Economics of Agriculture SI - 1
UDK: 339.72(438)

THE INFLUENCE OF FINANCIAL AND MONETARY VARIABLES ON THE ECONOMIC GROWTH IN POLAND

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Abstract

The paper analyzes if money and other monetary and financial variables cause economic activity using quarterly data from Polish economy starting with 2003 to 2011. I made bivariate models to see if the monetary and financial variables from this country cause the real economic activity in the short term or in the long term and the neutrality hypothesis of money is confirmed.

Key words: business cycles, bivariate models, financial market, money market, real activity.

INTRODUCTION

In the context of international economic crisis, the banking system is one of the pillars which provides confidence in certain economic activities as lending to certain sectors of a nation leads to relocation of relative prices of assets. This process is the foundation of economic growth in the next cycle. Nevertheless, the banking system can't achieve an efficient process for sustainable economic growth and reduce uncertainties in the absence of a coherent policy mix.

Many empirical studies have found that a significant contribution to the economic growth are the influence of factors such as degree of financial development or the efficiency of the risk management system(Levine, 2005; Wachtel, 2001). From the perspective of Levine, there are some advantages of the financial development: mobilize resources as deposits from a large number of investors, provide simplification in the exchange of goods and services due to payment services, more efficient allocation of resources by better processing of information relating to customers, increase liquidity in the economy by reducing inter-temporal risk.

After the '90s a sustained process of reforming the banking system in Central and Eastern European countries has started and foreign banks have begun investing, so that by 2004 most of them had a foreign capital.

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Credit to private sector grew rapidly during this period but with different rates, especially in terms of mortgage loans. Heterogeneity among different countries lending may have different causes, such as different degrees of development of financial intermediation or different regulatory and institutional frameworks. Among the determinants of credit factors we can enumerate the income growth and falling interest rates, bad debts or inflation, the implementation of reforms in the banking sectors. Noteworthy is that a household credit boom adversely affect the current account, a common problem in transition economies.

Caporale, G.M., Hassapis,C., Pittis, N.(1998) analyzed the correlation of the following quarterly data series for the period January 1979 and December 1993, using VAR models: the real GDP, the monetary aggregate M1, the short-run interest rate and the long-run interest rate for five industrialized states: US, UK, Germany, Canada and Japan. The interest rates used are 3-month interbank rates, for the short-term interest rate, and 10-year Government bonds yields for the long-term rate. Other monetary aggregate variables were used only if their inclusion changed the relevance of the model. After testing the presence and persistence of the unit root (integrated series of first order), bivariate models (incomplete models) or trivariate models (complete models) have been made, and the most statistically significant models were chosen. The article concluded that SR is a better predictor for Y than M1, with the exception of Germany where monetary aggregates targeting recommended.

In economics the Granger causality (Granger, 1969) is one of the most commonly applied research methods for testing the correlation between variables. A new stage of analysis of causality was made later by Engle and Granger(1987), and Johansen(1988); they used VECM (Vector Error Correction Model) to analyze causality for integrated data series. This method involves testing unit roots and cointegrating the series before testing causality.

METHODOLOGY

1. VAR Estimation

Given a VAR representation with two variables y_{1t} and y_{2t}. Each of this variables depends on it's own past values and the values of the other variables. For example, the VAR model of p = 2 order can be written as:

$$x_t = a_1 + \sum_{i=1}^{2} b_{1i} * x_{t-i} + \sum_{i=1}^{2} c_{1i} * y_{t-i} - d_1 * y_t + \varepsilon_{1t}$$

$$y_t = a_2 + \sum_{i=1}^{2} b_{2i} * x_{t-i} + \sum_{i=1}^{2} c_{2i} * y_{t-i} - d_2 * x_t + \varepsilon_{2t}$$

2. Co integration in bivariate models and estimating the Error corrector model (ECM) for two integrated variables of first order

Bivariate models test the correlation between monetary/financial variables and the economic growth. In order to be cointegrated two time series must be integrals of the same order and the residual variable (obtained by applying OLS to the initial variables)

must be stationary.
Engle and Granger have demonstrated that all cointegrated time series can be represented with an error correction model. Let there be two integrated variables of first order x_t, y_t. In the first phase an estimation is made using the method of least squares for the relation between x and y: $y_t = \hat{a}_0 + \hat{a}_1 x_t + u_t$.
In the second phase the estimation of the dynamic $\Delta y_t = \alpha_1 \Delta x_t + \alpha_2 u_{t-1} + e_t,\ \alpha_2 < 0$ model is made.
The α_2 coefficient (the force of attraction to equilibrium) must be significant and negative. This way a representation of ECM type is rejected. In this case, the error correction mechanism (the movement that allows the attraction to equilibrium) is of opposite way, and the evolution is moving away from the target in the long term.

DATA AND RESULTS

The data series refer to the economy of Poland and have a trimestrial frequency from 2003-01 to 2011-01. The selected variables are: the rate of modification of GDP regarding the previous trimester (gdp_p), the government bond yields for 10 years (lr_p), the three-month interest rate on the money market (sr_p), and the rate of change for the monetary mass M1. The variables are chosen in order to reflect the monetary and financial market regarding the real economy. Data was collected from the following sites: www.eurostat.com and www.oecd.org.
In the first phase the unit square root was tested using the ADF test. For Poland gdp_p and dm1_p are stationary but sr_p and lr_p are not. In this case a stationarity through differentiation of first order is performed so that the series will be integrated and series of type I (1) are obtained. The new series will be called dgdp_p, ddm1_p, dsr_p, dlr_p.

The condition of integration for the same order was respected for the four variables. In order to emphasize the short term relation between the variables, bivariate models of type VAR are going to be constructed. The following equation systems were obtained:

dgdp_p=-0,03-0.81*dgdp_p(-1)-0.39*dgdp_p(-2)+7,06*ddM1_p(-1)+6,43*ddM1_p(-2),R^2=0.43 (1)

ddM1_p=-0.002-0.09*ddM1_p(-2)-0.73*ddM1_p(-1)+0.0006*dgdp_p(-2)-0.002*

dgdp_p(-1),R^2=0.64 (2)

The first equation system (1 and 2) suggests that the variable specific to the evolution of economic growth has a strong autoregressive characteristic which pays of in time. If the real GDP is growing in the present, then in the future it will drop because the sign of the coefficients between the present and past value is a negative one. This fact is explained by the Ricardian equivalence and the intertemporal choices. The evolution of money supply M2 has a strong multiplicative character on the economic growth. An increase of 1% for the rate of change of money supply will cause an increase of GDP with 7.06% after a month, and 6.43% after two months. The multiplicative effect diminishes over time, which shows that although the initial impact of money

supply growth strongly influences the evolution of GDP, it drops until it reaches the level of equilibrium. In reverse, the coefficients of 0.002 or 0.0006 expresses a weak correlation between variables, GDP having a weak influence on the evolution of monetary aggregate M2. The increase of the money velocity or disinflationary policy measures can be explanatory factors for the lack of coordination between the money supply (endogenous variable) and the economic growth (exogenous variable).

dgdp_p=-0.08-0.49*dsr_p(-2)-0.29*dsr_p(-1)-0.62*dgdp_p(-2)-0.93*dgdp_p(-1), R^2=0.55 (3)

dsr_p=0.002+0.02*dsr_p(-2)+0.53*dsr_p(-1)+0.17*dgdp_p(-2)+0.35*dgdp_p(-1),R^2=0.28 (4)

The short-term interest rate has a different character from that of the money supply because its effect increases from a coefficient of 0.29 after a month, up to 0.49 after only 2 months (equation 3). The meaning of the relationship is inversed, as the interest rate for three months drops, the economic growth process increases, which demonstrates the functionality of the credit channel. But the equation does not say anything about the effectiveness of credit or its effect on long-term GDP. The positive sign between the two variables from the 4th equation indicates an anticyclical behavior of short-term interest rate. According to the first two equations the money supply M1 has a stronger impact on the rate of evolution of the real GDP compared with short-term interest rate. This confirms the lower reliance on credit and explains why Poland was the only country which has not entered into recession although the growth rate of real gross domestic product fell from 5% in 2008 to 1.8% in 2009.

dgdp_p=-0.02-0.27*dlr_p(-2)-0.02*dlr_p(-1)-0.44*dgdp_p(-2)-0.72*dgdp_p(-1), R^2=0.38 (5)

dlr_p=0.02+0.05*dlr_p(-2)+0.34*dlr_p(-1)+0.18*dgdp_p(-2)+0.26*dgdp_p(-1), R^2=0.24 (6)

Using a VAR model, the long-term interest rate has the lowest impact on economic growth, which suggests testing the correlation between two variables in the long term, so testing the cointegration was started. Cointegration test results indicate the possibility of long-term relationships over the economic growth only for lr_p, therefore only for this equation the autocorrelation model for errors that expresses the relationship between variables will be realized. The equation for the models looks like:

$dgdp\_p = 0.02 - 0.21 * dlr\_p - 0.79 * u1(-1)$ R^2=0.46, where u1(-1) is the residue delayed by one unit. Tests on coefficients and residual term indicates that this model is relevant.

In the error correction model the residual term is significant and negative, which means that the influence in the long-term of the financial variable on the real activity is found in the residual value and this may be explained by the fact that the long-term dynamics is found in short-term evolution of the economy.

CONCLUSIONS

M1 is a leading indicator for the economic cycle, pro cyclical to the real economy, which was demonstrated by the evolution before the international crisis when the growth rate of money supply in the last stages of economic growth tended to decrease as the ability of banks to create deposits restricting the availability of reserves. Although Poland hasn't entered recession, the risk adversity of investors generated by the international economic situation determined a preference for liquidities instead of assets and M1 increased (anti cyclical behavior).

This result is consistent with Caporale's paper (1998) who found that Germany is the only country from the European Union where money supply had a great impact on the real economy. The other countries were mostly affected by the short interest rates. It can be concluded that the monetary policy of Germany has a significant influence on the other member countries, and financial convergence between Germany and the other member states has increased.

Short interest rate has a different behavior compared to the money supply: if the three-month interest rate decreases then the real activity increases demonstrating the efficiency of the credit channel. Monetary aggregate M1 has a more significant effect on the real GDP than the short term interest rate. This confirms the lower reliance on credit in Poland.

Te existence of long term correlation between the 10-year bond yields and real GDP dynamic infirms the money neutrality theory. According to this theory, a growth of monetary aggregate M2 will only influence prices in the long term and the real activity won't be affected. Therefore, in order to ensure a sustainable growth, it is recommend to avoid long-term loans and credit tips.

ACKNOWLEDGEMENT

This work was cofinaced from the European Social Fund through Sectoral Operational Programme Human Resources Development 2007-2013, project number POSDRU/107/1.5/S/77213 „Ph.D. for a
career in interdisciplinary economic research at the European standards" (DOCCENT).

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