WORKING PAPER

33 (72) 2017

BANK OF ALBANIA

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*Note: The views expressed herein are of the author and do not necessarily reflect the views of the Bank of Albania.*

*The paper is based on data published up to 2011 Q4.*

# C O N T E N T

## ABSTRACT

This discussion paper focuses on the long-run mean-reverting properties of debt to GDP ratio and the role of the government in shaping the fiscal policy across the different regions for the period 2000-2011. The material, evaluates the solvency condition by mean of panel unit root and also estimate the fiscal responses of fiscal policy in 27 European Union and Euro area and other future and potential member countries in a panel VAR. Results exhibit substantial inertia in fiscal behaviour and imply that fiscal authorities react to aggravating debt position by generating future surpluses, but not enough to fulfil the solvency condition and to be coherent with the IBC and Ricardian fiscal regime. Further, fiscal policy appears to be pro-cyclical across all groups of countries.



*Keywords: Fiscal sustainability, pro-cyclicality, panel unit root and panel VAR approach*

*JEL Classification: C32, E32, E62, E63, H6 and H62*


## I. INTRODUCTION

Appraising fiscal policy (henceforth FP) has always taken much attention in the context of the individual and/or cross-country analysis setup. Fiscal sustainability and consolidation have become among the most widely used concepts in assessing the behaviour of FP. In academic literature, although the exact definition remains an open debate, the concept of fiscal sustainability refers to a dynamic equilibrium. This dynamic equilibrium does not require any significant change in fiscal policy, and it implies long term financial stability, where markets provide funds to cover the borrowing requirements. As such, sustainability does not mean budgets have to be balanced at all times, provided temporary deviations from the sustainable rate are duly corrected. But, it would require that governments respect the intertemporal budget constraint (IBC) such that they can repay their debt back and interest out of future revenues. Therefore, almost everyone agrees that the sustainability of public finances is closely

linked to the state of the financial situation of the government, which often represents the economical strength and stability of the country. However, when deficits become excessive and debt explodes, the solvency of governments is threatened, while the rising risk of default would lead sooner or later to the need to review and accommodate the anticipated government revenues and expenditures, even if it is solvent and its debt is fundamentally sustainable. Thus, the need to revise the current FP is a sign of unsustainable public finances, while an adjustment caused by a loss of confidence in financial markets would dry out the liquidity necessary for refinancing new or maturing debt, which is generally much more costly. Furthermore, the stability of FP is questionable when rising rates of debt to GDP reaches above a certain level and when the revenues are not sufficient to cover financing costs related to new levels of debt issued or when it is clear that the government needs are higher than the taxpayers can support.

In the aftermath of the 2008-2009 economic and financial crises and in the context of important restrictions to the implementation of fiscal policies in the current international situation, notably across all the European and non-European Union countries, with the need for fiscal consolidation ever so present, the appraisal of fiscal solvency and how fiscal authorities adjust their reactions is quite important for at least two reasons. On the one hand, the ongoing slump in the aftermath of the crises has brought a renewed interest on the use of fiscal policy to promote also economic growth. At a time when the private sector is engaged in a collective effort to spend less, economists like Krugman and Layard[1] call for more active public policy, which should act as a stabilizing force by attempting to sustain spending. Thus, at a time when real interest rates are at very low levels, limiting the possibility of central banks to dampen the effects of the economic downturn, non-austerity fiscal measures are generally perceived as the only way of restoring the countries back on the track of sustainable growth. But, on the other hand, in the aftermath of the financial crisis, a sovereign debt crisis and unsustainable FP have emerged, across different countries and regions, especially among the European Union (EU) countries. Notably across all the European and non-European Union countries raising fiscal deficit,

[1] See: Krugman and Layard (2012)

hence public debt, among rising unemployment and/or bailout costs, reflected both the impact of automatic stabilisers in form of reduced government revenues and expenses surged in connection with stimulus packages. As such, expansionary fiscal policy might threaten the solvency condition of the IBC.

The main question, hence in this discussion material, relates to the analysis on whether the level of public debt among European Union (EU), Central and South Eastern (CEE and SEE) European countries has reached a limit where there is less scope for further non-austerity FP policies to support economic growth. Hence, the purpose of this paper is to provide robust features of the FP among these regional countries, paying attention to the behaviour of FP in the long-run. In particular, the aim is to examine two aspects of the same question:

(i) First, is FP stable in the aftermath of the 2008-2009 economic and financial crises?
(ii) And second, can fiscal authorities employ further non-austerity FP in support of economic growth or it would provide excessive debt accumulation?

In transition and developing countries the possibility of generating excessive surplus diminishes as public debt to GDP ratio moves toward 50 percent of GDP ratio and beyond that threshold level the obscurity developments in FP cannot guarantee financial solvency without incurring further debt growth [IMF (2003)]. In the context of the EU and Euro zone, within the Stability and Growth Pact (SGP) rule-based framework, Member States are required to implement indispensable sound public finances for the well functioning of the European and Monetary Union (EMU). Such fiscal framework consists of a preventive and a dissuasive arm, notably not breaching the 3 (60) percentage of GDP threshold on fiscal deficit (public debt). However, over time track records have been mixed, with some countries breaching such fiscal rules mainly in the aftermath of economic and financial. Besides, deterministic fiscal indicator and rules offer clear objectives and signals and are easily interpreted[2].

[2] The EU Member States' track records of complying with the fiscal rules laid down in the SGP have been mixed.

But, overall deterministic fiscal rules are based on a subjective definition. First, there is no strong theoretical reason to link fiscal solvency with the return to a pre-determined threshold level and not another one. Meanwhile, although in some cases high levels of deficit and public debt may be appropriate, it is impossible for a country to adhere to a consistent ratio throughout the all time. Second, within the policy making process, the adequate stabilising policies might be more indispensable at low levels, but not when the country is already at a high level and exposed to shocks such as sudden stops of capital. A deterministic fiscal rule approach sticks to a pre-determined threshold level, regardless of uncertainties associated with the volatility of other economic indicators and the rising demand for implementation of non-austerity fiscal policies. Jonas (2010) implies that a lower threshold level would place a compulsory tighten FP for a long period of time, while the initial actual level is too high. In return, as in the actual post-financial and economic crisis situation, this induces public expenditure reduction and slowdown of potential economic growth given that there is a demand rather than supply side problem. But, placing a higher level might raise concerns about sustainability, as consequently debt burden and interests rate raise simultaneously.

Solvency requires that governments respect the IBC[3], based on no ponze game, and most economic literature follows an empirical approach to examine if the observed data are consistent with this requirement[4]. Besides, an empirical approach evaluates long-term sustainability of public finances based on the stochastic mean-reverting properties. Therefore, this empirical paper approaches the topic of fiscal solvency, through unit root[5] and fiscal reaction function

[3] The concept of intertemporal budget constraint is based on the transversality condition and on the assumption that government expects some future tax revenues and based on this expectation makes the payment on debt at present. For this reason it is necessary to discount the present-value of the expected tax revenues in the future. Discounted value is compared with government need to make payments on time t. If the present value of expected revenues is equal or higher than the present value of government obligations, then fiscal policy is considered stable.

[4] See: Hamilton dhe Flavin (1986); Wilcox (1989); Trahan dhe Walsh (1991) dhe Wickens dhe Uctum 1993, Bohn (1998), Chalk and Hemming (2000), Uctum (2006) and Giammarioli et al. (2007).

[5] See: Trehan and Walsh (1991) and Taylor (2002).

in a panel VAR[6] data analysis for a sample comprising a total of 36 EU and non-EU countries across 11 years. Both approaches bring a different perspective to the question of solvency of FP pursued by the government. The former approach describes the data-generating process characterizing the debt series. The later reflects the role of the government in shaping the fiscal policy.

The structure of the paper is as follows: Section 2 presents the methodology, the model and the data. Empirical results and discussions are presented in section 3. The material concludes in section 4.

# II. THE METHODOLOGY AND DATA

## A. UNIT-ROOT TEST AND FISCAL POLICY REACTION FUNCTION APPROACH TO TEST FOR SUSTAINABILITY

The traditional approach in evaluating the solvency of fiscal policies requires that governments respect the IBC. Debt holders expect the current debt to be offset by the sum of excepted future discount primary budget surpluses, while market will not tolerate Ponzi games[7] under which new debt is issued systematically to cover debt servicing [Cuddington, (1996)]. This is also known as the transversality condition and implies that the present debt value must equal with the present value of expected surpluses, otherwise, the adjustment of the necessary stabilizing measures to restore the

[6] See: Bohn (1998 and 2007), Canzoneri et al., (2001), Uctum (2006) and Afonso and Jalles (2011)

[7] No Ponze game is also considered as a Ricardian fiscal regimes.

deficit and public debt at sustainable levels is inevitable[8]. Besides, for growing economies debt sustainability depends on size of government liabilities and rate of economic growth as the ability to repay the debt grows proportionally to the rate of economic growth [Hakkio and Rush (1991), Cuddington (1996)]9. Hamilton and Flavin (1986) implies that high and consistent borrowing rates cannot continue forever due to government borrowing capacity and higher costs associated with that and inevitable the ratio of debt to GDP should come to an acceptable level, simply by generating a positive fiscal surpluses. In this way, IBC imposes restrictions on the long-run relationship between expenditure and revenues by requiring them not to drift far away from one another and on the government to generate enough future net primary surpluses to pay back the outstanding stock of debt. So when the government generates a certain level of budget deficit, it implicitly promises that in the future it will enable positive fiscal surpluses. Therefore, if the IBC condition is satisfied, then any debt-to-GDP ratio accumulation in the long-term will be defined as mean-reverting and the budget will be balanced in present value terms as possible high levels of past debt would be offset by future positive surpluses [Uctum, (2006)].

Using historical data, Trehan and Walsh (1991) and Taylor (2002) recommended assessing transversality condition and mean-reverting properties by unit root test techniques. This approach

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[8] Based on these conditions, the hypothesis that the government is subject to IBC can be expressed mathematically as follows:

$$B_t = \delta_{t+n} B_{t+n} + \sum_{i=1}^{n} \delta_{t,i} S_{t+i}, \qquad (a)$$

Where, $\delta_{t+n} = \prod_{s=1}^{n} (1 + \rho_{t+s})^{-1}$ is the time-varing discount factor $n$ period ahead. A necessary and sufficient condition for sustainability is that, as $n$ goes to infinite, $lim_{n\to\infty} \delta_{t+n} B_{t+n} = 0$. In this case, Trehan and Walsh (1991) suggest that as long as the stock of the outstanding debt $b_t$ follows a trend stationary process and if $\delta_{t+n}$ grows exponentially, then $B_t = \sum_{i=1}^{\infty} \delta_{t,i} S_{t+1}$ and IBC are satisfied.

[9] In apprising debt sustainability based on the size and changing growth rate, Taylor (2002) suggests the condition is satisfied as long as $0 < g < r$ and that the discounting factor presented by Trehan and Walsh (1991) will take the form:

$$\delta^*_{t+n} = \prod_{i=0}^{j} \frac{R_{t+i}}{G_{t+i}} \qquad (b)$$

Where, $G=1+g$, with g representing the real economic growth rate and $R=1+r$ with $r$ representing the real interest rate. IBC is satisfied if $lim_{n\to\infty} \delta^*_{t+n} B_{t+n} = 0$ while as $n$ goes to infinity. This condition holds if $\delta^*_t$ follows a stochastic process bounded below by $1+\delta^*$ $(\delta^*>0)$ for the expected values and the ratio of debt to GDP is a stationary process.

requires to test the null hypothesis that the data generating process (DGP) for discounted debt is non-stationary ($H0: \pi \neq 0$) against the alternative ($H0: \pi = 0$), while mean-reverting requires ($<0$). The rejection of the null hypothesis implies no presence of a unit root properties. The IBC based on no Ponzi condition is satisfied and the DGP for discounted debt embodies a stationary stable mean-reverting property, while government revenue and expenditure can continue their past stochastic process without losing market confidence and veca versa.

An alternative complementary approach for the validation of the existence of no-Ponze game focuses on estimating empirically a FP reaction function (henceforth FPRF)[10] that would evaluate if fiscal authorities are motivated by stabilization and sustainability motives and whether further non-austerity FP in support of economic growth would provide excessive debt accumulation? The underlying principle behind this is rooted in the government fiscal behaviour based on IBC and no Ponzi game condition, while monetary policy (PM) is free to adjust its instruments such as money supply or the nominal interest rates [Walsh (2003)]. Bohn (1999) considers also that the budget balance, D, is a function of the degree of government debt, B, and a set of control variables, Z, of budget balance representing the Barro (1979) variables, such as output gap and temporarily government expenses. Using a similar framework, we build and estimate a panel Vector Autoregression (P-VAR) model[11], as follows:

$$X_t = \beta_0 \sum_{i=1}^{p} \beta_i X_{t-1} + \sum_{i=0}^{q} \beta_i Z_t + \varepsilon_t \qquad (1)$$

Where, $X_t$ and $Z_t$ is a vector given by,

$$X_t = [s_t, b_t] \text{ and } Z_t = [\tilde{y}_t, \rho_t, i_t] \qquad (2)$$

[10] This approach assumes that in the future the government intends to collect enough revenues as to offset the present-value of collection costs over time such that the behaviour of debt to GDP ratio over time is mean-reverting and pursued FP avoids excessive debt accumulation. Bohn (2007) implies that such assumptions represent a form of error correction mechanism.

[11] Canzoneri et al. (2001) and Afonso and Jalles (2011) based their approach on a panel VAR approach

Where, $S_t$ is a measure of fiscal stance, expressed as the primary fiscal surplus (expressed as a percentage of GDP) and reflects the correction of an overshoot over target in the year following its identification, $b_t$ represents the stock of public debt-to-GDP ratio, $\tilde{y}_t$ represents the output gap; $\rho_t$ represents annual inflation rate; $i_t$ is a measure of debt cost servicing; $\beta_0$ is a vector of constant terms; $\beta_i$ are the matrixes of the coefficients measuring lagged effect of variables on each other; $\varepsilon_t = [\varepsilon_{st}, \varepsilon_{bt}]$ is the vector of error terms and $\varepsilon_t \sim iid(0,\sigma^2)$.

Our empirical model assumes IBC reflects primary budget surplus and the advantage is twofold. First, primary expenditures are more easily controlled by the government and less affected by interest payments on accumulated public debt. Second, this allows analysing the effects of automatic stabilisers and discretionary policy actions[12]. Besides, following other empirical studies[13], we opted for the unadjusted primary deficit for three reasons. First, this allows us avoiding the numerous shortfalls in the methodology of estimating the cyclically adjusted variables relating to evaluating trend/potential output. Second, cyclically-adjusted primary surplus may also be affected by temporary factors, not directly linked to the cycle, including one-off operations, creative accounting and classification errors. Finally, with the exception of unemployment-related expenses that generally hold a small weight in total public expenses, the dynamic of public expenses generally reflects discretionary decisions and is hence not correlated with the business cycle. Further, $s_t$ and $b_t$ are expressed as percentage of GDP to account for the solvency condition based on the preposition that the government's ability to repay the debt grows proportionally by the rate of economic growth. Based on Bohn (1998), output gap, $\tilde{y}_t$, serves as a control variable and can capture any possible government short-run demand stabilisation pursue policies. It also detains the impact of the business cycle on the budget deficit, depending on the size of automatic stabilisers [de Mello, 2005)]. Inflation rate, $\rho_t$, accounts for shocks to seigniorage revenues [Gali

[12] An assessment, on the other hand, through budget surplus is important and allows the identification of the effect of debt service over the business cycle.

[13] See also Girouard and André (2005), Koen and van den Noord (2005), Tagkalakis (2010) and Stoica and Leonte (2011).

and Perroti (2003)] and also symbolizes a policy coordination issue between monetary and fiscal authorities [Khalid (2007)]. Finally, we have also included cost of debt servicing, $i_t$, since it capture the partial effect of raising cost on primary surplus[14].

In the P-VAR model, we consider that government adjust the $s_t$ in response to changes in $b_t$ so as to ensure the sustainability of the debt level over time, whilst the set of control variable, $Z_t$, are out of the government control in the decision making process and have a lag effect on both $s_t$ and $b_t$. Moreover, in principle the FP decisions for the next year (the budget law) are taken somewhere in autumn of the previous year. Therefore, according to Tagkalakis (2010), using the lagged value reflects the time when budgetary decisions are taken rather than the year in which budgetary actions are in effect. For these reasons, the set of control variables enter into the model as exogenous variable with 1 lag. The specified 2 variables P-VAR model takes the matrix form (system equations), as follows:

$$s_t = \beta_{1,0} + \beta_{1,1}^{p} s_{t-p} + \beta_{1,2}^{p} b_{t-p} + \beta_{1,3}\tilde{y}_{t-1} + \beta_{1,4}\rho_{t-1} + \beta_{1,5} i_{t-1} + \varepsilon_{1,t} \qquad (3.1)$$

And,

$$b_t = \beta_{2,0} + \beta_{2,1}^{p} s_{t-p} + \beta_{2,2}^{p} b_{t-p} + \beta_{2,3}\tilde{y}_{t-1} + \beta_{2,4}\rho_{t-1} + \beta_{2,5} i_{t-1} + \varepsilon_{2,t} \qquad (3.2)$$

Where, all variables are explained as above[15]. In equation 3.1, $(s_t)$ is a function of government debt $(b_t)$ and allow testing for the solvency condition based on Ricardian fiscal regime, while it represents a FPRF along the lines of Bohn (1998). According

[14] According to Laubach (2009), in recession monetary authority cut short-term interest rates, long-term interest fall, while automatic stabilizers drive up the deficit. Hence, there exist a negative correlation between interest rate and deficits (or debt), even though this is inconclusive about the partial effect of raising cost on discretionary spending or tax decision.

[15] According to Collignon (2012), the FPRF as formulated by eq. 3.1 and 3.2 is symmetrical, which is consistent with the SGP (balanced structural budgets), while it functions as an asymmetric ceiling in the Excessive Deficit Procedure (EDP). It can therefore be interpreted as the limiting condition for sustainability, given that the actual performance should in general be better because a deficit below 3% will not necessarily cause higher deficits in the next period.

to Afonso and Jalles (2011), equation 3.2 embodies a standard budget deficit and debt dynamics formulation.

In order to provide some further robustness check, we report additional results from the impulse-response functions from the estimated P-VAR. The reaction function and the VAR approach provide some vital advantages while appraising fiscal policy stance. FPRF allows testing for the mean-reverting properties of the $b_t$ and to localise the effects of other factors that normally have an impact on fiscal behaviour. According to De Mello (2005) government might find it impossible to implement sufficient measures to bring significant policy change in a single period, while lagged variable in $s_t$ through VAR approach allow us to distinguish for inertia in government behaviour. Besides, the coefficient and the impulse response estimation through VAR approach allow evaluating the FP behaviour at current state and through time [Burger (2011)]. Furthermore, using panel estimation seems more adequate and the advantage is threefold. First, it provides more information contained in the cross-section dimension and increases the performance and accuracy of the estimated specifications reducing the probability of a spurious regression, while the variance of government indebtedness is both cross-sectional and time series related [Barnerjee, (1999)]. Second, cross-country dependence can mirror common changes in fiscal behavior authorities (EU membership, run-up to EMU, SGP, peer pressure, capital markets views) due to increase economic synchronization across all countries and that common policy shocks can affect fiscal positions in all countries [Afonso and Hauptmeier (2009)]. Third, but not least importantly, panel estimation enables to by-pass the difficulty related to short spanned time series, while the unit root tests are more powerful than the conventional ones [Afonso and Jalles (2011)]. On the other hand, the panel approach allows us to estimate separate coefficients, respectively, and then estimate results for the all sample and also compare the results across the three groups of countries. This would enable to distinguish how and to what extend fiscal policy stance among the panel countries different among them. A similar approach is used in Gali and Perotti (2003), Wyplosz (2006) and Staehr (2008) to assess changes over time. The choice of the three groups and to arrange countries under some groups is based on a number of

factors. First, the countries within each group have been restrainted to a number of similar challenges, respectively, i.e. from the EMU and SGP condition and qualification criterio to the post-transition adjustments. Second, the economic structure varies markedly across each group. Third, countries within each group have been constrained to different institutional and policy arrangements[16].

The literature, on the fiscal reaction function approach, does not place any resctrions on the sign of the estimated coefficients. But, under such estimation approach (eq. 3.1), $\beta_{1,1}^{p}$ and $\beta_{1,2}^{p}$ are the two key parameters to judge for fiscal solvency. The former $(\beta_{1,1}^{p} > 0)$ is a sign of the tendency that the government tries to increase the primary balance in order to react to the existing stock of public debt and comply with the government budget constraint, while solvency requires that raising indebtness is associated with an increase in the primary surplus, $(\beta_{1,2}^{p} > 0)$[17]. Hence, in such a regime, making the primary balance a function of government debt allows testing, in other words, if primary budget balances are expected to react to government debt, in order to ensure fiscal solvency and vice versa. However, Alfonso (2005) suggests that the solvency condition requires that the size of the coefficient should be closer to one and statistically significant. Further, according to Uctum (2006) if both unit root tests and the FPRF approaches[18] are conducted simultaneously, fiscal solvency can be appraised from different perspective in four possible ways, as follows:

(i) Test results are consistent and fiscal policy is sustainable if $(H0: \pi \neq 0)$ rejected and $(\beta_{1,2}^{p} > 0)$;
(ii) Test results are consistent and fiscal policy is not sustainable if $(H0: \pi \neq 0)$ not rejected and $(\beta_{1,2}^{p} > 0)$;
(iii) Primary surplus generated by the government has not been sufficient to revert the unsustainable path of fiscal policy and

[16] Under the operation of the EMU common monetary policy is determined in co-operation between the eurozone countries, while the stabilisation policies in the C&PCs have not been constrained by similar institutional arrangements.

[17] See also [Bohn (1998), Afonso and Hauptmeier (2009), Lewis (2009) and Afonso and Jalles (2011)]

[18] The former approach evaluates solvency on unit root analisys for, while the later checks out whether the government reacts to raising debt by generating future primary surplus in order to ensure fiscal solvency.

further efforts are required if (H0: $\pi \neq 0$) not rejected and ($\beta_{1,2}^{p} > 0$);

(iv) Fiscal policy is sustainable, but the profligacy of government may put it at risk if (H0: $\pi \neq 0$) rejected and ($\beta_{1,2}^{p} > 0$);

Moreover, $\beta_{1,3} < 0$ is evidence of a pro-cyclical policy ($\beta_{1,3} > 0$, a countercyclical), which means that primary surplus falls when actual output gap rises relatively to potential output, reducing the sustainability of the public financies [Uctum (2006), Turrini (2008) and Dobrescu and Salman (2011)].

## B. DATA

The empirical model evaluates the FP stance through FPRF approach using policy inertia instruments (primary surplus), debt burden, economic fluctuations, inflation rate and the variable reflecting debt-servicing requirements. The analysis covers 36 EU and non-EU countries members[19] distinguishing among countries in the EU-17 (eurozone), the other EU, but non-Eurozone states (EU-10) and a group of candidate and potential candidate countries (C&PCs)[20]. Sufficient and full data for this empirical study were available and taken from International Monetary Fund (IMF) database, which means we estimate a dynamic balanced panel specification. Our sample, hence, covers harmonized IMF data for the 12-year period across 2000 to 2011. Primary surplus is the sum of revenues excluding primary expenditure (expenditure minus interest payments) and together with stock of government debt (domestic + foreign borrowing) are expressed to nominal GDP ratio. The data on the output gap represents a deviation of nominal GDP from potential GDP estimated by the HP filter and is then

[19] The list of countries included in the study consist of Albania, Austria, Belgium, Bosnia and Hercegovina, Bulgaria, Croatia, Cyprus, Czech, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Turkey and United Kingdom (UK).

[20] This includes Albania, Bosnia and Herzegovina, Croatia, FYRoM, Montenegro, Serbia and Turkey. Iceland and Normay are excluded form the group of C&PC, since as developed economies they have not been restrained to transition and structural reforms.

divided by the potential GDP. Cost of debt servicing represents interest payments for both domestic and foreign debt borrowing and is expressed as GDP ratio.

# III. EMPIRICAL RESULTS

## A. UNIT-ROOT TESTS

Applications of panel unit root tests have become a common place in empirical economics and most of them are designed to test the null hypothesis of a unit root (assuming common unit root process) for each individual series in the panel, i.e. does contain a unit root within the existing panel time series. According to Pesaran (2011), the rejection of the panel unit root[21] hypothesis should be interpreted as evidence that a statistically significant proportion of the units are stationary. Therefore, we have employed a panel-unit root approach based on ADF and PP Fisher-type tests (Maddala and Wu (1999) used to analysis for solvency condition or the mean-reverting properties of government debt to GDP ratio as explained by Trehan and Walsh (1991) and Taylor (2002). Considering Lewis (2010), the data is pooled and estimated as panel time series, given the relatively short time period involved. Results are confirmed through Levin, Lin and Chu (2002) and Im, Pesaran and Shin (2003). The appropriate lag length in the autoregressive panel-based unit root test process, reported in Appendix A, is based on Schwarz Info Criterion (SIC).

Evidence in Table 2, after conducting the panel-based unit tests, overwhelmingly fails to reject the null unit root hypothesis at the conventional significance level in all regional panel-samples, but except the C&PCs as the LLC test suggests that there is some evidence on stationarity on $b_t$ as a region with a constant and without a constant. Thus, based on conclusive evidence we can accept most conservatively that nonstationarity cannot be ruled

[21] Accordingly, one has to note that even though such tests are described across as "panel-based unit root" tests, theoretically, they are simply multiple-series unit root tests that have been applied to panel data structures (where the presence of cross-sections generates "multiple series" out of a single series).

out in our panel dataset for debt to GDP ratio. Accordingly, this indicates that debt to GDP ratio across different region within Europe is not stable (stationary). Past high levels are not offset by positive balances in the future, such as to allow the public debt to GDP to be mean-reverting. Therefore, based on the traditional unit root tests, countries within different region in general are not in Ricardian equivalence regime. They do not satisfy their IBC or no Ponze condition during the time period considered, and that to be solvent governments have to change the course of their fiscal policies.

## B. FISCAL POLICY REACTION FUNCTION

Following the previous section, as in Uctum (2006), this part checks whether governments respond to debt accumulation by generating primary surplus in the manner suggested in eq. (3.1 and 3.2), and where the feedback coefficients capture this effect. The panel unit root test results, reported in Table 2 in Appendix, reveal that the null unit root hypothesis is rejected at the conventional significance for all or most of the cases and based on conclusive evidence we can support the stationarity of primary surplus, inflation rate, output gap and cost on debt servicing. Thus, we have estimated a VAR model in level (debt to GDP ratio entered the model in first difference)[22]. The appropriate one lag length on VAR model was based on SIC criteria, stability condition and LM test for serial correlation. The model fulfils condition on stability, autocorrelation, normality and heteroskedasticity tests.

Empirical results, (Table 1), altogether with impulse response function (in Appendix) for each group of countries have brought up some vital information for decision-making process. Results show that primary surplus is linked positively to previous balances. The coefficient on $s_{t-1}$ has a positive sign and is statistically significant at conventional level across all specified models. Such findings confirm that previous fiscal balances are considered in the decision making process and the magnitudes of primary surplus parameter across

[22] We did also estimate a P-VAR all in level (also debt to GDP ratio entered in level) for the C&PCs', but did not satisfy the diagnostic tests on serial correlation.

groups exhibit substantial inertia in fiscal behaviuor. This behavior is more prevalent in C&PCs', followed non-Eurozone states, while in the EU-17 such effect is found to be least prevalent. Results by impulse response illustrate that among the all sample a positive 1 percent point shock on the primary surplus would increase it by around 2.3 pp in the first following year, to reach about 1.8pp in the next year, while this effect would be diminishing thereafter, but still significant. Among the EU-17 this effect is found to be diminishing smoother compared to other groups. For every 1pp positive shock, $s_t$ would rise by around 2.8pp in the first year and by less than 2pp after the second year. This effect would be statistically insignificant after 7 periods. In the EU-10 (C&PCs') primary surplus would increase by around less than 1.8 (1.6) pp in respond of 1pp positive shock on $s_t$. This effect would be dimishing in the coming years and it would reach an impact of less than 1pp after three (two) periods for the non-Eurozone (C&PC) countries. This impact would be insignificant after 7 periods for the the C&PC countries.

Across all models, the effect of debt burden, $b_{t-1}$, on primary surplus is found to be negatively related, meaning that reduction of indebtness would boost primary surplus positively. This effect is found to be higher for Eurozone and EU-10 countries and very low for C&PCs', but statistically insignificant in the later case. The estimated impact for the all sample on primary surplus is found to be around -0.153 for every 1pp cut in debt burden. In the EU-17 and EU-10 the impact is around -0.1745 and -0.1674 compared to only -0.0213 for the C&PC countries. The low coefficient in the case of C&PCs' might reflect the inelastic behaviour and the necessity of primary spending due to structure and policy reforms that those countries face. This is, however, a preliminary conclusion that would need further analysis. On the other hand, as such, fiscal authorities do react to indebtness by generating future surpluses, but not enough to fulfil the solvency condition and to be coherent with the IBC and Ricardian fiscal regime. However, for C&PCs' such behaviour is not sufficiently incoherent to IBC, given the size and the significance level estimated. Consequently, a non-Ricardian fiscal regime is found only for the EU-27 countries, given the conclusive evidence on the sign and the significance level. These conclusive evidences are also complemantary to the impulse response findings.

For the aggregated sample, results through impulse response show that $s_t$ would recover in the first year by around 0.4pp in response of a positive shock that would reduce the debt to GDP ratio by 1pp. Thereafter this impact would dimish close to zero and become insignificant after 4 periods. In the case of EU-17 (EU-10) $s_t$ would react positive by around 0.7 (0.6)pp in respond of a 1pp cut in the indebtness. This effect would be diminishing thereafter in both cases and it would become insignificant after 5 (6) periods. For C&PC countries, the impact would be around zero and be statistically insignificant.

Furthermore, according to our results, the effect of $s_{t-1}$ on debt burden is found to be negative across all models. This confirms that raising primary surplus would eventually reduce the outstanding stock of government debt. Apart from the C&PCs', this effect is found to be statistically insignificant. In the case of C&PCs', still a preliminary conclusion, rising primary surplus this might not be sufficient enough and significant to off-shore the higher interest payments that these countries face. However, the estimated impact is found to be around -0.3375 for the all sample. It is higher in EU-10 and lower in the C&PCs'. According to the impulse response, for the aggregated sample, results show that  would recover in the first year by around 0.5pp in responde of a positive shock that would reduce the debt to GDP ratio by 1pp. Such impact, thereafter, would dimish close to zero and become insignificant after 4 periods. In the case of EU-17 (EU-10), $s_t$ would react positive by around 2.2 (1.7)pp in respond to a 1pp reduction in the debt to GDP ratio. This effect would be diminishing afterall in both cases and it would become insignificant after 5 (7) periods. For C&PCs', it would be around 1.7pp in the first years, but dimish subsequently and be statistically insignificant. Furthermore, cuts in $b_{t-1}$ is found to improve positively the debt positision across all the groups and apart from the case of C&PCs', this effect is statistically significant. For the all sample this effect is around 0.2922. It is greater in the EU-17 compared to EU-10 and lower in C&PC countries. Such findings are also complementary to the impulse response results estimated.

In addition, conducted simultaneously results from both panel approach techniques reveal two essential findings. First, fiscal policy is unsustainable across each group in the aftermath of the 2008-2009 economic and financial crises, even though there is some evidence of sustainability in the case of C&PCs'. Second, profligacy of fiscal authorities in EU-27 and C&PC countries is exposing public finances at more risk, considering that the pursued fiscal policies do not avoid excessive debt accumulation. This effect, however, is insignificant in the later case. According to Uctum (2006), such findings confirm that test results are consistent and fiscal policy is not sustainable across all groups of countries. Therefore, with regards to such results, the future role of the government would be fundamental in shaping the fiscal policy behavior, as further non-austerity FP in support of economic growth would place more risk on public finances and would have a reverse effect on avoiding excessive debt accumulation.

*Table 1. Fiscal Policy Reaction Function based on Panel VAR approach*

| | EU-17 | | EU-10 | | C&PCs | |
|---|---|---|---|---|---|---|
| | $s_t$ | $\Delta(b_t)$ | $s_t$ | $\Delta(b_t)$ | $s_t$ | $\Delta(b_t)$ |
| $s_{t-1}$ | 0.5234 | -0.3352 | 0.6344 | -0.4600 | 0.6723 | -0.3169 |
| | *[ 5.9]* | *[-2.5]* | *[ 7.0]* | *[-2.7]* | *[ 7.0]* | *[-1.1]* |
| $\Delta(b_{t-1})$ | -0.1745 | 0.5413 | -0.1674 | 0.4529 | -0.0213 | 0.1081 |
| | *[-2.7]* | *[ 5.5]* | *[-2.9]* | *[ 4.2]* | *[-0.9]* | *[ 1.5]* |
| Exogenous Variables | | | | | | |
| $c$ | -0.2240 | 0.5357 | -0.3307 | -0.3784 | -0.2163 | -1.0527 |
| | *[-0.39]* | *[ 0.6]* | *[-0.96851]* | *[-0.59010]* | *[-0.7]* | *[-1.1]* |
| $i_{t-1}$ | 0.1356 | 0.0559 | 0.0559 | 0.0373 | 0.1857 | 0.2884 |
| | *[ 0.9]* | *[ 0.2]* | *[ 0.4]* | *[ 0.1]* | *[ 1.7]* | *[ 0.8]* |
| $\tilde{y}_{t-1}$ | -0.2545 | 0.6121 | -0.1912 | 0.4227 | -0.2710 | 0.6316 |
| | *[-3.6]* | *[ 5.6]* | *[-4.6]* | *[ 5.4]* | *[-3.5]* | *[ 2.6]* |
| $\rho_{t-1}$ | -0.1090 | 0.0806 | -0.0502 | 0.0410 | -0.0667 | -0.1920 |
| | *[-0.8]* | *[ 0.4]* | *[-1.2]* | *[ 0.5]* | *[-1.8]* | *[-1.7]* |
| | | | | | | |
| *R-squared* | 0.49 | 0.47 | 0.70 | 0.55 | 0.63 | 0.41 |
| *Adj. R-squared* | 0.48 | 0.46 | 0.68 | 0.52 | 0.60 | 0.36 |
| *SSR* | 1201.5 | 2848.7 | 291.1 | 1026.6 | 197.1 | 1831.3 |
| *F-statistic* | 31.68 | 29.24 | 42.59 | 22.60 | 64.94 | 8.65 |
| *AIC* | 4.87 | 5.73 | 4.04 | 5.30 | 4.08 | 6.31 |
| *SIC* | 4.98 | 5.84 | 4.19 | 5.46 | 4.27 | 6.50 |

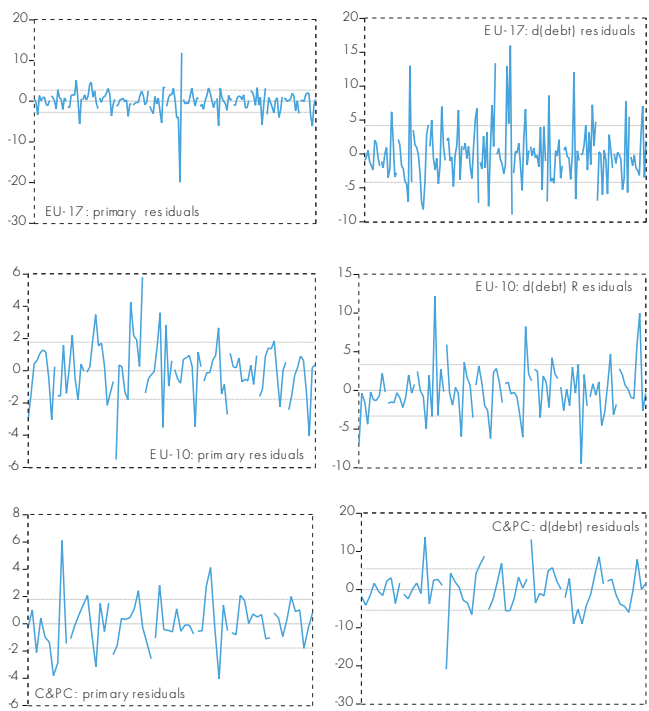
t-statistics in [ ]
Source: Authors' Calculations

Regarding other results, the coefficient of output gap is found to be negatively related to primary surplus and positively to debt burden. These effects are found to be statistically significant at conventional level. Accordingly, for the all sample, a 1pp rise in $\tilde{y}_{t-1}$ is associated with around -0.2491 decrease in primary surplus. In the case of EU-17 and EU-10 this impact is found to around -0.2545 and -0.1912, while for the C&PCs' the effect is around -0.2710. On the other hand, 1pp boost in $\tilde{y}_{t-1}$ would amplify debt ratio by around 0.5308 for the all sample. In the EU-17, this effect is found to be around 0.6121 and lower for the EU-10, while in the C&PCs', it is estimated to be around 0.6316. These findings confirm that during the sample period the pursued fiscal policy appears to react positively to the cycle tending to be pro-cyclical, thus putting more risk relating to the position of fiscal stance. Evidence on pro-cyclicality of FP is also found by Staehr (2007), Turrin (2008), Afonso and Jalles (2011) and Escalano et al (2012) for the EU-27 countries. According to Gavin (1996), for transition and emerging market economies pro-cyclicality is not surprising and is mostly dictated by borrowing constraint and financial institutions development. Accroding to Turrin (2008) explanation for pro-cyclicality in EU-27 overall are not hard to find, in the light of well-known trade-off faced by fiscal authorities between exerting an impulse on aggregated demand consistent with cyclical conditions and keeping deficits and debt under control, when fiscal numerical rules are present. Coricelli (2004) suggest that the 3% ceiling on the budget deficit does not leave sufficient room to acceding countries to run counter-cyclical policies during downturns.

Finally, Lazano (2010) reveals that residuals (error term $\varepsilon_t$) behaviour on each specified P-VAR models reflects any exogenous shocks or fiscal development through decision-making process, which is not related to the explanatory variables. Accordingly, this allows getting a perception of the effects of pursued the discretionary FP, from a macroeconomic volatility perspective. Results show (Graph 1), measured by the standard deviation on the error term, volatility in discretionary FP (primary surplus) is relatively lower in the Eurozone countries compared to EU-10 and C&PCs'. This might reflect a number of factors. First, as Staehr (2007) explains countries in the Euro area are constrained to more biding fiscal rules under the EMU and SGP condition and to demterminating institutional

and policy arrangements. Second, countries in Eurozone are mostly considered developed economies and have mostly relatively more stabilized economies, therefore less fluctuations in primary surpluses. Third, apart from the UK, Sweeden and Denmark, countries in EU-10 and C&PC have been under continues structural, institutional and policy reforms through the transitional process. However, these are preliminary conclusions and would need a deeper analysis. On the other hand, according to results on residuals in debt to GDP dynamics the picture is relatively different. Findings demostartes that debt to GDP ratio in EU-17 is virtually more volatile compared to the other two groups. Debt to GDP ratio is also found to be volatile in the C&PCs', but relatively less compared to those in EU-10. A possible preliminary explanation might be the relatively high debt levels across the EU-17 and EU-10 countries, mainly in the aftermath of financial and economic crisis.

Graph 1. Volatility of fiscal policy based on P-VAR
Standardised Residual Approach




Source: Author's calculations.

# IV. CONCLUSION

The question of fiscal sustainability has been around and always taken much attention, especially, in the aftermath of the financial and economic crisis, as a sovereign debt crisis and sustainable FP have emerged mainly among the EU and other Southern and Easters European countries. This discussion paper, hence, appraises the solvency condition of fiscal policy among the 27 EU and Euro area and other future and potential member states through usage of panel techniques. Our analysis focuses on the long-run mean-reverting properties of debt to GDP ratio and the role of the government in shaping the fiscal policy across the different regions. The former is based on a panel unit root test approach as suggested by Trehan and Walsh (1991) and Taylor (2002). The later, considered a government fiscal policy reaction function to understand whether government pursued appropriate policies to avoid excessive debt accumulation based on a P-VAR approach. Both approaches focus on evaluating the long run stochastic behaviour of fiscal policy over time, beyond concluding on a deterministic empirical optimal sustainable level.

Results, through panel unit root tests techniques, overwhelmingly failed to support mean-reverting properties on debt to GDP ratio, even though the LLC test provided some supportive evidence on stationary in the case of C&PCs'. Therefore, we can accept most conservatively that non-stationary behaviour cannot be ruled out and accordingly debt position within EU-27 and across South Eastern countries is not stable. Complementary findings based on panel VAR techniques, reveals that the Euro area, the other EU member states and other South Eastern European countries (C&PCs') show evidence of relatively similar fiscal reaction functions. Under the FPRF assumption, results imply that fiscal authorities consider previous balances in the decision making process and they exhibit substantial inertia in fiscal behaviour. The later is more prevalent in C&PCs' and less is EU-17. On the other hand, policies oriented towards cuts in debt to GDP ratio are found to boost positively fiscal surpluses and vice versa, it is found that raising primary surplus would eventually reduce the outstanding stock of government debt. Both effects are found to be higher for EU member countries and very low for C&PCs', but statistically insignificant in the later case.

Simultaneously, results, by both approaches, suggest that fiscal authorities react to aggravating debt position by generating future surpluses, but not enough to fulfil the solvency condition and to be coherent with the IBC and Ricardian fiscal regime. According to Uctum et al (2006), therefore, fiscal policy is unsustainable across each group in the aftermath of the 2008-2009 economic and financial crises and the profligacy of future Krugman and Layard (2012) type non-austerity fiscal policies to support economic growth would expose public finances at more risk through reverse effects on excessive debt accumulation.

Further findings confirm that during the sample period the pursued fiscal policy appears to react positively to the cycle tending to be pro-cyclical, thus putting more risk relating to the position of fiscal stance. Coricelli (2004) and Turrin (2008) linked pro-cyclicality behaviour to actual fiscal numerical rules across EU countries, while Gavin (1996) justifies it by borrowing constraint and financial institutions development that transition and emerging market economies face. Finally, based on Lazano (2010), discretionary policies are found to be more volatile in Centre and South Eastern compared to Euro area countries, possible due to continues transition and structural reforms these countries face. On the other hand, debt position is virtually more volatile in the in EU-17, mainly due to higher debt to GDP ratio especially after the financial and economic crisis.

In light of further developments, as in Uctum et al (2006), future research will consider nonlinear unit-root test to capture any possible structural breaks and nonlinear behaviour in the time series. On the other hand, applying Smooth Transition Autoregressive (STAR) or/and Threshold Autoregressive (TAR) model would provide a deterministic level at which the debt to GDP ratio revert towards high or lower levels. Further, as in Bouthevillain and Dufrénot (2012), we would apply a new estimator based on quantile regression given that countries are not sufficiently close so that we cannot learn enough by analysing mean effects. As in many other studies, considering the cyclical-adjusted primary surplus would in return provide robust conclusions in terms of both solvency condition and cyclical behaviour. Finally, future research we will also consider a structural VAR approach, notably with variables entering the model as endogeneous.

# REFERENCES


*Alfonso, A., (2005), "Ricardian Fiscal Regimes in the European Union", ECB, Working Paper Series No. 558/November 2005;*

*Afonso, A., (2008), "Ricardian Fiscal Regimes in the European Union", Empirica, Vol. 35 (3), pp: 313–334;*

*Afonso, A., and Jalles, J. T., (2011), "Appraising fiscal reaction functions", Technical University of Lisbon, Working Paper 23;*

*Banerjee, A., (1999), "Panel Data, Unit Roots and Cointegration: An Overview", Oxford Bulletin of Economics and Statistics, Special Issue on Testing for Unit Roots and Cointegration using Panel Data, Theory and Applications, Vol. 61, pp: 607-629;*

*Barro, R., (1979), "On the determination of public debt", Journal of Political Economy, Vol. 87, No. 5, pp: 940-971;*

*Bohn, H., (1998), "The behaviour of US public debt and deficits", The Quarterly Journal of Economics, Vol. 113 (3), pp: 949-63;*

*Bohn, H., (2005), "The sustainability of fiscal policy in the United States", CESifo Working Paper;*

*Bouthevillain, C., and Dufrénot, G., (2012), "Fiscal policies enhancing growth in Europe: can we apply common remedies to different countries?", Banque de France, presented in the Banca D'Italia 14th Public Fiance Workshop "Fiscal Policy and Growth", March 2012;*

*Burger, Ph., Stuart, I., Jooste,Ch. and Cuevas, A., (2011), "Fiscal sustainability and the fiscal reaction function for South Africa", IMF Working Paper, WP/11/69;*

*Canzoneri, M., et. al., (2001), "Fiscal discipline and exchange rate regimes", Economic Journal, pp: 667-690;*

*Chalk, N., and Hemming, R., (2000), "Assessing fiscal sustainability in theory and practice", IMF Working Paper no. 81;*

*Collignon, S., (2012), "Fiscal policy rules and the sustainability of public debt in Europe", International Economic Review, Vol. 53, Issue 2, pp: 539–567;*

*Coricelli, F., (2004), "Fiscal Policy in an enlarged EU", University of Siena and CEPR;*

*Cuddington, J. T., (1996), "Analyzing the sustainability of fiscal deficits in developing countries", Georgetown University, Working Paper 97/01;*

*De Mello, L., (2005), "Estimating a fiscal reaction function: the case of debt sustainability in Brazil", OECD Economics Department, Working Paper No. 43;*

*Dobrescu, G., and Salman, L., (2011), "Fiscal Policy during Absorption Cycles", IMF Working Paper, WP/11/4;*

*Escolano, J., Eyraud, L., Badia, M. M., Sarnes, J. and Tuladhar, A., (2012), "Fiscal Performance, Institutional Design and Decentralization in European Union Countries", IMF Working Paper, WP/12/45;*

*Gali, J., dhe Perotti, R., (2003), "Fiscal policy and monetary integration in Europe", Economic Policy, 18 (37), pp. 533-572;*

*Gavin, M., Hausmann, R., Perotti, R., and Talvi, E., (1996), "Managing Fiscal Policy in Latin America and the Caribbean: Volatility, Procyclicality, and Limited Creditworthiness", Working Paper no. 326, Inter-American Development Bank (1994);*

*Giammarioli, N., Nickel, Ch., Rother, Ph. and Vida, J-P., (2007), "Assessing fiscal soundness. Theory and practice", European Central Bank, Occasional Paper Series, no. 56;*

*International Monetary Fund, (2003), "World Economic Oulook", September 2003, Washington, D.C.;*

*Hakkio, C., and Rush, M., (1991), "Is the deficit too large?", Economic Inquiry, Vol. 29, pp: 429–45;*

*Hamilton, D. J., and Flavin, M. A., (1986), "On the limitations of government borrowing: a framework for empirical testing", The American Economic Review, Vol. 76, No. 4, pp: 808-819;*

*Im, K., Pesaran, M. and Shin, Y. (2003). "Testing for Unit Roots in Heterogeneous Panels", Journal of Econometrics, Vo. 115 (1), pp: 53-74;*

*Jonas, J., (2010), "Fiscal objectives in the post IMF program world: the case of albania", IMF Working Paper, WP/10/77;*

*Khalid, M., Malik, W. Sh. and Sattar, W. A., (2007), "The fiscal reaction function and the transmision mechanism for Pakistan", The Pakistan Development Review, Vol. 46: Part II (Winter 2007), pp. 435-447;*

*Krugman, P., and Layard, R., (2012), "A Manifesto for Economic Sense", The New York Times, June 28, 2012, http://www.manifestoforeconomicsense.org/;*

*Laubach, Th., (2009), "New evidence on the interest rate effects of budget deficits and debt", European Economic Association, Vol. 7, No. 4, pp: 858-885;*

*Levin, A., Lin, C. and Chu, J., (2002). "Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties", Journal of Econometrics, Vol. 108 (1), pp: 1-24;*

*Lewis, J., (2010), "Fiscal Policymaking in Central and Eastern Europe: What Does 12 Years of Real Time Data Tell Us", Economics and Research Division , De Nederlandsche Bank;*

*Lozano, I., (2010), "Fiscal policy in colombia and a prospektive analysis after the 2008 financial crisis", Fiscal Workshop, Perugia, Italy, March 25-27 2010;*

*Lozano, I., and Toro, J., (2007), "Fiscal policy throughout the business cyle: the Colombian experience", Ensayos sobre Politica Economica, Edicion Dicimbre 2007, pp. 12-39;*

*Maddala, G. and Wu, S. (1999). "A Comparative Study of Unit Root Tests and a New Simple Test", Oxford Bulletin of Economics and Statistics, Vol. 61 (1), pp: 631-652;*

*Pesaran, M. H., (2011), "On the Interpretation of Panel Unit Root Tests", Trinity College, Cambridge, England;*

*Staehr, K., (2007), "Fiscal policies and business cycles in an enlarged euro area", Research Department, Bank of Estonia, Economic Systems, Vol. 32 (2008), pp: 46–69;*

*Taylor, M. A., (2002), "A century of current account dynamics", NBER Working Paper Series, Working Paper 8927;*

*Trehan, B., and Walsh, C., (1991), "Testing intertemporal budget constraints: theory and applications to U.S. federal budget and current account deficits", Journal of Money Credit and Banking, Vol. 23, pp: 210-223;*

*Turrini, A., (2008), "Fiscal policy and the cycle in the Euro area: the role of government revenue and expenditure", Economic and Financial Affairs, Directorate-General;*

*Uctum, M., Thurston, Th. and Uctum, R., (2006), "Public debt, the unit root hypothesis and structural brekas: a multi-country analysis", Economica, Nr. 73, pp: 129-156;*

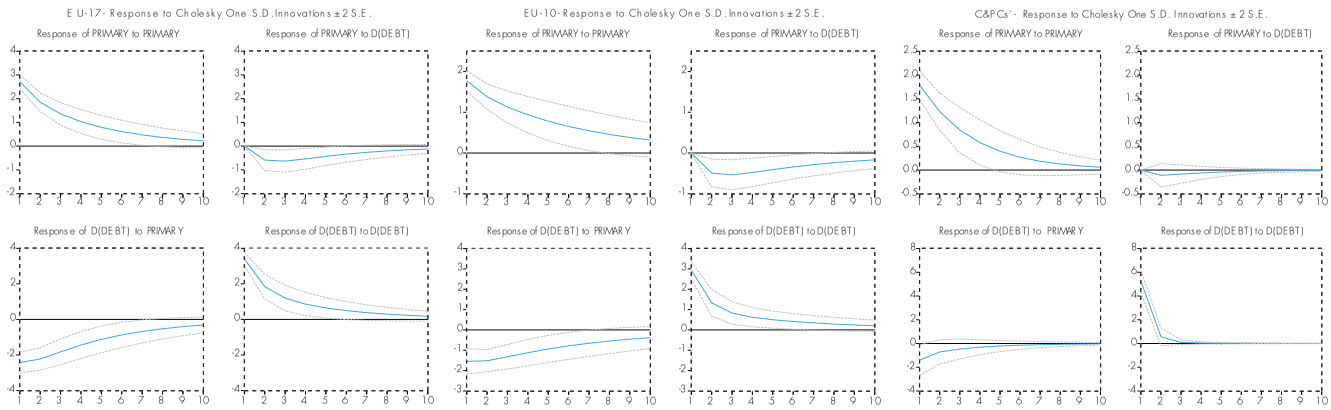
*Wyplosz, C., (2006), "European Monetary Union: the dark sides of a major success", Economic Policy Paper, Vol. 21, Issue: 46, pp: 207–261;*

*Walsh, C. E., (2003), "Monetary theory and policy", 2nd edition, Massachusetts: the MITT Press;*

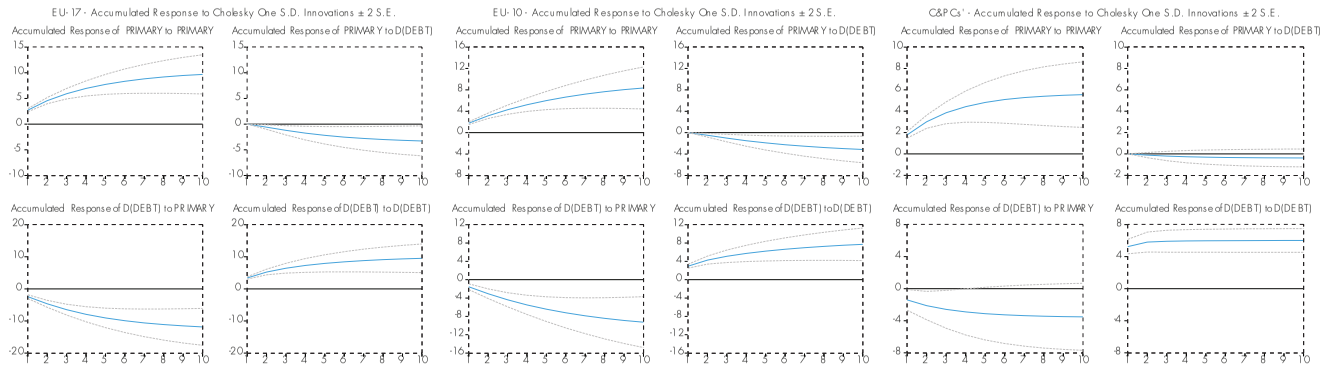
# APPENDIX

| | ADF - Fisher Chi-square | | | | | | PP - Fisher Chi-square | | | | | | Levin, Lin & Chu t* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Level | | | First Difference | | | Level | | | First Difference | | | Level | | | First Difference | | |
| | (a) | (b) | (c) | (a) | (b) | (c) | (a) | (b) | (c) | (a) | (b) | (c) | (a) | (b) | (c) | (a) | (b) | (c) |
| | EU-17 countries | | | | | | | | | | | | | | | | | |
| $s$ | .141 | .098 | .000 | .001 | .138 | .000 | .132 | .159 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 |
| $b$ | .657 | .870 | 1.00 | .192 | .229 | .000 | .999 | 1.00 | 1.00 | .108 | .189 | .000 | .998 | .181 | .968 | .000 | .000 | .000 |
| $\tilde{y}$ | .005 | .816 | .000 | .013 | .393 | .000 | .259 | .988 | .000 | .000 | .052 | .000 | .000 | .000 | .000 | .000 | .000 | .000 |
| $\rho$ | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 |
| $i$ | .001 | .699 | .134 | .008 | .000 | .000 | .000 | .268 | .000 | .001 | .000 | .000 | .000 | .423 | .003 | .000 | .000 | .000 |
| | EU-10 countries | | | | | | | | | | | | | | | | | |
| $s$ | .127 | .237 | .001 | .027 | .188 | .000 | .833 | .996 | .041 | .064 | .291 | .000 | .000 | .000 | .000 | .000 | .000 | .000 |
| $b$ | .799 | .818 | .611 | .277 | .513 | .001 | .809 | .909 | .004 | .036 | .008 | .000 | .119 | .183 | .677 | .011 | .001 | .000 |
| $\tilde{y}$ | .043 | .813 | .000 | .067 | .370 | .000 | .583 | .992 | .000 | .008 | .299 | .000 | .001 | .004 | .000 | .000 | .000 | .000 |
| $\rho$ | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 |
| $i$ | .070 | .055 | .000 | .001 | .067 | .000 | .017 | .004 | .000 | .000 | .000 | .000 | .000 | .000 | .004 | .000 | .000 | .000 |
| | Candidate and potential candidate countries (C&PCs') | | | | | | | | | | | | | | | | | |
| $s$ | .037 | .326 | .000 | .003 | .005 | .000 | .141 | .831 | .001 | .000 | .000 | .000 | .000 | .001 | .000 | .000 | .000 | .000 |
| $b$ | .122 | .995 | .027 | .289 | .007 | .000 | .120 | .425 | .000 | .000 | .000 | .000 | .075 | .992 | .001 | .905 | .009 | .000 |
| $\tilde{y}$ | .083 | .841 | .000 | .240 | .790 | .000 | .219 | .785 | .000 | .002 | .003 | .000 | .086 | .685 | .000 | .024 | .007 | .000 |
| $\rho$ | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 |
| $i$ | .005 | .356 | .000 | .043 | .384 | .000 | .001 | .032 | .000 | .000 | .000 | .000 | .000 | .020 | .000 | .018 | .114 | .000 |

## Graph 2. Impulse Response of a 1% primary surplus and public debt shock in levels P-VAR



## Graph 3. Cumulative Impulse Response of a 1% primary surplus and public debt shock in levels P-VAR



CIP Katalogimi në botim BK Tiranë

Shijaku, Gerti
Fiscal sustainability across the EU and other
potential member countries / Gerti Shijaku. –
Tiranë : Banka e Shqipërisë, 2017
36 f. ; 15 x 21cm. – (Working paper)
Bibliogr.
ISBN 978-9928-4453-5-3

1.Politika fiskale 2.Evropë

336 .02(4) "20"

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ISBN 978-9928-4453-5-3