Public Debt Management & Fiscal Sustainability in Italy

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ABSTRACT

This paper examines the government finances for Italy to determine if they satisfy the Inter-temporal Budget Constraint (IBC) especially since post-Maastricht. Italy met the convergence criteria in order to be accepted as an EMU country. Arghyrou and Luintel (2005) examine the finances of Italy up to the pre-Maastricht convergence period and find that the finances of Italy showed weak form sustainability demonstrating a Maastricht effect. Standard assumptions have been that Italy's true position of un-sustainability would be inherent post-Maastricht. This paper examines this issue and finds: (i) that the debt to GDP series shows that the finances of Italy are un-sustainable; (ii) however the government revenue and expenditure show weak form sustainability. This paper also finds a downward trend of the government debt to GDP ratio and a convergence of the government revenue and expenditure in recent times. This implies that the finances of Italy satisfy the IBC and indeed continue to maintain the result of weak sustainability even post-Maastricht.

1. INTRODUCTION

A growing public debt is looked upon with great concern because of the fear of the ability of a government to sustain its current fiscal policies. Fiscal sustainability problems exist if a government is unable to service (finance) the costs of its debt (new issuance of debt) from its revenues. A country is deemed to have sustainable fiscal position if it satisfies the Inter-temporal Budget Constraint (IBC). Early literature as may be found in Hamilton and Flavin (1986) conducted on United States of America (otherwise referred to as the US) annual data find that the government finances satisfied the IBC and therefore deemed the finances of the US sustainable as a result.

This paper aims to examine the fiscal sustainability of Italy particularly since it joined the euro. In previous literature as may be seen in that of Corsetti and Roubini (1991), it was found that the finances of Italy were unsustainable. The Maastricht convergence criteria were a pre-cursor to the emergence of the euro. With the emergence of the euro, the treaties governing the euro (i.e. The Treaty of the European Union which is also known as the Treaty of Maastricht as a result of the Treaty having been signed in the Dutch town of Maastricht) impose the necessity for fiscal sustainability. The Maastricht treaty requires governments to run a maximum deficit of 3% of Gross Domestic Product (GDP) and a debt to GDP ratio of 60% in line with the Stability and Growth Pact (SGP) reference value. The SGP, which was spearheaded by Germany, was adopted by the euro zone in 1997. It also advocates maintaining a close to budget balance or a budget surplus in normal times so that automatic stabilizers can operate in times of shock among the countries using the euro.

The motivation for this paper therefore stems from this – i.e. to know if Italy still shows some form of fiscal sustainability since it successfully joined the euro since it has been alluded at that some of the countries with the highest debt to GDP ratios converged due to various "accounting adjustment" in order to meet the Maastricht convergence criteria and that their real positions would be manifest/inherent again upon post-Maastricht (i.e. upon successfully become a euro member). This paper therefore examines more recent data on Italy especially that of the post-Maastricht era. The importance of this finding cannot be lightly underscored in view of the wider implications for the euro area which pursues a singular monetary policy; thereby making the issue of fiscal sustainability of the euro member countries of great import. Subsequent literature since that of Corsetti and Roubini (1991) as may be found in that of Arghyrou and Luintel (2005) re-examined this sustainability issue for Italy and four other OECD countries – Ireland, Belgium, Greece and the Netherlands – that Corsetti and Roubini (1991) found had unsustainable fiscal positions. Arghyrou and Luintel (2005) find that the finances of these countries were weakly sustainable. The paper by Arghyrou and Luintel was anchored/hinged on the model set by Quintos (1995) which defined the minimum conditions for fiscal sustainability and

stressed that countries which met this minimum requirement, displayed/had some form of sustainability which could be termed as weak form sustainability. Arghyrou and Luintel (2005) upon this premise, find the finances for these countries sustainable albeit weakly.

What this paper attempts to do is examine for stationarity in the debt to GDP annual series; government revenue and expenditure quarterly series; and also test for co-integration and structural breaks. Prior to this study, except for Arghyrou and Luintel (2005) and Makrydakis et al (1999), the issue of structural breaks was largely neglected. Arghyrou and Luintel (2005) account for multiple structural breaks in their paper while Makrydakis et al (1999) account for a single structural break. The issue of structural breaks is important because of its impact on a country's fiscal stance and it is also tied to the way governments respond to them i.e. do they respond more vigorously/aggressively to worsened fiscal stance than they would ordinarily do? *If structural breaks are not taken into account and they actually occur, then an error could be made in findings whereby the finances of a country could be deemed unsustainable whereas in actual fact they might display some form of sustainability.* Where structural breaks are discovered in this paper, they are tied to endogenous events/occurrences in Italy, which have impacted on its fiscal position.

Fiscal sustainability is said to exist if a country's debt to GDP ratio is stationary and also said to exist if government revenue is sufficient to finance the cost of the issuance of new public debt.

In this paper, the debt to GDP series has been examined for the period 1980 – 2004; the findings indicate un-sustainability at all levels. This is consistent with that obtained by Corsetti and Roubini (1991). If the series had displayed weak form sustainability, it would have been deemed that although the government is able to service its debt, it would have to offer higher interest rates to the market in order for its bonds to be bought. However, at this junction, it should be pointed out that although the finances of the government were found to be unsustainable (based on its debt to GDP series), the debt to GDP ratio has been on a downward trend in recent times. This therefore should have interesting outcomes for the future.

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In examining the government revenue and expenditure series, data for the period 1962.1 - 2004.4 was utilized. This data was divided into five sub-samples namely: pre-oil shock period, oil shock period, pre-Maastricht period, post-Maastricht period and the full sample. The results as they indicate seem to satisfy the conditions for weak stationarity and therefore based on the government revenue and expenditure series, the finances of the government can be deemed weakly sustainable. This is consistent with the findings by Arghyrou and Luintel (2005).

Also, in examining the data for structural breaks, multiple structural breaks were identified. This is also consistent with the findings by Arghyrou and Luintel (2005). One of the shifts identified in this paper was during the post-Maastricht period. Tying/associating this shift to specific policy change that impinged on the economy, it would appear that the government is responding aggressively in its policies in order to have sustainable finances. The interesting thing to note about the Italian government revenue and expenditure is the fact that in recent years they have actually converged. In the past, the degree of divergence between the two was quite alarming – with expenditures soaring high above revenue. This seemingly convergence would therefore imply that the government is not spending more than it is earning – which on the surface is not surprising because of the result of weak sustainability. This therefore has interesting implications for the post-Maastricht period which is an important/integral reason for this paper. It would therefore seem that the government has not just purposed to meet the Maastricht convergence criteria for the sole purpose of joining the euro but is also determined to pursue policies that would lead it towards fiscal sustainability.

This paper's theoretical approach is primarily suggested by Arghyrou and Luintel's (2005) work on structural breaks. However, this paper additionally tests the debt to GDP series by following traditional methodology. This paper is therefore important in the sense that by extending the data set it allows one to recognise that Italy is fighting as hard as it can to have sustainable finances and to stay on the sustainable course it strived towards during the convergence period.

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The rest of the paper is organised in the following order: section 2 reviews the relevant literature; section 3 examines the analytical framework for the paper while; in section 4 we find the model and data set; section 5 looks at the methodology approach, testing and findings and finally; in section 6 the paper is summarised and conclusion shown.

2. LITERATURE REVIEW

Different studies have been done on several aspects of the theme public debt management and fiscal sustainability, with each bothering on one recurring aspect – fiscal sustainability. A growing public debt is often viewed with great concern, mainly over the ability of a government to sustain its current fiscal and financial policy. Debt becomes a problem when it is unsustainable in the context of a social efficient plan for future taxes, transfers, and provision of government services. Deficits therefore, disturb financial markets, place excessive burdens on future generations, slow down private capital formation and retard economic growth. In fact a look/delve into sustainability has broader implications for the financial stability of an economy as a whole.

Studies have been carried out to analyze the sustainability of fiscal policy based on the government Inter-temporal Budget Constraint (IBC)[1]. It is generally agreed that fiscal policy is sustainable if the government Inter-temporal Budget Constraint holds in present value terms. In other words, the current debt should be offset by the sum of expected future discounted primary surpluses[2] (exclusive of interest payments).

From the literature analyzing fiscal policy sustainability, two approaches have emerged for testing to find if government finances satisfy the IBC. The first involves the way interest rates are analysed while the second involves the testing approach that is utilized. For the former, some authors have chosen to treat it as constant while others have treated it as

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[1] The IBC imposes a limit on the ability of a government to engage in indefinite borrowing by setting/requiring initial net debt and the present value of expected future government expenditures to be equal to the present value of expected future government revenue.
[2] This is defined as (government revenue – government expenditure)/GDP.

stochastic. For the testing approach, some authors have chosen to test the stationarity of debt and/or deficit while others look for a co-integrating relationship which links the primary deficit, the stock of outstanding debt and interest payments; whilst still some others have chosen to establish if there is co-integration between government expenditures and revenues (i.e. if expenditures and revenues move closely together in an almost one-to-one relationship).

These tests of stationarity are based on the assumption that the processes generating deficits and debt will continue far into the future. However, in view of the Maastricht Treaty and the Stability and Growth Pact, the need to alter fiscal policy to achieve sustainability has been adopted. This has therefore brought about the need to analyze sustainability allowing for expected future changes in fiscal policy.

Against this background, various tests have been undertaken to examine sustainability.

Hamilton and Flavin (1986), Trehan and Walsh (1988) choose to assume the constancy of interest rates in testing the stationarity of debt and find the finances of the US sustainable.

However, in another study by Trehan and Walsh (1991), the constancy of interest rate is disregarded and sustainability is checked for by testing the stationarity of primary deficits inclusive of interest payments. The paper finds that if these are stationary, then a sufficient condition has been met for satisfying the IBC.

In a study by Wilcox (1989), the study however shows that Hamilton and Flavin's (1986) stationarity test suffers from serial correlation in its residuals and that once this is accounted for that it reverses the findings of sustainability for US finances.

Corsetti and Roubini (1991) develop from the analysis framework of Hamilton and Flavin (1986), Trehan and Walsh (1989), Wilcox (1989) Buiter and Patel (1990) and Corsetti (1990); and examine government solvency by testing using traditional indicators of public

debt sustainability and patterns of fiscal deficit. Four alternative solvency tests were carried out: Tests on the discounted debt; Tests on the debt to GDP ratio; Tests on the adjusted real inflation and adjusted seigniorage overall balance of general government and; Tests on the adjusted real inflation and adjusted seigniorage current balance of the general government. These tests were carried out on 18 OECD countries for a period of 30 years (1960 – 1989) and indicate that all of the OECD countries apart from Italy and Germany showed a declining debt to GDP ratio. In fact a serious problem of solvency was found for Italy.

Ahmed and Rogers (1995) motivated by Hamilton and Flavin's (1986) also carried out studies on the US and UK economy; and find similar outcomes in the US finances but inconsistent results for the UK.

Quintos' (1995) paper premises its approach on previous work done by Hamilton and Flavin (1986), Hakkio and Rush (1991), Trehan and Walsh (1991) and Ahmed and Rogers (1995). The paper goes further and derives conditions for weak and strong forms of sustainability. These conditions became a breakthrough for the way sustainability was classified thereafter. The sustainability conditions derived are:

a. If $0 < \beta < 1$ the IBC is satisfied in the weak sense whether or not government revenues and expenditures are co-integrated

b. If $\beta \leq 1$ but government revenues and expenditures are not co-integrated, then there is an implied form of weak sustainability

c. If $\beta = 1$ and government revenues and expenditures are co-integrated, then there is implied strong-form sustainability

The paper tested the IBC in the US for the period 1947 – 1992 and identified an endogenous structural shift which indicated that the US government finances were weak

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form sustainable despite the non-co-integration between government revenues and expenditures.

Uctum and Wickens (1996) examine the sustainability of fiscal policy in the US and in the E.U for the period 1965 – 1994 by combining two approaches: testing for the stationarity of debt and/or deficit and; a co-integrating relationship which links the primary deficit, the stock of outstanding debt and interest payments. Their paper extended on Wilcox (1989) tests where the discount rate used is stochastic and time varying; and the discounted primary deficit is either exogenous or endogenous; and forecasted values are used for fundamental values.

The paper finds that on the basis of finite horizon-tests, that many of the countries do not have a sustainable fiscal policy. It was also found that the evidence for sustainability for most countries in the study was strengthened when data is extended to incorporate future fiscal consolidation plans.

Bohn (1998) considers how governments react to accumulation of public debt (i.e. do they take corrective measures when the debt to GDP ratio grows or do they stand by and do nothing) by examining the response of the primary surplus to changes in the debt to GDP ratio using data set for the US for period 1916-1995.

The study shows significant evidence that the primary surplus is an increasing function of the debt to GDP ratio for the period in question and also several other sub-periods. It also shows that the link between the primary surplus and the debt to GDP ratio can easily be blurred by shocks such as war time spending and cyclical fluctuations.

Arghyrou (2003) goes further on the way tests for sustainability are carried out by modeling jointly the issues of non-linearity of public debt and structural breaks which hitherto had been examined separately. Bohn (1998) and Sarno (2001) examined non-linearities; while Ahmed and Rogers (1995), Quintos (1995) and Makrydakis et al (1999) examined the issues of structural breaks.

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Arghyrou (2003) finds, by modeling these jointly in examining Greece's data from 1970 – 2000, an evidence of non-linear fiscal adjustment with the authorities correcting for large deficits at a faster rate than for small deficits. It also finds evidence of two structural shifts i.e. multiple structural breaks in Greek fiscal policy. The paper therefore concludes that Greek public debt is sustainable.

Arghyrou and Luintel (2005) go a step further by addressing a number of issues in the testing of the IBC by:

a. Modeling structural shifts while testing the present value criteria;

b. Associating identified structural shifts to specific endogenous policy changes and/or exogenous shocks that affect the economies of the countries being examined and; calculating their long run effect on fiscal sustainability;

c. Performing both strong and weak form tests for fiscal sustainability hinged on the breakthrough tests of Quintos (1995); and

d. Testing for non-linearity in fiscal adjustment.

These tests were carried out by reviewing the issues of solvency on five of the OECD countries - Netherlands, Greece, Ireland, Belgium and Italy. Ayghyrou and Luintel (2005) find that these countries have all experienced multiple structural shifts in fiscal policy; the government finances satisfy the IBC; there is evidence of a Maastricht effect conducive to fiscal sustainability and; that fiscal disequilibrium adjusts non-linearly to its long run equilibrium i.e. in other words the government authorities tended to react more vigorously when fiscal deficits reached certain thresholds.

3. ANALYTICAL FRAMEWORK

Theoretically it could be said that any value for the budget deficit is possible if the government could raise its liabilities without limit. But this is obviously not feasible, since the government is faced with the prospect that the public may refuse to buy any more of its debt or demand an interest rate that is too high for it to pay.[3]

The one-period government budget constraint[4] as tested by Trehan and Walsh (1991) is:

$$b_{t+1} = (1+r)b_t + g_t - \tau_t - s_t \tag{1}$$

Where b is the stock of outstanding public debt, r is the real interest rate, g_t is real government expenditure net of interest, τ_t is real tax revenues and s_t is real revenue from seignorage (which is defined as changes in the real stock of money base).

The standard IBC in expected value terms is seen below. It states that the stock of outstanding debt b_t equals the sum of the present values of the flow of primary surpluses and the stock of debt in the limit.

$$b_t = -E_t \sum_{j=0} (1+r)^{-(j+1)} \left(g_{t+j} - \tau_{t+j} - s_{t+j} \right) + \lim_{j \to \infty} E_t (1+r)^{-(j+1)} b_{t+j+1} \tag{2}$$

Where E_t is the mathematical expectation operator which is dependent on the information set available at time t.

One of the procedures that would be used for assessing the sustainability of the IBC involves testing the co-integration regression between government revenues (R) and government expenditure (G). This is seen below as:

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[3] Government deficits can be financed by either issuing new debt (bond financing) or printing money (money financing). An excess of the latter could result in inflation. Since the one (current) period budget does not impose a strong constraint on governments that issue debts, the inter-temporal budget constraint is able to do this.
[4] This is an expression that states that the flow of government revenue and expenditure should be equal to changes in public debt stock and the monetary base.

$$R_t = \alpha + \beta G_t + u_t \tag{3}$$

The conclusions that may be arrived at are as follows as per Quintos' (1995) paper:

a. if $0 < \beta < 1$ the IBC is satisfied in the weak sense whether or not government revenues and expenditures are co-integrated

b. If $\beta \leq 1$ but government revenues and expenditures are not co-integrated, then there is an implied form of weak sustainability

c. If $\beta = 1$: and government revenues and expenditures are co-integrated, then there is implied strong-form sustainability

d. If $\beta = 0$ irrespective of whether there is co-integration or not, fiscal policy is not sustainable.

Quintos (1995) further notes that when deficits are weakly sustainable, the limit term as seen above in (2) converges to zero at a much slower rate than when they are strong form sustainable. In addition, the limit term converges to zero more rapidly under weak form sustainability, when government revenues and expenditures are co-integrated than when they are not.

4. **THE MODEL AND DATA**

As seen earlier on, in satisfying the IBC, the outstanding debt stock should equal the sum of present values of the primary surpluses and debt stock in the limit. This is captured thus:

$$b_t = -E_t \sum_{j=0} (1+r)^{-(j+1)} \left(g_{t+j} - \iota_{t+j} - s_{t+j} \right) + \lim_{j \to \infty} E_t (1+r)^{-(j+1)} b_{t+j+1}$$

Therefore in order to see if the IBC is satisfied, the debt to GDP series is tested. This is done by carrying out tests on the debt face value, market value and discounted market value.

The debt face value which is also referred to as the undiscounted public debt is represented by:

$$D/Y \qquad (4)$$

Where D is the public debt level and Y is the GDP level, so that D/Y becomes the undiscounted public debt to GDP ratio.

The debt market value is therefore seen as:

$$[D/Y] \times \left[1/\left(1+p_t\right)\right] \qquad (5)$$

And the debt discounted market value becomes:

$$[D/Y] \times \left[1/\left(1+p_t\right)\right] \times \left[\prod_{i=1}^{t} 1/\left(1+p_{t-1}\right)\right] \qquad (6)$$

where p_t is the ex-post real interest rate which is equal to nominal interest rate lagged for one period minus the current inflation rate $i_{t-1} - \pi_t$;

$\left[\prod_{i=1}^{t} \dfrac{1}{(1+\rho_{t-1})}\right]$ is the discount factor, taking the value of 1 for 1980.

Real interest rates are calculated ex-post, and are defined as the difference between the long term yields on government bonds and the Consumer Price Index.

In also testing to see if the IBC is satisfied, tests will be carried out on the co-integrating relationship between government revenue and expenditure. This is seen as:

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$R_t = \alpha + \beta G_t + u_t$

Where R_t is real government revenue and G_t real government expenditure. In deriving the real government revenue and expenditure, the government revenue and expenditure are deflated by the Consumer Price Index.

To identify where the structural breaks in the data could possibly occur, a visual inspection is done of the residual graph of the government revenue and expenditure. Where breaks are suspected, a breakpoint date test is determined using the Chow breakpoint test and then this is further tested for structural breaks using the regression equation seen below:

$$R_t = \alpha + \beta G_t + \gamma \left(DG_t \right) + u_t \tag{7}$$

Where γ is the dummy slope; D_t takes the value of one before the break and zero after the break or vice-versa. Therefore for the above regression, when values (of one and zero) are substituted for D_t, it can be shown as:

$$R_t = \alpha_0 + \alpha_1 g + \alpha_2 dg + \alpha_3 d + u_t \tag{8}$$

$$R_t = \alpha_0 + \alpha_1 g + u_t \qquad \text{When d is equal to zero and} \tag{9}$$

$$R_t = \left(\alpha_0 + \alpha_3 \right) + \left(\alpha_1 + \alpha_2 \right) g + u_t \qquad \text{When d is equal to one} \tag{10}$$

Data used in the testing of the debt to GDP series is the general gross debt in percentage of GDP. Therefore the market value and discounted market value had to be obtained from this gross debt (i.e. debt face value). In calculating/deriving these values, the nominal interest rate was deflated using the Consumer Price Index; also yield on long term government bonds was used as the nominal interest rate. Time series data was utilized and the

frequency was annual. The graph as seen on fig 1.1 in the appendix on this data depicts the trend of these series for the period 1980 – 2004.

The reason why the market debt value and the discounted market value is obtained is to see if the minimum requirement for sustainability is met: this is if there exists a unit root in the market value and none in the discounted market value, then the minimum requirement is fulfilled i.e. $0 < \beta < 1$.

Data on government revenue and expenditure is time series data and is quarterly in frequency. The Consumer Price Index is also used to deflate these series.

The graph figure 2.1 in the appendix of these series is quite interesting. It shows periods of marked divergence between government revenue and expenditure especially in the 1970s and this continues (although not so marked) till the 1980s. From onwards of the mid to late 1990s to the present there has been a convergence of the government revenue and expenditure and this can be attributed as a fall out of the Maastricht Convergence Criteria.

The graph figure 2.2 in the appendix on the residual of government revenue and expenditure is also interesting to look at, because at a visual inspection one might begin to suspect that there might be a structural break which however is subject to testing.

All data used for the purpose of inference and estimation is obtained from the International Monetary Fund's *International Financial Statistics (IFS)*. Quarterly data for the period 1999 – 2002 for government revenue and expenditure was not available. However, the annual data for this period was available and this was converted to quarterly data.

5. METHODOLOGY

The procedure/models used by Arghyrou and Luintel (2005) will be utilised as a reference. *However, it should be noted that the test done on Italy by Arghyrou and Luintel (2005) was limited to the period 1962 – 1997 and also that the debt to GDP series was not modeled*

and tested for stationarity. The aim of this paper is therefore to see whether since post-Maastricht if the Italian finances are still sustainable. Therefore this paper will cover the period from 1960 – 2004.

Therefore in testing the IBC, strong and weak form tests of fiscal sustainability will be performed bearing in mind that studies by Quintos (1995) indicate that a condition of weak form sustainability is sufficient for it to hold. The following processes will be done:

a. Tests for sustainability will include unit root tests on the debt to GDP series and government revenue and expenditure for the periods 1980 – 2004 and 1962.1 – 2004.4 respectively; and also a co-integration test on the government revenue and expenditure.

b. Structural shifts will be modeled while testing the present value criteria; in doing this, break dates will be identified endogenously using the Chow breakpoint test and then sequential Wald tests will be used to test for the validity of the break dates.

c. Any identified structural shift will be associated to specific endogenous policy changes/or exogenous shocks that impact on the Italian economy. Once this is done, then the long run effect of this in fiscal sustainability will be calculated.

By addressing structural breaks, sources of possible bias are accounted for in examining the sustainability of government finances.

The usual practice has been to investigate past fiscal data to see if government debt follows a stationary process or to establish if there is co-integration between government expenditures and revenues.

In testing for sustainability in government debt, the Augmented Dickey Fuller Unit Root tests are carried out. The DOLS regression is seen below:

$$R_t = \alpha + \beta G_t + u_t$$

Where R_t is government revenue; G_t is government expenditure; u_t is the random error term; and α and β are the co-integrating vectors.

The co-integrating regression is augmented by the lead and lag differences of the regressors in DOLS in order to control for any endogenous feedback and the nuisance parameters. If the random error term (u_t) is serially correlated, then the appropriate estimator is DGLS; this allows for an autoregressive error under the Feasible Generalised Least Squares.

In testing for restrictions that might be apparent in the co-integrating parameters, the Wald tests which are χ^2 distributed will be employed. The advantage of this particular estimator is that it can take care of unbalanced regressors. In other words, there will be no need for G_t and R_t to be of the same order of integration. The disadvantage is that there is no unique method of determining the order of the lead and lag variable. In order to take care of this, a fourth order lead and lag is employed since the data used is quarterly in frequency.

Fiscal regime shifts is assessed through tests of structural breaks in the co-integrating relationship between R_t and G_t. Break dates will also be identified by using sequential Wald test (Quintos, 1995). Therefore the auxiliary regression for the stability test is seen below as:

$$R_t = \alpha_0 + \alpha_1 g + \alpha_2 dg + \alpha_3 d + u_t$$

5.1 ESTIMATION, TESTS AND RESULTS

As a first step, the debt to GDP series were examined and tested for the presence of unit roots. The results of the tests conducted are based on a specification of intercept and the choice in lag length is also based on the standard likelihood ratio test. The hypothesis tested is:

H0: $\beta = 0$ Not Sustainable

H0: $\beta = 1$ Strong Form Sustainable and u_t must be stationary

H0: $0 < \beta < 1$ Weak Form Sustainable

If the test results reveal the presence of unit root in the debt face, market debt and discounted market debt values, then the government finances are not sustainable. If the results show the absence of unit roots in the discounted market value but reveal its presence in the market value, then the minimum requirement for sustainability would have been met i.e. $0 < \beta < 1$. This therefore would mean in real terms that the government can service its debt but the market would require higher interest rates in order to invest in government bonds.

However, the tests results indicate that these series are not significantly different from zero. In other words, they reveal non-stationarity (i.e. the presence of unit roots) in all three series at 1%, 5% and 10% levels. The null for unit elasticity ($\beta = 1$) is also rejected. Therefore the hypothesis of $0 < \beta < 1$ for the minimum requirement of sustainability i.e. weak form sustainability is not met at all levels of significance for all three series of debt for Italy. The debt to GDP series therefore does not satisfy the IBC.

Secondly, the time series for G_t and R_t (real government expenditure and revenue) were examined. This data was broken down into five different components and examined for different periods namely: pre-oil price shock; oil-price shock; pre-Maastricht; post-Maastricht and the full sample.

The same hypothesis seen in the previous page is tested on the G_t and R_t series by carrying out ADF unit root tests and co-integration tests. If the test results reveal that the beta co-efficient β is equal to one and co-integration occurs, then fiscal policy is sustainable in the strong sense. If β is less than or equal to one and there is no co-

integration, then fiscal policy is only sustainable in the weak sense. If β is equal to zero, then fiscal policy is not sustainable irrespective of whether co-integration occurs or not.

The results of the tests are based on a specification of intercept and a lag length of four. The choice of lag length is based on the quarterly frequency of the data. Results suggest that in the first three periods (i.e. pre-oil price shock, oil-price shock and pre-Maastricht) that the series are not stationary (in order words unit roots were found) at all levels of significance; furthermore, the null of unit elasticity is rejected. However, the post-Maastricht period seems to indicate stationarity in the series since the slope parameter (β) is not significantly different from one. Therefore the null of unit elasticity is not rejected for this sample. Also in the full sample, the results indicate stationarity since the slope parameter is significantly different from zero at the 5% and 10% level of significance.

The results of the tests on the estimated residuals of the regression u_t (i.e. co-integration tests) are based on a specification of no trend and intercept but with a constant and a lag length of four based on the quarterly frequency of the data. G_t and R_t appear non-co-integrated in all the samples at all the levels of significance except for the oil-price shock period. In this sample, G_t and R_t appear co-integrated at the 10% level of significance; thereby the hypothesis of co-integration is apparent only for this period.

Therefore, as deduced from the requirements for sustainability for G_t and R_t, since the slope parameter in the post-Maastricht period and full sample; and the co-integration result in the oil-price period fall within the weak sustainability category, it therefore means that the G_t and R_t suggest a satisfaction of the IBC.

To test for structural breaks in the data, the residual graphs for all the five samples are looked at for an indication at which point the breaks might occur and breakpoint dates are determined by the Chow breakpoint tests. The dates identified include 1965.4, 1986.2, 1998.1, 2002.4, 1966, 1972 and 2003. 1965.4 and 2002.4 will be taken to be the same as 1966 and 2003 respectively which were identified in the full sample. Thereafter, a dummy

is inserted in line with regression $R_t = \alpha + \beta G_t + \gamma (DG_t) + u_t$ outlined in equation (7) and tests are carried. It should be noted here that that the break years of 1966, 1972 and 2003 are significant break dates and are significant for a structural change and are correcting for it. *By this, it means that the government seems to be striving for better revenue figures or lower expenditure figures as the case may be*. Since the dummy variables pick up the long run effect of regime shifts, the results seem to indicate that R_t converges with G_t thereby encouraging/indicating sustainability.

To test for constant and slope shifts of these significant dates, the regression $R_t = \alpha_0 + \alpha_1 g + \alpha_2 dg + \alpha_3 d + u_t$ as outlined in equations (8) is employed. The results seem to indicate a change towards negative figures except for the period 2003 where the constant is significantly different from zero. It should be noted that the closer the c coefficient tends towards zero indicates a move towards sustainability. Therefore the values of the coefficients (c and β) would imply the direction towards sustainability. Positive values are indicative of this while negative values imply a move towards the opposite direction.

Sequential Wald tests $R_t = (\alpha_0 + \alpha_3) + (\alpha_1 + \alpha_2) g + u_t$ are used to test the null of overall slope of unity H0: $\beta = 1$ when d is equal to one and $R_t = \alpha_0 + \alpha_1 g + u_t$ is used to test $\beta = 0$ when d is equal to zero. The results seem to indicate weak stationarity for the periods.

The break identified in the 2003 period seems to show a significantly positive effect on sustainability. The slope co-efficient is statistically significantly different from zero but less than one. The break can be tied to the after effects on the world economy of the September 11 2001 attack on the US. Here, the Italian government seemed to respond more aggressively than usual as can be gleaned from the address of the Governor of the Banca d'Italia on the workings of the economy in January of 2003.

SUMMARY OF TEST RESULTS

UNIT ROOT TESTS ON DEBT TO GDP SERIES 1980 - 2004			
	Debt Face Value	Market Debt Value	Discounted Market Value
$H_0:\beta = 0$	-3.645	-3.612	-3.612
$t-stat$	-0.307	-0.881	-2.092
$H_0:\beta = 1$	-14.452	-8.502	-14.243
$t-stat$	-1.96	-1.96	-1.96
INFERENCE	Un-sustainability	Un-sustainability	Un-sustainability

UNIT ROOT, CO-INTEGRATION & STRUCTURAL BREAK TESTS ON $G_t\, and\, R_t$ 1962 - 2004					
	Full Sample	Pre-Oil Shock	Oil – Shock	Pre-Maastricht	Post-Maastricht
Estimated Eqn: $\log R_t = \alpha + \beta G_t + u_t$					
ADF on R_t					
$H_0:\beta = 0$	-2.879**	-2.939**	-2.939**	-2.916**	-3.029**
$t-stat$	-2.351	-1.371	-0.581	-2.053	-0.149
$H_0:\beta = 1$	-84.87	-16.805	-13.593	-12.843	-1.87
$t-stat$	-1.96	-1.96	-1.96	-1.96	-1.96
ADF on G_t					
$H_0:\beta = 0$	-2.879**[5]	-2.939**	-2.939**	-2.916**	-3.029**
$t-stat$	-3.466	-0.114	-0.479	-1.520	-0.022
$H_0:\beta = 1$	-84.91	-16.997	-12.534	-9.928	-3.84
$t-stat$	-1.96	-1.96	-1.96	-1.96	-1.96
ADF on u_t	-3.375**	-3.497**	-3.154***	-3.677**	-3.677**
$t-stat$	-1.641	-1.559	-3.223	-1.392	-0.022
INFERENCE	Weak Sustainability	Un-sustainability	Weak Sustainability	Un-sustainability	Weak Sustainability
F-Wald $H_0:\beta = 0$ pvalue	0.0022	0.0000	0.0000	0.0000	0.780
F-Wald; $H_0:\beta = 1$ p-value	0.0029	0.0003	0.169	0.895	0.856

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[5] ** and *** refers to 5% and 10% significant levels respectively

6. __CONCLUSION__

Italy as well as Belgium and Greece have for long been dubbed as countries with unsustainable policies. Italy which was warned (as well as the two other countries mentioned above) during the build-up to the euro on the need to have sustainable finances is now a euro member country.

Studies previously conducted such as that of Corsetti and Roubini (1991) found the finances of Italy, Belgium, Ireland, Greece and the Netherlands to be unsustainable. However, Arghyrou and Luintel (2005) revisited this issue using Quintos (1995) studies as a basis for determining if the finances of the countries examined by Corsetti and Roubini (1991) were sustainable or not. Quintos (1995) derived conditions for various forms of sustainability (i.e. weak and strong).

Arghyrou and Luintel (2005) on this premise for weak sustainability, tested to see if these countries satisfied the IBC. Their paper tested for multiple structural breaks and also modeled non-linearities in fiscal adjustments. Their study thereafter rejected strong form sustainability in these countries in line with the previous studies done by Corsetti and Roubini (1991) but found that the minimum condition for weak sustainability was present and therefore these countries satisfied the IBC.

However, some believe that Italy only contrived to converge solely in order to meet the criteria and that its true position would be manifest post the convergence. This paper therefore deems to find if the finances of Italy are sustainable post the convergence period i.e. since joining the euro.

In this paper, in line with the studies done by Arghyrou and Luintel (2005), the fiscal sustainability for Italy is examined. However, the sample period for government revenue and expenditure has been extended and the sample broken down into smaller sub-samples classified as:

Pre-oil price shock period   1962.1 - 1972.4

Oil-price shock period   1973.1 - 1983.4

Pre-Maastricht period   1984.1 - 1998.4

Post- Maastricht period   1999.1 - 2004.4

Full sample period   1962.1 - 2004.4

Also, fiscal sustainability tests have been carried out on debt to GDP ratio for the period 1980 – 2004. The sustainability test of the debt to GDP ratio was not carried out by Arghyrou and Luintel (2005). Structural breaks have also been tested here. The main aim of this study is to see if the minimum condition of sustainability is met even in the extended sample and most especially since the post-Maastricht period.

The key results are as follows: first, the government debt to GDP ratio test shows that the Italian finances are not sustainable. It is unsustainable in the three series (i.e. debt face, market debt and discounted market debt values). In order words it does not satisfy the present value criteria of the IBC. This is in line with the results found by Corsetti and Roubini (1991).

Secondly, the government revenue and expenditure show weak form sustainability; thereby indicating that the government in recent times is not spending above its earnings. This is in line with findings by Arghyrou and Luintel (2005).

Thirdly, over the last 42 years, Italy has witnessed multiple structural breaks and these breaks can be tied to important events in the country. These breaks have been found to have produced anticipated effects in the finances of the country. However, most important to this study, the break identified in 2003 (which could be tied to the after effects of the

September 11 2001 attack in the US on the world economies) has shown that the positive effects of the Maastricht convergence criteria even continues since the joining of the Euro by Italy

Finally, making allowances for structural breaks indicated the occurrence of co-integration between government revenue and expenditure.

From a visual look at the data, it can be seen that in recent times that there has been a downward trend in the debt to GDP series. *This downward trend in the series is quite exciting to consider because despite the result of un-sustainability found in the series, it means that the government is striving hard towards reducing its debt. Also from the data, it is quite apparent that government revenue and expenditure have converged. Simply put, the government apparently is no more spending more than it earns* (as can be seen from the government revenue and expenditure series). Will there be an increase in earnings over expenditure in later years and can this result in a strong form of sustainability for Italy the country which has for so long been deemed unsustainable in its finances and in more recent times weakly sustainable? And will the government debt to GDP ratio continue on its downward trend to meet the acceptable criteria. This remains to be seen and can possibly be looked at again in future studies.

Since there has been an attempt to maintain the Maastricht convergence criteria for sustainable finances by Italy, it is to be hoped that this improvement would continue.

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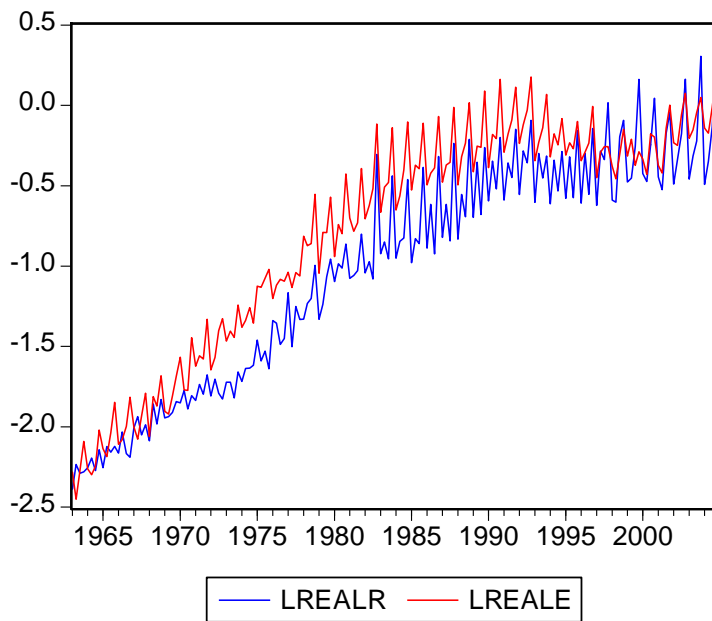
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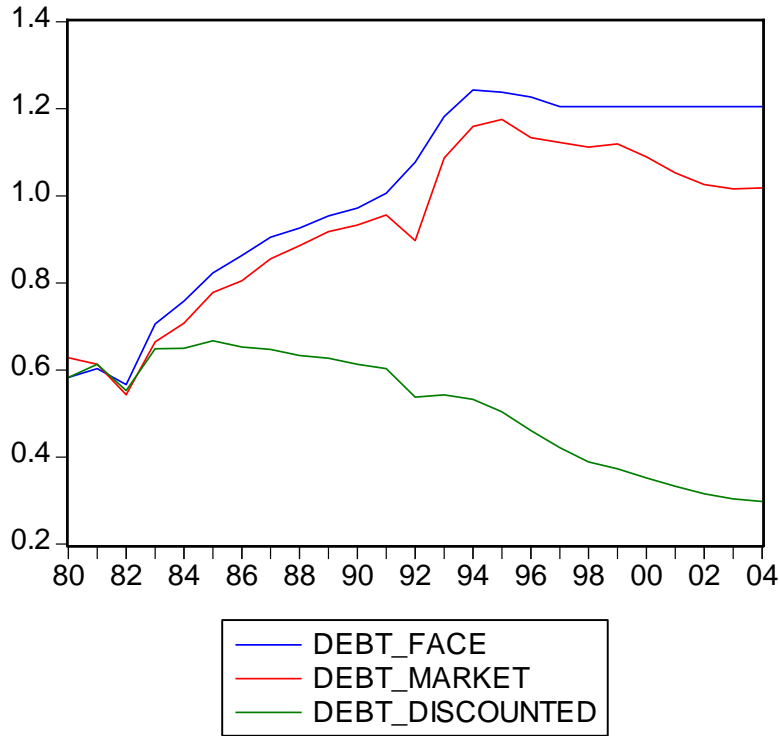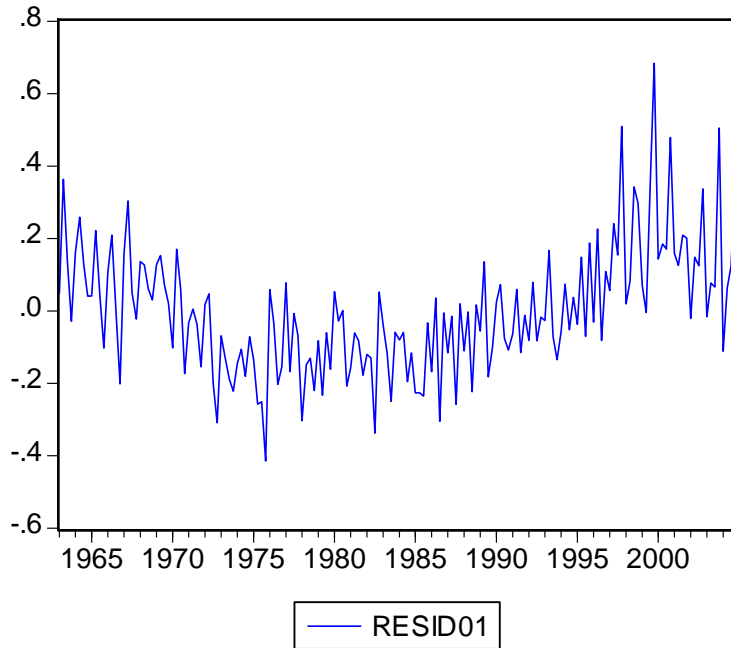
FIGURE 1.1

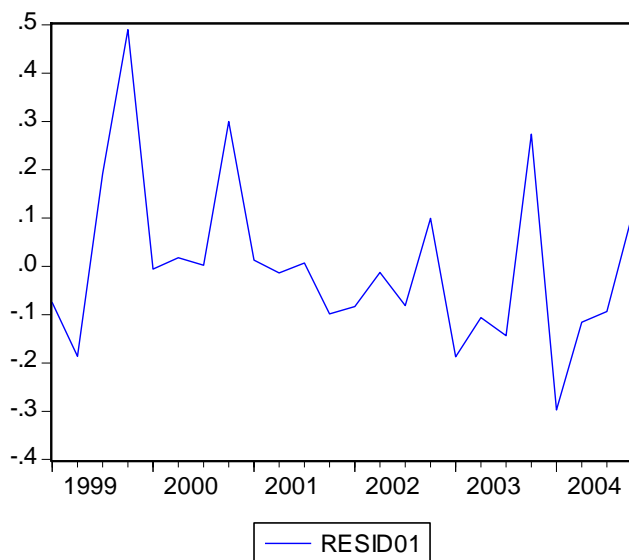**FIGURE 2.1**
GRAPH ON REAL GOVERNMENT REVENUE & EXPENDITURE

FIGURE 2.2

RESIDUAL GRAPH OF REAL GOVERNMENT REVENUE & EXPENDITURE

RESID01

FIGURE 3.1
RESIDUAL GRAPH – POST MAASTRICHT

RESID01

FULL SAMPLE 1962.1 - 2004.4

FIGURE 4.1
RESIDUAL GRAPH – FULL SAMPLE