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Monetary and Fiscal Policy Interaction in the Greece: A Cointegration Approach

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Recently, monetary authorities have increasingly focused on implementing policies to ensure price stability and strengthen central bank independence. Simultaneously, in the fiscal area, market development has allowed public debt managers to focus more on cost minimization. This « divorce » of monetary and debt management functions in no way lessens the need for effective coordination of monetary and fiscal policy if overall economic performance is to be optimized and maintained in the long term. This paper analyzes the interaction between monetary and fiscal policies in Greece from 1980 to 2012. 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. The evidence does not let hear strong political interactions in Greece, and supports the idea that the monetary policy is more stabilizing in its influence on the economic activity than the budget policy.

JEL Codes: E52, E58, E62 and E61

1. Introduction

In recent years, the debate on public deficits and public debt have resurged again, mainly as an answer to the serious problems of a number of countries providing public finances in balance or in surplus. Taylor, 1995 note that for a quarter century of large budget deficits causing a doubling of the national debt by 20% to 42% of GDP in developed countries, the need for greater fiscal discipline appears to be a consensus.

In this approach, the reduction of budget deficit has been further developed by several economists and political analysts investigations. Economic research has shown that reducing budget deficits lowers the real interest rate, increase investment, and increase productivity and real income growth. In this context, Taylor, 1995 has been shown that increased investment is generally less than the proportional reduction of the budget deficit as consumption and net exports increase gradually as the budget deficit reduction.

Therefore, the European Central Bank (ECB) and the Pact of Stability and Growth (PSC) have been the subject of recent controversies that suggest the sidelines of an action on potential growth, the importance of coherent coordination of the two instruments to regulate the actual growth of monetary policy and fiscal policy. However, the need for policy coordination will take different forms depending on a country's specific situation and the particular characteristics of its economy, including the depth of its financial markets, the exchange rate regime, and other institutional arrangements.

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In the early stages of development, where there are no local markets for government debt, the central bank tends to finance fiscal deficit almost entirely, except for that part that the government aboard. Under these circumstances, formal rules to constrain central bank financing to the budget are need to avoid an excessive expansion in domestic credits. A framework that projects the demand for board money and the sources of domestic credit, a board money programming framework is very useful in facilitating a balanced policy mix.

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 Greece from 1980 to 2012. We use the theoretical model of kirsanova and al. (2005) to examine the cointegration relation between variables. This paper deals with the problems of interaction between monetary and fiscal policies in Greece. 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. The evidence does not let hear strong political interactions in Greece and supports the idea that monetary policy is more stabilizing in its influence on the economic activity than budget policy.

In this paper we review the recent literature's perspective on monetary and fiscal policy interaction. We discuss the Greek political and the crisis in section 2, and literature review on theoretical models of monetary and fiscal policies in section 3. Section 4 presents data used as well as methodology applied in this study while Section 5 provides the estimation results. Finally, some conclusions and policy implications are illustrated in Section 6.

2. Greek Political Economy and Crisis

The Greek economy entered the second phase of the pre-EMU accession period in 1994 with both a large public debt and a large budget deficit, and went through a reduction of 9 percentage points (of GDP) in its budget deficit between 1993 and 1999 in order to be admitted to the euro area.

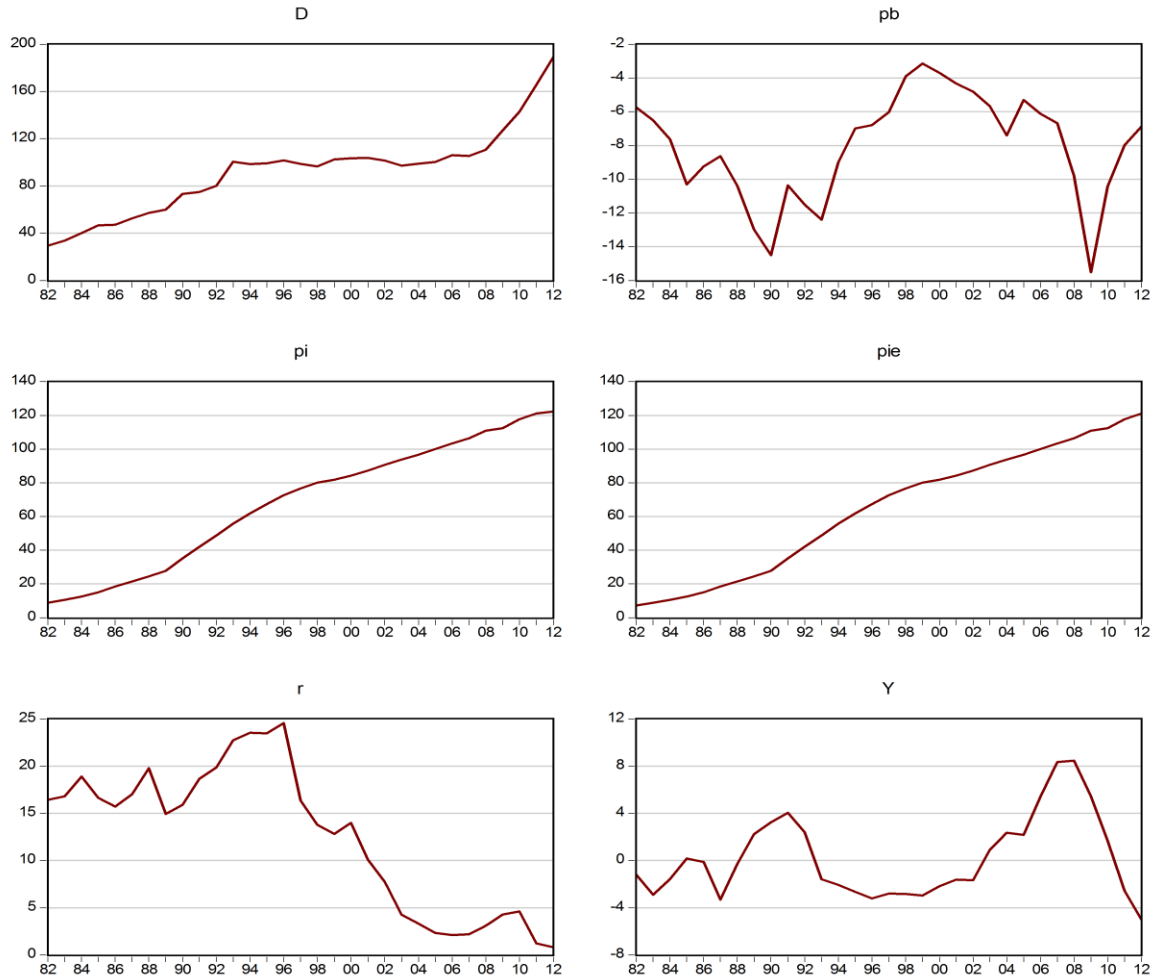
As most European countries were coming out of recession at the end of 2009, Greece was entering a tumultuous period. The announcement of the newly elected Greek government in October 2009 that the projected budget deficit for 2009 would be 12.7 percent of GDP (rather than the 5.1 percent projection that appeared in the 2009 Spring Commission forecast), was initially met with shock and opprobrium in Brussels and other euro-area capitals. The initial reaction of policymakers across the European Union was that the risk of contagion was minimal, and that the right way to deal with the situation was to let Greece « swing in the wind ».

The Greek public budget is still in crisis. The debt to GDP ratio is more than 150%, while the current budget deficits exceed 10%. Given the weak economic outlook for the coming period, financial markets doubt that the country can solve the financial problem in time. Rather, the unsustainability of development has led investors to demand huge risk premiums to maintain the public debt. Before the crisis, markets and policy makers have ignored the specific risk associated with some countries in the euro zone.

High interest rates aggravated the budgetary problems by increasing government borrowing of its large debt costs. The annual government budget deficits have often exceeded 10% production. The annual budget deficits in peacetime than 10% of the GDP are important to all countries. So, gross public sector debt of Greece was about 88% of GDP in 1995. In 1995, the ratio of the weighted average GDP of debt to GDP in the European Union was 73%.

Within this part we present in Fig. 1 the evolution of the principal economic variables during the period of our study from 1982 to 2012. In order to describe the economic cycle of Greece, we resort to the description of principal data such as the public debt, the primary balance, nominal interest rate and the output gap.

Figure 1: Evolution of different economic variables Greece between 1982-2012



The Greek crisis arose from the confluence of several basic factors. First, Greece's large fiscal deficits until 2008 were not incurred for economically sound reasons; they were neither a deliberate macroeconomic response to the dangers of serious recession nor were they associated with an increase in the quality of publicly provided goods and services. Rather, the budget deficits of the previous decade must be seen as reflecting either lack of ability (or complicity) among governments to stem the predatory behaviour of powerful elites to raid the state coffers.

Second, the interdependence between the tax burden, public good provision and tax compliance. The necessary reductions in the budget deficit involve political choices that include higher taxes, lower (hidden) subsidies to private firms, lower wages for public sector employees, and reduced social entitlements.

Third, the rise in unit labour costs in Greece relative to the other Euro Area countries may appear to reflect an inherent inability of the Greek trade union movement to accept real wage increases for private-sector workers in line with productivity developments.

Fourth, the large increase in taxation (since 1975, tax revenue have increased from about 25% to about 40% of GDP) without an equivalent increase in the provision of public services has discouraged tax compliance. A common complaint amongst citizens is that they have been « forced » to spend an increasing share of their income on privately-provided services, in order to complement the worsening quality of publicly-provided ones.

Finally, the continuing, and possibly increasing, incidence of tax evasion privileges the non-traded sector at the expense of the traded sector, because tax evasion is more prevalent in non-traded goods (medical and law services, car repairs, etc) than in traded goods. This creates a vicious circle in which the efforts of government to collect more taxes by raising tax rates shifts resources to the sector more prone to tax evasion, thus, in the medium-term, worsening both the fiscal and the current account deficits.

3. Empirical Literature Review

Monetary policy analyses remained strongly in favor since the Second World War, analysis of fiscal policy has lost favor with the optimization Keynesian countercyclical policies in the 1970s to the extent that much of monetary indifferent literature considered to the achievement of price stability (Walsh, 2003).

Taylor (2000) gives an overview of increased interest in the development of policies in macroeconomic models during the past twenty years, describing that by «the new normative macroeconomics». This new approach focuses on the evaluation of the various political rules in the context of a particular, micro-founded, the model of the economy.

Leeper (1991) developed the Fiscal Theory of the Price Level (FTPL), he introduced two essential points: the distinction between active and passive political policy, highlighting two stable organizations of economic policies (active monetary policy and passive fiscal policy passive or vice versa).

Leith and Wren-Lewis (2000) defined an active monetary-policy regime which satisfies the Taylor principle. They concluded that monetary and fiscal policies should be either active or passive for stability.

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.

Kirsanova.al (2005) extend the three equations of monetary model to a five equations model of monetary and fiscal policies by adding the government's inter-temporal budget constraint. 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. Kuttner doubt whether fiscal policy, given these delays could achieve interaction with monetary policy.

Melitz(1995) analyzes the effect of monetary and fiscal policy on public debt and deficits in 19 OECD countries 1960/78 to 1995 by using the pooled data. He made several interesting results: First, fiscal policy reacts to report of the public debt in a manner of stabilization. Second, the laxist fiscal policy leads to a restrictive monetary policy and vice versa. Third, the automatic stabilization of fiscal policy is much lower than generally perceived.

Melitz (1997) examines the interaction between monetary and fiscal policies in a pooled regression annual data on 19 OECD countries. He notes initially 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.

Muscatelli and al. (2004) estimate a New Keynesian model with the generalized method of moments (GMM) in a system with multiple equations. They allow fiscal policy to have two instruments, taxation and expenditure and motivate policy interactions by first the cyclical nature of each policy, and secondly, by the direction of movement of the shocks of production. They find that monetary policy attenuates satisfies the Taylor principle and reacts to produce a stabilizing manner. Thus, they conclude that the interaction depends on the shock. Shocks to the production of fiscal and monetary policy they act as complements whereas inflation shocks, they act as substitutes.

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.

J.J.Reade and J.Sthe (2010)using multivariate cointegration methods to study the interactions between monetary and fiscal policies by examining the example of the United States since the early 1980s. They find that the elaboration of the monetary policy is strongly prospective and

passive in the sense that it meets the policy rules. In contrast, fiscal policy is found to be active in the sense that it does not respond to rules of fiscal policy. Thus, interactions between the two spheres of politics seem limited so that no policy instrument enters the political rule of the other sphere. But monetary policy is heavily passive is in response to movements of the tax policy. Furthermore, they found that the two policies are complementary, since both policies respond in the same way to revitalize the economy in a downturn and to brake during Boom.

Fragetta and kersanova (2010) studying monetary and fiscal policy interactions in three countries, the United Kingdom, the United States and Sweden. They use a structural general equilibrium model of an open economy and the estimate using Bayesian methods. They assume that the authorities can act in a strategic way in a non-cooperative policy game and compare different leadership regimes. Thus, they characterize monetary and fiscal interactions in the three countries as follows: in each country, monetary authorities and fiscal authorities use their instruments with a substantial smoothing, and there is no evidence debt stabilization in 'any country and finally, the feedback is low to maintain stable economy, but no evidence on the goal of stabilizing the debt was obtained.

4. Methodology and Data

The present study is carried out using annual time series of Greece 1982-2012. The data used include y_t is the output gap, π_t is the inflation rate, r_t is the nominal interest rate, d_t is the public debt and pb_t is 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.

Turning to economic activity, it may seem sensible to consider the information provided in a wide range of different measures when considering economic activity, as policymakers surely consider various measures when deciding upon the level of economic activity. Although this might suggest taking the principle component of a number of measures of economic activity, previous Taylor rule studies have generally taken the output gap or some measure of firms real marginal costs to be the indicator of economic activity. We use the FMI output gap measure.

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:

$$PB_t = T_t - G_t \quad (1)$$

To isolate automatic stabilisers from discretionary policy, we also consider the cyclically adjusted primary balance measure from the FMI. 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.

Debt sustainability is an issue of importance for fiscal policy; a fiscal-policy stance is sustainable if it satisfies the government's intertemporal budget constraint.

We model fiscal policy in a more general setting which allows for data non-stationarity and endogeneity, and we also model fiscal policy in the context of monetary policy, not least to consider the interactions of the two policy spheres. Questions such as the role of monetary policy in debt-sustainability can be investigated in this manner.

Section 4 has emphasised the non-stationarity, of the data series under consideration here. Granger and Newbold (1974) suggested that regression output may be spurious if several of the series modelled are non-stationary.

The data series from section 4 can be combined to form a vector autoregression:

$$X_t = \prod_0 + \prod_1 t + \sum_{i=1}^{k} \prod_i X_{t-i} + u_t\,, \quad u_t \sim N(0, \sigma^2) \tag{2}$$

Here, X_t is a $p \times T$ data matrix, while $\prod 0$ is a $p \times p$ coefficient matrix, where $p = 6$ is the number of variables in the system, and T the number of observations. If the data are non-stationary, so $X_t \sim I(1)$, it must be rearranged into equilibrium-correction form:

$$\Delta X_t = \Pi^* \mathrm{X}^*_{t-1} + \sum_{\mathrm{i}=1}^{\mathrm{k}-1} \Gamma_{\mathrm{i}} \Delta \mathrm{X}_{\mathrm{t}-\mathrm{i}} + \mathrm{u}_{\mathrm{t}}\,, \tag{3}$$

Where $X^*_{t-1} = (X_{t-1,}1)$, $\Pi^* = (\Pi, \Pi_0)$, $\Pi = \sum_{i=1}^{k} \Pi_i - I$ and $\Gamma_i = -\sum_{j=i+1}^{k} \Pi_j$. The coefficients for the lagged regressors and the constant term have been banded together, for ease of exposition. Further, if $X_t \sim I(1)$, then given that $u_t \sim I(0)$ and $\Delta X_t \sim I(0)$ then Π must be of reduced rank for equation (3) to be balanced. If Π is of reduced rank then there exist $p \times r$ matrices α and β such that $\alpha\beta'$ and equation (3) becomes:

$$\Delta X_t = \alpha \breve{\beta}' \mathrm{X}^*_{t-1} + \sum_{\mathrm{i}=1}^{\mathrm{k}-1} \Gamma_{\mathrm{i}} \Delta \mathrm{X}_{\mathrm{t}-\mathrm{k}} + \mathrm{u}_{\mathrm{t}}\,, \tag{4}$$

Where $\check{\beta} = (\beta, \beta_0)$' and $\mathrm{X}^*_{t-1} = (X_{t-1,}1)$. The $\breve{\beta}' \mathrm{X}^*_{t-1}$ terms are cointegrating vectors, the stationary relationships between non-stationary variables, or steady-state relationships. Importantly, $\mathrm{E}(\beta' \mathrm{X}_t)$ since these cointegrating vectors describe steady state relationships which must be mean zero.

In order to test the direction of causality between different variables, a 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. Stationarity of a series is an important phenomenon because it can influence its behavior. 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 heterodasticity in the error term. Akaike information criterion (AIC) is used to select the lag length in ADF test, while Newey-West Bartlett kernel is used to select the bandwidth for the PP test.

We study in this paper the stationarity of variables. We use three types of tests. Initially, we apply the Dickey-Fuler Augmented (ADF), then the test of Philips and Perron (PP), which takes into account heteroscedasticity and autocorrelation. These two tests are based on the

null hypothesis that the process is non-stationary. We confirm our results by a third test of Kwiatkowski, Phillips, Shmidt and Shin (1992) (KPSS). The latter test, contrary to the two first, is based on the null hypothesis of stationarity of the series. Tables below present the results of three respective tests of unit root. These tests are carried out by the Logiciel E-Views 6.

5. Empirical Results

As mentioned in tables below, d_t, π_t, π_t^a and y_t are the series which is closest to being I(2), yet this cannot be the case: This would require the primary balance and nominal interest rate ($pb_{t,}r_t$) to be I(1). Furthermore, an AR(1) model in the first difference of the debt-to-GDP ratio yields an autoregressive parameter of ADF tests such as those of \Phillips and perron (1988) and KwiatkowskiPhillipShin1992}}. However, the cointegrated VAR framework introduced in the next Section does not require that all the series be I(1). All that is required is that the data series are at most I(1). Furthermore, Juselius (2007) argues it is better to treat near-non-stationary data series as I(1) in order to exploit the co-movements between series. Thus, unit-root testing is not of utmost importance. An I(0) variable in a cointegrated VAR model will appear as a cointegrating vector on its own. Nonetheless, for completeness we present some unit-root testing evidence. Of the six variables under consideration, only the output gap returns a rejection of the null hypothesis of a unit root. The primary balance-to-GDP ratio is found to be I(1), although the test statistic is closer to the 5% critical value than for any other variable apart from the output gap.

Table 1: Results of KPSS unit root tests

Variables	Statistics «*tc* » with *T* + *C*	Conclusion
d_t	0.093452	Non-stationary I(2)
y_t	0.072686	Non-stationary I(2)
π_t	0.142920	Non-stationary I(2)
$\pi^a{}_t$	0.122689	Non-stationary I(2)
pb_t	0.098943	Non-stationary I(1)
r_t	0.139705	Non-stationary I(1)

Table 2: Results of ADF and PP unit root tests

Variables	Trend and constant	Constant	None	Conclusion
ADF				
d_t	-2.137159	0.872953	1.987001	Non-stationary I(2)
y_t	-2.619854	-2.940079	-2.985892	Non-stationary I(2)
π_t	-2.178048	-0.959335	0.201734	Non-stationary I(2)
${\pi^a}_t$	-3.060912	-0.887847	0.160656	Non-stationary I(2)
pb_t	-2.161387	-2.059103	-0.626149	Non-stationary I(1)
r_t	-1.904593	-0.266424	-1.127389	Non-stationary I(1)
PP				
d_t	-1.081812	0.523568	2.672985	Non-stationary I(2)
y_t	-1.703156	-1.909682	-1.942903	Non-stationary I(2)
π_t	-1.275701	-0.714045	3.080642	Non-stationary I(2)
${\pi^a}_t$	-1.700280	-0.242353	3.226135	Non-stationary I(2)
pb_t	-4.757157	-4.830190	-4.937365	Non-stationary I(1)
r_t	-1.778173	-0.266424	-1.115684	Non-stationary I(1)

The cointegration term was introduced by Granger in 1981. The cointegration test is used to check the long-term equilibrium relationship between the variables d_t, pb_t, r_t, π_t , ${\pi^a}_t$ and y_t. The presence of an equilibrium relationship between these variables is formally tested using statistical procedures (Engle and Granger, 1987; Johansen, 1988).

Table 3: Order of integration

Variables	d_t	y_t	π_t	${\pi^a}_t$	r_t	pb_t
	I(2)	I(2)	I(2)	I(2)	I(1)	I(1)

According to the table 3 we note that for variables have the same order of integration: I(2), moreover two variables are : (1) , which justifies the use of cointegration test of (Engle and Granger, 1987. Indeed, a necessary condition for using this test is that all variables must be of the same order of integration. Analysis about integration of variables justifies the presence of a long-term relationship that relates a common stochastic trend. This will be tested by two approaches: the approach of Engle and Granger, (1987) and Johansen, (1988).

Since the series are integrated of the same order I(1), the Johansen's approach is used to test if the variables are cointegrated.

Johansen (1988, 1995) proposed a multivariate approach based on the method of maximum likelihood. Is used to check the cointegration series by a cointegration rank test. Johansen cointegration results are reported in Table (4) and (5).

Hypothesis testing:

H0: Non-cointegration ($r = 0$)

H1: Cointegration ($r \geq 1$)

Table 4: Trace test results

Series	Trace statistic	Critical value (0.05)	probability	conclusion
$r = 0$	262.5143	47.85613	0.0001	H0 rejected
$r \geq 1$	55.52078	29.79707	0.0000	H0 rejected
$r \geq 2$	15.91870	15.49471	0.0432	H0 rejected
$r \geq 3$	1.309336	3.841466	0.2525	H0 rejected

In the table 4 the trace statistics at r=0 of 262.514 exceeds its critical value of 47.8561, we reject the null hypothesis of no cointegrating equations. The same thing at r=1, The trace statistics at r=1 of 55.5207 exceeds its critical value of 29.7970, we reject the null hypothesis of no cointegrating equations. The trace statistics at r=2 of 15.91870 exceeds the critical value of 15.49471, we reject the null hypothesis of no cointegrating equations. The trace statistics at r=3 of 1.3093 is less than the critical value of 3.8414 we cannot reject the null hypothesis that there is one cointegration relationship.

Here we find that the four 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 three cointegrating equations. Moreover, the existence of cointegration relationship justifies the adoption of a model error correction (Engle and Granger, 1987).

Cointegration between series indicates a confirmed causal relationship in the long-run but it fails to give the causality direction. Hence, a VECM is used to test the short-run as well as the long-run Granger causality.

Table 5: Trace test results

Series	Trace statistic	Critical value (0.05)	probability	conclusion
None	9.030021	15.49471	0.3626	H0 accepted
At most 1	0.014173	3.841466	0.9051	H0 accepted

In contrast, in the second table we found no cointegrating relationship, according to the test “trace". Therefore, the nominal interest rate and the primary balance are not cointegrated and have no long-term relationship.

The existence of cointegration relationship justifies the adoption of a model error correction (Engle and Granger, 1987).

Using the error correction model can highlight the common cointegrating relationship (common trend) and deduct the interactions between variables. We propose to estimate the model error correction according to the model representation by Hendry.

Granger (1969) introduced non-causality concept in 1969 in order to make optimal prediction made at the variables. Objective’s test causality is to evaluate the temporal order and the ability of forecasting 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 analysis of causality will put the interactions between the variables of monetary and fiscal policies.

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

Figure 3: Causality test

Null Hypothesis:	Obs	F-Statistic	Prob.
PI_T does not Granger Cause D_T	27	1.66123	0.2027
D_T does not Granger Cause PI_T		0.52522	0.7186
PIE_T1 does not Granger Cause D_T	26	1.58516	0.2236
D_T does not Granger Cause PIE_T1		0.40734	0.8008
Y_T does not Granger Cause D_T	27	2.64712	0.0674
D_T does not Granger Cause Y_T		0.67774	0.6162
PIE_T1 does not Granger Cause PI_T	26	1.18834	0.3514
PI_T does not Granger Cause PIE_T1		1.61680	0.2158
Y_T does not Granger Cause PI_T	27	1.94949	0.1458
PI_T does not Granger Cause Y_T		0.20749	0.9309
Y_T does not Granger Cause PIE_T1	26	0.10740	0.9783
PIE_T1 does not Granger Cause Y_T		0.22473	0.9208

The figure 3 shows on the one hand a bi-directional causality between the pairs of variables (output gap and the inflation rate), (the inflation rate and debt), (the rate of expected inflation and debt) and (the output gap and debt). 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 (the output gap causes the debt within the meaning of Granger (1969).

6. Conclusions

The main sphere of interaction between monetary and fiscal policies relates to the financing of the budget deficit and monetary management. 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. At the same time, the financing needs of the government and its funding strategy will place constraints on the operational independence of the monetary authorities.

This paper evaluate the effect of the interaction between monetary and fiscal policies, case of Greece, the sustainability of developments in public debt and budget deficit, which is the subject of a theoretical model studied by Kirsanova and al. (2005), and contribute to his theory by introducing elements robust to issues remained ambiguous answers yet. we have studied empirically the issue of monetary and fiscal policies as well as their interactions in the case of Greece, for its troubled economy after the financial crisis .

The survey of cointegrated VAR methodology is used as it is argued to be the most significant and appropriate means to model these are economic time non-stationary series. The advantage also use methods of cointegration is that each policy area will have its own path stationary state, which should be ungovernable in the data, and the responses of policy instruments and target variables can also be set using the cointegrated VAR approach.

While monetary and fiscal policies are implemented by two different entities, these policies are far from independent. A change into one will affect the effectiveness of the other, and thus, the overall impact of any policy change. Tensions can arise between each policy will contribute to facilitate economic and achieve macroeconomic stability and growth cycles. That is why it is essential to pursue a coherent policy mix of monetary and fiscal policies and to coordinate as much as possible to avoid tensions or inconsistencies. This combination of policies is a key element of IMF policy advice on macroeconomic policy and programs supported by the economic adjustment policies with the external sector, structural and financial. In practice, the imbalances in the fiscal situation are in many cases turned out to be an essential element in both macro-economic problems and their solution.

In this paper we have investigated empirically the issue of monetary and fiscal policies and their interactions. We use recent advances in the techniques of multiple equations series, chronological, and econometric principles as conventional econometric modeling to provide a comprehensive survey of monetary and fiscal interactions using the example of Greece since the early 1982.

Finally, we can conclude that, in the case of Greece, the interaction between monetary and fiscal policy has a negative effect on the sustainability of the development of public debt and the budget deficit. The evidence does not suggest a policy of strong interactions, and supports the idea that monetary policy is stabilizing in its influence on economic activity that fiscal policy in the case of Greece.

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Appendix

Figure 2: ECM model

Dependent Variable: D(D_T)
Method: Least Squares
Date: 05/21/12 Time: 00:32
Sample (adjusted): 1983 2012
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.464769	4.555014	0.321573	0.7507
D(Y_T)	-1.497870	0.597273	-2.507849	0.0197
D(PI_T)	-1.048139	0.931435	-1.125295	0.2721
D(PIE_T)	-1.195938	0.899996	-1.328826	0.1969
D_T (-1)	0.369880	0.149941	2.466844	0.0215
Y_T (-1)	1.277428	0.483797	2.640424	0.0146
PI_T (-1)	-0.317943	0.134585	-2.362399	0.0270

R-squared	0.569488	Mean dependent var	5.325833
Adjusted R-squared	0.457180	S.D. dependent var	7.594794
S.E. of regression	5.595562	Akaike info criterion	6.482788
Sum squared resid	720.1373	Schwarz criterion	6.809734
Log likelihood	-90.24182	Hannan-Quinn criter.	6.587381
F-statistic	5.070791	Durbin-Watson stat	2.385552
Prob (F-statistic)	0.001906		