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Business cycle, interest rate and money in the euro area: A common factor model

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ABSTRACT

In this paper we model and analyze the contemporaneous correlation between interest rate, monetary aggregates, production and prices (of consumer goods, financial assets and real estate) of the euro area. To do this, firstly we estimate a common cyclical factor by means of an unobserved component model with the common factor located in variations in the underlying growth rates, that is, accelerations and decelerations of the variables. The variables mentioned share a significant cyclical factor being all procyclical except for narrow money. Finally we offer an explanation of this empirical finding based on the monetary policy strategy of interest rate pegging followed by the European Central Bank. In this regard, the shared cyclical information suggests (a) that inflation should be considered as a phenomenon that affects the whole economy, and therefore all prices, and (b) that monetary indicators such as monetary aggregates may contribute to the assessment of inflationary risks throughout the cycle.

1. Introduction: money in the conduct of the ECB monetary policy

In this paper we model and offer an explanation of the common cyclical behavior of some fundamental monetary and real variables in the euro area. The common cyclical factor found in interest rates, monetary aggregates, CPI inflation, as well as stock and housing prices is consistent with the framing and the conduct of a monetary policy based on interest rate pegging by the European Central Bank (ECB). Specifically, pegging the short-term nominal interest rate to that resulting from following an implicit Taylor rule in order to achieve price stability – strictly defined as moderate consumer goods and services inflation – has resulted in procyclical interest rate and endogenous money creation in the euro area, with inflationary and destabilizing effects on stock and housing prices.

The ECB conducts its monetary policy according to a two-pillar strategy which comprises the combined (or 'cross-checking' in the ECB jargon) analysis of both monetary and economic indicators in order to achieve its primary policy goal, that is, price stability in the medium term.[3] As detailed by the then Chief Economist of the ECB, Otmar Issing, with this strategy monetary policy makers were able to consider the valuable information money growth provides in assessing inflationary trends in the long term along with the analysis of a wide variety of indicators of the real economy affecting prices in the short term. However, aware of the uncertainties surrounding the launch of the euro in 1999 and the need to build up credibility in the markets from the very beginning, the ECB did not mimic the strategy of the Bundesbank as it did not adopt an explicit target for M3 growth but just a 'reference value' compatible with price stability in the medium term (see ECB, 1999; Issing, 2008a,b). As a result, the conduct of monetary policy in the euro area does not respond to a traditional 'monetary targeting strategy' nor to 'strict inflation targeting', which would imply assigning no explicit role to monetary aggregates in the framing of monetary policy in the euro area.

The conduct of monetary policy by the ECB has received much attention by prominent monetary economists. On the one hand, according to

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[3] The ECB's primary statutory objective consists of achieving 'price stability' in the euro area (art. 127.1 of the Treaty on European Union). However, the ECB's Governing Council interprets this general mandate as prescribing an inflation rate, as measured by the Harmonized Index of Consumer Prices (HICP, or Consumer Price Index, CPI), below but close to 2% annually, a figure that precludes deflation.

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the advocates of the New Keynesian models, monetary aggregates should not be given an explicit role in policy-making since they are not needed (nor contain valuable information) to determine the rate of inflation according to the above mentioned macro model (see Woodford, 2008; Svensson, 1999). As a result, New Keynesian models explain the rate of inflation without money. On the other hand, there is a wide range of empirical and theoretical studies concluding that there is a reliable relation between money growth and inflation in the medium to the long term, some of them specifically focused on the monetary determinants of inflation in the euro area. See some recent examples in Carstensen (2007), Christiano et al. (2008), Fisher et al. (2008), Hofmann (2008) and Dreger and Wolters (2013), which show that the explanation and forecast of inflation improve when monetary information is taken into account into the models and estimates used to predict inflation. Within this debate and academic discussion, the ECB has opted for a monetary strategy that takes explicitly into account the information embodied by monetary (and credit) indicators to achieve price stability in the medium to the long term, even though de facto it conducts its main monetary policy decisions through changes in key nominal interest rates in the money markets (see ECB, 2011a,b, pp. 93–96).

A key point in this debate is the time scope of the relation between money growth and inflation which has proved to be an elusive and more complicated question than suggested by some simple interpretations of the quantity theory of money. For example, Benati (2009) finds that the fraction of inflation's long-run variation explained by long-run money growth has been very high and relatively stable but the cross-spectral gain at the null frequency has exhibited significant changes, being smaller than one for long periods of time. As a result the expected one for one correlation between money growth and inflation as explained by the quantity theory of money would remain hidden in the data except when infrequent inflationary outbursts occur.

In this paper, we focus our attention on contemporaneous correlation of some fundamental monetary and real variables in the euro area which is found to be closely linked to business cycle dynamics. In particular, we estimate and analyze a common cyclical factor for the GDP, narrow money supply (M1), certain components of M3 (i.e. M3 minus M1),[4] interest rate (the three-month Euribor rate as a representative short-term interest rate), consumer prices (Harmonized Index of Consumer Prices, HICP), housing prices and the stock index Euro Stoxx50. As a distinctive contribution, we have identified this common cyclical factor in the accelerations and decelerations of the variables. The variables mentioned above share a significant cyclical factor being all procyclical except for narrow money. This 'second derivative' approach is considered in econometrics when integrated of order 2, I(2), processes are found (Haldrup, 1998), and it is widely accepted in growth theory models where the stationary state is defined as a balanced-growth path. Accordingly, when the variables move along their transitional dynamics, the second derivatives are not zero and their dynamics could be attributed to the business cycle.

Secondly, we provide an explanation of this empirical finding based on the de facto interest rate pegging followed by the ECB, which has resulted in procyclical interest rate and endogenous money creation. The common cyclical factor shows business cycle dynamics affecting not only production and prices but also both monetary aggregates and the short-term interest rate, which share this common factor. Monetary theory assumes that only one of these variables (either the money stock or the interest rate) adjusts endogenously to business cycle shocks, while the other could be exogenously determined by the monetary authority (e.g. Walsh, 2010, pp. 9–18). We interpret this empirical evidence as a direct consequence of the monetary policy strategy conducted by the ECB; one by which the ECB instruments its policy decisions by pegging the short-term nominal interest rate to that resulting from following an implicit Taylor rule in order to achieve its ultimate statutory objective of price stability (Albulescu et al., 2013; Belke and Klose, 2011; Cendejas et al., 2014; Maza and Sánchez-Robles, 2013; Sauer and Sturm, 2007). As price stability is strictly defined by the ECB in consumer price terms while money intervenes in all real and financial transactions, monetary policy decisions on short term interest rates become biased. The significant common cyclical factor affecting interest rate, money and all prices (consumer goods, financial assets and real estate) points out the need of broadening the definition of inflation by the monetary authorities given its intimate relation to financial stability and the business cycle in the medium to the long term.

The rest of the paper is as follows. In Section 2, we present the unobserved component model employed in the estimation of the common cyclical factor. In Section 3, we interpret the estimated results within the context of the monetary policy strategy adopted by the ECB. In particular, the pro-cyclical character of the interest rate and certain components of the euro area's broad monetary aggregate, and the counter-cyclical characteristics of M1, will fit well in the framework previously outlined. Section 4 concludes.

2. An unobserved component model with a common cyclical factor

The multivariate unobserved component model estimated here assumes that each of the observed series (which are expressed in logarithms, except for the interest rate) follows the equation

$$\ln y_{i,t} = T_{i,t} + e_{i,t} \tag{1}$$

where $T_{i,t}$ is a non-stationary trend component and $e_{i,t} \sim iid\ N(0, \sigma^2_{e,i})$ is an observation noise. The growth of each trend $T_{i,t}$ is the sum of a constant rate, μ_i, and an underlying growth rate $g_{i,t-1}$

$$T_{t,i} = T_{i,t-1} + \mu_i + g_{i,t-1} \tag{2}$$

where $g_{i,t-1}$ can be interpreted as a deviation of the growth rate (ruling out the observation noise) in relation to average growth. By taking the differences in Eq. (1)

$$\Delta \ln y_{i,t} = \Delta T_{i,t} + \Delta e_{i,t} = \mu_i + g_{i,t-1} + \Delta e_{i,t} \tag{3}$$

and $g_{i,t-1} = \Delta \ln y_{i,t} - \mu_i - \Delta e_{i,t}$. Changes in $g_{i,t}$ and $\Delta g_{i,t}$, are the sum of a common cyclical variation C_t shared with the other series in the model, and possibly an idiosyncratic or specific variation $C_{i,t}$. Thus,

$$\Delta g_{i,t} = \gamma_i C_{t-1} + C_{i,t-1} \tag{4}$$

where γ_i is a factor loading (a scale factor that amplifies or reduces C_t). Both cyclical variations C_t and $C_{i,t}$ are assumed to follow stationary autoregressive processes $\phi(L)C_t = \varepsilon_t$ and $\phi_i(L)C_{i,t} = \varepsilon_{i,t}$, where the respective noises are assumed $\varepsilon_t \sim iid\ N(0, 1)$ and $\varepsilon_{i,t} \sim iid\ N(0, \sigma^2_{\varepsilon,i})$. The variance of ε_t is normalized to unity to allow the identification of the model. The three noises in the model $e_{i,t}$, ε_t and $\varepsilon_{i,t}$ are mutually uncorrelated in all leads and lags.

The specification of Eq. (4) is based on the unobserved component model with a common cyclical factor originally proposed by Stock and Watson (1989, 1991), which was designed to obtain a coincidental economic indicator in monthly time series. These authors used transformed stationary series (logarithmic differences) and so estimated a common cyclical variation in a first log-difference, that is, in the rate of growth. In contrast, our specification of Eqs. (1)–(4) assumes that the common cyclical variation is present in the second log-difference, and so it is assumed that the variables share accelerations and decelerations as a consequence of business cycle dynamics, these being represented by

[4] The specific components of M3 not included in M1 comprise deposits with an agreed maturity of up to two years, deposits redeemable with a notice period of up to three months, repurchase agreements, money market fund shares/units and debt securities of up to two years. These instruments yield an interest rate and are close substitutes of narrow money.