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Policy Mix and Economic Performance in Euro Area

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Policy Mix and Economic Performance in Euro Area

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I. Introduction

The effective implementation of monetary and fiscal policies thus requires extensive coordination between the respective authorities. Effective coordination makes it easier for policy makers to achieve their stated policy objectives in an efficient manner .It also ensures the commitment of decision makers responsible for these two policy areas to mutually agreed objectives, thus helping to eliminate the problem of time inconsistency in the design of monetary policy.

Within this general framework, coordination can take the form of ongoing contacts between the fiscal and monetary authorities to decide jointly on aspects relating to policy design and implementation, or alternatively, coordination could be based on a set of rules and procedures which minimizes the need for frequent interaction; the particular characteristics of any given country and its degree of institutional development will determine the most efficient choice.

Until the mid 80s, in most countries monetary policy was subservient to fiscal policy; central banks were required to finance public sector deficits, including those arising from quasi-fiscal activities. Such subordination of monetary policy to fiscal needs introduced an inflationary bias. Following, policy changes in initiated in the US, however, there has been a worldwide trend, in the context of the modernization of financial markets, to set up institutional and operational mechanisms that would ensure more efficient overall policy design and implementation. These include the adoption of market-based monetary and debt management instruments, as well as moves to increase central bank independence.

Two fundamental issues need to be stressed regarding the nature of monetary and fiscal policy coordination. First, the overall policy mix as well as each individual policy must be set on a sustainable course. Second, monetary and fiscal policies operate in different time frames, with monetary policy adjusting almost on a continuous basis and economic agents reacting with much shorter lags to it than in the case of changes to fiscal policy, while fiscal policy takes time to adjust and economic agents react with a lag to such adjustments.

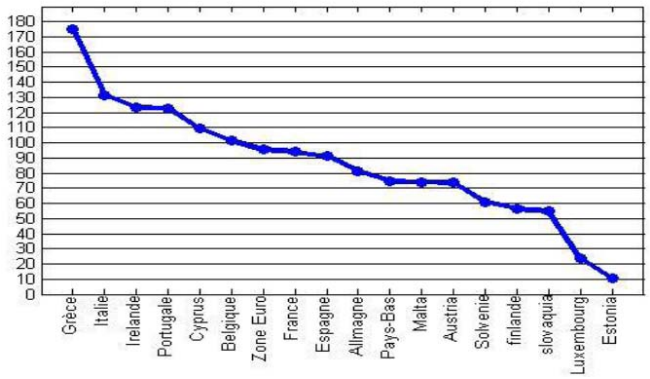

Figure 1 : Public debt to GDP ratio in Euro Area

The crisis of public debt is a symptom which must result in searching the main causes which are multiple from one country to another: a very strong government debt related to important structural problems (difficulty in raising the tax and controlling the expenditure). Debt crisis in the euro (Figure1) area indicates a succession of financial events which affect, since the beginning of 2010, in the wake of the financial crisis of 2007-2010.

First event is raised in 2010, with the Greek debt crisis as well as its important and constant deficit. It extends to autumn 2010 with public debt crisis of Ireland, caused by the rescue of national banks, made it necessary by previous excessive private debt. During summer 2011 a stock exchange storm occurs caused

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by the crisis of the Greek debt. At the end of the first quarter of 2013, the euro area debt-to-GDP ratio was established to 92.2% in Euro Area (EA17), against 90.6% at the end of the fourth quarter of 2012.Compared to the first quarter of 2012, the debt-to-GDP ratio has increased in both the Euro Area (from 88.2% to 92.2%) than in the EU27 (83.3% to 85.9%).

This paper examines the causal relationship between output gap, public debt, budget deficit, interest rate and inflation rate, and the impact of monetary policy on public debt management, in Euro Area from 1999Q1 to 2013Q4. The evidence does not let hear strong political coordination in Euro Area, and supports the idea that the monetary policy is more stabilizing in its influence on the economic activity than the budget policy. This paper deals with the problems of coordination between monetary and fiscal policies in Euro area. The particular stance of monetary policy affects the capacity of the government to finance the budget deficit by changing the cost of debt service and limiting or expanding the available sources of financing. Lack of coordination between the monetary and fiscal authorities will result in inferior overall economic performance. A weak policy stance in one policy area burdens the other area and is unsustainable in the long term.

The paper is organized as follows: Section 2 reviews the Empirical literature review. Section 3 analyzes Methodology and data. Section 4 presents variables analyses, section 5 presents empirical result and in end we have concluding remarks.

II. Empirical and Literature Review

Thinking about macroeconomic policy has been transformed in the past 20 years. Nearly all of us now analyse short-run macroeconomics using a simple three-equation system. This contains an IS curve, a Phillips curve and a Taylor-type rule for monetary policy. This was explained in papers by Sevensson (1977) and Ball (1999), and was applied to the UK in a simple paper by Bean (1998). This set-up contains no fiscal policy.

Kirsanova and al (2005) extend the three equations of monetary-policy model to a five equations model of monetary and fiscal policies by adding a Taylor-type rule for fiscal policy, and also by adding an equation which tracks the evolution of public debt. They show that one can use the resulting of five-equation system to analyse the interaction of monetary policy and fiscal policy.

They suppose that there are a lag period of implementation of fiscal policy that reflects the legislative and political processes required for important modifications in discretionary fiscal policy, and shift a one period of effect of the monetary policy, which reflects the transmission system.

Kuttner (2002) doubts if the budget policy, taking into account these delays, could arrive to an interaction with the monetary policy and a period of effect of the shift monetary policy, which reflects the transmission mechanism.

a) The Three-equation Taylor-type macroeconomics

There is an IS curve, a Phllips curve, a Taylor rule for monetary policy, and no active fiscal policy. The first equation is an IS curve, showing the evolution of the output gap (y_t) driven by the real interest rate (r_t):

$$y_t = ky_{t-1} - \delta r_{t-1} + \epsilon_t \quad (1)$$

Where (ε_t) is a demand shock. As discussed by Woodford (2003), an equation like this can be obtained by optimizing behavior of individuals who choose consumption, given by a budget constraint.

The second equation is an accelerationist Philips curve. This describes the dynamics of inflation (π_t) in term of past inflation and he output gap:

$$\pi_t = \pi_{t-1} + \omega y_{t-1} + \vartheta_t \quad (2)$$

Where (π_t) is an inflation shock.

In these two equations, the real interest rate is taken to be the instrument of monetary policy, and it affects output with the lag of one period. It then takes output another period to affect inflation. Following Bean (1998), there is "persistence" in output as well as in inflation process.

The third equation Taylor (1995) famously demonstrated that actual US monetary policy could be well described by a simple rule that relates the real interest rate to inflation and output gap, with parameters θ_Z and θ_Y respectively:

$$r_t = \theta_\pi \pi_t + \theta_y y_t \quad (3)$$

The first term in the Taylor rule shows that if inflation raised to weaken demand, which will reduce inflation. The second term shows that the real interest rate is raised if output rises.

Let the preferences of the monetary policy-maker be:

$$L = E_0 \frac{1}{2} \sum_{t=0} \beta^t (\pi_t^2 + \alpha(y_t - \bar{y})^2) \quad (4)$$

Where E_0 denotes expectations conditional on information available at time zero. Every period, the loss function penalizes deviations of inflation from its target (here zero for simplicity), and of output from its target,$\bar{y}$, where $\bar{y}$ denotes the extent to which the output target is in excess of its potential level. The parameter α denotes the relative weight given to deviations of output from target.

b) The Five-equation macroeconomics with fiscal policy

Kirsanova and al. (2005) add fiscal policy to the model, by adding a description of the behavior of the

fiscal policy authority, and also an equation showing the evolution of public debt. The model presented here is analyzed in more detail in Sthein (2006).

The first equation is, as before, a dynamic IS curve:

$$y_t = ky_{t-1} - \delta r_{t-1} + \omega b_t + \delta g_t + \epsilon_t \quad (5)$$

Where ε_t is a demand shock.

As in equation (1), monetary policy sets the interest rate which affects output with a lag. Fiscal policy will be taken to mean changes in government expenditure, g_t, not change in tax rates.

The second equation is, as before, a standard accelerationist Phillips curve:

$$\pi_t = \pi_{t-1} + \omega y_{t-1} + \vartheta_t \quad (7)$$

Note that, in the five-equation model, (i) both fiscal policy and monetary policy affect the IS curve, and (ii) neither policy influences inflation, other than through an indirect effect via output. This means that, in the control of inflation and output, he two instruments are perfect substitutes.

The real stock of debt at the beginning of this period (b_t) depends on the stock of debt at the beginning of the last period, (b_{t-1}), plus the flows that occur between t-1 and t, in the following way:

$$b_t = (1 + r_0)\, b_{t-1} + r_{t-1} b_{0+} g_{t-1} - y_{t-1} + \quad (8)$$

Where μ_t is a debt shock.

When we return to the three-equation model if (i) government expenditure was exogenous, so that we could include any changes in government spending in the (exogenous) demand shock, ε_t , (ii) we could impose Ricardian Equivalence, by setting $\omega = 0$, and (iii) there were no other effects of debt accumulation. That last requirement would effectively mean that endogenous accumulation of debt did not induce changes in government expenditure or the interest rate, so as to avoid fiscal insolvency.

The five-equation model is completed by adding two equations showing the behavior of monetary policy and fiscal policy to the three equations (5, (6) and (7.)

Dixit and Lambertini (2000) consider the interactions between policies in a configuration where the monetary authority controls the inflation. The source of conflict is that the fiscal authority aims to increase output and inflation than the monetary authority. The non-cooperative Nash equilibrium has both a higher inflation and a decline in production commitment by the monetary authority is not appropriate or sufficient if fiscal policy is active, but the budget commitment hearing would result in a better outcome.

Melitz (1997) examine the interaction between monetary and fiscal policies in a pooled regression annual data on 19 OECD countries. He notes that the monetary and fiscal policies settle in opposed directions, as substitutes, then, that the budget policy plays a stabilizing role of low debt « the taxes behave in a preoccupation with a stabilization, but move the expenditure in a destabilizing way ».

Favero and Monacelli (2003) studies the interactions of policies by using Markov-Switching Vector Autoregressive Models (Krolzig, 1997), they stipulated that although fiscal policy shall be subject to a given regime change in an endogenous way and the regime changes monetarist are imposed in an exogenic way. They note than in the U.S., only between 1987 and 2001 can be described as passive fiscal regime. Thus, Woodford (1998) affirms that since 1980 the passivity would be a good description, and Gali and Perotti (2003) found that fiscal policy more and more passive during this period, after having discussed significant contributions to monetary and fiscal policies and their interactions.

Hughes and Hallett (2005) use individual regressions by instrumental variables to study the interactions between monetary and fiscal policies in the United Kingdom and the euro area. He notes that monetary and fiscal policies acting as substitutes in the UK, but complement each other in the euro area.

Kirsanova and al. (2006) study the interactions between fiscal and monetary policy when it stabilize a single economy against shocks in a dynamic environment. They suppose that fiscal and monetary policies stabilize the economy by causing changes in aggregate demand. Thus, they find that if policy makers are both volunteers, then the best result is obtained when the tax authority can perform monetary policy.

J.J.Reade and J.Sthe (2008) applied the cointegrated VAR method to study the interaction of monetary and fiscal policy and its effect on the sustainability of developments in public debt in the United States in 1960-2005. They conclude that fiscal policy has ensured the sustainability of long-term debt by responding to the increase in debt in a way that the stabilization of the reaction was moderate. However, according to their results, discretionary fiscal policy did not ensure a countercyclical behavior. In addition, monetary policy has followed a Taylor rule type and corrected the imbalance both in the short and long term.

III. Methodology and Data

The present study is carried out using annual time series of Euro Area 1999Q1-2013Q4. The data used include y_t is the output gap π_t, the inflation rate,r_t the nominal interest rate, d_t the public debt pb_t and the primary government balance defined as government receipts minus spending. The latter two fiscal variables are represented as fractions of GDP.

For inflation, we calculate this from the consumer price index (CPI) measure as the most appropriate measure. Debt, deficit, interest rate and inflation rate variables are downloaded from the Annual Macro-Economic database (AMECO) and the output gap is downloaded from the International Monetary Fund (IMF).

Following the literature, the interest rate rt is the instrument of monetary policy, while pbt is defined here as the instrument of fiscal policy. There is disagreement whether the fiscal instrument should be taxes or spending or the balance. Kirsanova et al. (2005) take government spending to be the tool, Schmitt-Grohé and Uribe (2004) consider taxation and a number of others take both (for example Muscatelli and Tirelli (2004); Gali and Perotti (2003).

Considering fiscal variables, there is disagreement over whether taxes, government spending or the primary balance ought to be used as the fiscal tool. Primary balance data is defined as:

$$PB_t = T_t - G_t$$

Hendry (1980) notes that measures of the public debt are readily available and accord to the theoretical variable for gross debt, which can deviate dramatically from net debt.

Our model allows for non-stationarity data and endogeneity, questions such as the role of monetary policy in debt-sustainability can be investigated in this manner.

The empirical strategy used in our study can be combined to form vector autoregression:

$$\Delta X_t = \breve{\alpha}\ {}^{*}_{t-1} + \sum_{i=1}^{k-1} {}_{i}\ X_{t-k} + u_t,$$

where $\breve{\beta} = (\beta, \beta_0)'$, $X^*_{t-1} = (X_{t-1}, 1)$, $\Gamma_i = -\sum_{j=i+1}^{k} \Pi_j$ and $X^*_{t-1} = (X_{t-1}, 1)$. the $\breve{\beta}' X^*_{t-1}$ terms are cointegrating vectors, the stationary relationships between non-stationary variables, or steady-state relationships. Importantly $E(\beta' X_t)$, since these cointegrating vectors describe steady state relationships which must be mean zero.

Three-stage procedure is followed. First, we search for the order of integration of the different time series using unit root tests. Generally, a variable is said to be integrated of order d, written by I(d), if it turns out to be stationary (integrated of order 0, I(0) after differencing d times. In this paper, we conduct unit root tests using the Augmented Dickey-Fuller(ADF) Dickey and Fuller (1979), Phillips-Perron (PP) Phillips-Perron (1988) tests and Kwiatkowski, Phillips, Shmidt and Shin (1992) (KPSS) tests. We use three tests in order to check the robustness of the results. One advantage of the PP test over the ADF test is that the former is robust to general forms of heteroskedasticity in the error term. Akaike information criterion (AIC) isused to select the lag length in ADF test, while Newey-West Bartlett kernel is used to select the bandwidth for the PP test. These tests are carried out by the Logiciel E-Views 6.

IV. Empirical Results

In this section we present the evolution of the main economic variables during the period of our study 1999Q1 to 2013Q4 and the unit root test. In order to describe the economic cycle of the Euro Area, we use the description of data, such as public debt, primary balance, nominal interest rate, inflation and output gap.

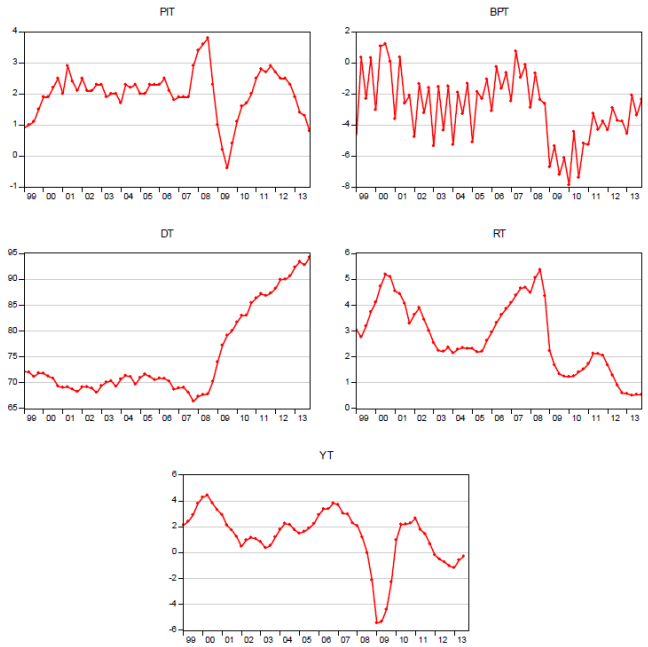

Figure 2 : Evolution of the main variables

Based on the ADF, PP and KPSS unit root tests, we find that all tested series are non-stationary in level, that is, we cannot reject the null hypothesis of non-stationarity. However, the stationarity property is reached after first differencing the series for r_t and pb_t and after second differencing for d_t, and y_t. Unit root testing is carried out and reported in Table 1, 2 and 3. Augmented Dickey-Fuller (ADF) unit root tests are carried out using enough lags for each variable to ensure that no residual autocorrelation remains.

Table 1 : Results of ADF and PP unit root tests

	ADF		PP	
Variables	Level	First difference	Level	First difference
d_t	-1.054850	-5.454765	-1.292041	-2.954490
y_t	-2.712947	-2.732191	-2.821901	-2.203366
π_t	-1.676087	-5.516187	-3.000098	-5.614475
pb_t	-6.557104	-7.69769	-2.909461	-2.669498
r_t	-2.189057	-4.285402	-3.167218	-1.967961

Table 1 : Results of KPSS unit root tests

KPSS		
Variables	Level	First difference
d_t	0.220191	0.073592
y_t	0.149442	0.127639
π_t	0.055811	0.35796
pb_t	-6.557104	0.124578
r_t	0.101077	0.52157

According to the results of these three tests, we can conclude that the following series: Public debt, inflation, primary balance, output gap and nominal interest rates are non-stationary. The non-stationary character of the series used to search for the presence of a stationary or more linear combinations of these variables. Indeed, the study of the series in first difference for the inflation rate and the nominal interest rate, and the second difference for the remaining variables, ensures the stationary nature of differentiated series.

However, the three tests retain the integration of order 1 of the following series: nominal interest rate and inflation rate and the integration of order 2 of public debt, primary balance and the output gap. This implies the existence of cointegration between the various variables.

The cointegration test is used to check the long-term equilibrium relationship between the variables d_t, pb_t, r_t,, π_t and y_t. The presence of an equilibrium relationship among these variables is the most used formally tested using statistical procedures, are those of Engle and Granger (1987) and Johansen (1988). If the presence of cointegration is confirmed between different variables, then Engle and Granger (1987) error correction specification can be used to test for Granger causality and show its direction.

Johansen cointegration results are reported in Table 4 and 5

Table 4 : Trace test results

Series	Trace statistic	Critical value (5%)	Probability
None	55.09319	29.79707	0.0000
At most 1	16.10871	15.49471	0.0000
At most 2	0.003144	3.841466	0.9536

From Table 4, we see that the three variables are cointegrated, where they have a cointegrating relationship long term. Therefore, the null hypothesis of no cointegration is rejected because the trace test indicates two cointegrating equations. Moreover, the existence of cointegration relationship justifies the adoption of a model error correction Engle and Granger (1987).

We see from Table 5 that the two variables are cointegrated, where they have a cointegrating relationship long term. Therefore, the null hypothesis of no cointegration is rejected because the trace test indicates one cointegrating equation. Moreover, the existence of cointegration relationship justifies the adoption of a model error correction Engle and Granger1987.

Table 5 : Trace test results

Series	Trace statistic	Critical value (5%)	Probability
None	17.58206	15.49471	0.0239
At most 1	2.505959	3.841466	0.1134

Cointegration between series indicates causality relationships confirmed in the long term, but it does not give the direction of causality. Therefore, the vector error correction model (VECM) is used to examine causality in the short term as well as Granger causality in the long term. The VECM is a template that models adjustments leading to a state of long-term equilibrium. This is a model which incorporates the time, the evolution of short and long term. Thus, the use of error correction model can highlight the common cointegrating relationship (common trend) and deducing the interactions between variables.

Results suggest that there is a causal relationship from long-term public debt and budget deficit to the output gap (the term correction associated with the restoring force x error is negative (-0.266766)., and is significantly different from zero at 5\% statistical level (prob. equal to 0.0347) so there is catching up to the equilibrium value ie, a mechanism error correction: in the long term the imbalances between 3 variables are offset so the series have similar trends.

Nevertheless, in the short term testing and test Wald we find that 'there is not a causal relationship from the budget deficit and public debt to output gap (Chi-square: 0.8686 pro> 0005 therefore we accept the null hypothesis). The value of R2 = 0.61% > 0.60% and the Prob (F-statistic) 0.000647 <0.005 shows an explanatory power of the model.

Concerning tests of residues, we tested serial correlation, so the model does not admit a serial correlation. The model errors are heteroscedastic since the value of probability is less than 5 % and normality test presented in the following figure.

In contrast, the causal relationship between the interest rate and the inflation rate is as follows: at a disaggregated level, the results suggest that there is a causal relationship from long-term inflation rate of interest (the term associated with the restoring force β error correction is negative (-0.007716) and is significantly different from zero at statistical threshold of 5 % (Prob= 0.0347). There so much catching up to the equilibrium value ie, an error correction mechanism: in the long term the imbalances between the interest rate and the inflation rate are offset so the series have similar trends.

Nevertheless, in the short term, testing the Wald test we see that there is a causal relationship from the inflation rate to the interest rate (Chi-square: pro 0.0097 <0.005 so we do not accept hypothesis null). The value of R2 = 53% is less than 60% and the Prob (F-statistic) 0.000032 < 0.005 shows an average explanatory power of the model.

Concerning tests of residues, we tested serial correlation (we have: Prob Chi-Square (2) = 0.7315 is greater than 0.005. So the model does not admit a serial correlation. The model errors are heteroscedastic since the value of probability is less than 5 % (prob. Chi-Square 0.0313 we reject the null hypothesis) and normality test presented in the following figure.

Indeed, Granger (1969) introduced the concept of non-causality, which aims to make the optimal forecast made at the variables. The causality test's objective is to evaluate the temporal order and the ability to forecast variables. Thus, it allows to formalize statistically economic relations between the variables of monetary and fiscal policies for obvious reasons of economic policy but also to study the variables that are likely to predict the evolution of variables monetary and fiscal policies and inflation. The causation analysis will highlight the interactions between the variables of monetary and fiscal policies. Thus, it can also have "information on the temporal relations between variables.

The relationship between debt and instruments of monetary policy will be analyzed from the causality test Granger (1969). This test is to study the relationship between debt and the different variables of fiscal policy. If the coefficients values of debt are significant, then the primary balance and the output gap is a "cause" of the debt.

Table 6 : Granger Causality Test

Nul Hypothesis	Obs.	F-statstic	Prob.
DT Does not Granger Cause BPT	58	0.23281	0.7931
BPT Does not Granger Cause DT		3.21514	0.0481
YT Does not Granger Cause BPT	57	8.98176	0.0004
BPT Does not Granger Cause YT		0.04700	0.9541
YT Does not Granger CauseD T	57	7.84317	0.0011
DT Does not Granger Cause TY		0.36158	0.6983

Table 6 shows the one hand, a bi-directional causality between pairs of variables (debt and deficit) (the output gap and the budget deficit), (debt and the output gap). On the other hand, a uni-directional causality between the couple (the output gap and the budget deficit).

Table 7 : Granger Causality Test

Nul Hypothesis	Obs.	F-statstic	Prob.
PIT Does not Granger Cause RT	58	4.37549	0.0174
RT Does not Granger Cause PIT		0.82804	0.4425

The Table 7 above shows a bi-directional causality between pairs of variables (the interest rate and inflation rate). The presence of bi-directional causality denotes variables that influence each other in terms of forecasting ability. On the other hand, a unidirectional causality between the pair of variables (inflation causes interest rates Granger).

V. Conclusions

The stabilization of expectations through monetary policy can only be successful if public finances do not give rise to destabilizing expectations; the pursuit of price stability could lead to very high interest rates or a large loss of international reserves if the markets called policy credibility into question owing to an unfavorable perception of the fiscal stance. At the same time, the less credible monetary policy is, the larger the burden on fiscal policy, since interest rates would tend to be higher than otherwise.

Policy coordination needs to be undertaken at two different levels. First, there is a need to address the constraints that arise in the short term regarding the operating procedures of monetary and fiscal policies. Second, policy coordination also has to deal with the long-term macroeconomic effects that could arise from an unbalanced policy mix.

Based on our model, we find that, at the aggregate level, there is evidence of unidirectional causality between pairs of variables (budget deficit cause public debt) (output gap cause t budget deficit) (output gap cause public debt). It is observed that the public debt has a direct impact on the budget deficit, and it is observed that the budget deficit and public debt have a direct impact on the output gap. Also, we find a unidirectional causality between the pair of variables (inflation causes interest rates Granger) indeed, we note that the interest rate has a direct impact on the rate inflation. At the disaggregated level, the results suggest that there is a causal relationship to long-term public debt from dt and the budget deficit bt to yt as a causal relationship from long-term rate of inflation in interest rates. So there is a catch to the equilibrium value, an error correction mechanism: long-term imbalances between different variables are offset so that the series have similar trends.

Nevertheless, in the short term, we see that there is no causal relationship from the budget deficit and public debt to output gap; however, we see that there is a causal relationship ranging from inflation to interest rates.

We conclud that monetary policy has minimal impact on output via the output gap; nonetheless, this ought to be somewhat expected since economic theory implies that neither monetary nor fiscal policy ought to be able to permanently impact economic growth. The fiscal policy rule has a counter-cyclical output gap term, and a debt correction term. There appears to be a negative impact of fiscal proigacy long-term in terms of

lower than potential economic growth, but in the short-term fiscal policy does appear able to inuence output relative to potential. This conclusion would appear relevant for the debate on the efficacy of fiscal stimuli; they are effective in the short term, but in the longer term should be phased out, rather akin to the traditional textbook exposition of fiscal policy. Our results show that there is no strong interaction between monetary policy and fiscal policy in the euro zone. Without efficient policy coordination, financial instability could ensure, leading to high interest rates, exchange rate pressures, rapid inflation, and an adverse impact on economic growth.

Efficient coordination of monetary and fiscal policies will only be possible if account is taken of the need for policy sustainability and credibility. Both the overall policy framework as well as each policy area considered individually must be set on a sustainable course and be credible. To burden one policy area excessively as a result of a weak stance in the other policy area will sooner or later doom the achievement of the objectives of macroeconomic policy.

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