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Leveraging interest-growth differentials: Hidden effects of government financial assets in the European Union*

José Alves[$] Clarisse Wagner[#]

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Abstract

Conditions of fiscal sustainability have been widely studied in the literature. Fiscal reaction functions or cointegration between government revenues and expenditures are two approaches that economists have been paying their attention, not only on a theoretical perspective, but also empirically assessing the sustainability of several economies during different timespans. Whereas a predominant focus has been attributed to primary deficits, little attention has been dedicated to government financial assets contribution to government debt paths. Given that government financial assets represent a large proportion of gross debt accumulation, we enquire about their role on government debt leveraging of economic growth over interest rates, focusing on a channel of gross debt, investment, external balance and ratings, in 27 European Union economies during the period from 2000 to 2022. Large heterogeneities in the statistical characteristics of the series and impacts of financial assets on interest rate-growth rate differentials call for a closer attention to financial assets on a granular approach at individual country level, rather than on the aggregate. Our results highlight the importance of government financial assets holdings to the short and long-run debt trajectories, enhancing or potentially undermining gains from primary deficits consolidation efforts and consequently on the differentials between interest rates and output growth.

JEL: C23; E44; F65; H60; H63
Keywords: Public debt; Stock Flow Adjustments; Financial Assets Holdings; ARDL; PMG

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1. Introduction

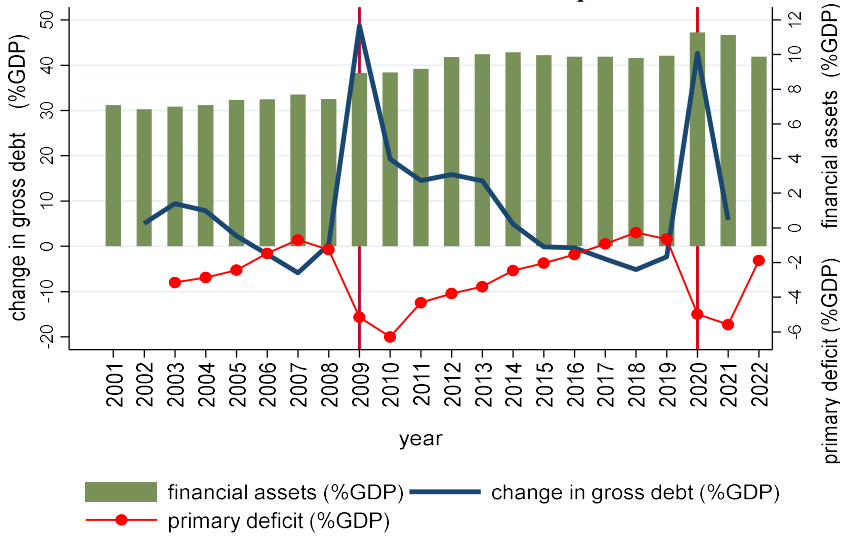
Government debt supports underlying multidimensional public policies, namely macroeconomic stabilization aimed at moving the economy to optimal equilibria, when market failures preclude the reliance on automatic stabilizers. The need of cyclical borrowing raises concerns about unsustainable government debt limiting government financing capacity during macroeconomic strain, making public debt one of the most important macroeconomic factors of a country's development potential.

Theoretical and empirical assessments of debt sustainability along different timespans usually follow two approaches, fiscal reaction functions and cointegration of government revenues and expenditures. We argue that debt containment is not an end in itself, rather, it is a means aimed at expanding financing capacity, supporting government interventions towards generating larger growth potential, that otherwise would not be unattainable, above borrowing costs, the interest rate-GDP growth rate (*r-g)* differential. The leverage capacity of debt in generating or hindering potential growth is influenced, besides primary budgets and debt service, by stock-flow (debt-deficit) adjustments (SFA), within which financial assets are an important component.

Holdings of financial assets influence fiscal income and expenditure and may play a precautionary role as insurance or fiscal buffers, hedging against tax changes, contributing to the smoothing of income across time and states of nature, whenever additional public financing needs arise from geopolitical, environmental, public health or other shocks. On the contrary, financial assets may suffer market devaluations that might increase expenses. This ambiguity of effects beseechs our research question: what is the leverage effect of financial assets in expanding or contracting government financing capacity, when supporting interventions towards generating larger growth potential above borrowing costs?

A general depiction of government financial assets, nominal primary deficit and changes in gross debt (as percentage of GDP) in the EU from 2001 to 2022, highlights two upward spikes around 2009 and 2020 (respectively the Great Financial Crisis and the Covid pandemic). The large increase in gross debt was conveyed both by a deterioration of primary deficit and an increase in financial assets (Figure 1).

Figure 1 - Changes in gross debt versus primary deficit and financial assets in the European Union



Source: Eurostat.

Financial assets holdings are not captured by accrual accounting, but rather by cash flow approaches. However, in the EU fiscal framework regarding the 60% gross debt cap enshrined in the EU Treaties and Maastricht Treaty (1992), the Fiscal Compact (2011) and the (2023) agreement on the reform of European fiscal rules, the European Commission indicators for determining the structural primary deficit merely rely on a S0 short-term one-year horizon weighted compound index aggregation, which includes the gross debt ratio; S1 indicator until 2030; and S2 with an infinite time horizon (for details on these indicators, see among others EC, 2017; Priewe, 2020).

Understanding financial assets effects may widen the traditional narrow focus on primary deficit, expanding the acknowledgement that drivers of debt dynamics go beyond mere subsidies and transfers. Whereas budget primary balance may directly impact aggregate demand (unless Ricardian equivalence might cancel out any fiscal stimulus), government supply side interventions via financial assets holdings concern multiple discretionary policies, requiring an identification strategy modelling the transmission channels towards the *r-g* differential, of which we focused on capital formation, external trade balance and government bonds ratings.

Estimations results lead us to conclude about the mixed effects of financial assets on leveraging the *r-g* differential, reflecting country-specific factors regarding debt management strategies and the multiplicity of instruments underlying financial assets. In the long run, panel estimates point to *r-g* largest impacts coming from ratings, highlighting the importance of financial market conditions. Since leverage effects are related to debt

capacity, panel cointegration specifications of gross and net debt on *r-g* differentials pointed to the absence of long term cointegration effects running from debt (either gross or net), through changes in sovereign bonds ratings, towards *r-g* differentials, questioning the statistically validity of taking debt (both gross and net) as long-term indicators of leveraging growth potential. Financial assets effects on gross debt, compared to primary deficit, applying ARDL to individual countries, evidence heterogeneous effects on government debt dynamics, in some countries preponderantly driven by primary deficit and in some countries by financial assets. Estimates warn about the need of analysing financial assets interventions according to their effect on *r-g* differentials, calling attention to financial assets effects in enhancing or potentially undermining gains from primary deficits consolidation efforts.

The paper is organised as follows. Section 2 reviews the related literature on stock flow adjustments in general and government financial assets in particular. Section 3 discusses the methodological approach, describes the data and sources used in this study. Section 4 presents the results of the empirical analysis and ARDL individual country vignettes, about the effects on gross debt from changes in financial assets holdings and primary deficit. Lastly, Section 5 summarizes our conclusions and draws policy implications.

2. Literature Review

Mainstream public finance sustainability concerns a composite informed judgement on liquidity and solvency, concerning the non-excess of existing obligations over the present value of future primary balances (Debrun et al. , 2020). Warning against unsustainability, the Reinhart-Rogoff rule (2012) estimated that economic growth would dramatically decline when exceeding 90% of gross domestic product, whereas Romer and Romer (2019) claimed that countries with lower debt-to-GDP would benefit from wider debt space in supporting expansionary policies, suffering smaller output declines during a crisis.

A strand of literature has called attention to government debt dynamics driven not only by primary balances but also by a multitude of financial assets instruments, accounted in more general stock-flow adjustments[1], better captured by stock-flow consistent

[1] Eurostat main components of SFAs include: 1) adjustments encompassing transactions in financial derivatives; 2) Net acquisition and disposals of financial assets; 3) Statistical discrepancies arising from

approaches, that flourished from seminal works of Godley and Lavoie (2007). Financial assets capture government interactions combining different degrees of State and markets coordination, which frequent and apparent economic viability may deliver functional advantages, although might be weaker than those assumed by varieties of capitalism, in the terminology of Hall and Soskice (2001) and as argued by Campbell and Pedersen (2007).

Stock-flow adjustments in general and financial assets in particular are associated with discretionary policies, which heat debate over rules tends to be polarized, from Keynes defense of stabilization interventions, to the opposite side of the spectrum in the strand of Friedman (1948) fiscal restraint, endorsed by Eichenbaum et al. (1997), agreed by Feldstein (2002), and also Taylor (2000) defending fiscal budget containment.

Government indebtedness would traditionally be justified by Barro (1979) "*tax smoothing hypothesis*", justifying the reduction of changes in distortionary taxes, while keeping an optimal tax rate across time and states of nature. Only permanent components of expenditure would be relevant for taxation, whereas temporary changes would not change tax rates, instead, governments would borrow the amounts needed[2]. Bhandari et al. (2017) modelled, with a heterogeneous multi-agent economy, aggregate uncertainty and incomplete markets, how planner's preferences about minimizing welfare costs of fluctuating transfers, using fluctuations in return of the traded asset compensation for missing state-contingent securities, make policies over the business cycle differ from Ramsey representative agent models.

In this strand, Ostry et al. (2015) advanced that fiscal authorities would stabilize debt ratios and only reduce debt-to-GDP with less distortionary sources of incomes, such as privatizations or tax increases induced by output growth. In contrast, Missale (2001) argued that particularly highly indebted countries would not manage debt to smooth taxes, rather, as an insurance against macroeconomic shocks, aimed at reducing the risk of deficits and escalating interest burdens.

The plurality of financial assets underlying government interventions in the economy, including financial assets transactions, nationalizations, privatizations,

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compiling data from different data sources. For more details see Eurostat (2017). Retrieved from: http://ec.europa.eu/eurostat/documents/4187653/8332031/STOCK-FLOW-2017-OCT.pdf.
See the European System of National and Regional Accounts (ESA 2010) and the System of National Accounts (2008 SNA) description of government financial instruments.

[2] An additional argument, not pursued here, for government issuing debt, would be the provision of private sector with a safe asset. In this case, governments would issue debt opportunistically, benefiting from market making, providing risk-free securities or liquidity according to private sector demand for securities (Brunnermeier et al., 2022; Gorton et al., 2022).

materialization of contingent liabilities, were comprehensibly analyzed in Bova et al. (2016). Abbas et al. (2020) reported that nationalizations, subsidies, loans to the economy, accounted on average about 90 percent of stock-flow adjustments (SFAs) over the Great Depression.

Regarding implicit or explicit contingent liabilities, the literature adverts about their expansion weakening the explanatory power of traditional fiscal indicators, since they are not typically included neither in deficits nor debts, yet have an impact on interest rates (Laubach, 2009, for example guarantees to the banking sector). Contingent liabilities were found to induce yield increases, among others, by Hagen and Wolff (2006), Bernoth and Wolff (2008). SFAs were found as important as budget primary deficits in explaining fluctuations of public debt (Campos et al., 2006), occurring together with debt surges and consolidation episodes (Abbas et al., 2011).

Financial assets contribution to debt reductions or accumulation were extensively analyzed for instance by Seiferling (2013), whereas their long-term contribution to debt dynamics was discussed in Eichengreen et al. (2019). SFAs impact on changes in debt-to-GDP has been widely reported, as in the panel approach of Weber (2012) for advanced, emerging and low-income countries. On the contrary, financial assets may finance deficits temporarily keeping gross debt from rising, until their depletion eventually may raise debt again (Buiter et al., 1985). Afonso and Jalles (2020) concluded that SFAs were main components of large increases in debt-to-GDP. 42. Jaramillo, Granados, & Jalles (2017) reported that peaks in SFAs accumulation were associated with spikes on public debt (especially in advanced economies), related to financial market distress, leading to higher probability of non-declining debt paths and implying that large one-off adverse shocks from SFAs might place debt on a new higher plateau for quite a while, until eventually another large one-off positive shock was realized (such as a privatization episode or an asset price boom). Large debt surges could lead to persistent lower economic growth, especially when initial debt levels were already high (Jalles et al., 2022).

This plurality of topics in literature also pointed to the link between SFAs and fiscal transparency. Unlike deficits and debt, SFAs are not subject to fiscal rules and are usually omitted from public debt sustainability assessments. Using a sample of European Union countries, von Hagen and Wolff (2006) showed how governments strategically use SFAs to circumvent fiscal rules, under reporting deficits in the European Economic and Monetary Union. Weber (2012) documented SFAs inducing significant debt increases in 14 EU countries, playing only a minor role in explaining debt decreases, concluding that those

components can only be partly explained by balance sheet effects and realizations of contingent liabilities, with significant differences reflecting country-specific factors. Further, evidences of correlation between budget transparency and SFAs, pointed to low quality of budgetary institutions, creating space for "fiscal gimmickry" (Alt et al., 2014), emphasizing the need to reduce off-budget operations and calling for improvements in fiscal transparency. In this strand, Jaramillo, Granados, & Jalles (2017) hypothesized, especially in the case of advanced economies, that it is grounded that SFAs are not only a residual value but can be intentionally used as a form of creative accounting to circumvent fiscal constraints rules, undermining two core principles of prudent fiscal policy, transparency and sustainability (also noted by Milesi-Ferretti, 2003). Further, Alt et al., (2014), Maltritz and Wüste (2015), Reischmann (2016), showed that SFAs are tactically used in pre-election periods, aimed at showing favorable deficit figures to attract voters. In contrast, for Afonso and Jalles (2020), SFAs can be fully explained by changes in the volume and valuation of financial assets and are neither correlated with transparency of fiscal rules nor used to manipulate budget deficits.

The inclusion or absence of SFAs were found to have methodological effects on overly optimistic fiscal forecasts (pointed by Beetsma et al., 2013), advocating their accounting in debt sustainability forecasting, due to their critical role in projecting risks of public debt accumulation (Acosta-Ormaechea, 2020), akin to the measurement of public debt costs as already proposed by Hall and Sargent (2011), Berndt and Yeltekin (2015) or Ellison and Scott (2020).

Concerning SFAs transmission of effects, ratings and the interest rate channel reflect borrowing conditions requiring compensation, by financial markets, for liquidity and credit risk (Jaramillo, Granados, & Kimani, 2017). Peaks in stock-flow adjustments arise in times of financial market distress (especially in advanced economies), whereas credit risks arises from considerations about public debt sustainability. Afonso and Alves (2019) found that, before the Great Financial Crisis (GFC), an increase in Portuguese SFAs was associated with a decline in interest rates, counteracting an increase in public debt, whereas afterwards both increases in debt and SFAs caused higher interest rates. These findings explained why, for instance, from 2001 to 2006, Portugal reported positive SFAs and a downfall in the 10-year yield, whereas from 2010 to 2012 large SFAs were associated with highest yields rates since 1995. Larger interest rates makes the hedging of debt service more difficult, requiring non attainable growth potential that might throw governments into a trap of spiral liquidity shortages. This phenomena may be associated with austerity

regimes, when a critical positive interest rate-growth rate differential may turn improvements in primary balances into decreasing debt-to-GDP ratios, an effect that disappears with negative interest rate-growth differentials (Afonso and Alves, 2021).

Regarding SFAs effects through external trade accounts channels, Afonso et al. (2023) argued that cyclically adjusted primary budgets are determinants of the current account, a twin deficits hypothesis, justifying our delving into how government financial assets impact on public debt dynamics may also have an effect on external accounts and subsequent economic growth. Along this line of enquiry, for example Perla et al. (2021) found that economic growth benefits from trade, since it increases export opportunities and foreign competition, that induces a more rapid technological adoption, a strand of literature going back for example to Solow (1956) claims of positive impact of foreign direct investment on economic growth, derived from the introduction of new technology in the production process (a model that would subsequently be augmented by Mankiw et al., 1992, to include the accumulation of human as well as physical capital).

In spite of a prolific literature on SFAs in general, and financial assets in particular, remains unanswered the question of the impact of these instruments on enhancing or weakening the capacity of debt towards widening government financial space, in the sense of leveraging growth potential above debt service (*r-g* differential), a gap in the literature to which we intend to contribute.

3. Methodological Strategy

We follow Hamilton and Flavin (1986) proposition of analyzing government budgets balances in present-value terms. The present initial position of the stock of debt carried from the past is compared with the present value of future budget positions discounted to the present, including a terminal stock.

Our approach is also closely related to analytical approaches to public finance influenced by Bohn's (1995, 1998) and Weber (2012) findings of SFAs inducing significant debt increases, while playing only a minor role in explaining debt decreases. We build on a cointegration approach, expanded to account for leverage effects of financial assets in expanding or shrinking the *r-g* differential of borrowing costs to output growth. We investigate the statistically significance of building an intertemporal budget constraint reaching a long-run in-built stationary equilibrium (absence of a unit root), with dynamic short run corrections (Castle and Hendry, 2021), a cointegration approach linking Sargan

(1964) stationary time series with error correction and Engle and Granger (1987) spurious regressions.

3.1. Government intertemporal budget constraint (IBC)

The widely used intertemporal budget constraint approach is characterized by a debt progression equation on the outstanding legacy of nominal stock of debt B_{t-1} at the end of any previous period *t-1*, that will change in the present period *t* by the components: debt service[3], $i_t\, B_{t-1}$; the amount of debt change (amortization or issue) ΔB_t; the nominal primary public budget balance PB_t; and, for our purposes, we include stock-flow adjustments SFA_t, contributing to the management of liquidity and financing government interventions in the economy.

Taking real government debt and real output growth g_t as function of real GDP y_t, adjusted for inflation π_t (GDP deflator) and taking the differential between real interest r_t and real growth rates g_t, government debt will depend on the outstanding legacy of the stock of debt d_{t-1}, the change in the stock of debt in the period Δd_t, the size of the primary balance pb_t (which in turn depends on the distribution of shocks to the economy and subsequent fiscal policy reactions); on stock-flow adjustments sf_t; and on the real interest-growth differential $r_t - g_t$, that may be responsible for exploding debt dynamics under the so-called debt-snowballing, when the average effective interest rate exceeds the rate of economic growth, such that increases in government income will not suffice to cover interest payments on outstanding debt.

The leverage effect at any period *t*, represented as the *r-g* differential, comes as depending on the outstanding legacy of the stock of debt d_{t-1}, the change in the stock of debt in the period Δd_t, the size of the primary balance pb_t and of stock-flow adjustments sf_t, which depend on the distribution of shocks to the economy and subsequent fiscal policy reactions. The expected value of the current outstanding debt ratio at period *t,* $E[d_t]$, will evolve according to the expected net present value of future primary budget balances pb_{t+i}, plus stock flow adjustments sf_{t+i}, adjusted for some terminal value (null according to the transversality condition), assuming the following standard representation in the literature:

[3] In our paper we abstract from market arbitrage mechanisms and don't differentiate interest rates premia on sovereign bonds.

$$E[d_t] = \sum_{i=1}^{\infty} E\left[\frac{1}{\prod_{j=1}^{j}(1+r-g)_{t+j}}(pb_{t+i} + sf_{t+i})\right] \quad (1)$$

3.2. Empirical specification

Econometric specifications were directed by a line of enquiring about the channels through which government financial assets support larger growth prospects, that otherwise would be unattainable. This leverage effect may be represented by indicator *r-g*, the differential between real interest rate and GDP growth, that when negative, in fact represents a positive leverage of growth rates *g* above debt service *r*.

An under explored factor in the literature affecting the *r-g* differential are stock flow adjustments, that have an impact on both sides of the leverage *r-g*. Instead of working with the whole SFAs that, besides financial assets, also reflect for example the reclassification of certain entities inside or outside the public sector, statistical discrepancies, or mere accounting adjustments, we focused on the government financial assets components of SFAs. This approach narrowed our research question to: what is the leverage effect of financial assets in expanding or contracting government financing capacity, aimed at supporting interventions generating larger growth above borrowing costs?

The understanding of leverage effects requires the examination of the transmission channels on both sides of the differential, output growth and interest rates. Regarding variables affecting real output growth, in section 4.1.1. we focus on the empirical results on investment, backed by Woodford (2011), Christiano (2011), Boehm (2020), about the effectiveness of productive public investment stimulus crowding in private investment; and on the current account tradition of Solow (1956), Mankiw et al. (1992), Perla et al. (2021), that increasing trade benefits economic growth, amplifying export opportunities, whereas foreign competition induces technological adoption. Regarding interest rates, are reflected in borrowing risks proxied by changes in sovereign bonds ratings, that capture market conditions, as argued for example in Jaramillo, Granados and Kimani (2017) results of peaks in stock-flow adjustments often associated with financial market distress; and Dahlquist et al. (2013) risk premia considerations about public debt sustainability.

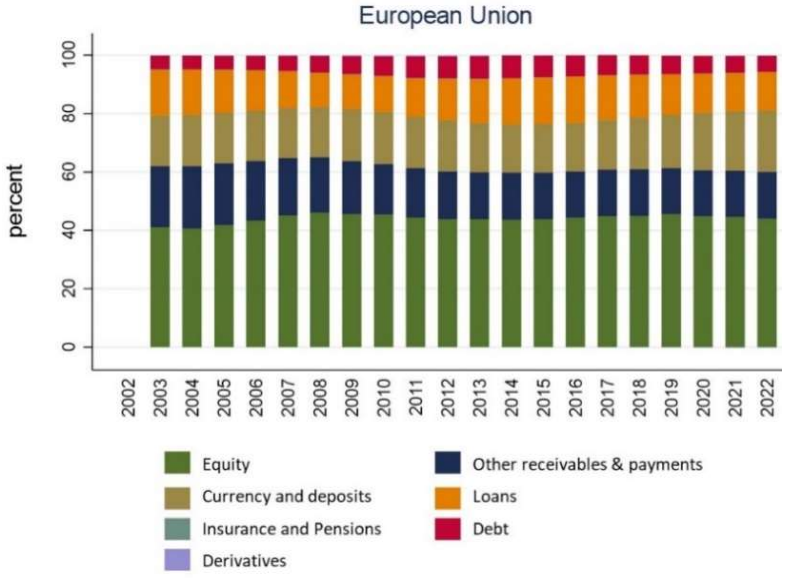
The literature and regulatory standards mostly emphasize the control of primary deficit, begging the question of comparing the effects vis a vis with those of financial assets. Therefore, in the empirical analysis we compare financial assets and primary deficit effects on the *r-g* differential through investment and external trade channel and, bearing in mind that the leverage of financial assets operates through a debt channel, we analyse

the gross and net debt contributions to *r-g* differential. Lastly, we also discuss the contribution to gross debt from financial assets compared to primary deficit.

3.2.1. Variables and data

Government financial assets have differentiated compositions as depicted in Figure 2, comprising the net change of financial assets and its value (purchases less sale impacting cash and deposits); depreciations/appreciations, mostly equity and investment fund shares; in smaller proportion currency and deposits and typical instruments underlying government financial interventions in the economy supply side such as loans and debt[4].

Figure 2 – Financial assets main components in percentage of GDP



Source: Eurostat.

We worked with a sample of financial assets of 27 European Union countries[5], over the period between 2000 and 2022, depending on data availability. We used quarterly data retrieved from Eurostat database, as percentage of GDP and annualized. Besides financial assets (*FA*), primary deficit (*PD*), gross debt (*GD*) and net debt (*ND*), we focused on the channels affecting real output growth, gross capital formation (*GCF*) and external trade

[4] Eurostat classification includes: [F] Financial assets/liabilities; [F1] Monetary gold and special drawing rights (SDRs); [F2] Currency and deposits; [F3] Debt securities; [F31] Short-term debt securities; [F32] Long-term debt securities; [F4] Loans [F41]; Short-term–Loans [F42]; Long-term–Loans; [F5] Equity and investment fund shares [F51]; Equity [F52]; Investment fund shares/units; [F6] Insurance, pensions and standardised guarantees; [F61] Non-life insurance technical reserves [F66]; Provisions for calls under standardised guarantees; [F7] Financial derivatives, employee stock options. [F8] Other receivables/payables.
[5] Austria, Belgium, Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

balance (*CAB*). Interest rates reflect market borrowing risk conditions, proxied by changes in sovereign bonds ratings (*ratings*). Government ratings were downloaded from the site of World Government Bonds[6].

Summary statistics, presented in Table 1, display standard deviations above one, denoting large sample dispersion and heterogeneity, motivating the exploration of variations at individual country data. Primary deficit standard deviations were much lower, since this is the main scrutinised variable within the Stability and Growth Pact fiscal rules and the European Semester Budgetary surveillance. The asymmetry of financial assets and gross debt are positively right skewed, with the tail of the distribution longer on the right side. With the exception of primary deficit and external trade deficits negatively left skew with the tail of the distribution longer on the left side, all other variables were positively right skewed. In turn, all variables displayed high peaked leptokurtic distributions, the higher displayed by capital formation and change in financial assets holdings. Largely skewed and kurtotic statistics warn against considerations of normality assumptions, also illustrated by density and quantiles of the *r-g* differentials distribution in in Figure 3.

Pretesting the strength of correlations between the variables reveal low multicollinearity (linear dependence). *R-g* differentials were more correlated with the change in gross debt (49%), capital formation (-33%) and changes in financial assets (31%), than with primary deficit (-19%). Whereas negative correlations of capital formation and primary deficit denote a favourable leverage effect, on the contrary, gross debt and financial assets point towards a decreasing impact unfavourably contributing to a positive widening of *r-g* differentials. In turn, primary deficit contribution (-62%) to the decline in gross debt was larger and on opposite direction of the increasing impact from financial assets (59%). Combining these contributions with a negative correlation (-18%) between primary deficit and financial assets, raises the hypothesis that part of consolidation efforts from primary deficits may be undermined by financial assets, in line with Jaramillo, Granados, and Jalles (2017) findings about the use of stock flow adjustments to intentionally circumvent debt.

Comparing with the twin deficits hypothesis, primary deficit correlated about less than a quarter (24%) with external trade balance, which was mostly affected by capital formation (48%). Surprisingly, capital formation was negatively impacted by the change in financial assets (-18%), questioning their role in fostering investment and growth,

[6] https://www.worldgovernmentbonds.com/

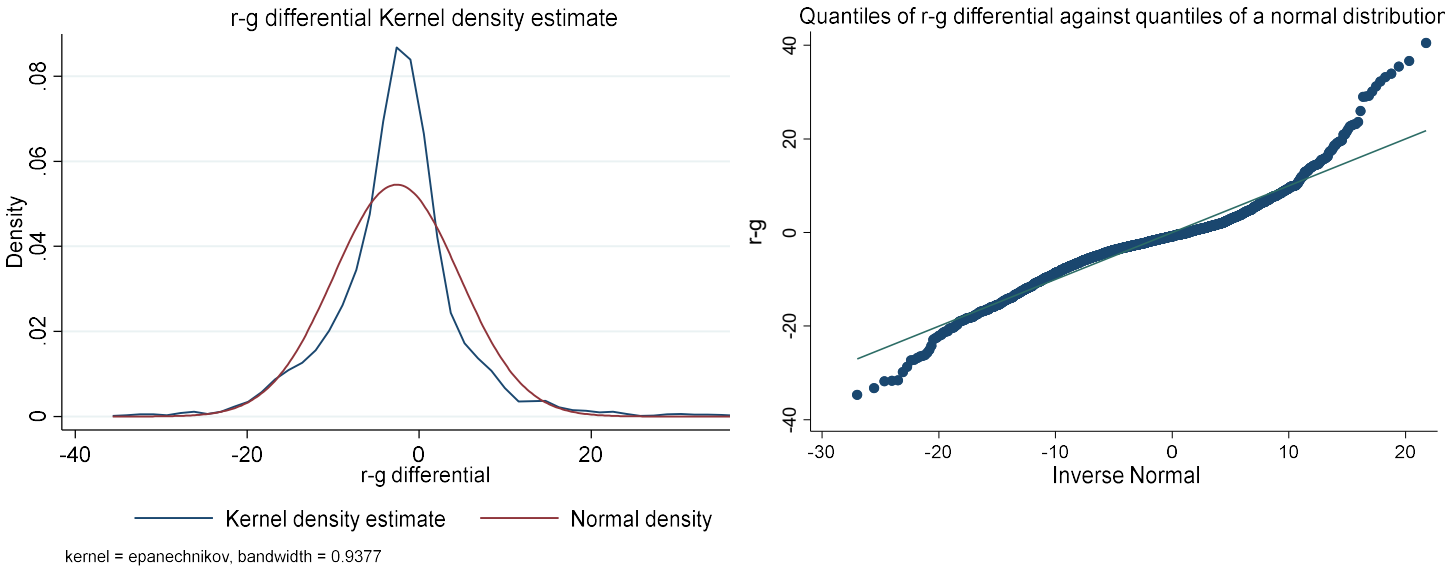
considering the unfavourable impact of financial assets changes on widening increasing *r- g* differentials (31%).

Table 1- Descriptive statistics

	r-g	*ΔGD*	*CAB*	*GCF*	*PD*	*ΔFA*
Observations	2 319	2 260	2 400	2 497	2 376	2 261
Mean	-2.613	0.940	-0.839	23.206	-0.5120	0.236
Standard deviation	7.317	6.103	5.675	4.607	3.262	4.857
Variance	53.542	37.242	32.209	21.228	10.645	23.595
Skewness	0.356	0.910	-0.633	1.555	-1.130	0.827
Kurtosis	6.894	6.524	4.271	12.502	8.546	9.113
Correlations						
r-g	1.000					
ΔGD	0.489	1.000				
CAB	0.104	-0.042	1.000			
GCF	-0.327	-0.224	-0.481	1.000		
PD	-0.185	-0.617	0.244	0.036	1.000	
ΔFA	0.315	0.587	0.118	-0.167	-0.176	1.000

Note: Variables as percentage of GDP. Source: Eurostat.

Figure 3 – Density and quantiles of *r-g* distribution



3.2.2. Econometric specification of the effects on r-g differential

We empirically investigated the leverage effects of changes in financial assets holdings (*ΔFA*) in amplifying or shrinking *r-g*, through a transmission channel focused on both sides of the differential, variables affecting real output growth, gross capital formation (*GCF*), external current account balance (*CAB*); and interest rates proxied by changes is sovereign bonds ratings (*Δratings*). To estimate the effect of these variables on *r-g* differentials, we employed a panel quantile autoregressive distributed lag model (QARDL), as proposed by the autoregressive distributed lag extension of Cho et al. (2015), aimed at providing information about the *r-g* quantile-dependent estimates. As a panel quantile regression approach, it can help avoiding false results due to heteroskedasticity,

skewness, multicollinearity (Dawar et al. 2021) and structural breaks (Selmi et al. 2018). As a caveat, this specification is not applied to more than first differences (Arshad et al. 2022). The equation estimated for period *t* is specified as:

$$\Delta(r-g)_t = \alpha_{0i} + \alpha_1 \Delta ratings_{it} + \alpha_2 \Delta CAB_{it} + \alpha_3 \Delta GCF_{it} + \alpha_4 \Delta(\Delta FA_{it}) + \\ + \beta_0 (r-g)_{i,t-1} + \beta_1 \Delta\, ratings_{i,t-1} + \beta_2 CAB_{i,t-1} + \beta_3 GCF_{i,t-1} + \\ + \beta_4 \Delta FA_{i,t-1} + \varepsilon_t \qquad (2)$$

where α_1 represents short run coefficients and β_i/β_0 (i≠0) long run coefficients. Estimation results are represented in Table 2.

The predominance in the literature attributed to primary deficits bequests a comparison of the effects vis a vis that of financial assets on *r-g* differentials. We focus on the real economy side of growth *g*, through investment (*GCF*) and external trade balance (*CAB*) channels.

To disentangle how much the data sample contains information about short run and hypothetical persistent long-run co-variabilities between the variables, in feedback corrective loops towards an inbuilt long run equilibrium, for each country *i* in period *t*, a re-parametrized ARDL for panel data was implemented with a pooled mean group (PMG) approach (Pesaran et al., 1999), specified as:

$$\Delta(r-g)_{it} = \alpha_{0i} + \theta_i[(r-g)_{it-1} - \beta_i' X_{it}] + \\ + \sum_{j=1}^{p-1} \phi_{ij} \Delta(r-g)_{i,t-j} + \sum_{j=0}^{q-1} \alpha_{ij}' \Delta X_{i,t-j} + \varepsilon_{it} \qquad (3)$$

where X_{it} is the vector of cointegrating variables represented by the change in financial assets holdings (ΔFA) and primary deficit (*PBB*), through investment (*GCF*), external trade balance (*CAB*) and *ratings* channel, impacting *r-g* differentials; θ_i are the panel speed of adjustment coefficients; β's the vector of long run coefficients; $[(r-g)_{it-1} - \beta_i' X_{it}]$ the error correction terms; ϕ_{ij} and α'_{ij} the short run dynamic coefficients, estimated by applying a PMG-Pooled Mean Group Regression. According to diagnostic estimates of the modified Wald test for groupwise heteroskedasticity, Wooldridge test for autocorrelation in panel data and Pesaran test cross sectional independence, fixed effects regressions were applied estimating Driscoll-Kraay (DK) standard errors. PMG estimation results are presented in Table 3.

The leverage effect is related to debt and its capacity to expand the space of growth opportunities, making the effect of financial assets on gross debt an important indicator

about their effectiveness in leveraging growth potential. We analysed financial assets gross and net debt contributions to *r-g* differential and the contribution to gross debt from financial assets compared to primary deficit.

The effect to *r-g* differential going through gross or net debt contributions, mediated by changes in government bonds ratings, applying the panel PMG, was parallel to the previous specification (3), but now X_{it} is the vector of cointegrating variables of changes in government bonds ratings (*ratings*), changes in gross (*Δgross debt*) and net debt (*Δnet debt*), with results presented in Table 4. Optimal lags for each variable, the larger number of occurrences for all countries, that were estimated by individual ARDLs, had to be reduced until the maximum likelihood matrix was positive definite.

Estimates revealed large heterogeneities and asymmetries, calling for the disentangling of effects on a granular approach at individual country level, rather than on aggregate, to analyse the contribution to changes in gross debt (*Δgross debt*) from changes in financial assets (*ΔFA*) compared to that of primary deficit (*PBB*). We applied individual country ARDL(*p, q*), estimating three models: (1) a twin model taking financial assets, primary deficit and gross debt together; (2) assets as a standalone model with gross debt; (3) primary deficit as a standalone model with gross debt. The comparison of the standalone model (SM) and twin model (TM) allowed to evaluate whether financial assets and primary deficit were interrelated when impacting gross debt; or instead were affecting gross debt independently.

The usual approach to individual ARDL estimation was applied, taking unit root tests (at 10% significance) and since the data was a mixture of I(0) and I(1) data, confirming that I(2) series were precluded. Note that unit root tests were applied to individual ARDL but not to panel models. In panel specifications, there was no need to restrict the data dynamic behaviour, since we were estimating fixed-T, large-N asymptotic (Wooldridge, 2010). Since samples were organised in 27 countries, the data panel dimension may statistically be interpreted as 27 blocks that replicate the phenomenon under study, resulting in a number of N cross section observations above the size of time series T (N>T).

To test the presence of structural breaks in the series and specify dummies, the Gregory-Hansen test was applied (that does not support more than 4 variables).

Cointegration bounds tests (Pesaran et al., 2001) were applied. To disentangle how much the data sample contains information about short run and hypothetical persistent long-run co-variabilities between the variables in feedback corrective loops towards inbuilt

long run equilibria, were estimated country specific ARDL-EC (auto regressive distributed lag; equilibrium correction) models.

ARDL (*p, q*) models were estimated with lag orders *p* and *q* for each country *i* and period *t*, specified as:

$$\Delta gross\ debt_{i,t} = \alpha_{0i,t} + \alpha_{1i,t} + \sum_{j=1}^{p} \phi_i X_{i,t-j} + \sum_{j=1}^{q} \beta'_{ij} X_{j,t-i} + \varepsilon_{i,t} \quad (4)$$

where $X_{i,t-j}$ is the matrix of the relevant cointegrating variables, change in financial assets holdings (*ΔFA*) and primary deficit (*PBB*); and t = {max(*p*, *q*),…,T} with T the period length. Reparametrizing the above equation, taking the speed-of-adjustment coefficient $\alpha = 1 - \sum_{j=1}^{p} \phi_{i,j}$ and long-run coefficients $\theta = \frac{\sum_{j=0}^{q} \beta_{i,j}}{\alpha}$, the error correction form for country *i* comes with a *p-1* lags VEC model (one less the VAR order, based on Lütkepohl and Krätzig, 2004):

$$\Delta gross\ debt_{i,t} = \alpha_{0i,t} + \alpha_{1i,t} - \alpha\left(\left[(r-g)_{i,t-1} - \theta X_{i,t-1}\right]\right) + \sum_{i=1}^{p-1} \psi_{i,yi}\, \Delta(r-g)_{i,t-i} + \\ + \omega' \Delta X_{i,t} + + \sum_{i=1}^{q-1} \psi'_{i,xi}\, \Delta X_{i,t-i} + \varepsilon_{i,t} \quad (5)$$

Estimations of error correction terms and short run VARs provided adjustments coefficients and long run cointegration equations, taking as parameters the number of lags. Since estimation inferences are asymptotically invalid in mis-specified models with heteroskedasticity and serial correlation, diagnostic tests were taken, the Breusch–Godfrey LM test for autocorrelation, Durbin–Watson serial correlation, the White test and Breusch–Pagan, Cook–Weisberg test of heteroskedasticity. When estimation assumptions for serial correlation and heteroskedasticity estimates had a significance level above 10%, it implied the correction of standard errors with Newey–West (NW) estimates; and when no serial correlation was present but only heteroskedasticity, we took the heteroskedasticity and autocorrelation-consistent (HAC) standard errors. Impulse responses and variance decompositions were estimated structuring CVARs information sets with target variable change in gross debt and as exogenous shocks the change in financial assets holdings and primary deficit. Results of country estimates are reported in section 4.2.2. and Table 5, organized in clusters, according to statistical commonalities among countries about the impact of financial assets and primary deficit on gross debt.

4. Empirical results

The set of estimations conducted aimed at finding statistical evidences about the impact of financial assets, compared to primary deficit, on gross debt, in leveraging the

economic growth potential, specified by *r-g* differentials, through a transmission channel of gross capital formation, throughout the paper indifferently designated as investment, external trade balances and government bonds ratings.

4.1. r-g Differential through investment and external trade channel

To understand financial assets leverage effects, that is, their impact on debt in amplifying the prospects of larger economic growth, in the following we examine estimation results on both sides of the *r-g* differential equation, the effect on GDP growth and on debt service as proxied by government bonds ratings.

4.1.1. From financial assets through investment, external trade and ratings channel

Quantile panel ARDL simulations gathered evidence about the impact of changing government holdings of financial assets on *r-g* differentials (as a proxy for growth leverage), through a transmission channel of investment (capital formation), current account trade balances and sovereign bonds ratings.

As reported in Table 2, largest short run estimates at the lowest 50% quantile of the *r-g* differential distribution, where growth rate is preponderant, were driven mostly by investment (-0.704; -0.608), followed by ratings (-0.535; -0.429), whereas on the upper 50% quantile, towards larger *r-g* differentials when the gap declines, ratings took the leading impact (-0.903; -1.637). In all quantiles external trade balance was the third variable in importance (-0.399 to -1.069, but declining in the second quantile to -0.289), whereas the lowest impact was conveyed by changes in financial assets (only negative in the first quantile with -0.003; and with a positive coefficient afterwards). Note that whereas ratings, investment and external trade balances coefficients were negative for the whole distribution of *r-g* differentials, denoting a favourable gap widening and emphasizing the preponderance of growth rates over ratings, the change in financial assets was the only variable contributing to increasing ratings over GDP growth rates.

The coefficient associated with the convergence speed was negative and statistically significant, yet denoting rather low adjustments (from -0.130 to -0.283) towards long run equilibria. In the long run, ratings coefficients to *r-g* differentials also estimated largest impacts, but were followed by changes of financial assets, whereas investment and external trade balances impact became lower in importance.

This pattern highlights the preponderant role of ratings and financial markets. Financial assets lowest coefficients in the short rather than on the long run means their impact took time to materialize, while investment and external trade balances had a quicker impact, as shown by the comparatively importance of their short-term coefficients.

Table 2 – Quantile panel ARDL – from financial assets through investment, external trade, and ratings towards *r-g* differentials

		Q1	Q2	Q3	Q4
Short run coefficcients	***Δratings***	-0.535***	-0.429***	-0.903***	-1.637***
	CAB	-0.399***	-0.289***	-0.405***	-1.069***
	GCF	-0.704***	-0.608***	-0.725***	-1.096***
	ΔFA	-0.003***	0.034***	0.057***	0.349***
Convergence	***r g***	-0.154***	-0.130***	-0.145***	-0.283***
Lag coefficients	***Δratings***	-1.300***	-0.899***	-1.830***	-5.286***
	CAB	0.024***	0.001***	-0.042***	0.073***
	GCF	-0.043***	0.011***	0.041***	-0.025***
	ΔFA	-0.087***	-0.047***	-0.042***	-0.471***
Long run coefficients	***Δratings***	8.442***	6.915***	12.621***	18.678***
	CAB	-0.156***	-0.008***	0.290***	-0.258***
	GCF	0.279***	-0.085***	-0.283***	0.088***
	ΔFA	0.565***	0.362***	0.290***	1.664***

Notes: *, **, and *** denote significance at the level of 10%, 5%, 1% respectively.

Effect of financial assets

In the short run, the direct effect of financial assets changes on *r-g* differentials was the lowest of the examined variables (ranging from 0.003 to 0.349 along the quantiles) and displayed a positive sign at the upper 75% quantile, denoting an unfavourable contribution to leverage, that is, towards increasing the *r-g* differential, while penalizing the gap towards a preponderance of increasing ratings. The low magnitude of influence is understandable, since increases in financial assets are associated with cash outflows and additional financing needs, that don´t have an immediate impact on GDP. In contrast, the long run effect of changes in financial assets on *r-g* differentials became the second larger in magnitude (after the ratings impact). The effect had a positive sign, also denoting an unfavourable leverage, increasing the differential of lower economic growth compared to higher debt burden. Note the magnitudes of the coefficients were higher at the tails of the quantiles (0.565; 1.664) and lower in middle quantiles (0.362; 0.290), characteristic of leptokurtic distributions.

Effects of ratings

Both in the short and long run, estimates evidence that ratings effects on *r-g* differentials declined from the 25% to the 50% quantile, suggesting ratings influence was higher on the left tail and upper second quantile of the *r-g* distribution.

In the short run, negative coefficients evidence that ratings effects on *r-g* differentials contributed to the declining of the differential gap in all quantiles, that is, points in the direction of its improvement, meaning a favourable leverage effect towards expanding the space of output growth. In contrast, whereas in the first half quantile the relative contribution of ratings became second larger after investment, the relative contribution of ratings became predominant in the second half quantile, penalizing *r-g* differentials towards increasing ratings.

Long run estimates highlight the magnitude of ratings coefficients also taking the leading role. However, the impact was in the direction of the differential increase, that is, in the direction of its deterioration, reducing the space of output growth over increasing interest burdens.

Capital formation and external trade

In the short run, investment second magnitude in influencing the declining of *r-g* differentials supported investment prominence as a driver of economic growth, along the literature in the tradition for example of Solow (1956), especially the positive impact of foreign direct investment on economic growth, eventually associated with the introduction of new technology in the production process. Estimates evidence that the capital formation transmission channel was more important than external trade, in all quantiles of the *r-g* differential distribution, contributing to the decline of the differential, that is, pointing in the direction of its improvement, meaning a favourable leverage effect, expanding the space of output growth rate over ratings.

However, in the long run, on the contrary, the effect of capital formation on the *r-g* differential was below that of external trade balance in the upper half quantile, becoming the variable least affecting the differential. Estimates point to the direction of improving the differential in middle quantiles (-0.085; -0.283), denoting a favourable leverage towards declining the differential in the direction of its improvement, that is, of growth overrunning interest rate, while contributing to a deteriorating positive effect at the tails, especially in the upper quantile (0.279; 0.088).

External trade coefficients were mostly negative, denoting an impact in the direction of the differential improvement. On the contrary, above quantile 50% and below 75%, the effect was positive, denoting an unfavourable impact in the direction of increasing the differential, suggesting a relatively low effect compared to Perla et al. (2021) findings of economic growth benefitting from trade, increasing export opportunities and foreign competition inducing a more rapid technology adoption. These estimates are coherent with short run lower coefficients and larger in the long term for external trade balances, since increasing trade opportunities take time to materialize.

4.1.2. Comparing financial assets and primary deficit

Regarding the transmission channel from financial assets compared to primary deficit through investment, external trade and ratings towards *r-g* differentials (Table 3), negative and statistically significant error correction terms and long-term coefficients of panel cointegration estimates denote the presence of inbuilt long-run equilibria. The absence of estimates for ratings implied the exclusion of this variable in Estonia, Luxembourg and Netherlands. The optimal number of lags of the full model was 3 0 1 1 1 0. However, for lags 3 and 2 applied to *r-g*, p-values were not estimated for ratings and financial assets changes. We are not interested in auto regress *r-g*, so we reduced the number of lags to 1 0 1 1 1 0. We applied the same principle for the model without ratings, from an optimal lag of 3 1 1 1 0 to 1 1 1 1 0.

Diagnostic tests estimated the presence of heteroskedasticity, autocorrelation and cross-sectional dependence and subsequently were estimated fixed-effects regressions with Driscoll-Kraay (DK) standard errors, reported in Appendix 1. DK long term cointegration estimates were negative for all variables, pointing to favourable *r-g* leverage effects, in the sense of increasing growth rates becoming predominant than changes in ratings. The magnitude of primary deficit contribution estimates (-0.671 in the full model with ratings; -0.684 without ratings) to *r-g* differentials were larger than that of changes in financial assets (-0.153; -0.154). The change in ratings took the second larger contribution (-0.637), followed by investment (-0.629; -0.521) and external balance (-0.385; -0.243).

All countries equilibrium correction terms were negative, implying that long run processes were converging to inbuilt equilibria, running from primary deficit and financial assets through investment, external trade and sovereign bonds ratings towards *r-g* differentials.

Short term estimates were statistically significant and informative for many countries, about government financial assets transmission mechanism towards impacting *r-g* differentials. The magnitude of financial assets contribution to *r-g* differentials were much larger than that of primary deficit in most countries, except for Luxembourg and Netherlands. Comparing statistically significance coefficients for both variables, estimates displayed a strong predominance of effects from financial assets changes towards increasing the differential (ranged from a minimum of 10.191 in Greece to a maximum of 66.996 in France), compared with a lower magnitude of primary deficit contribution to the differential decline (-0.485 in Cyprus to -3.530 in Croatia).

Regarding short run coefficients signs, large positive financial assets coefficients denote an effect towards higher ratings and consequently interest burdens than economic growth rates. France estimates of changes in financial assets coefficient (66.996) reported the largest deterioration of the *r-g* differential towards its increase, steeply rising debt service costs with comparatively lower counterpart from economic growth, followed by changes of financial assets coefficients of Italy (58.915) and Belgium (56.458), whereas the lowest coefficients were observed in Greece (10.191 for effects from changes in financial assets, with primary deficit not statistically significant).

While changes in financial assets coefficients point to raising *r-g* differentials, we must bear in mind that they also have an intermediary impact through the transmission channel variables, in our simulations, investment and external trade balance, which in turn have an impact on *r-g* differentials. This means that since investment and external trade balances had an impact on *r-g* differentials, indirectly financial assets changes might also have an indirect share in that effect. Indeed, for those countries with statistically significant investment and external trade balance, the majority of estimates reported negative coefficients for these variables, favourably impacting *r-g* differentials, contributing to its decline. Exceptions, with positive coefficients of external accounts balance, were Latvia (1.384) and Romania (2.813).

Those countries with largest effects of investment on *r-g* differentials were Italy (-5.459), Spain (-4.426), France (-3.877), Denmark (-3.310), Sweden (-2.961), Lithuania (-2.705), Austria (-2.583). Negative coefficients denote a contribution to the predominance of GDP growth over ratings. The countries with the strongest external trade balance impact on *r-g* differentials, reporting estimates contributing to strengthening growth over debt service, towards decreasing *r-g* differentials, were Italy (- 3.268), France (-2.853), Denmark (-2. 394), Romania (2.813), Germany (-2.108).

Table 3 – Comparing financial assets and primary deficit effects on *r-g* differential

	ECT	*Δratings*	*CAB*	*GCF*	*PBB*	*ΔFA*
Long term		-1157.4***	-0.420***	-0.645***	0.442***	-75.470***
Short term						
Austria	-0.691***	801.655***	-1.264**	-2.583***	-1.572***	52.356***
Belgium	-0.744***	859.222***	-0.224	-1.161**	-1.880***	56.458***
Bulgaria	-0.274***	318.914***	0.252	-1.810***	-0.616**	20.660***
Croatia	-0.294***	339.324***	0.049	-1.106	-3.530***	22.093***
Cyprus	-0.231***	265.987***	-0.004	-0.299	-0.485**	17.462***
Czechia	-0.261***	304.836***	-1.236**	-0.346	-2.345***	19.167***
Finland	-0.656***	760.934***	-0.548*	-0.960**	-2.906***	49.459***
France	-0.888***	1030.30***	-2.853***	-3.877***	-2.880***	66.996***
Greece	-0.136***	156.366***	0.187	-1.369**	-0.035	10.191**
Hungary	-0.352***	402.078***	-0.757	-0.879	-1.416*	26.484***
Ireland	-0.365***	419.287***	-0.813	-0.806	-0.397	27.862***
Italy	-0.780***	901.691***	-3.268***	-5.459***	-2.291***	58.915***
Latvia	-0.264***	304.75***	1.384***	-0.861	-0.280	20.213***
Lithuania	-0.258***	300.073***	0.132	-2.705***	-0.578	19.293***
Malta	-0.293***	338.977***	-1.211***	-1.020**	-1.730***	22.008***
Poland	-0.229***	266.022***	-1.348	-2.001*	-2.627***	16.152***
Portugal	-0.504***	581.245***	0.840	-1.942*	-0.240	38.317***
Romania	-0.317***	369.174***	2.813***	-0.567	-0.930	24.179***
Slovakia	-0.289***	332.323***	-1.175***	-1.628***	-0.696	21.928***
Slovenia	-0.411***	474.296***	0.738	-1.530**	-0.600***	31.072***
Spain	-0.525***	605.784***	-1.927	-4.426***	-1.956***	39.862***
Sweden	-0.326***	378.403***	-0.953	-2.961***	-1.802**	24.258***
Long-term			-0.416 ***	-0.628***	0.443***	0.981***
Short term						
Denmark	-0.695***		-2.394***	-3.310***	-0.610	-0.613***
Estonia	-0.722***		1.441	1.291	-0.763	0.039
Germany	-0.553***		-2.108***	-1.832**	-0.917**	-0.344**
Luxembourg	-0.299***		0.168	-0.689	-1.427***	-0.355***
Netherlands	-0.381***		0.195	-0.004	-1.715***	-0.185*

Notes: *, **, and *** denote significance at the level of 10%, 5%, 1% respectively.

4.2. The debt channel

Since leverage effects are related to debt potential in expanding the space of growth opportunities, impacting interest burden and GDP growth rate, we applied a panel specification to estimate the role of financial assets, breaking down gross and net debt effects on *r-g* differentials (4.2.1). To uncover the effect of changes in financial assets on gross debt compared to that of primary deficit, accounting for large heterogeneities among countries, we applied a more granular estimates with ARDLs country basis (4.2.2).

4.2.1 Gross and net debt contribution to r-g differential

We applied a homogeneous panel PMG cointegration specification to estimate gross and net debt contribution to *r-g* differentials through government bonds ratings. Only panel aggregate gross debt estimates was statistically significant. At country level, although

equilibrium correction terms were below 10% p-value estimates (Table 4 and in Appendix 1), all equilibrium correction terms were positive, implying that long run processes were not converging to an inbuilt long run equilibria, rather, they were explosive in the direction of widening the gap between interest burden above output growth. Consequently, estimates pointed to the absence of a long term cointegration running from debt through sovereign bonds ratings towards *r-g* differentials, questioning a long run cointegration from either gross or net debt.

In turn, in the short term, ratings reported highest coefficients impacting *r-g* differentials, well above those of gross and net debt. For many countries, the effect of ratings was towards decreasing (improving) *r-g* differentials (Belgium, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden). The exceptions were Denmark, Germany and Netherlands due to the stability of ratings; and Austria, France, Cyprus, Greece increasing effects on r-g differentials.

In all countries, the magnitude of gross debt coefficients (that account for changes in financial assets) was larger than those of net debt, the highest in Romania (0.908), Latvia (0.609), Croatia (0.552), Malta (0.531), Lithuania (0.527). Regarding net debt, with exception of Cyprus and Netherlands, where coefficients were not statistically significant, all other countries reported negative coefficients, denoting an impact on decreasing *r-g* differentials, meaning debt burdens tended to be below GDP growth rates.

These estimates enlighten the predominance of financial markets conditions in determining *r-g* differentials. Further, in the short run, they validate taking gross debt, that accounts for changes in financial assets holdings, rather than net debt, as significant indicators of leveraging growth potential, in the sense of targeting the widening of the differential towards interest rates lower than GDP growth rates.

Table 4 – PMG estimates of gross and net debt on *r-g* differentials

	Long run		
	Δratings	***ΔGD***	***ΔND***
Aggregate	-334.085	1.012***	-0.168

	Error correction	Short run				Error correction	Short run			
		r-g	***Δratings***	***ΔGD***	***ΔND***		***r-g***	***Δratings***	***ΔGD***	***ΔND***
Austria	0.150***		-50.375***		-0.025***	Italy	0.189***		-63.212***		-0.032***
d1				0.194***		*d1*				0.364***	
d2		1.548***				*d2*		1.526***			
d3		-0.908***				*d3*		-0.889***			
d4		0.193***				*d4*		0.203***			
Belgium	0.126***		-41.777***		-0.021***	Latvia	0.140***		-48.775***		-0.024***
d1				0.388***		*d1*				0.609***	
d2		1.488***				*d2*		1.683***			
d3		-0.957***				*d3*		-1.130***			
d4		0.234***				*d4*		0.282***			
Bulgaria	0.150***		-50.795***		-0.025***	Lithuania	0.240***		-80.769***		-0.040***
d1				0.162**		*d1*				0.527***	
d2		1.725***				*d2*		1.887***			
d3		-1.092***				*d3*		-1.308***			
d4		0.260***				*d4*		0.344***			
Croatia	0.288***		-95.773***		-0.048***	Malta	0.176***		-57.632***		-0.030***
d1				0.552***		*d1*				0.531***	
d2		1.570***				*d2*		1.633***			
d3		-1.004***				*d3*		-1.108***			
d4		0.244***				*d4*		0.288***			
Cyprus	-0.011		2.991		0.002	Netherl.	0.027		.000***		-0.005
d1				0.173***		*d1*				0.175***	
d2	1.370***					*d2*		1.419***			
d3	-0.857***					*d3*		-0.871***			
d4	0.204***					*d4*		0.205***			
Czechia	0.190***		-61.609***		-0.032***	Poland	0.291***		-97.206***		-0.049***
d1				0.488***		*d1*				0.377***	
d2		1.718***				*d2*		1.857***			
d3		-1.186***				*d3*		-1.203***			
d4		0.319***				*d4*		0.306***			
Denmark	0.052**		0.000		-0.009**	Portugal	0.106***		-36.091***		-0.018***
d1				0.248***		*d1*				0.298***	
d2		1.455***				*d2*		1.505***			
d3		-0.943***				*d3*		-0.873***			
d4		0.236***				*d4*		0.190***			
Finland	0.150***		-49.946***		-0.025***	Romania	0.134***		-45.968***		-0.023***
d1				0.156***		*d1*				0.908***	
d2		1.262***				*d2*		1.705***			
d3		-0.586***				*d3*		-1.090***			
d4		0.095**				*d4*		0.243***			
France	0.088***		-29.587***		-0.015***	Slovakia	0.094**		-31.864**		-0.016**
d1				0.435***		*d1*				0.337***	
d2		1.409***				*d2*		1.459***			
d3		-0.898***				*d3*		-0.896***			
d4		0.222***				*d4*		0.215***			
Germany	0.103***		0.000***		-0.017***	Slovenia	0.111***		-37.570***		-0.019***
d1				0.284***		*d1*				0.281***	
d2		1.462***				*d2*		1.499***			
d3		-0.867***				*d3*		-0.930***			
d4		0.199***				*d4*		0.217***			
Greece	0.074***		-25.539***		-0.012***	Spain	0.179***		-59.835***		-0.030***
d1				\		*d1*				0.408***	
d2		1.569***				*d2*		1.567***			
d3		-1.033***				*d3*		-0.947***			
d4		0.257***				*d4*		0.219***			
Hungary	0.175***		-58.727***		-0.030***	Sweden	0.208***		-68.929***		-0.035***
d1				0.451***		*d1*				0.410***	
d2		1.649***				*d2*		1.784***			
d3		-1.006***				*d3*		-1.189***			
d4		0.222***				*d4*		0.297***			
Ireland	0.213***		-70.820***		-0.036***						
d1				0.456***							
d2		1.718***									
d3		-1.186***									
d4		0.319***									

Notes: *, **, and *** denote significance at the level of 10%, 5%, 1% respectively.

4.2.2. Contribution to gross debt from financial assets compared to primary deficit

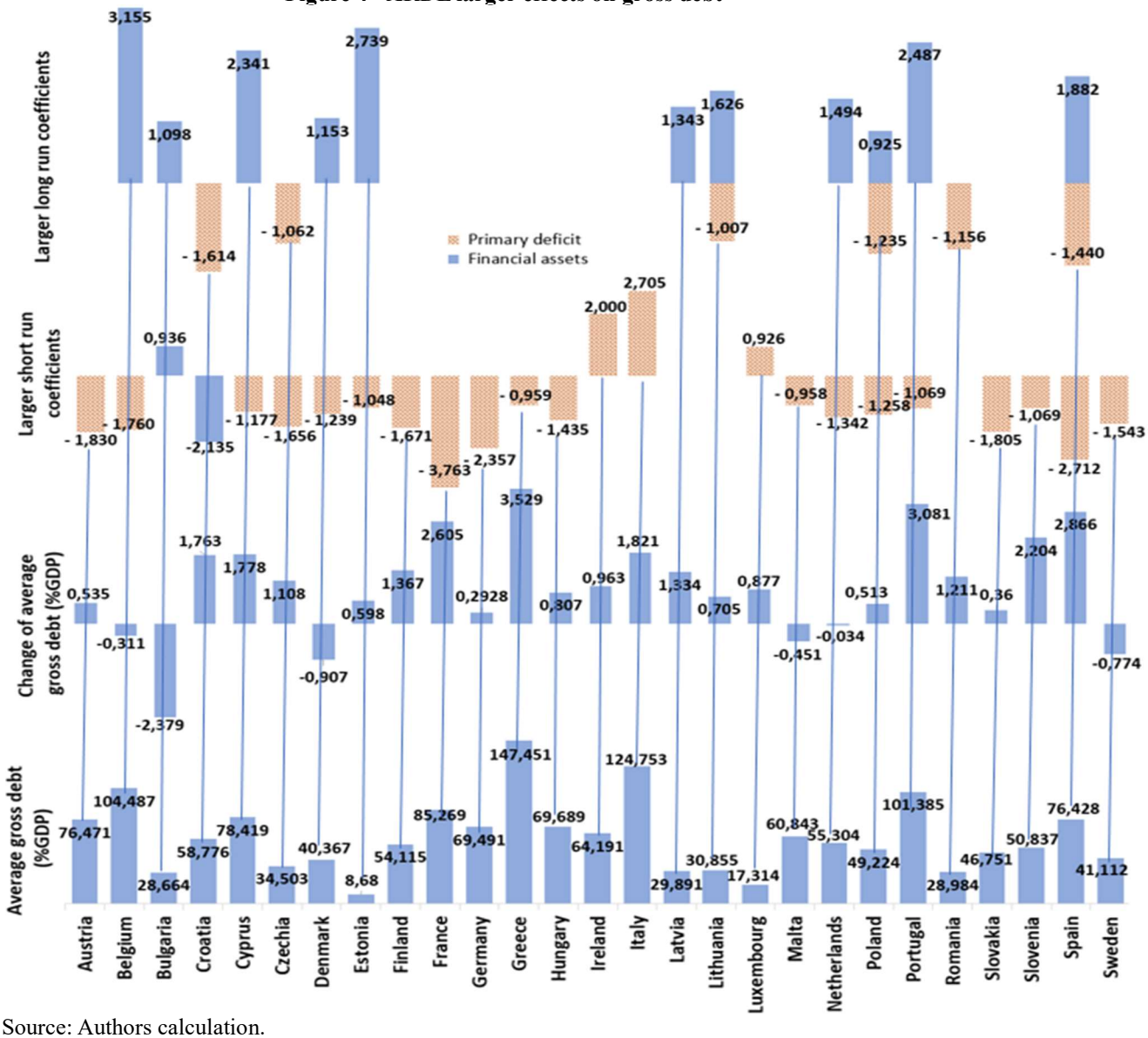
The binomial gross debt and deficit is at the heart of fiscal policy, with regulatory standards usually taking gross debt limits on the total amount governments treasuries are legally authorized to borrow.

In the previous section, estimates pointed to gross debt, that encapsulates financial assets, as a better indicator of *r-g* differentials than net debt. As illustrated in Figure 4, during the period of analysis, the average gross debt as percentage of GDP was larger in Greece (147%), also reporting the largest average increase (3,53%), followed by Italy (125%) and Portugal (101%). Highest efforts towards gross debt reduction came from Bulgaria (-2.38%), Denmark (-0.9%), Sweden (-0,77%), Malta (-0.45%), Belgium (-0.31%), Netherlands (-0.03%), while on the country other countries enlarged gross debt, the largest increases, besides Greece (3,53%), came from Portugal (3.08%), Spain (2.86%), France (2,60%), Slovenia (2.20%), Italy (1.82%).

Since debt controls emphasize primary deficit reductions, bequest the question of its effectiveness when compared with effects of changes in financial assets holdings. Estimates were widely differentiated among countries, justifying a granular approach at individual level. As illustrated in Figure 4, Table 5 and Appendix, ARDL statistically significant short run estimates displayed largest magnitudes preponderantly coming from changes in financial assets only in Croatia and Bulgaria, whereas in all other countries the largest effects were driven by primary deficits towards declining changes in gross debt, especially in France and Germany. On the contrary, coefficient estimates of Ireland, Italy, Luxembourg, pointed to effects towards increasing changes in gross debt.

In the long run, larger magnitudes of effects driven by financial assets contributed to escalating gross debt in Belgium, Bulgaria, Cyprus, Germany, Ireland, Latvia, Netherlands, Portugal, Spain. Larger magnitudes coming from primary debt contributing to decreasing gross debt growth were estimated for Croatia, Czechia, Romania. Large long run estimates driven both by financial assets and primary deficit were reported in Lithuania and Spain. On the contrary, in Poland, the predominance came from primary deficit towards declining gross debt growth, whereas the impact of changes in financial assets holdings was of lower magnitude, in the direction of amplifying gross debt growth.

Figure 4 - ARDL larger effects on gross debt



Source: Authors calculation.
Note: averages computed for the period of analysis.

Aimed at building an aggregation rationale, individual countries ARDL results (Table 5 and Appendix) were classified in clusters, according to the strength of the statistical significance of estimates and the magnitude of effects on gross debt growth.

Cluster C1 – Largest coefficients from financial assets in the short and long run

The predominance of changes in financial assets contributing to gross debt, both in the short and long run, were estimated for Bulgaria and Latvia. Bulgaria adjustment term in the twin model was one of the highest of the sample, estimating that deviations from the in-built long term equilibrium were corrected at 75% adjustment speed. Long run effects from financial assets contributing to the building up of gross debt were larger than primary deficit containment and the sign of short run coefficients alternated. Overall, on average,

gross debt decline was the largest of the sample (-2.379% of GDP) and gross debt level remained low at 28.644% GDP. Latvia largest coefficient was also driven by contributions from changes in financial assets (in the long run 1.343 as a standalone and 0.944 in the twin model), justifying a gross debt increase of 1.334 on average.

Cluster C2 – Alternance of predominance of assets and primary deficit in the short and long run

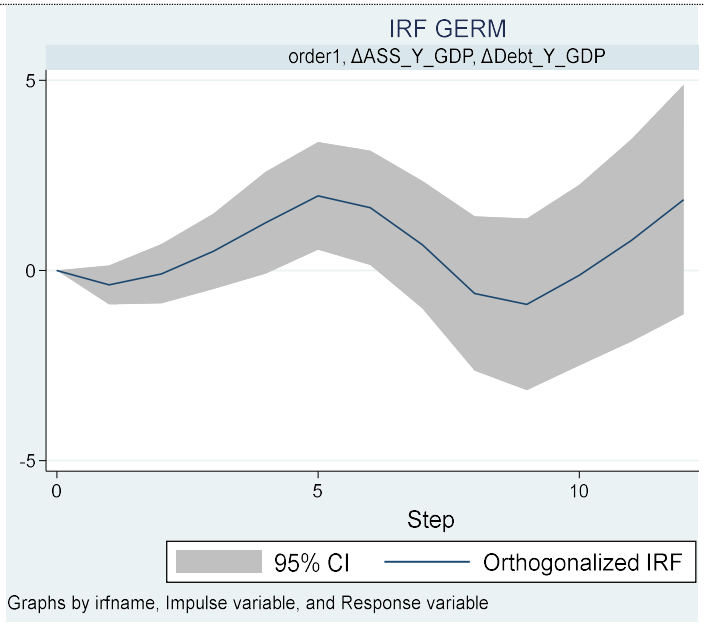
Belgium largest long term contributions from changes in financial assets to gross debt amplification (3.155 in the standalone model) was the largest of the sample. In the short run, primary deficit coefficients were larger than that of financial assets (the larger at lags -1.047 in the standalone model). Overall, the average gross debt managed to be reduced on average -0,311% of GDP.

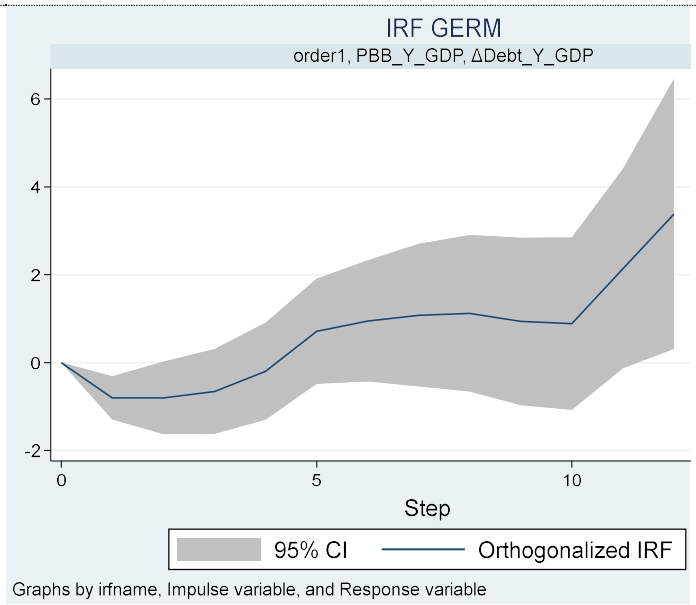
Ireland long run coefficients displayed largest magnitudes for financial assets, however, the adjustment term (-3.582) denotes a high oscillatory dynamics. In the short run, primary deficit took the lead, with the largest coefficient (2.000 in the standalone model) contributing to gross debt increase. In the period of analysis, on average gross debt increased 0,963% GDP, and registered a level of 64% GDP on average.

Germany largest magnitude came from primary deficit reductions of gross debt growth, while in the long run financial assets assumed preponderance (but with bounds test nor statistically significant and a low adjustment term of -0.178), contributing to a slightly average gross debt increase (0,292% GDP) while government average gross debt reported 69% GDP. The preponderance of financial assets is illustrated by higher impulse responses (Figure 5), estimating a shock in increasing financial assets of one standard deviation having an effect on gross debt growth up to about 3.383% (at lag 12), whereas variance decompositions explained above 30% of gross debt growth variance. In contrast, primary deficits estimates stayed below, respectively IRS of 1.86% and VD up to 29.8%, both at lag 12.

Figure 5 - Impulse responses (IRF) of gross debt from financial assets and primary balance (Germany)

ΔFA **PB**





Source: Authors calculation.

In Austria, whereas in the short run the largest coefficient was estimated for primary deficit debt consolidation, in the long run the predominant coefficient came from financial assets contributing to gross debt growth (0.928 as a standalone, although with a non-statistically significant bounds test). Long run debt containment from primary deficit consolidation was somewhat lower, resulting in a slight amplification of average gross debt (0.535% GDP) during the period of analysis.

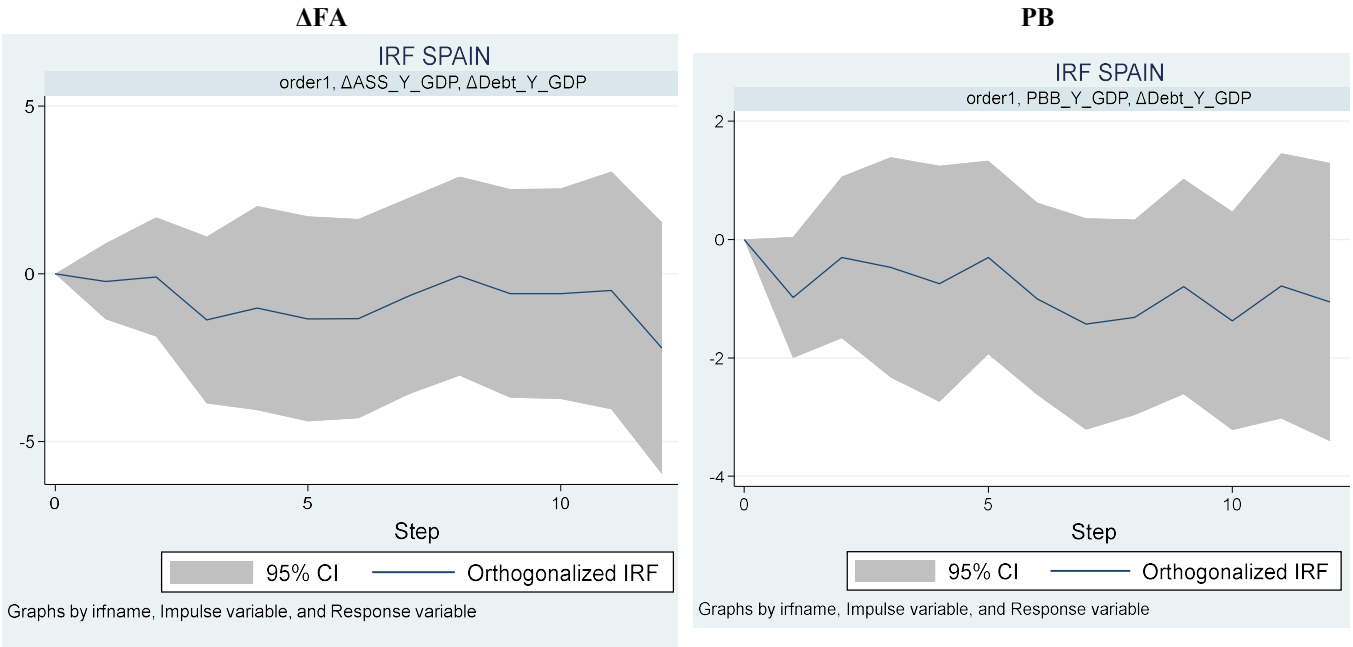
Cyprus long term larger magnitudes of financial assets (2.341 in the standalone model) was reduced when estimating the twin model (0.656 for financial assets; and -1.631 for primary deficit assuming the leading impact). The adjustment speed was estimated at 50% of deviations from the in-built equilibrium corrected each period. In the short run, primary deficit coefficients were larger than those of financial assets (the larger -1.296 at lag 7). Primary deficit consolidation was surpassed by financial assets in amplifying gross debt growth, resulting in increasing gross debt of about 1.778% GDP with an average gross debt of 78% GDP during the period.

Netherlands average gross debt of 55% GDP reported a decrease in the period (-0.034% GDP). In the short run, larger effects were driven by primary deficit over financial assets change with the effects of both variables alternating between increasing and decreasing gross debt dynamics. In the long run, the adjustment coefficient was at most -24%, with the largest coefficient driven by changes in financial assets towards gross debt

growth, whereas in the period of analysis average gross debt slightly increased (0.034% GDP on average).

Spain long term financial assets effects on gross debt growth in the standalone model were larger (1.882, yet with a slow adjustment term of -10.8%). This magnitude declined in the twin model to concede predominance to primary deficit (-1.141) in reducing gross debt growth (also with a low adjustment term of -14.5%). Lower coefficients of the twin model reduce the validity of the hypothesis that financial assets and primary deficit were strategically managed together. Large magnitudes of financial assets effects are illustrated (Figure 6) by estimates of an impulse of one standard deviation shock from financial assets increases impacting gross debt growth up to about 2%, with alternate effects, that included decreasing gross debt growth from lag 1 to 4 and increasing from lag 8 to 10, while impulses in primary deficit displayed lower impacts. Variance decompositions of financial assets explaining up to 37% (at lag 11) of the variance of gross debt growth, were also larger than those of primary deficit up to 7% variance explained by primary deficit.

Figure 6 - Impulse responses (IRF) of gross debt from financial assets and primary balance (Spain)



Source: Authors calculation.

Hungary drivers of gross debt growth were differentiated in the short and long run. All financial assets estimates were statistically significant. In contrast, primary deficit was statistically significant in the standalone model only in the short term, while in the twin model only in the long run. In the short run, the preponderance was driven by primary

deficit (-1.435 at levels and 1.137 at lag 1); and in the long run predominated financial assets (up to 0.649), amplifying gross debt growth larger than primary deficit efforts (-0.485) in reducing gross debt growth. The speed of correction was one of the highest in the sample, estimating that deviations from in-built equilibrium were corrected at 78.6% each period. During the period of analysis, on average, gross debt increased 0.807% GDP and was about 69.689% GDP.

Lithuania low gross debt (on average 30.855% GDP) increased slightly, about 0.705% GDP, mainly driven by financial assets, that reported the largest long term coefficient, while primary debt contributed less to the containment of gross debt growth. Estonia average gross debt during the period of analysis was the lowest of the sample, below 9% of GDP. In the short run, primary deficit effects were larger than that of financial assets. In the long term, primary debt coefficients were not statistically significant, while changes of financial assets holdings contributed to gross debt growth (0,598% of GDP).

Cluster C3 – Predominance of primary deficit

The larger group of countries reported estimates with larger magnitude of effects on gross debt growth coming predominantly from primary deficit.

C3.1 Financial assets statistically significant in the short and long run

Although the effects on gross debt came predominantly from primary deficit, in a group of countries financial assets also played a role, with statistically significant estimates both in the short and long run.

Denmark adjustment term in the twin model (including financial assets and primary deficit), was one of the largest of the sample, estimating a correction speed of deviations from the in-built long run equilibrium at 75% each period. In the long run, the primary deficit effect towards reducing gross debt growth was predominant, resulting in an average decline of gross debt growth (-0,907), whereas reporting an average gross debt of only 40% during the period of analysis.

Luxembourg reported one of the lowest gross debt (on average 17% GDP), with a slight increase over the period (on average 0.877% GDP). Larger coefficients were estimated for primary deficit, both on the short run and on the long run, pulling towards reducing gross debt growth, with one of the largest adjustment coefficients of the sample, correcting about 78% of deviations from the inbuilt equilibria each period.

Portugal short and long term estimates pointed to a preponderance of primary deficit contributions towards declining gross debt growth, however the adjustment coefficient was moderate (-28,7%). In the short term, the primary deficit had some effects on increasing gross debt growth, but at some lags effects from financial assets were slightly preponderant towards intensifying gross debt growth (at levels, financial assets effect 0.678; primary deficit -0.615). These combined effects concurred to increase gross debt growth (on average 3.08% GDP, the second largest of the sample, and an average gross debt of 101% GDP).

Poland primary deficit estimates were preponderant towards gross debt growth containment, both in the short run and long run. The adjustment coefficient of the twin model was lower (-6,6%), compared to those of the standalone models (20.4%; 69.3%), reducing the validity of the hypothesis that financial assets and primary deficit were strategically managed together. In the long run, financial assets estimates towards accelerating gross debt growth were lower than that of primary deficit, whereas in the short run were towards intensifying gross debt growth at first lag with a larger magnitude than the deacceleration in the second lag, leading to a 0,513% GDP increase of average gross debt and an average gross debt of 49% GDP.

Sweden preponderance of primary deficit contributions to gross debt containment in the short and long run surpassed some effects towards increasing gross debt growth. Note the -49,7% speed of adjustment towards equilibrium in the standalone model, larger than the -29.4% twin model, reducing the validity of the hypothesis of financial assets and primary deficit strategically managed together. Effects towards declining gross debt during the period were on average -0774% GDP, with a moderate average gross debt of 41% GDP.

Greece registered the highest average gross debt (147% GDP) of the sample, as well as average increase (1.778% GDP), in spite of primary deficit effects towards reducing gross debt growth. This dynamic is illustrated by the only statistically significant long term coefficients coming from financial assets effects on amplifying gross debt growth.

Slovenia increase in gross debt was on average 2.204% GDP with gross debt 50.8% GDP. Although long term effects were predominantly driven by primary deficit reducing gross debt growth, they were adjusted only at a speed below 30%, making short term effects of financial assets and primary deficit increases of gross debt growth more prominent.

Slovakia average gross debt of 47% GDP reported a slight average increase of 0.3% GDP, that do not reflect the predominant influence of primary deficit effect on declining gross debt, instead reflecting the influence of financial assets in pushing gross debt growth.

Other countries also reported financial assets effects statistically significant both in the short and long run, yet lower than primary deficit contributions, including Czechia average gross debt of 34% GDP that increased on average 1.108% GDP. Romania low gross debt, on average about 29% GDP (and an average increase of 1.211% GDP), reflected the predominance of primary deficit containment. Malta, which primary deficit containment reflected an average decrease in gross debt of -0,451% GDP and an average gross debt of 61% GDP.

C3.2 Financial assets statistically significant in the short run and statistically insignificant in the long run

In a group of countries, changes in financial assets were nor statistically significant in the long run, instead, their influence on gross debt was only in the short run.

Croatia long run primary deficit effects on gross debt growth estimated a moderate convergence speed to equilibrium, denoting a rather slow adjustment towards a long run equilibrium declining gross debt growth. Slow long term convergence made short term effects more relevant, mostly driven by larger magnitudes of primary deficit, that alternated between increasing and reducing gross debt, the former effects increasing gross debt about 1.763% GDP, whereas on average gross debt was 58.776% GDP.

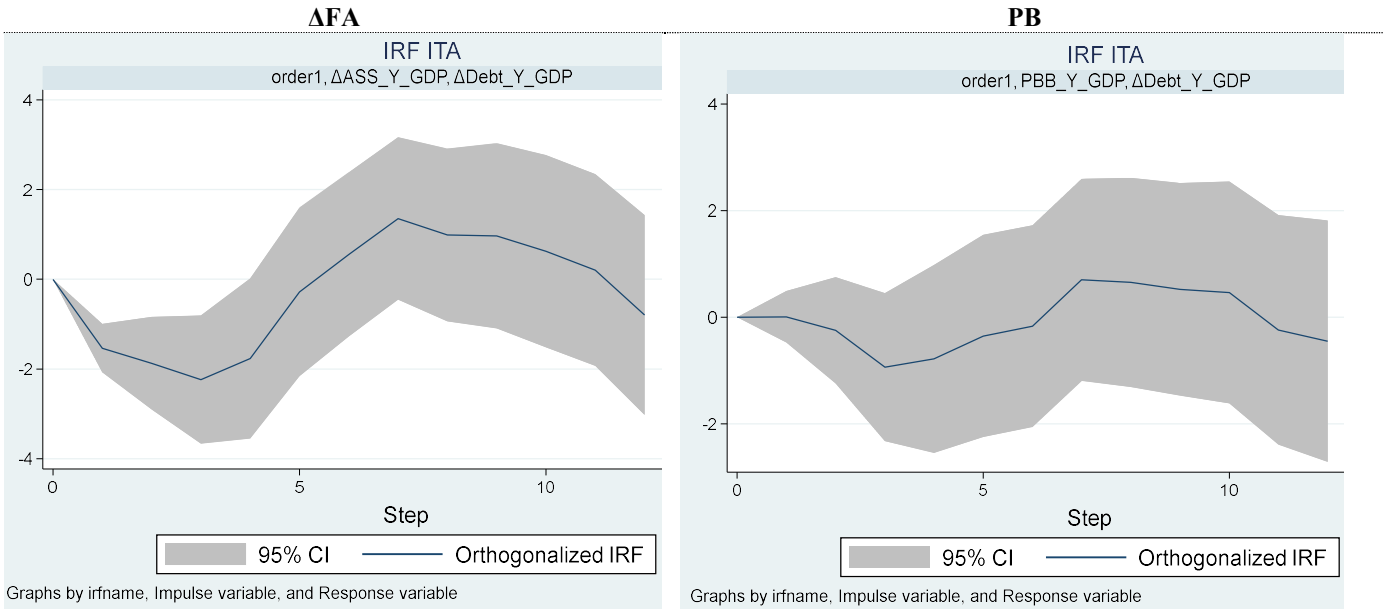
France gross debt containment driven by primary deficit was the only statistically significant coefficient in the long run, with 47.9% speed of adjustment towards the long run inbuilt equilibrium. Also in the short run primary deficit was preponderant over financial assets effects, with opposite effects on gross debt estimating. Overall, during the period, gross debt growth was predominant, on average 2.605% GDP, while average gross debt was about 85% GDP.

Finland primary deficit effects surpassed those from changes in financial assets holdings, both in the short and long run. Cointegration of primary deficit, financial assets and gross debt was not statistically significant and neither short run coefficients of financial assets in the twin model. Primary deficit predominant coefficients of the standalone model estimated a decrease in gross debt growth, with larger magnitude of -1.671 in the short run and -0.456 in the long run (with a 41% adjustment speed), whereas in the period of analysis gross debt increased on average 1.367% GDP and reached 54% GDP on average.

Italy gross debt was the second largest of the sample (average 124,7% GDP). Long run equilibria was not statistically significant, thus only short run VARs were relevant. Standalone models estimates were larger than in the twin model, suggesting a less

important strategic management of financial assets and primary deficit together. In the standalone model, short run effects of primary deficit were towards containing gross debt growth at lags (-2.520), but amplifying at lag 1 (2.705), that might explain Italian gross debt second largest of the sample (average 124,7% GDP and increase of 1.821% GDP). The alternance of effects is illustrated by impulse response dynamics (Figure 7). In the twin model, the predominance of financial assets effects is illustrated by estimates increasing gross debt growth up to 1.355% (at lag 7) after an impulse of one standard deviation shock in financial assets, larger than the highest coefficient of primary deficit (-0.938% at lag 3). Variance decompositions of financial assets were also larger, explaining above 40% of gross debt growth variance, larger than the primary deficit of 7% at most (above lag 11).

Figure 7 - Impulse responses (IRF) of gross debt from financial assets and primary balance (Italy)



Source: Authors calculation.

Table 5 – ARDL largest coefficient estimates of changes in financial assets holdings and primary deficit on gross debt

	Short run					Long run							
	ΔFA		*PD*			*Bounds test*		*Adjacent term*		*ΔFA*		*PD*	
Cluster C1 – Largest coefficients from financial assets in the short and long run													
Bulgaria	SM												
	t	*0.936*	***			3.213		-0.186	***	1.098	***		
Latvia	SM	*t*	-0.822	**		5.422	*	-0.223	***	1.343	***		
Cluster C2 – Alternance of predominance of assets and primary deficit in the short and long run													
Austria	SM	*t*	-1.830	***		2.931		-0.118	***	0.928	***		
Belgium	TM					3.270	*	-.171	***			-1.047	***
	SM		-1.760	***									
Cyprus	TM	*t-7*	-1.296	*									
	SM					8.010	***	-0.126	***	2.341	***		
Estonia	TM					2.281		-0.201	***	0.578	**	0.002	
	SM	*t*	-1.048	***									
Germany	SM	*t*	-2.357	**		2.822		-0.130	**	1.324	***		
Hungary	TM					7.842	***	-0.786	***	0.649	***		
	SM	*t*	-1.435	***		10.346	***	-0.580	***	0.646	***		
Ireland	TM					11.782	***	-3.582	***	1.710	***	-0.998	***
	SM	*t-1*	2.000	***		5.471	*	-0.141	***	2.739	**		
Lithuania	TM	*t*	-0.978	***									
	SM					3.546		-0.116	**	1.626	**		
Netherlands	TM					3.931	**	-0.241	**	1.494	***	-1.193	***
	SM	*t*	-1.342	***		2.676		-0.240	*			-1.275	*
Spain	SM	*t*	-2.712	***		1.689		-0.108	**	1.882	**		
Cluster C3 – Predominance of primary deficit													
C3.1 Financial assets statistically significant in the short and long run													
Czechia	TM					7.091***		-0.371***		0.254***		-1.062***	
	SM	*t*	-1.656***			14.423***		-0.487***				-0.950***	
Denmark	TM					8.136***		-0.753***		0.798***		-1.225***	
	SM	*t*	-1.239**										
Greece	TM	*t*	-0.959*			2.893		-0.335***		0.793**		-0.323	
Luxembourg	TM					8.923***		-0.785***		0.402***		-0.571***	
	SM	*t-2*	0.926**										
Malta	TM	*t*	-0.958***			2.890		-0.415***		0.754***		-0.870***	
Poland	TM	*t-1*	.258***			4.018*		-.066**		0.925***		-1.612***	
Portugal	SM	*t*	-1.069***			6.156***		-0.293***				-0.973**	
Romania	TM	*t*	-0.733***										
	SM					6.152**		-0.237***				-1.156***	
Slovakia	SM	*t*	-1.805**			5.022*		-0.275***				-1.149**	
Slovenia	TM					4.056**		-0.287***		0.543***		-0.935***	
	SM	*t*	-1.069***			6.156**		-0.293***				-0.973**	
Sweden	TM	*t*	-1.543***										
	SM					11.425***		-0.497***				-1.184***	
C3.2 Financial assets statistically significant in the short run and not statistically significant in the long run													
Croatia	TM					4.217*		-0.286***		0.053		-1.614***	
	SM	*t*	-2.135***										
Finland	SM	*t*	-1.671***			7.435***		-0.415***				-0.456***	
France	TM					8.106***		-0.479***		-0.117		-1.145***	
	SM	*t*	-3.763***										
Italy	SM	*t-1*	2.705***										

Notes: *, **, and *** denote significance at the level of 10%, 5%, 1% respectively.

5. Conclusions and policy recommendations

The binomial gross debt and deficit is at the heart of fiscal policy, yet government financial assets, included in stock flow adjustments, are typically accounted neither in deficits nor debts. Financial assets largely affect debt levels, yet they may expand the economy financing capacity, underlying government interventions aimed at generating larger growth potential above borrowing costs, requiring the examination of both sides of the differential, effects on growth and on interest burdens.

Quantile panel ARDL long run estimations pointed that *r-g* largest impacts came by far from ratings, followed by financial assets, then by external trade balances, whereas capital formation recorded lower impacts. In the short run, increases in financial assets were associated with immediate cash outflows, additional financing needs, that don´t have an immediate impact on GDP, meaning that effects on *r-g* differentials mainly run through debt increase and respective interest burdens. External trade lower coefficients on the short run and larger on the long term suggest that it takes time to translate investment into trade opportunities, referred in Perla et al. (2021) of economic growth benefitting from increasing trade opportunities and foreign competition inducing technology adoption.

Comparing financial assets and primary deficit effects on *r-g* differentials through investment and external trade with a panel cointegration model, revealed large heterogeneity of country estimates. In the long run, cointegration estimates were negative for all variables, pointing to favourable *r-g* leverage effects, in the sense of GDP growth rates predominant over changes in ratings. The magnitude of primary deficit contributions was larger than that of financial assets. The change in ratings was the second larger contribution, followed by investment and external balance. In the short run, most countries evidence a strong predominance of financial assets effects on increasing the *r-g* differential, compared to a lower magnitude of primary deficit contributions to differential declines. However, there were some exceptions of countries with not statistically significant short run coefficients of primary deficit.

Since leverage effects are related to debt capacity in expanding the space of growth opportunities, a panel specification breaking down gross and net debt also enlightened the importance of government bonds ratings, except in countries where this indicator was stable, such as Denmark, Germany, Netherlands. Estimates pointed to the absence of a long term cointegration running from debt through sovereign bonds ratings towards r-g differentials, questioning the validity of taking either gross or net debt as long run indicators of leveraging growth potential.

Delving into financial assets impacts through gross debt compared with that of primary deficit, granular ARDLs estimates at individual country level were widely differentiated. In some countries, either financial assets or primary deficit estimates were only statistically independent in standalone models (Croatia, Estonia, Finland, France, Italy, Greece, Slovakia), suggesting low coordination when managing both variables together. In contrast, in other countries, twin models statistically significance and symmetric coefficients between financial assets and primary deficit, suggested these variables were managed together. In the short term, the impact of changing financial assets holdings was hybrid, in the majority of countries positive at levels, contributing to gross debt increases, whereas negative at first lags towards debt declines, empirically refuting a general hypothesis that financial assets always contribute to government indebtedness. Rather, they might lower debt levels, demanding a granular approach uncovering the nature of financial assets. Primary deficit estimates alternated between increasing and decreasing gross debt, but in all countries ARDL statistically significant long-term estimates confirmed that increasing financial assets holdings lead to gross debt growth, that might undermine primary deficit debt consolidation efforts.

Estimates warn about the need to account financial assets interventions according to their effect on *r-g* differentials, calling attention that financial assets effects may undermine gains from primary deficits consolidation on *r-g* differentials. Since primary balance transmission channels operate mostly through the aggregate demand and financial assets through the aggregate supply, these results raise the question whether primary deficit approaches and financial assets supply side interventions might end up having opposite effects on *r-g* differentials. This means that financial assets interventions may even crowd out eventual gains from primary deficit efforts, questioning the validity of government supply side financing approaches.

Open questions for further research include namely the need to deal with differentiated datasets, non-stationarities, nonlinearities, differentiated effects at frequency ranges, for example understanding the sequential nature of flow adjustments usually carried along cycles, which may be difficult to uncover in time-domain. Further, a distinction has to be made between financial assets holdings by governments and by central banks, interventions that operate through differentiated transmission channels and pursue different objectives. In sustainability assessments, besides effects on government debt and liquidity, we need to understand under which conditions financial assets may contribute to debt restrain or exacerbation and their effects on *r-g* differentials. We analysed the output

growth side channel of financial assets operating through capital formation and the current account, that in turn carry forward financial assets impacts. This calls for estimating financial assets intermediary effects, for example in the vein of the long-standing literature pointing to investment and building of export capacity as prominent drivers of economic growth.

On the policy side, impacts depend on the nature of underlying financial assets instruments and reflect country-specific factors and different debt management strategies. Whereas this multiplicity concurs to the principle of subsidiarity, the use of financial assets call for a closer monitoring, at country level, within the European semester budgetary surveillance, calling for Weber (2012) claims for more transparent budgets and reduction of off-budget operations, since financial assets in particular and stock flow adjustments in general might be used, as pointed by Jaramillo, Granados, and Jalles, to intentionally circumvent fiscal debt constraints rules, disrespecting, as already pointed by Milesi-Ferretti (2003), two core features of prudent fiscal policy, transparency and sustainability.

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Appendix 1 – PMG estimates *versus* Driscoll-Kraay (DK) standard errors

Appendix to Table 3 – Comparing financial assets and primary deficit effects on *r-g* differential

	Δratings	*CAB*	*GCF*	*PBB*	*ΔFA*
Model (excluding Denmark, Estonia, Germany, Luxembourg, Netherlands)					
Aggregate long run	-1157.4***	-0.420***	-0.645***	0.442***	-75.470***
Driscoll-Kraay	-0.637*	-0.385***	-0.629***	-0.671**	-0.153***
Model including Denmark, Estonia, Germany, Luxembourg, Netherlands					
Aggregate long run		-0.416 ***	-0.628***	0.443***	0.981***
Driscoll-Kraay		-0.243***	-0.521***	-0.684**	-0.154***

Appendix to Table 4 – PMG estimates of gross and net debt on *r-g* differentials

	r-g	*Δratings*	*ΔGD*	*ΔND*
Aggregate long run		-334.085	1.012***	-0.168
Driscoll-Kraay		-0.683***		-0.000
d1			0.286***	
d2	1.528***			
d3	-1.024***			
d4	0.255***			

Appendix 2 – ARDL estimates of changes in financial assets holdings and primary deficit on gross debt

	Short run		**Long run**			
	ΔFA	**PD**	**bounds test**	**adjacent term**	**ΔFA**	**PD**

Cluster C1 – Largest coefficients from financial assets in the short and long run

Bulgaria	TM					
	t 0.774***	*t* -0.702***	19.568***	-0.750***	0.968***	-0.914***
	t-1 -0.491***	*t-1* 0.536***				
	t-2 0.161	*t-2* -0.240				
	t-3 -0.167	*t-3* 0.243**				
	t-4 0.449***	*t-4* -0.522***				
	SM					
	t 0.936***		3.213	-0.186***	1.098***	
	t-1 -0.732***					
		t -0.309***	0.999	-0.150**		-0.668
		t-1 0.209				
Latvia	TM					
	t 0.696*	*t* -0.648	3.406	-0.283***	0.944***	-0.677***
	t-1 -0.428	*t-1* 0.456				
	SM					
	t 0.698*		5.422*	-0.223***	1.343***	
	t-1 -0.399*					
		t -0.822**	2.531	-0.822**		-0.970
		t-1 -0.635*				

Cluster C2 – Alternance of predominance of assets and primary deficit in the short and long run

Austria	TM											
	t 0. 772	***	*t -1*.025	***	4.975	**	-0.368	***	0.684	***	-0.580	**
	t-1 -. 520	***	*t-1* .812	***								
	SM											
	t 0.863	***			2.931		-0.118	***	0.928	***		
	t-1 -.690	***										
			t -1.830	***	8.882	***	-0.443	***			-0.856	***
			t-1 1.450	***								
Belgium	TM											
	t .865	*****	*t* -1.458	***	3.270	*	-.171	***	.685	**	-1.047	***
	t-1 -.747	*	t-*1* 1.252	***								
			t-2 0.0260									
	SM											
	t 1.196	***			1.702		-0.069		3.859			
	t-1 -1.372	***										
	t-2 0.292											
	t-3 0.033											
	t-4 0.720	***										
	t-5 -0.601	***										
			t -1.760	***	6.374	***	-.250	***			-.674	*
			t-1 1.591	***								
Cyprus	TM											
	t 0.331	*	*t* -1.177	**	2.252		-0.504	**	0.656	**	-1.631	**
			t-7 -1.296	*								
	SM											
	t 0.722	***			8.010	***	-0.126	***	2.341	***		
	t-1 -0.813	***										
	t-4 0.336	*										
	t-6 0.147	**										
			t -1.144	***	1.211		-0.258	*			-1.405	*
			t-1 0.782	**								
Estonia	TM											
	t 0.584	***	*t* -0.681	***	2.281		-0.201	***	0.578	**	0.002	
	t-1 -0.470	***	t-*1* 0.682	***								
	t-2 0.040											
	t-3 -0.037											
	SM											
	t 0.586	***			5.338	*	-0.176	*	0.528	*		
	t-1 -0.493	***										
			t -1.048	***	2.29		-0.275	***			-0.141	
			t-1 1.009	***								
Germany	TM											
	t 0.777	***	*t* -1.259	***	5.964	**	-0.178	**	1.153	***	-0.130	***
	t-1 -0.572	***	*t-1* 1.219	***								
			t-2 -0.107									
	SM											
	t 0.814	***			2.822		-0.130	**	1.324	***		
	t-1 -0.975	***										
	t-2 0.334	***										
			t -2.357	***	22.937	***	-0.086				9.364	
			t-1 1.268	**								

			t-10 -1.073 **									
			t-12 0.850 **									
Hungary	TM											
	t 0.510			7.842	***	-0.786	***	0.649	***	-0.485	**	
	SM											
	t 0.745	***		10.346	***	-0.580	***	0.646	***			
	t-1 -0.370	**										
			t -1.435 ***	1.434		-0.237				-1.260		
			t-1 1.137 ***									
Ireland	TM											
	t . 0.999	***	*t* -0.873 ***	11.782	***	-3.582	***	1.710	***	-0.998	***	
	t-1 -0.128		*t-4* -1.059 **									
	t-2 0.443	**	*t-8* -0.860 *									
	SM											
	t 0.896	***		5.471	*	-0.141	***	2.739	**			
	t-1 -0.834	***										
	t-4 0.312	**										
			t -1.127 ***	3.155		-0.150	***			-1.641	***	
			t-1 2.000 ***									
			t-2 -1.071 ***									
			t-4 -0.756 **									
			t-5 1.822 ***									
			t-6 -0.874 ***									
Lithuania	TM											
	t 0.756	***	*t* -0.978 ***	5.390	**	-0.382	***	0.952	***	-1.007	***	
	t-1 -0.434	***	*t-1* 0.593 ***									
	t-2 0.042											
	SM											
	t 0.777	***		3.546		-0.116	**	1.626	**			
	t-1 -0.587	***										
			t -0.830 ***	15.518	***	-0.892	***			-0.931	***	
Nether.	TM											
	t 0.893	***	*t* -1.134 ***	3.931	**	-0.241	**	1.494	***	-1.193	***	
	t-1 -0.534	***	*t-1* 1.102 ***									
	SM											
	t 0.998	***		6.001	***	-0.010		25.938				
	t-1 -0.806	***										
	t-2 -0.037											
	t-3 | 0.143											
	t-4 0.493	***										
	t-5 -0.525	***										
			t -1.342 ***	2.676		-0.240	*			-1.275	*	
			t1 1.275 ***									
Spain	TM											
	t 0.863	***	*t* -1.915 ***	1.738		-0.145	**	0.992		-1.141	***	
	t-1 -0.565	***	*t-1* 1.750 ***									
	t-2 -0.154											
	SM											
	t 1.491			1.689		-0.108	**	1.882	**			
	t-1 -1.288											
			t -2.712 ***	1.533		-0.112	**			-1.440	***	
			t-1 2.527***									
			t-5 0.023									

Cluster C3 – Predominance of primary deficit

C3.1 Financial assets statistically significant in the short and long run

Czechia	TM					
	t 0.486***	*t* -1.221***	7.091***	-0.371***	0.254***	-1.062***
	t-1 -0.391***	*t-1* 0.827***				
	SM					
	t 0.542***		2.226	-0.138**	0.169	
	t-1 -0.518***					
		t -1.656***	14.423***	-0.487***		-0.950***
		t-1 1.193***				
Denmark	TM					
	t 0.735***	*t* -0.591**	8.136***	-0.753***	0.798***	-1.225***
	t-1 -0.369***	*t-1* -0.454				
	t-2 -0.002	*t-2* 0.757*				
	t-3 -0.158	*t-3* 0.179				
	t-4 0.395***	*t-4* -0.813***				
	SM					
	t 0.681***		1.639	-0.101**	0.970***	
	t-1 -0.583***					
		t -1.239**	3.472	-0.205***		-0.204
		t-1 1.197***				
Greece	TM					
	t 0.265**	*t* -0.959*	2.893	-0.335***	0.793**	-0.323
		t-1 0.851				
	SM					
	t 0.765***		5.457	-0.332***	-0.019	
	t-1 -0.772***					
		t -0.294***	3.411		-0.363***	-0.810
Luxemb.	TM					
		t -0.579	8.923***	-0.785***	0.402***	-0.571***
	t 0.316***	*t-1* -0.321**				
		t-2 0.453				
	SM					
	t 0.419***		5.858***	-0.339***	0.250	
	t-1 -0.629***					
	t-2 0.295***					
		t -0.037	9.548***	-0.453***		0.182
		t-1 -0.806				
		t-2 0.926**				
Malta	TM					
	t-1 -0.364***	*t* -0.958***	2.890	-0.415***	0.754***	-0.870***
	t-2 0.203***	*t-1* 0.597***				
	SM					
	t 0.561***		2.625	-0.120**	0.019	
	t-1 -0.558***					
		t -0.780***	2.796	-0.249**		-0.763***
		t-1 0.049				
		t-2 0.542***				
Poland	TM					
	t 1.055***	*t -1*.258***	4.018*	-.066**	0.925***	-1.612***
	t-1 -0.760***	*t-1* 0.745**				
	SM					
	t 1.134***		3.312	-0.204***	0.846**	
	t-1 -0.961***					
		t -0.856***	4.544*	-0.693***		-1.235***

		t-1 -0.221				
Portugal	TM					
	t 0.678*** *t-1* -0.499*** *t-2* -0.024	*t* -0.615 *t-1* 0.347***	4.056*	-0.287***	0.543	-0.935***
	SM					
	t 0.759 *t-1* -0.634 *t-2* 0.916		2.108	-0.154**	0.804***	
		t -1.069*** *t-1* -0.132 *t-2* -0.024***	6.156***	-0.293***		-0.973**
Romania	TM					
	t 0.246*** *t-1* -0.116***	*t* -0.733*** *t-1* 0.577***	3.612	-0.187***	0.694***	-0.837***
	SM					
	t 0.195*** *t-1* -0.099***		3.002	-0.150**	0.640	
		t -0.274***	6.152**	-0.237***		-1.156***
Slovakia	TM					
	t 0.550*** *t-1* -0.407***	*t* -0.541 *t-1* 0.530	3.203	-0.191***	0.749 ***	-0.057
	SM					
	t 0.585*** *t-1* -0.419***		3.137	-0.175***	0.947***	
		t -1.805** *t-1* 1.467 *t-2* 1.334 *t-3* -1.311*	5.022*	-0.275***	-1.149**	
Slovenia	TM					
	t 0.678*** *t-1* -0.499*** *t-2* -0.024	*t* -0.615*** *t-1* 0.347	4.056**	-0.287***	0.543***	-0.935***
	SM					
	t 0.759*** *t-1* -0.634***		2.108	-0.154**	0.804***	
		t -1.069*** t-*2* 0.916***	6.156**	-0.293***		-0.973**
Sweden	TM					
	t 0.345** *t-1* -0.268**	*t* -1.039** *t-1* 0.856**	4.654*	-0.294**	0.260**	-0.622*
	SM					
	t 0.377*** *t-1* -0.368***		4.362*	-0.160**	0.053	
		t -1.543*** *t-1* 0.954**	11.425***	-0.497***		-1.184***

C3.2 Financial assets statistically significant in the short run and not statistically significant in the long run

Croatia	TM					
	t 0.199** *t-1* -0.184**	*t* -2.013*** *t-1* 1.552***	4.217*	-0.286***	0.053	-1.614***
	SM					
	t 0.240*** *t-1* -0.229***		3.841	-0.168***	0.065	
		t-2 0.135*** *t-1* 1.880***	2.179	-0.178**		-1.437 ***
Finland	TM					
	t -0.019	*t* -1.638*** *t-2* 1.407***	7.028***	-0.401***	-0.048	-0.577
	SM					
	t 0.138*** *t-1* -0.178***		7.914***	-0.198**	-0.355	
		t -1.671*** *t-1* 1.481***	7.435***	-0.415***		-0.456***
France	TM					
	t 0.318*** *t-1* -0.327*** *t-2* 0.033 *t-3* -0.015 *t-4* -0.094 *t-5* 0.158* *t-6* -0.129*	*t* -2.911*** *t-1* 2.363***	8.106***	-0.479***	-0.117	-1.145***
	SM					
	t 0.774*** *t-1* -.827***		3.724*	-0.182**	-0.368	
		t -3.763*** *t-1* 3.654***	3.991*	-0.218**		-0.500
Italy	TM					
	t 0.897*** *t-1* -1.353*** *t-2* 0.384**	*t* -.539*** *t-1* -.489*** *t-2* -.326*** *t-3* -.255**	6.652***	-0.085*	-0.853	0.104
	SM					
	t 1.119*** *t-1* -1.567*** *t-2* 0.942** *t-3* -0.621** *t-4* 0.931*** *t-5* -0.862***		4.630*	-0.216**	-0.266	
		t -2.520*** *t-1* 2.705***	14.590***	0.804		0.804

Notes: *, **, and *** denote significance at the level of 10%, 5%, 1% respectively. NW-correction of standard errors with Newey–West estimates; HAC - heteroskedasticity and autocorrelation-consistent standard errors.