far (Svensson, 1999; pp. 607–654).

Svensson and Woodford (Svensson and Woodford, 2002, pp. 712) conclude that there is very low information content of money supply growth for inflation forecasts in the short and medium run. The ECB monetary strategy is often criticized because many authors can not find rational support for the prominence of the money supply growth indicator (Svensson, 1999; Rudebusch and Svensson 1999; Gerlach and Svensson 2003).

All above mentioned opinions were reflected in the decision of Council of ECB which was announced by May 2003. After four years experience conducting monetary policy, the Council of ECB has announced a significant change in its monetary policy strategy. The revised strategy contains two important alterations. First, there has been a change in the definition of price stability that leaves it both more precise and more relaxed. Second, the special importance of money growth in appraising the danger to price stability has been abandoned (Sibert, 2003).

10 The correlation analysis used in this article is rather simple method which indicates correlation but nay the causality. For better identification of relationship between the money supply growth and inflation the authors will continue in research with application of Granger causality test and cointegration analysis. This methodology could identify potential causality indicated by correlation analysis. The Granger causality analysis could show possibility of existence of long-term equilibrium between the money supply growth and price level. And if such causality exists how long it takes to restore the equilibrium after the initial shock? The results may be differ for big and small countries. In case of small countries the price level is probably more influence by price development in big (main trading partners) countries than by money supply. Both methods (Granger causality and cointegration tests) will be applied in further research.

On the contrary, the empirical analysis made in this article proves the significant correlation between money supply growth and inflation in low-inflation countries (Germany, Ireland, Netherlands and Eurozone as a whole). Those findings are fully consistent with conclusion of Löchel and Polleit *"From a conceptual point of view, the ECB two pillar monetary policy strategy is generally suitable to deliver and maintain the bank's price stability promise in the euro area. Under the latest ECB strategy review, the role of money has, de facto, been downgraded to second rank status. However, a strong theoretical and empirical rationale exists for continuing to assign a prominent role to money. Empirical evidence points to the stability and controllability of money demand, and a number of arguments lend some comfort to the view that the demand for M3 might prove to be stable going forward"* (Löchel and Polleit, 2005; pp. 15–16).

The conclusions of studies analyzing the existence of relationship between money supply growth and inflation significantly differ. Let's therefore conclude discussion with the statement of Svensson: "... *money contains some information about the state of the economy, and rational central bank uses money contains some information about the state of the economy, and a rational central bank uses money together with other signals in its estimation of the underlying state of the economy. Indeed, to the extent that money has information about the underlying state of the economy, and thereby information about future inflation and output gaps, it makes perfect sense and is completely uncontroversial to use money as one indicator among others. Then, the weight money receives, as an indicator is an empirical issue, without ideological overtones. This, I believe, is the potentially most useful role for money in monetary policy analysis."* (Svensson, 2003; pp. 1070).

SUMMARY

In period 1995–1998, the empirical analysis identified significant statistical correlation between the money supply growth and inflation in three Eurozone member countries (Germany, Ireland and Netherlands). In other countries (Belgium, Spain, France and Austria) the statistically important correlation was also identified, nevertheless 1 to 2-months lag between the time series doesn't fully correspond to the expected impact of money supply growth on the inflation (Table IV). The correlation was found with different lags in different countries. These asymmetries are caused especially by differences in transmission mechanism of the monetary policies in these countries and differences in financial systems of analyzed countries (see also Angeloni, 2002, pp. 43–44). The different velocity of money and intensity of influence of money supply growth on inflation observed among member states of the Eurozone negatively affects ability of the ECB to meet its primary objective, which is defined as price stability. The empirical analysis identified statistically significant correlation between the money supply growth and inflation for the whole Eurozone with the lag of 12 months (Table III). On the contrary, the reaction of ECB to increasing inflation via money supply growth reduction is thanks to the fast accessibility of the first estimation of HICP, almost immediate.

The empirical analysis in this article did not reject the significant role of the money supply growth in the ECB´s monetary policy strategy. But as was already mentioned the differences in transmission mechanisms among the members of the European Monetary Union influence the ECB´s decision to strengthen the role of the second pillar of its strategy called economy analysis. Since May 2003 the ECB monetary policy analysis starts with the economic analysis to identify short to medium-term risks to price stability. As in the previous period, this includes an analysis of shocks hitting the euro area economy and projections of key macroeconomic variables. The monetary analysis then follows to assess medium to long-term trends in inflation in view of the close relationship between money and prices over extended horizons. As in the past, monetary analysis takes into account developments in a wide range of monetary indicators including M3, its components and counterparts, notably credit, and various measures of excess liquidity.

SOUHRN

Růst nabídky peněz a inflace – měnová strategie Evropské centrální banky

Empirická analýza provedená v příspěvku identifikovala ve sledovaném období statisticky vysokou závislost mezi růstem peněžní zásoby a inflací ve třech členských zemích eurozóny (Německu, Irsku a Nizozemí). V dalších sledovaných zemích (Belgii, Španělsku, Francii a Rakousku) byla také identifikována statisticky významná závislost mezi zkoumanými časovými řadami, avšak identifikované zpoždění v rozsahu 1 až 2 měsíců plně nekoresponduje s očekávaným dopadem růstu peněžní zásoby na inflaci (Tabulka IV). Závislosti mezi zkoumanými řadami, které byly nalezeny při různých zpožděních, jsou způsobeny především rozdíly v působení transmisních mechanismů měnových politik v jed-

notlivých zemích a svůj vliv hrají také rozdíly ve finančních systémech zkoumaných ekonomik (tyto důvody uvádí také např. Angeloni, 2002; s. 43–44). Rozdílná rychlost obratu peněz a rozdílná intenzita vlivu růstu peněžní zásoby na inflaci pozorovaná mezi jednotlivými zeměmi eurozóny pak negativně ovlivňuje schopnost Evropské centrální banky plnit svůj primární cíl, kterým je cenová stabilita. Empirická analýza identifikovala také silnou statistickou závislost mezi růstem peněžní zásoby a inflací pro celou eurozónu se zpožděním 12 měsíců. Na druhou stranu, reakce Evropské centrální banky na rostoucí hrozbu růstu inflace prostřednictvím snížení růstu nabídky peněz je díky rychlé dostupnosti odhadů harmonizovaného indexu spotřebních cen (HICP) téměř okamžitá.

Na základě výše uvedených výsledků lze konstatovat, že empirická analýza provedená v příspěvku, i přes metodologické nedostatky uvedené v diskusi, nezamítla hypotézu o významné roli peněžní nabídky (agregátu M3) jako nástroje strategie měnové politiky Evropské centrální banky. Jak již ale bylo zmíněno, rozdíly v působení transmisních mechanismů na úrovni jednotlivých členských států eurozóny přinutily Evropskou centrální banku posílit roli druhého pilíře své měnové strategie, kterým je tzv. ekonomická analýza. Od května 2003 využívá Evropské centrální banky při formulaci své měnové strategie v úvodní fázi především výstupy ekonomické analýzy k identifikaci krátkodobých a střednědobých inflačních rizik. Stejně jako v předcházejícím období tato analýza zahrnuje především analýzu šoků postihujících eurozónu a odhad vývoje klíčových makroekonomických ukazatelů. Monetární analýza je následně použita k hodnocení středně a dlouhodobých inflačních trendů z pohledu těsného vztahu mezi růstem peněžní zásoby a inflací v rámci odhadovaného období. Stejně jako v předcházejícím období zahrnuje monetární analýza zkoumání vývoje široké škály měnových indikátorů včetně agregátu M3 a jeho jednotlivých komponent, zejména pak úvěrů a vybraných ukazatelů nadměrné likvidity.

míra růstu měnové zásoby, inflace, Evropská centrální banka, monetarismus, korelace časových řad

JEL CATEGORY

E42 Monetary Standards and Regimes; Government and the Monetary System or E50 Monetary Policy, Central Banking, and the Supply of Money and Credit: General (flow of funds)

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