

An Empirical Stock-Flow Consistent Model of the Italian Economy

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The sustainability of the Italian government debt has been under close scrutiny since the launch of the Euro Area, and even more so after the Global Financial Crisis. The Covid-19 crisis in 2020 has depressed the Italian economy further and negatively affected the government budget. Despite the rebound in 2021, the state of the economy and government debt in Italy remain precarious. Building on Pasinetti's work, this paper examines the sustainability of the Italian government debt through a medium-scale, stock-flow consistent, structural macroeconomic model. The model has been coded and calibrated using the R package *Bimets* developed by the Bank of Italy. Our findings show that the Italian government debt is unlikely to enter a sustainable trajectory in the next few years. While the Next Generation EU and the other fiscal and monetary measures are helping the Italian economy to recover, in the coming years, a greater effort on the part of the European authorities—including an intervention of the ECB in controlling the yield curve—seems necessary to stabilize the debt to GDP ratio in Italy.

Key words: Government debt sustainability, Covid-19, Italy, ECB, EU
JEL classifications: E17, E52, E63, H68.

1. Introduction

The sustainability of the Italian government debt (debt for short) has been under close scrutiny since the launch of the Euro Area, and even more so after the Global Financial Crisis. The current Covid-19 crisis in 2020 has depressed further the Italian economy, and negatively affected the government budget. The state of the economy and government debt in Italy is precarious.

In 2020, the debt to GDP ratio jumped more than 20 percentage points, trending at 155.6 percent. This is due to three reasons. First, the real GDP growth rate has contracted by 8.9 percent on an annual basis (Italian Government, Table 4 in Appendix). Second, the Italian government spending has increased by 8.6%. Third, tax revenues have contracted by 6.4% (Italian Government 2021a).¹

The Covid-19 emergency measures of the Italian government, the European Council's Next Generation EU (NGEU hereafter), the ECB's Pandemic Emergency Purchase Programme (PEPP hereafter), and other extraordinary EU measures like SURE have helped the Italian economy to rebound in 2021, with an expected increase in GDP of around 6 percent, and a minor decrease in

¹ Government spending increased around 75 billion euros, while tax revenues shrank by 54 billion euros in 2020.

the debt to GDP ratio with respect to the end of 2020. However, we show that these measures are unlikely to prevent the debt to GDP ratio from recording new and unsustainable higher levels in future. Although the *Stability and Growth Pact* and other institutional budget constraints remain temporarily suspended, the high and increasing government debt of Italy is at odds with its status of Euro Area member-state. Building on Pasinetti (1998) and using a stock-flow consistent macroeconomic model, our scenarios analysis suggests that a greater effort on the part of the European authorities - including expansive fiscal measures and new interventions of the ECB in controlling the yield curve - seems necessary to stabilise the Italian debt to GDP ratio. Austerity measures are counterproductive in terms of both national GDP and public finances.

2. Model setup

We examine the sustainability of the Italian debt by using a medium-scale, stock-flow consistent (SFC), structural macro econometric model. Differently from DSGE models and other macroeconomic methods, SFC models explicitly analyse the monetary and financial sides of the economic system, and their interactions with the real economy, in a discrete dynamic framework (Godley and Lavoie 2007).

Due to the success in macroeconomic forecasting, empirical SFC models have become increasingly popular in the last decade (Nikiforos and Zezza, 2017). Canelli *et al.* (2021) argue that empirical SFC models can be divided into two main groups, namely “data-to-theory” (DTT) models and “theory-to-data” (TTD) models, respectively. DTT models are grounded on data, that is sectoral balance sheets and flow of funds statistics of the economy under investigation, whereas TTD models start with a theoretical model, define the set of equilibrium conditions and behavioural equations, and then use observed data to estimate the coefficients of the model.

In practical terms, the main difference between empirical SFC models is in terms of the following two choices. First, DTT models usually consolidate the private sector such that to represent a 3-sectors economy (private, public, foreign), while TTD models have many more economic sectors. Second, TTD models include a set of Tobinesque portfolio management equations, which is not crucial in DTT models, in order to investigate more explicitly the financial sector. DTT models like the ‘Godley-CEPG-Levy’ models have proved popular in projecting turning points (e.g. Godley, 1999), whereas TTD models have often been used for cross-policy comparisons (e.g. Burgess *et al.* 2016).

We use a TTD model with six macro-sectors: firms, banks (including financial intermediaries), the central bank (ECB), the government, households (including non-profit institutions serving households), and the foreign sector. Table 1 and Table 2 in the Appendix show the model-adjusted balance sheet and the transactions-flow matrix, using annual data for 2020. These tables are used to record economic and financial relationships across different sectors. Table 1 is based on *Eurostat*’s financial accounts (FA), whereas Table 2 is based on non-financial accounts (NFA). Some entries have been reclassified to reduce the density of the original matrices, thus reducing the number of equations. The simulated model is made up of 65 identities and 38 behavioural equations.

Key behavioural features of the model are as follows. Firms are assumed to produce the whole output on behalf of other sectors. Real gross investment is a function of three variables: the size of the economy; the gap between the target and the current stock of capital; and the interest rate

(premium) on loans. Bank loans to firms and households are demand driven. Household real consumption is a positive function of labour incomes, non-labour incomes, and total wealth (in real terms). Banks' liabilities include deposits and advances from the central bank, whereas assets are loans and reserves. Since for simplicity production costs are ignored, banks' net income matches net interest payments. Households' financial holdings are defined using Tobinesque portfolio equations. Gross import is simply defined as a positive function of domestic income, while gross export is a positive function of foreign income and labour productivity. The average risk premium on Italian government securities is an increasing function of the debt to GDP ratio and a decreasing function of the share of debt purchased by the ECB. The available labour force adjusts endogenously to the demand for labour in the long run. The percentage change in the money wage rate depends on the unemployment rate and the inflation rate. Adaptive expectations are implicitly assumed, while production decisions are demand led.

The model has been coded, and calibrated, using the R package *Bimets* developed by the Bank of Italy (Luciani and Stok, 2020). Model coefficients are all estimated from *Eurostat* data. Annual time series over 1995-2020 have been used, both for the balance sheet entries and the transactions-flow variables. Behavioural equations are estimated in (log) levels even when they are found not to be stationary. Our choice is due to three reasons: first, spurious correlations are not a major issue, as the structural relationships defined by the behavioural equations are here assumed on a theoretical basis, not mined from data; second, we can only rely on a low number of available observations; third, the use of the level specification allows preserving possible cointegrations across variables.²

3. Findings

We have used the model to test the sustainability of the Italian government debt after the Covid-19 crisis. Like other countries, Italy has faced a supply and a demand shock, with severe effects on the labour market, autonomous components of demand, interest rates and tax revenues. For the next years, the effects on the economy are still uncertain. Similarly, EU and domestic policy responses are speculative. For instance, many measures are conditional on the successful achievement of structural reforms planned by the Italian government (2021b). Table 3 in the Appendix summarises the additional factors, i.e. shocks with respect to the pre-pandemic trend, which attempt to capture the economic effect of the Covid-19, and the EU and domestic policy responses to it. The size of the shocks is derived from the forecasts of the leading national and international institutions (Table 4, Appendix).

Fig. 1(a-b) shows the evolution of the (real) growth rate and government debt in Italy over the 1995-2026 period. The black line shows the observed path of the growth rate and government debt for the period 1995-2020, while the black dashed line indicates the model-predicted path of each variable in the absence of the Covid-19 crisis. The red line shows our SFC model forecasts for the period 2021-2026.

Fig. 1(a) shows that the growth rate contracted by 8.9% in 2020, and after a projected significant rebound of 6.1 % in 2021, it rapidly declines toward a 1.2% growth rate by 2026. Fig. 1(b) indicates

² The details of the model, including the model *R* code, the scenarios, and the related dataset are available online on the CJE website, and on <https://github.com/marcoverpas/Italy-SFC-Model>.

that the debt to GDP ratio reach 155.6 percent in 2020, and after a minor reduction in 2021, it keeps increasing in the following years.

PLEASE INSERT HERE FIGURE 1

Building on Pasinetti (1998), the sustainability condition for the government debt holds that the primary balance must cover the net debt burden:³

$$\frac{T-(G+TR)}{Y} \geq (r_b - g_y) \cdot \frac{B_s}{Y} \quad (1)$$

where T is total tax revenue, G is government consumption, TR is a composite entries including benefits and transfers to the private sector, Y is the nominal GDP, r_b is the average return rate on Italian debt securities, g_y is the nominal GDP growth rate (that is, $\Delta Y/Y$), and B_s is the total stock of debt issues.

Fig. 2 shows that the Italian government struggles to meet the debt sustainability condition (1), because the net debt burden exceeds the primary balance in 2020 and following years (with the exception of 2021).

PLEASE INSERT HERE FIGURE 2

We have then tested four alternative policy response scenarios:

1. Baseline or scenario (1), which corresponds to the present state of economic policies: covid-19 crisis + government expansive fiscal measures + ECB support (PEPP) + NGEU;
2. Scenario (1) + strong austerity;⁴
3. Scenario (1) + mild austerity;
4. Covid-19 crisis, no intervention (but ordinary government budget).

PLEASE INSERT HERE FIGURE 3

Fig. 3 (a) shows that the current EU and domestic policy responses are helping the Italian economy to recover, though the real GDP remains always below the pre-pandemic trend. Furthermore, the recovery fades away as the fiscal and monetary stimulus packages run out. Austerity scenarios are associated with dramatically lower real GDP levels compared with the baseline. Fig. 3(b) reveals that austerity policies are counterproductive also in terms of public finance, as the fall in GDP ends up offsetting government saving. Fig. 4 shows the actual average return rate on the Italian government debt (Scenario 1) compared with the maximum sustainable rate implied by equation (1). It is apparent that the current trajectory is not sustainable. Despite the significant intervention of the ECB, the actual average rate is still too high to stabilise the debt to GDP ratio in the next five years.

³ Following Domar (1944), the ‘net debt burden’ is the net average cost of debt as defined by the average interest rate adjusted for the nominal GDP growth rate.

⁴ Strong austerity is defined as cuts to government spending in the order of 10 percent of 2019 GDP, starting from 2021. Mild austerity is half as intense as strong austerity.

PLEASE INSERT HERE FIGURE 4

4. Concluding remarks

Based on different policy response scenarios to the current Covid-19 crisis, our findings show that the Italian government debt is still on an unsustainable trajectory. Austerity measures would be counterproductive in terms of both national GDP and public finances. While the Next Generation EU and the other expansive fiscal and monetary measures are helping the Italian economy to recover, they are not sufficient to put public finance on a sound footing. In the coming years a greater effort on the part of the European authorities, including an intervention of the ECB in controlling the yield curve, seems necessary in order to boost the recovery of the Italian economy, and to help stabilising its debt to GDP ratio.

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Figures

Fig. 1. Predicted GDP growth rate and government debt/GDP ratio in Italy

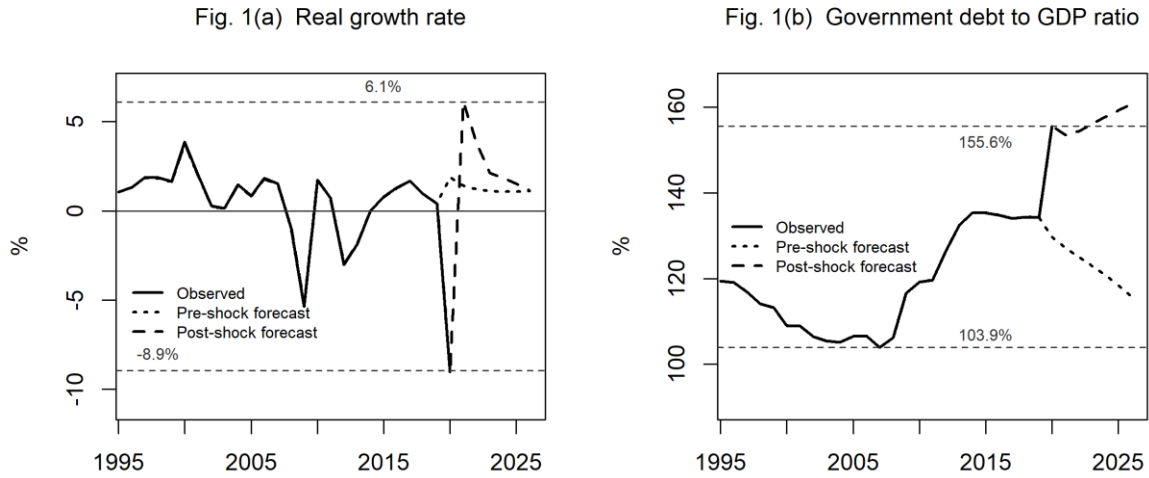


Fig. 2. Debt sustainability condition

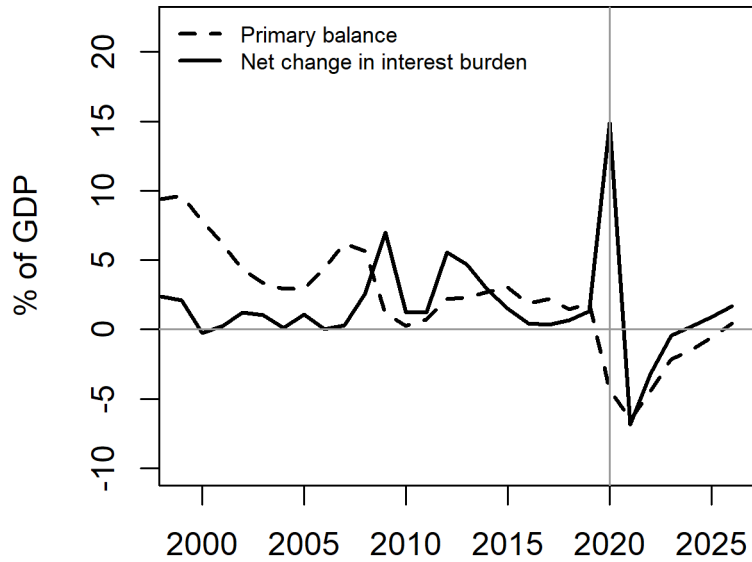
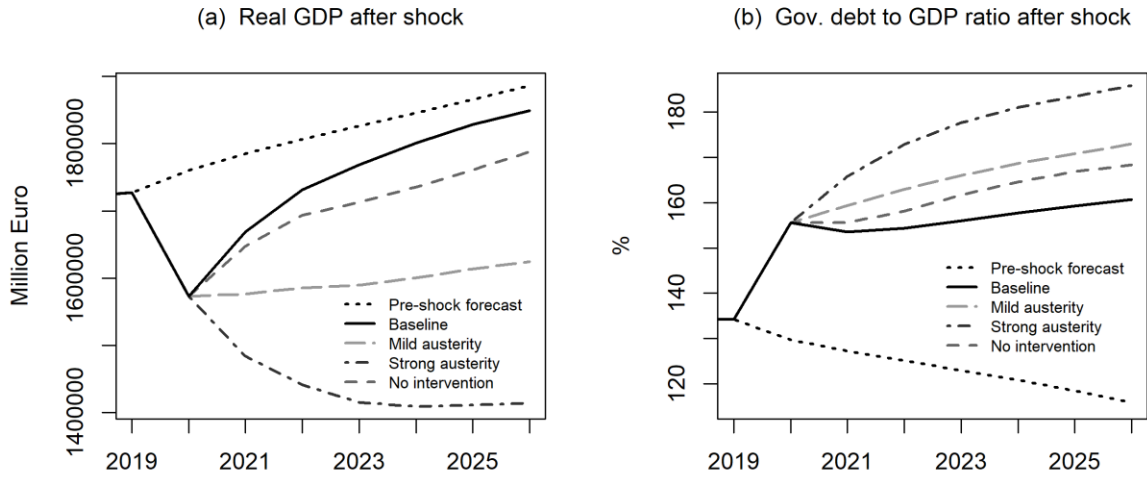
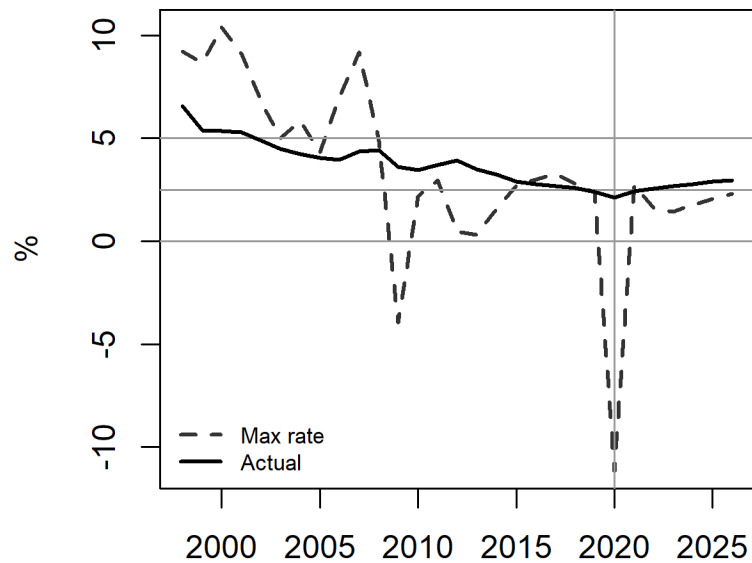


Fig. 3. GDP and government debt: alternative scenarios

Note: the plain line represents the baseline of our model. It is made of observed values until 2020 and of our model forecasts after 2020.

Fig. 4. Maximum sustainable average return rate vs. actual average return rate on Italian debt

Appendix

Table 1

Model modified balance sheet, Italy, 2020, annual series (assets net of liabilities), current prices, million euros

	Firms	Banks	Central Bank (CB)	Government	Household s	Foreign sector	Row total
Eurostat code	S11	[S12]	S121	S13	S14_S15	S2	
Cash (and reserves)		11474	-196907		185433		0
Deposits		1379289			1379289		0
Securities		1451428	764972	-2463489	247089		0
Loans	1043063	1776765			-733702		0
Shares	1115388				1115388		0
Other securities				-109477		109477	0
Other net financial assets	261933	-829800	-342779	-338787	744331	505102	0
Net financial wealth (column total)	1896518	1030578	225286	-2911752	2937828	614578	0

Source: Our elaboration on Eurostat data, 2021.

Notes: light grey shaded areas show new and/or reclassified series.

Table 2

Model modified transactions-flow matrix, Italy, 2020, annual series, current prices, million euros.

Eurostat code	Firms		Banks and CB	Government	Households	Foreign Sector	Total economy
	S11		S12	S13	S14_S15	S2	S1
	Current	Capital					
Consumption	956426				-956426		0
Investment	290768	-290768					0
Government spending	345374			-345374			0
Export	485944					-485944	0
Import	-424935					424935	0
<i>Memo: GDP</i>	[1653577]						
Taxes				466761	-466761		0
Transfers				-202442	202442		0
Wages	-637632				637632		0
Interests payments	-3926		47685	-54359	10600		0
Dividends	-709973				709973		0
Distributed bank profits			-47685	7715	39970		0
Other payments	78590		154073	-115728	-347451	230516	0
Changes in net wealth	89868		154073	-243427	-170021	169507	0

Source: Our elaboration on Eurostat data, 2021.

Notes: light grey shaded areas show new and/or reclassified series.

Table 3. Additional factors for the baseline scenario

	2021	2022	2023	2024	2025	2026
<i>Economic factors</i>						
Autonomous consumption*	-36 ^b	-41 ^b	-58 ^b	-58 ^b	-58 ^b	-58 ^b
<i>Policy factors</i>						
Additional tax revenues	-50 ^b	-40 ^b	-10 ^b	-10 ^b	-10 ^b	-10 ^b
Additional national resources ****	3 ^b	6 ^b	6.8 ^b	6.2 ^b	5.5 ^b	3.2 ^b
Δ in extra holdings by ECB (PEPP)**	143.3 ^b	+37.5 ^b	0	0	0	0
Adjust. of average return rate	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Δ in received SURE loans ***	10.9 ^b	0	0	0	0	0
Δ in received NGEU loans ****	6.8 ^b	12.7 ^b	16.2 ^b	29.4 ^b	30.1 ^b	25.8 ^b
Δ in received NGEU grants ****	10.9 ^b	19.1 ^b	26.5 ^b	13.4 ^b	8.3 ^b	4.3 ^b
Due contributions for grants *****	-6.2 ^b	-10.9 ^b	-15.1 ^b	-7.7 ^b	-4.7 ^b	-42.5 ^b

Notes: additional factors are modelled as a set of exogenous shocks with respect to the pre-pandemic trend.

^b billion euros; * calibrated such that the model generates the baseline scenario of Table 4 (based on IMF predictions) ** source: European Central Bank data, 2021 (<https://www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html>); *** source: our calculations on European Commission 2021; **** source: Italian Government 2021c; ***** Our calculations on European Commission 2021, and Italian Government 2021b, 2021c.

Table 4. Predicted values for 2021 and 2022 of GDP components, inflation and government balance

	Italian Government (NADEF September 2021)			IMF (October 2021)		European Commissio n (November 2021)		Bank of Italy (December 2021)		OECD (December 2021)		ISTAT (December 2021)		Our model*	
	2020 *	2021 1	2022 2	2021 1	2022 2	2021 1	2022 2	2021 1	2022 2	2021 1	2022 2	2021 1	2022 2	2021 1	2022 2
<i>Annual growth rates (%)</i>															
GDP	-8.9	6.0	4.7	6.2 ^a	3.8 ^a	6.2	4.3	6.2	4.0	6.3	4.6	6.3	4.7	6.1	3.8
Consumption	-10.7	3.9	4.2	4.2	5.0	5.3	4.8	5.1	4.6	5.5	4.7	5.1	4.8	9.3	2.4
Investment	-9.2	15.5	6.8	15.0	5.1	15.8	5.9	15.6	5.5	16.5	7.6	15.7	7.5	8.1	7.3
Import	-12.9	11.6	6.9	-	-	13.7	8.5	12.6	5.2	13.9	6.4	13.6	6.9	15.0	5.9
Export	-14.0	11.4	6.0	0.1 ^b	0.0 ^b	12.8	7.5	12.4	4.8	12.7	6.9	13.2	7.1	6.0	8.0
GDP deflator	1.2	1.5	1.6	-	-	1.1	1.5	-	-	1.5	1.9	1.2	1.9	0.9	0.9
<i>Government balance ratios (%)</i>															
Deficit to GDP	9.6	9.4	5.6	10.2	-	9.4	5.8	-	-	9.4	5.9	-	-	8.9	6.9
Debt to GDP	155.6	153.5	149.4	154.8	150.4	154.4	151.4	-	-	154.6	150.4	-	-	153.6	154.4

* GDP components are expressed at constant prices (2015 = 100);

^a Update released in January 2022 (<https://www.imf.org/en/Publications/WEO/Issues/2022/01/25/world-economic-outlook-update-january-2022>);

^b Foreign balance, changes expressed as percent of GDP in the preceding period;

* These are the observed values of GDP components, inflation and government balance in 2020.

Sources: Italian Government 2021c, IMF 2021, European Commission 2021, Bank of Italy 2021, OECD 2021, ISTAT 2021.