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Pandemic Shocks and Fiscal-Monetary Policies in the Eurozone: COVID-19 Dominance During January - June 2020

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ABSTRACT

This case study compares the importance of prevailing market factors against that of COVID-19 dynamics and policy responses in explaining the evolution of Eurozone (EZ) sovereign spreads during the first half of 2020. Focusing on daily Eurozone CDS spreads, we adopt a multi-stage econometric approach. First, we estimate a multi-factor model for changes in EZ CDS spreads over the pre-COVID-19 period of January 2014 through June 2019. Then, we apply a synthetic control-type procedure to extrapolate model-implied changes in the CDS from July 2019 through June 2020. We find that the factor model does very well in tracing the realized sovereign spreads over the rest of 2019, but breaks down during the pandemic – diverging substantially in March 2020. In the second stage, focusing specifically on the 2020 period, we find that the March 2020 divergence is well accounted for by COVID-specific risks and associated policies. In particular, mortality outcomes and policy announcements, rather than traditional determinants like fiscal space and systematic risk, drove CDS adjustment over this period. Daily CDS spread widening ceased almost immediately after the ECB announced the PEPP, but the divergence between actual and model-implied changes persisted. This divergence can be traced back to the fact that fiscally secure EZ Core countries saw spreads widen further than implied – comparable to the widening of more fragile countries - as several of the Core countries were hit hard by COVID-19. Taken all together, this points to COVID-19 Dominance: The widening spreads during the pandemic induced by COVID-specific risks and fiscal responses has led to unconventional monetary policies that primarily aim to mitigate the short-run fear of the worst economic outcomes, temporarily pushing away concerns over fiscal risk.

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I. Introduction and overview

While our investigation focuses specifically on the recent COVID-19 economic crisis, we first take a step back, contextualizing the rich economic evolution of the Eurozone leading up to 2020. The remarkable history of the Eurozone may be viewed through the lens of Eurozone (EZ) government yields spreads (for example, Figures 1a and 1b, for the 5-year CDS spreads over Germany, and the 10-year bond spreads over Germany, respectively). By 2003, the EZ sovereign spreads narrowed remarkably, reducing dramatically the borrowing costs of the GIIPS [Greece, Ireland, Italy, Portugal, and Spain].¹ The growing optimism regarding EZ success and GIIPS access to low-cost leverage increased markedly their domestic investment and consumption, rapidly magnifying their current account deficits. By 2007, the current account deficit/GDP of Greece, Portugal, and Spain exceeded 10%. These deficits were funded by borrowing mostly from the EZ core countries. GIIPS investment boom has been associated with construction and real estate booms, fuelled by easier access to cheaper mortgages, at times of accelerating economic growth, and bubbly real estate dynamics [Aizenman and Jinjara (2009)].

The dynamics unleashed by the GFC and the growing public and private debt overhang associated with GIIPS leverage booms were a wakeup call, raising concerns about GIIPS's ability to serve their debt at times of collapsing growth. This led to a rapid reversal of GIIPS sovereign spreads, from levels well below the spreads of comparable emerging markets with standalone currencies in 2003-2007, to alarmingly high levels, well above the spreads of these comparable emerging markets [Aizenman et al. (2013)]. These dynamics led De Grauwe and Ji (2013) to claim that the government bond markets in the Eurozone are more fragile and more susceptible to self-fulfilling liquidity crises than in standalone countries with a national currency. They concluded that a significant part of the surge in the spreads of the peripheral Eurozone countries during 2010–11 was disconnected from underlying increases in the debt to GDP ratios and fiscal space measures, and rather was associated with negative self-fulfilling market sentiments that became very strong since the end of 2010; driving GIIPS towards bad equilibria.²

¹ According to the World Bank collection of development indicators, the real borrowing cost of Spain dropped from about 7% in 1993, to about zero, the German level in early 2003. Greece experienced about a 10% drop in the real cost of borrowing during that period [source: <https://tradingeconomics.com/>].

² See de Grauwe (2016) and Brunnermeier and Reis (2019) for an overview of the EZ crisis.

The concerns about the viability and the nature of the Eurozone led the ECB president, Mario Draghi, to declare on July 26, 2012, “Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough.” Market observers credit Draghi’s declaration and the ECB steps that were announced on September 6, 2012 with the dramatic contraction of GIIPS sovereign spreads that followed.

A remarkable effect of ECB policies has been the massive re-pricing of GIIPS sovereign debt, effectively transferring purchasing power from the creditors to the debtors and reducing the odds of outright default. Reinhart (2012) views the rapid diffusion of Quantitative Easing policies [QE] as the modern incarnation of financial repression, succinctly noting, “Financial repression has come back to stay.” Accordingly, aggressive purchases of assets by the central bank are akin to financial repression, reducing the cost of servicing public and private debt, mitigating thereby defaults. One may view these policies as akin fiscal dominance, where central banks’ policies have profound fiscal implications.³ Figure 1c plots the public debt/GDP and the difference between r : real interest rate (10-year yield minus CPI inflation) and the g : real growth rate, showing the co-movements of the build-up of public debt and the cost of debt servicing. Figure 1d contrasts the public debt/GDP and $r-g$ in the Eurozone core (Belgium, France, Germany, and the Netherlands) and the southern peripheral countries, GIIPS (Greece, Ireland, Italy, Portugal, and Spain). Figure 1e plots the product of public debt/GDP and $r-g$, and the primary balance/GDP, highlighting the smoother adjustment of the debt servicing costs and the government balances of the Eurozone core countries.

These developments also set the stage for the gradual tepid recovery of the Eurozone. By the end of 2019, the Eurozone bond rates were clustered tightly around zero [Figures 1a and 1b]. Yet, for 2019 as a whole, the Eurozone grew by only 1.2%, its lowest increase since 2013 [Associated Press, Jan. 31, 2020]. Against this background, the COVID-19 shock hit the Eurozone in March 2020, mushrooming into a major pandemic that tested the medical, social, and economic capabilities of EZ countries. Within two months, the enormity of the health and economic threats and damages became clear. COVID-19 wreaked havoc on both domestic and external demand in France, Italy, and Spain, while contractions in smaller Eurozone economies were sizeable but less severe. Except for Malta, the forecast range of

³ The outcome of these ECB policies was that the cost of serving the Eurozone debt by 2015 was roughly in line with pre Euro-crisis levels, despite the GIIPS large accumulation of public sector debt since 2008 [Ahmed et al. (2020)].

economic activities in early May for the 18 EZ countries was in the range $[-5.5\%, -9\%]$, about -7% for the EZ, Germany, and France about -6% and -7% , respectively [Figure 1f].

In light of another unexpected global crisis, the purpose of our paper is to take stock of January-June 2020 data, evaluating the impact of COVID-19 dynamics, ECB's and countries' fiscal policies on the patterns of sovereign spreads in the Eurozone during the first half of 2020. The COVID-19 triggered costly containment policies, the collapse of aggregate demand and international trade, and a sharp drop in the GDP of OECD countries. Figure 2a shows the co-movements of the ECB rate and the Federal Reserve Funds rate, both of which are already closed to zero. The US embarked on massive fiscal stimulus, augmented by the expansion of QE policies to a wide spectrum of economic activities, and the provision of ample liquidity to foreign countries via swap lines and new repo facilities. The size of these innervations dwarfs the Fed's policies during the GFC.⁴

In March 2020, the ECB activated policies tuned to deal with the evolving dire financial and fiscal needs of the EZ. On March 18th, 2020 the ECB activated a new QE line of 750 billion Euro Pandemic Emergency Purchase Program (PEPP), targeting national and regional government bonds, including Greek sovereign debt, and various private sector bonds. On June 4, 2020, the ECB almost doubled the PEPP, increasing its size up to 1350 billion Euros. Figure 2b shows the cumulated net purchases of PEPP from March to May 2020, indicating the large weights of Belgium, France, Germany, Italy, Netherlands, and Spain. Figure 2c shows the differences of PEPP in terms of the maturity profile; the remaining weighted average maturity (WAM) in PEPP is shorter than the universe of eligible bonds for Belgium, Germany, and the Netherlands, while WAM is longer for France, Italy, and Spain. These new policies have increased the Fed balance sheet in 2020 to about a third of the US pre-COVID crisis GDP, while the ECB's balance sheet approaches half of EZ pre-COVID GDP.

⁴ These policies include up to \$2.3 trillion in lending to support households, employers, financial markets, and state and local governments. In addition, the Fed activated its international swap lines at low interest rate to Canada, England, the Eurozone, Japan, and Switzerland, and extended the maturity of those swaps. It has also extended the swaps to the central banks of Australia, Brazil, Denmark, Korea, Mexico, New Zealand, Norway, Singapore, and Sweden. The Fed is also offering dollars to central banks that don't have an established swap line through a new repo facility called FIMA (for "foreign and international monetary authorities"). The Fed will make overnight dollar loans to the central banks, taking U.S. Treasury debt as collateral. See Cheng et al. for more on the Federal Reserve's policies (2020). Also see Belz et al. (2020) for the ECB's policy response to the COVID crisis.

Arguably, the sudden stop of economic activities triggered by the COVID shock and accelerating contagion and mortality triggered “COVID dominance” – whereby nations focused monetary and fiscal policies on mitigating and containing the adverse health and the economic consequences of the pandemic. QE and fiscal policies have been committed to mitigating the fear of the worst outcome: collapsing household and corporate income at times of massive medical and policy effort to deal with the new highly contagious pandemic. To what degree the QE and fiscal policies would help synchronize the asymmetric responses of the Eurozone countries, by now display varying fundamentals (i.e., current account/GDP in Figure 3a, and business cycles in Figure 3b) remains an open question.

The main analysis applies a case study methodology, comparing the impact of prevailing market factors against that of COVID-19 dynamics, the ECB’s and countries’ fiscal policies on the sovereign spreads of EZ countries, and the overall financial and fiscal adjustments to the collapsing demand. In a multi-stage econometric analysis, we focus on daily CDS spreads, leveraging a Eurozone cross-country panel dataset. In the first stage, we estimate a dynamic heterogeneous multi-factor model for changes in EZ CDS spreads over the period of January 2014 through June 2019, the “pre-COVID-19” period. Then using the estimated model parameters, we apply a synthetic control-type procedure to extrapolate the model-implied change in the CDS – given realized values of the factors - from July 2019 through June 2020. This approach allows us to statistically derive the ‘COVID residual,’ i.e., the difference between the actual CDS adjustment and the change implied by the model, at both the individual country and aggregate EZ levels over the pandemic period. In the second stage, focusing specifically on the 2020 period, we explore whether daily COVID-19 related mortality rates and announced policy responses help to explain variation in the COVID residual.

In the first stage, we find that (1) the dynamic multi-factor model does an excellent job of tracing the CDS spread adjustment dynamics in the ‘validation’ period (7/1/2019 to 12/31/2019), but substantially underpredicts EZ CDS adjustment over March 2020, the arrival month of the COVID-19 to EZ; (2) CDS spread changes of high-mortality and low-mortality country groups were entirely parallel up until around mid-March, at which point we see a persistent gap emerge between high mortality and low mortality countries; and (3) the non-GIIPS and Core EZ countries saw actual CDS widening comparable to that of the more fiscally fragile GIIPS group. These findings point towards concerns shifting towards short-run economic instability related to the pandemic, temporarily pushing away more traditional sovereign risks such as fiscal space.

In the second stage, we find that the divergence of the CDS COVID residual in March 2020 is well accounted for by COVID-specific risks and factors, in particular, mortality outcomes and policy announcements, rather than traditional determinants like fiscal space or systematic risk. In particular, COVID-related mortalities explain the greatest share of the variation in COVID residual, and COVID-specific factors (including mortalities and fiscal-monetary policy announcements) account for a much larger share of the variation in daily CDS spread adjustment than predictions from the pre-estimated dynamic factor model. On the aggregate EZ level, after conditioning on COVID-specific mortalities and policy announcements, the model-implied CDS spread dynamics almost perfectly trace the realized dynamics.

Daily CDS spread widening ceased almost immediately around March 18, when the ECB announced the PEPP, but the divergence between actual and model-implied changes persisted. This divergence comes hand-in-hand with a divergence in the actual CDS spreads of countries hit hard by COVID versus those which weren't. Our findings clearly indicate "COVID-19 dominance": The widening spreads during the pandemic induced by COVID-specific risks and fiscal responses has led to unconventional monetary policies that primarily aimed to mitigate the fear of the worst economic outcomes such as collapsing household and corporate incomes, and temporarily pushed away concerns over fiscal risk. Specifically, COVID-19 mortalities and COVID-specific fiscal policies fueled a divergence in CDS pricing from fundamentals. In contrast, ECB's policies have been associated with lowering the spreads and their dispersion (with a lag), thereby providing more fiscal space to 'COVID-19 distressed' countries, i.e., countries which are systematically riskier and thus issued less fiscal stimulus/GDP in response to the pandemic.

Section II describes the patterns of COVID-19 mortalities and the policy responses, accounting for factors explaining variation in the Eurozone. Section III reports the analysis on set of COVID-specific risks and factors including COVID-19 mortalities, ECB policies and country-specific fiscal stimulus and their association with COVID residuals and CDS spread dynamics. Section IV provides the concluding remarks.

II. Covid-19 Crisis and the Eurozone

II.1 Mortality patterns

While the entirety of the Eurozone was hit by the COVID-19 pandemic, mortality dynamics across nations were incredibly heterogeneous. Figures 4a and 4b illustrate the large discrepancies in mortality per capita and deaths per million residents in Eurozone. Belgium,

Spain, France, and Italy are amongst the nations with the highest mortality and death rates. Meanwhile, Lithuania, Latvia, Slovenia, and the Slovak Republic hold some of the lowest mortality rates per capita. Some of this heterogeneity may be influenced by the different methodologies of local agencies tasked with capturing the contagion and severity of the virus.⁵ At the same time [Jinjarak *et al.* (2020)] provide evidence that the government pandemic policy interventions (in terms of their strictness, duration, and rapidity), along with initial country characteristics, may have influenced both the mortality growth rates and the empirical shape of the mortality curve (including the duration and peak).⁶ Their paper explores several demographic and structural features across a large sample of advanced and emerging economies from 1/23/2020 to 4/28/2020, finding that with a lag, more stringent pandemic policies were associated with lower mortality growth rates.

Furthermore, the association between stricter pandemic policies and lower future mortality growth was more pronounced in countries with a greater proportion of the elderly population, greater democratic freedom, larger international travel flows, and further distance from the equator. In addition, they document that the extent to which the peak mortality rates were explained by government pandemic policies and country-specific structural features is heterogeneous.⁷

II.2 Fiscal policies of Eurozone countries and the ECB monetary policies

While fiscal policies across the Eurozone varied in their substance and magnitude by nation, they often targeted similar sectors. Much of the funding allocated by key fiscal

⁵ Belgium, which has a noticeably pronounced mortality curve compared to other Eurozone nations, is radical in the approach they have taken to classifying COVID's contagion rate. Health agencies in Belgium have classified a far higher share of recent deaths to the virus than other nations, even when the status of the deceased as a COVID-infected individual was not confirmed (Source: <https://www.npr.org/sections/coronavirus-live-updates/2020/04/22/841005901/why-belgiums-death-rate-is-so-high-it-counts-lots-of-suspected-covid-19-cases>).

⁶ Greece has been lauded for its efforts to reduce the contagion of the virus. Amongst the Eurozone nations, Greece has one of the lowest mortality rates. This despite the nation's recent history of financial troubles and radical cuts to the health system. Many attribute the success of Greece to the precision and promptness of the government in establishing stringent policies to promote social distancing and reinvigorate the reeling medical system (Source: <https://theconversation.com/greece-despite-a-decade-of-health-cuts-coronavirus-death-rates-appear-comparatively-low-136293>)

⁷ Among all countries in the Eurozone, the peak new mortality rates of France, Belgium, Ireland, Italy, and Spain were overpredicted. At the same time, those of Greece, Cyprus, Slovak Republic, Finland, and Portugal were underpredicted [Figure 5].

policies were distributed to the reeling medical sector, as well as public transport, small businesses, and displaced workers. For example, in May alone, Austria allocated 300 million Euros to the public transport sector, 500 million Euros to pubs and gastronomies, and a billion Euros in direct support to local municipalities. In the same month, Estonia allocated 70 million Euros to promote local enterprises and alleviate the shock of the virus; France approved a new fund of 50 million Euros to aid the struggling transport industry; Greece approved two entrepreneurship programs with budgets totaling 500 million Euros; and Ireland approved a budget of 250 million Euros to support struggling small businesses and pubs (“COVID-19 Financial Response Tracker”, 2020). The ECB supplemented these country-specific measures with the introduction of the PEPP, which allocated 750 billion Euros to asset purchases, which was increased to 1350 billion Euros by June 4, 2020. Along with these purchase programs, the ECB engaged in healthy doses of forward guidance and has assured member states that the purchases will continue throughout the multiple waves of the crisis. At the same, as part of the European Union Recovery Plan, the European Commission has increased expenditure ceilings, granted additional access to emergency loans and assets for member states, and targeted specific funding to hospitals and the agricultural sector (“EU/EA Measures to Mitigate the Economic, Financial and Social Effects of Coronavirus,” 2020).

The universal fiscal and monetary responses in combination with containment policies across the world, and particularly in the Eurozone, might give credence to our theory of “COVID dominance.” As containment policies were reactionary and aimed specifically at reducing the spread of the virus, despite the associated introduction of painful adjustment costs for the general populace, monetary and fiscal policies have been committed to mitigating the fear of the worst outcome: collapsing household and corporate income at times of massive medical effort and containment interventions to deal with the new highly contagious pandemic. In this new ultimatum of “lives vs. livelihoods,” it appears those governments who have prioritized quick and direct interventions to save lives have been the most successful in reducing contagion and mortality. How has this COVID dominance forced the hands of financial institutions and regulatory agencies, to ensure short-term stability and restore livelihoods? And how have these policy decisions influenced consumer confidence and economic growth? We turn to explore these questions in Section III.

III. Analysis of COVID Dominance

In this section, our primary goal is to investigate whether and to what degree COVID-related developments and associated policy responses significantly influenced the pricing of sovereign debt across the Eurozone. We consider data on daily sovereign credit default swap (CDS) spreads to capture fluctuations in debt pricing and sovereign risk across countries and over time.

The literature points to several well-known determinants of sovereign pricing, with measures of fiscal space exhibiting robust explanatory power. During a conventional financial crisis, sovereign risk adjustments are relatively sharper for fiscally fragile countries – those with burgeoning debt/GDP or weaker interest coverage ratios. In a sense, fiscal capacity often dominates the pricing (or re-pricing) of sovereign debt. As such, one may expect fiscal space to play an important role in explaining differences in sovereign spreads amid the COVID-induced financial panic. However, COVID-19 was a unique shock in many ways: It was a public health crisis, rather than originating from the financial sector. It has been global and of unprecedented speed and severity. Moreover, not all Eurozone countries were impacted equally. While Italy and Spain suffered from some of the highest mortality rates during the first wave, countries like Greece and Slovakia managed remarkably well.

In this context, we ask whether and to what degree (1) prevailing factors explain CDS variation through 2020, and (2) COVID-related dynamics influenced sovereign debt pricing throughout the pandemic. We propose a multi-stage econometric analysis that takes advantage of a daily cross-country panel dataset. Our outcome variables of interest are daily CDS spreads for 17 Eurozone countries (excluding Malta and Luxembourg, for which data was unavailable). The data are from Thompson Reuters and Markit.

To summarize our methodological approach, in the first stage, we estimate a dynamic heterogeneous multi-factor model for changes in EZ CDS spreads over the period January 1, 2014, through June 30, 2019, denoted the “pre-COVID” period. Then using the estimated model parameters, we apply a synthetic control-type procedure to extrapolate the model-implied change in the CDS – given realized values of the factors - from July 1, 2019, through June 15, 2020. This approach allows us to calculate the ‘COVID residual,’ i.e., the difference between the realized CDS adjustment against the change implied by the model at both the individual country and aggregate EZ levels, over the COVID pandemic period. In the second stage, focusing specifically on the 2020 pandemic period, we explore whether daily COVID related mortalities and announced policy responses help to explain variation in the COVID residual.

III.1 First Stage Estimation, Jan 2014 to June 2019

In the first stage, we estimate a dynamic factor model on the pre-COVID period data of the following form:

[1]

$$\Delta cds_{it} = \alpha_i + \phi_i \Delta cds_{i,t-1} + \beta_{i1} \Delta GCDS_t + \beta_{i2} \Delta RCDS_{i't} + e_{it},$$
$$Jan\ 1, 2014 \leq t < June\ 30, 2019,$$

where

$$\Delta cds_{it} = \ln \frac{CDS_{it}}{CDS_{i,t-1}}.$$

Our outcome variable is the daily change in the log CDS spread of country i . On the right-hand side, we include the lagged dependent variable, along with two factors: A global factor, $\Delta GCDS_t$ and a regional Eurozone factor $\Delta RCDS_{i't}$. The global factor is measured as the cross-section average of daily log CDS changes over a sample of 51 non-EZ countries, therefore capturing the common component of sovereign risk fluctuations at the global level. The regional factor is measured similarly, but over the 16 EZ countries *excluding* country i , hence the notation i' . The regional factor, therefore, captures common fluctuations within the Eurozone.

It is important to note that the model is heterogeneous, allowing for regression estimates across countries to vary. Therefore, each country has its own unique global and regional ‘betas,’ β_{1i} and β_{2i} , which captures country-specific systematic exposure to aggregate global and regional risk, respectively. The main assumption we make is that the estimated factor ‘betas’ capture the most important determinants which influenced sovereign spreads over the 2014-2019 period.

Because we rely on daily data for this analysis, low-frequency observables often included in the literature - such as measures of fiscal space - cannot be effectively incorporated into our model without introducing considerable challenges for estimation and inference. However, we believe (and show) that our heterogeneous factor betas can adequately capture these low-frequency observables. We estimate the model over the pre-COVID period of January 1, 2014, through June 30, 2019. Instead of estimating the model through 2019, we choose this particular window because it leaves us the remaining six months of 2019 to validate the out-of-sample efficacy of our model, prior to the COVID shock in 2020. Finally, the COVID residual is defined as

[2]

$$\Delta cr_{it} = \Delta cds_{it} - [\hat{\alpha}_i - \hat{\phi}_i \Delta cds_{i,t-1} - \hat{\beta}_{i1} \Delta GCDS_t - \hat{\beta}_{i2} \Delta RCDS_{i't}],$$

$$t \geq \text{July 1, 2019},$$

simply comparing the realized change in log CDS each day after the estimation period to the model-expected value, given the true realizations of the factors and lagged log CDS change.

Global and Regional Risk Exposures and Eurozone Fiscal Fundamentals

Figure 6 plots public debt/GDP of EZ countries against their estimated global betas and regional betas estimated from the factor regressions with daily data. The public debt/GDP measure is an average over annual data spanning from 2014 to 2018. The association between public debt levels and global betas are weak, while public debt levels are positively associated with regional betas across EZ countries. If Greece is excluded due to its remarkably large debt/GDP, the positive correlation between regional betas and fiscal space strengthens sharply, turning significant at the 10% level,⁸ confirming the notion that riskier CDS spreads are associated with fiscal fragility.

Figure 7 shows the correlation between COVID-related fiscal stimulus announced in 2020 and country-specific global and regional betas (estimated over 2014-2019). Regional betas are significantly and negatively associated with COVID-related fiscal stimulus size across the EZ. That is, systematically riskier countries (higher regional betas) issued less stimulus/GDP.

Interestingly, these findings support the view that 1) The risk associated with limited fiscal space is priced into EZ sovereign spreads during ‘normal times’ and 2) country risk possibly constrained, at least to some degree, the size of COVID stimulus which was able to be deployed. However, because of the small sample size of these associations, the interpretation of such relationships is made cautiously.

Model-Implied Spreads and COVID Residuals, July 2019 to June 2020

After estimating the 2-factor model from January 1, 2014 through June 30, 2019, we extrapolate the model based on realized values from July 1, 2019 through June 15, 2020 which spans the COVID period. The upper-left panel of Figure 8 traces the EZ average

⁸ We also test the association between the factor betas and the flow cost of debt, given as the product of $r - g$ and Public Debt/GDP, but the correlations were close to zero. We do not report these results for brevity.

cumulative log CDS change over this period (solid line) against that implied by the model (dashed). Firstly, note that the model does an excellent job of tracing the realized values from 7/1/2019 to 12/31/2019, the ‘validation period’. In March 2020, the realized values diverged from the model-implied, triggered by panic over the COVID pandemic. Hence at the aggregate EZ level, the factor model on its own could not explain all of the variation in CDS adjustment due to the COVID shock. CDS spread widening ceased almost immediately around March 18 (the first vertical line), when the ECB announced the PEPP, but the divergence between actual and model-implied changes persisted. The subsequent vertical line represents June 4, when the ECB announced the doubling of the program.

Figure 8 upper-right charts the cross-sectional dispersion of CDS spreads over the same period, highlighting the sharp rise in volatility amid the COVID panic of March 2020. The lower charts compare high mortality (by end of April) versus low mortality EZ countries. Figure 9 compares GIIPS versus non-GIIPS, and GIIPS versus Core (here defined as Germany, France, Belgium, Netherlands).

High versus Low COVID Mortalities: Tracing the realized evolution of CDS spreads of high versus low COVID mortality countries in the Eurozone yields what looks to be a very clean illustration of an event study⁹: trends between the two groups were entirely parallel up until around May 18th, at which point we see a persistent gap emerge between high mortality and low mortality countries (Figure 8 lower-left panel). The gap persists when comparing the cumulative COVID residual between these two groups (Figure 8 lower-right panel), suggesting that this divergence cannot be explained by the factor model, possibly being driven by COVID-specific risks rather than traditional determinants like fiscal space or systematic risk.

GIIPS versus Non-GIIPS: The GIIPS group cumulative COVID residuals (Figure 9 upper-right panel) are far more volatile than non-GIIPS. Both groups saw similar spikes following the initial COVID panic in March, but the GIIPS group reverted sharply upon the May 18th announcement of the ECB PEPP. In contrast, non-GIIPS CDS on average rose sharply and remained high. Interestingly, this goes against the conventional view where fiscally fragile countries would realize wider and more persistent credit spreads.

⁹ High mortality-per-capita countries: Belgium, Spain, Italy, France, Netherlands. Low mortality-per-capita countries: Slovakia, Latvia, Cyprus, Greece, Lithuania. We consider mortality-per-capita as off the end of April 2020.

GIIPS versus Core: Examining the evolution of the GIIPS versus Core¹⁰ show that Core country log CDS moved just as sharply as GIIPS countries. This is peculiar, because if we believe fiscal space matters for debt pricing, we'd expect sharper GIIPS adjustment, given an adverse macroeconomic shock, compared to Core because the latter is relatively less fragile. When we adjust for model-implied movements and look at the cumulative COVID residuals, (Figure 9 upper-right), this peculiarity becomes even more severe. On a model-adjusted basis, the Core spreads widened *much more* than the GIIPS spreads, despite the GIIPS relatively limited fiscal space. The adjustment in sovereign spreads is in fact opposite of what one would expect in a typical crisis.

A potential explanation for the ‘GIIPS-Core’ puzzle may be that the Netherlands, Belgium and France are contained in the Core, three countries severely impacted by COVID, while Greece is contained in GIIPS and was one of the least impacted countries by COVID. Taking this together with the divergence in high-low COVID mortality CDS adjustment, suggests quite clearly that CDS pricing over this period may have been dominated by COVID risk, while the market temporarily pushed away concerns over fiscal risk. To take a closer look at the potential drivers of EZ debt pricing during the COVID pandemic first wave, we move to the second stage of the analysis, where we investigate the 2020 COVID period exclusively.

III.2 Second Stage Estimation, 2020

By separating the out-of-sample COVID-19 pandemic period in 2020 (from January to May 2020) into three subsamples, January – February, March, and April – May, we document that March is the period during which the realized values of daily CDS spread change diverged the most from the model-implied values, while the dynamic model does an excellent job of tracing the realized values before and after that (Figure 10). Moreover, we observe that daily CDS spread changes were the most volatile in March. Therefore, we focus on the sample in March 2020 and examine whether COVID-specific indicators may account for the variation in CDS adjustment that is not explained by the dynamic factor model.

We first estimate a panel model examining the relationship between COVID residual, defined as the difference between the realized values of daily CDS spread change and the model-implied values of the dynamic factor model (Equation [1]), and a set of COVID-specific variables. Specifically, our specification is

¹⁰ We define EZ Core countries as: Germany, France, Netherlands, Belgium.

[3]

$$\Delta cr_{it} = \vartheta_i + \lambda_t + \theta X_{it}^{mortality} + \gamma X_{it}^{economy} + \eta X_{it}^{policy} + \varepsilon_{it},$$

March 1, 2020 $\leq t \leq$ March 31, 2020.

COVID-specific variables are grouped into three categories: (1) mortality outcomes, in which we include daily new mortality rate (per 1,000,000 population), daily new mortality growth rate, total mortality rate (per 1,000,000 population), and total mortality growth rate; (2) economic activity, in which we include daily mobility measure in terms of driving (reported by Apple) and daily growth rates of policy Stringency Indices (constructed by [OxCGRT](#)). Lower mobility levels or stricter government non-pharmaceutical interventions may signal greater economic contraction, which may increase the debt financing burden and thus impact debt pricing during the COVID-19 pandemic; and (3) policy interventions, in which we include dummy variables indicating the date of country-specific key fiscal policy announcement, the date of European Commission’s fiscal policy announcement, the date of European Central Bank’s Pandemic Emergency Purchase Programme (PEPP) announcement, and the date of the Federal Reserve’s monetary policy announcement.^{11 12} Fixed effects are denoted as ϑ_i and λ_t , representing country and time fixed effects, respectively.

Results are reported in Table 1. Daily new mortality rates and new mortality growth rates are positively and significantly associated with COVID residuals across all three specifications, and explain the greatest share of variation in COVID residuals among all three categories of COVID-specific variables, implying that debt pricing during the COVID-19 pandemic may have been impacted significantly by country-specific mortality outcomes. Specifically, countries that saw higher new mortality rates or new mortality growth rates were

¹¹ In order to capture key policy announcements, we aggregated a set of variables from numerous datasets for a set of key fiscal, monetary, and miscellaneous policies, across individual countries, the European Union as a whole, the European Central Bank, and the Federal Reserve. These variables captured *whether or not an action or proposal was made by a given nation/institution on a specific date in the sample*. Thus, we did not control for the size or number of policies on any given day, and only if the date corresponded with the announcement of at least one key policy. With the exception of the Federal Reserve (whose major announcements related to reductions in the interest rate along with fiscal spending), we restricted our analysis of key fiscal policies to those which provided “millions” or “billions” of local currency units in spending.

¹² The primary data sources used to construct these policy announcement variables are listed here and in our references: [Yale COVID-19 Financial Response Tracker](#); [Harvard Global Policy Tracker](#); [Bruegel COVID-19 National Dataset](#); [IMF Policy Responses to COVID-19](#); [OECD COVID-19 Action Map](#); [St. Louis Federal Reserve](#); and the [European Parliament](#).

likely to see wider divergence in realized CDS spread dynamics from model-implied values. In contrast, mobility measures and the Stringency Index growth do not seem to correlate with COVID residuals. Among all policies, country-specific fiscal policy announcements have a significantly positive association with COVID residuals, indicating that countries that increase their debt burdens were likely to see larger discrepancy in CDS spread dynamics. In sum, country-specific mortality outcomes, especially daily new mortality dynamics, and country-specific fiscal responses help account for the variation in CDS spread dynamics that is left unexplained by the dynamic factor model.

Next, using a slightly modified specification, we compare the explanatory power of the dynamic factor model predictions and COVID-specific variables. We do this by treating realized log changes in CDS spreads as the outcome variable, while augmenting the panel regression with the model-implied values from Equation [1] on the RHS along with COVID-specific variables,

[4]

$$\Delta cds_{it} = \vartheta_i + \lambda_t + \Gamma \widehat{\Delta cds}_{it} + \theta X_{it}^{mortality} + \gamma X_{it}^{economy} + \eta X_{it}^{policy} + e_{it},$$

$$March\ 1, 2020 \leq t \leq March\ 31, 2020,$$

Where $\widehat{\Delta cds}_{it} = \hat{\alpha}_i + \hat{\phi}_i \Delta cds_{i,t-1} + \hat{\beta}_{i1} \Delta GCDS_t + \hat{\beta}_{i2} \Delta RCDS_{i't}$ is the model-implied values of daily CDS spread change generated from the dynamic factor model (Equation [1]). Fixed effects are denoted as ϑ_i and λ_t , representing country and time fixed effects, respectively. Essentially, we take apart the two components that make up the COVID residual. This way, it becomes obvious that the regression in Equation [3] with the COVID-residual as an outcome variable is equivalent to the restricted regression shown in Equation [4] when $\Gamma = 1$. Equation [4] relaxes this implicit assumption of Equation [3] while lending to a richer analysis.

Results are reported in Table 2. First, after including COVID-specific variables, the coefficient of model-implied values changes from significantly positive to significantly negative, implying that model-implied values no longer trace realized CDS spread changes during the COVID-19 pandemic. In fact, the changing coefficient on $\widehat{\Delta cds}_{it}$ upon the inclusion of COVID-specific covariates suggests that after conditioning on mortalities, countries expecting wider CDS adjustment realized lower-than-expected spread changes. These results are fully consistent with fragile EZ countries, like the GIIPS, exhibiting relatively low CDS adjustment given their fiscal space compared to other EZ countries, as we showed in the previous section.

Second, new daily mortalities and the growth rate of new mortalities are both positively and significantly correlated with daily CDS spread changes across all specifications. Consistent with time-series evolution of the COVID residuals shown in the previous section (Figures 8), countries that had higher level of daily new mortality rates or higher new mortality growth rates were likely to realize more severe daily CDS spread changes. Third, country-specific announcements of fiscal responses to the pandemic appear significantly associated with daily CDS spread changes. Those countries which announced fiscal responses and thus increased their debt burden were more likely to experience greater daily CDS spread changes.

Importantly, our results show that COVID-specific factors explain the greatest share of variation in CDS spread dynamics during the COVID-19 pandemic period. In particular, mortality outcomes, especially daily new mortality dynamics, explain about 6 percent of the variation, and COVID-specific policy announcements add another 3 percent. By contrast, the dynamic factor model predictions only explain around 2 percent of the variation over this period. Given our daily frequency setting, the explanatory power of COVID-specific variables (which is about 10 percent in total) is substantial.

In Figure 11 we chart the aggregate (average) CDS spread dynamics over all Eurozone countries during the COVID-19 pandemic by plotting the aggregate realized values, model-implied values from Table 2 column [1], and model-implied values from Table 2 column [4]. Surprisingly, the aggregate model-implied values from Equation [4] – which controls for COVID-specific factors, traces the realized values almost perfectly so the their lines coincide with each other. Hence, we conclude that COVID-specific factors play an important role in explaining the divergence of CDS spread dynamics during the pandemic and thus shall not be ignored in debt pricing in Eurozone over this period.

IV. Concluding Remarks

We conclude the paper by placing the ECB's COVID-19 policies in the context of the short history of the Eurozone, and its future challenges. The Euro crisis of 2010-2015 exposed the growing asymmetries induced by unsustainable GIIPS borrowing sprees during 2000-2008, funded mostly by Germany, France, and other Core countries. The crisis induced painful internal adjustments and a sharp growth contraction of the GIIPS; at times when Germany and other core countries mostly sustained positive and robust growth. In contrast, the COVID-19 crisis is a global pandemic, adversely affecting EZ countries irrespectively of their borrowing and lending histories. The pandemic induced most EZ countries to follow

similar containment policies during the first wave of contagion and mortality, resulting in sharp contractions of demand and production, shared more equally among the EZ countries than the growth collapses experienced during 20010-2015. The GIIPS debt crisis of 2010-2012 provided a clear lesson about the risk of delaying policy action at times of peril, triggering self-fulfilling dynamics and inducing bad equilibria associated with fire sales, defaults, and financial meltdown. The looming threats of accelerated COVID-19 infection and mortality put fighting the medical and economic risks as the top EZ priority. The outcome is ‘COVID dominance’ – a rapid mobilization of resources to fund the medical system and local government challenged by emergency expenses, forced to provide emergency credit to the corporate sector to minimize costly bankruptcies and liquidation. COVID dominance suggests the need to keep these unconventional operations at rates dictated by the pandemic dynamics, probably until the arrival of effective vaccination or ‘herd immunity.

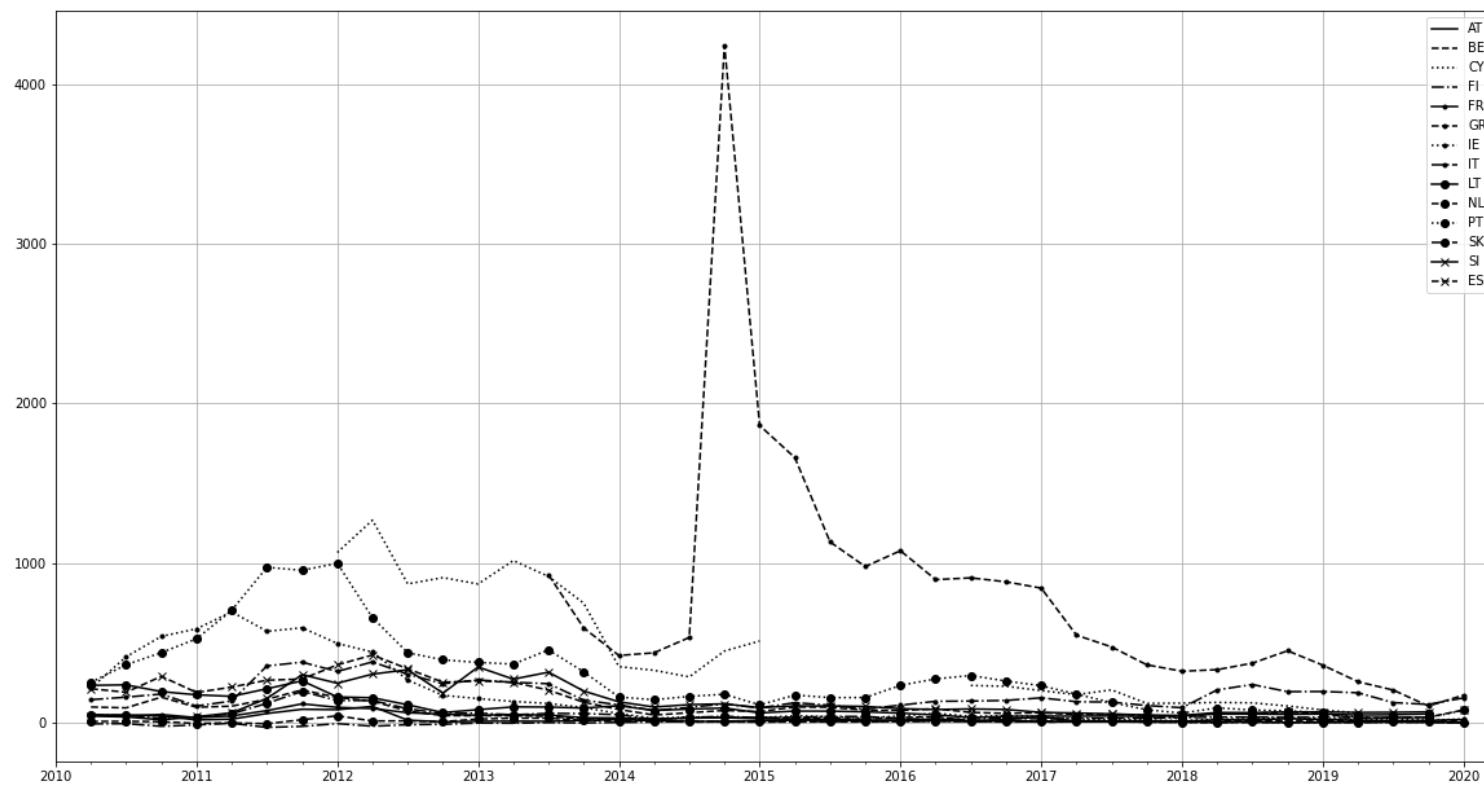
The outcome was the provision of ample liquidity and credit, the refinancing of existing debts at low-interest rates, and a broadening of the scope of QE policies. The evidence presented in this paper shows that the implementation of the PEPP and other programs (including the Federal Reserve Swap Arrangements; FRBNY, 2020) substantially reduced the dispersion of EZ sovereign spreads. During the first waves of the pandemic (2020, January-June), these policies prevented self-fulfilling runs on sovereign and corporate debt, thereby freeing and funding resources needed to fight the medical and economic consequences of the pandemic. These policies thereby increased the fiscal space of the GIIPS and other indebted countries, supporting expansionary fiscal policy needed to fund the medical and economic struggles associated with COVID-19.

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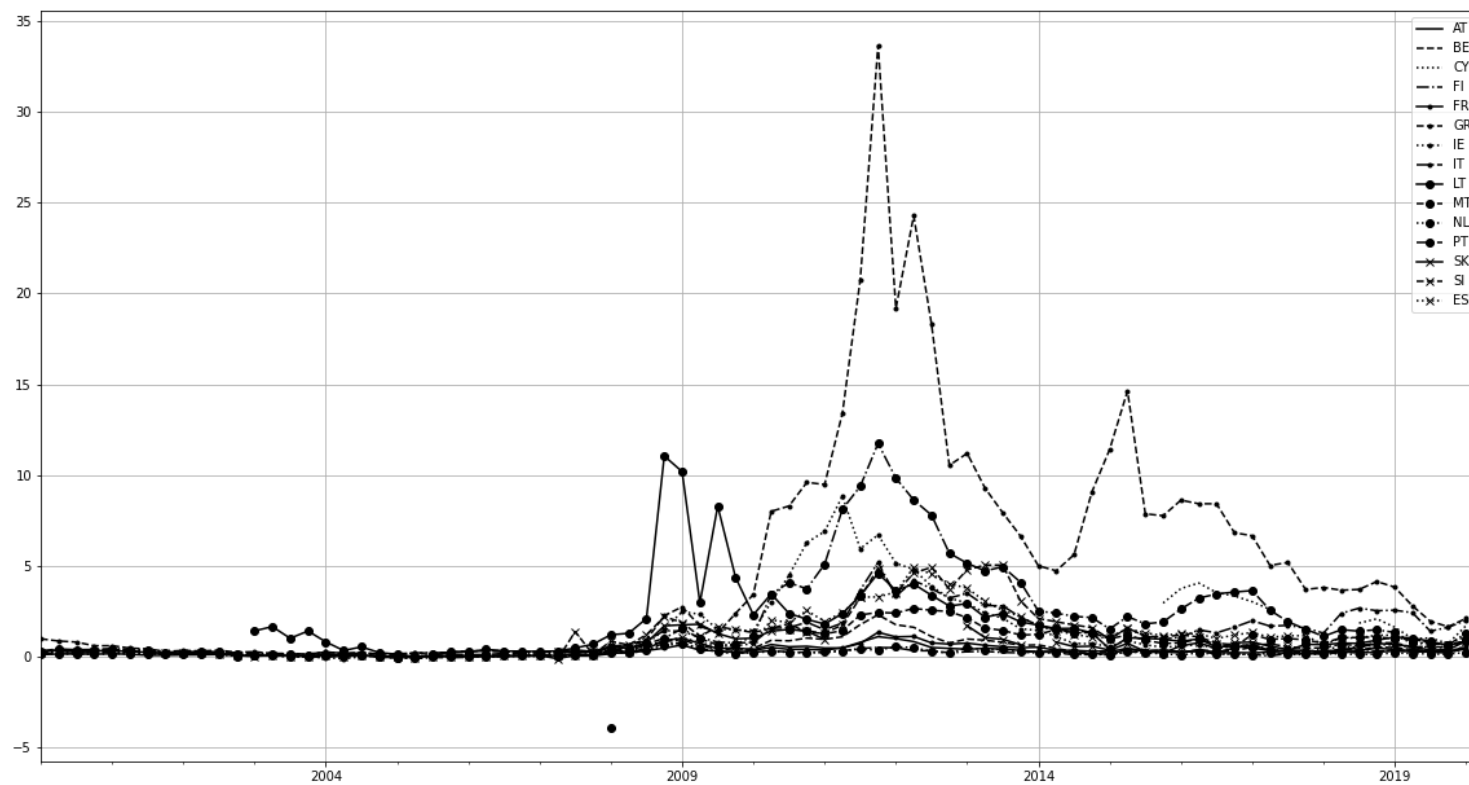
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Figure 1a. Sovereign 5-Year CDS Spreads over Germany.



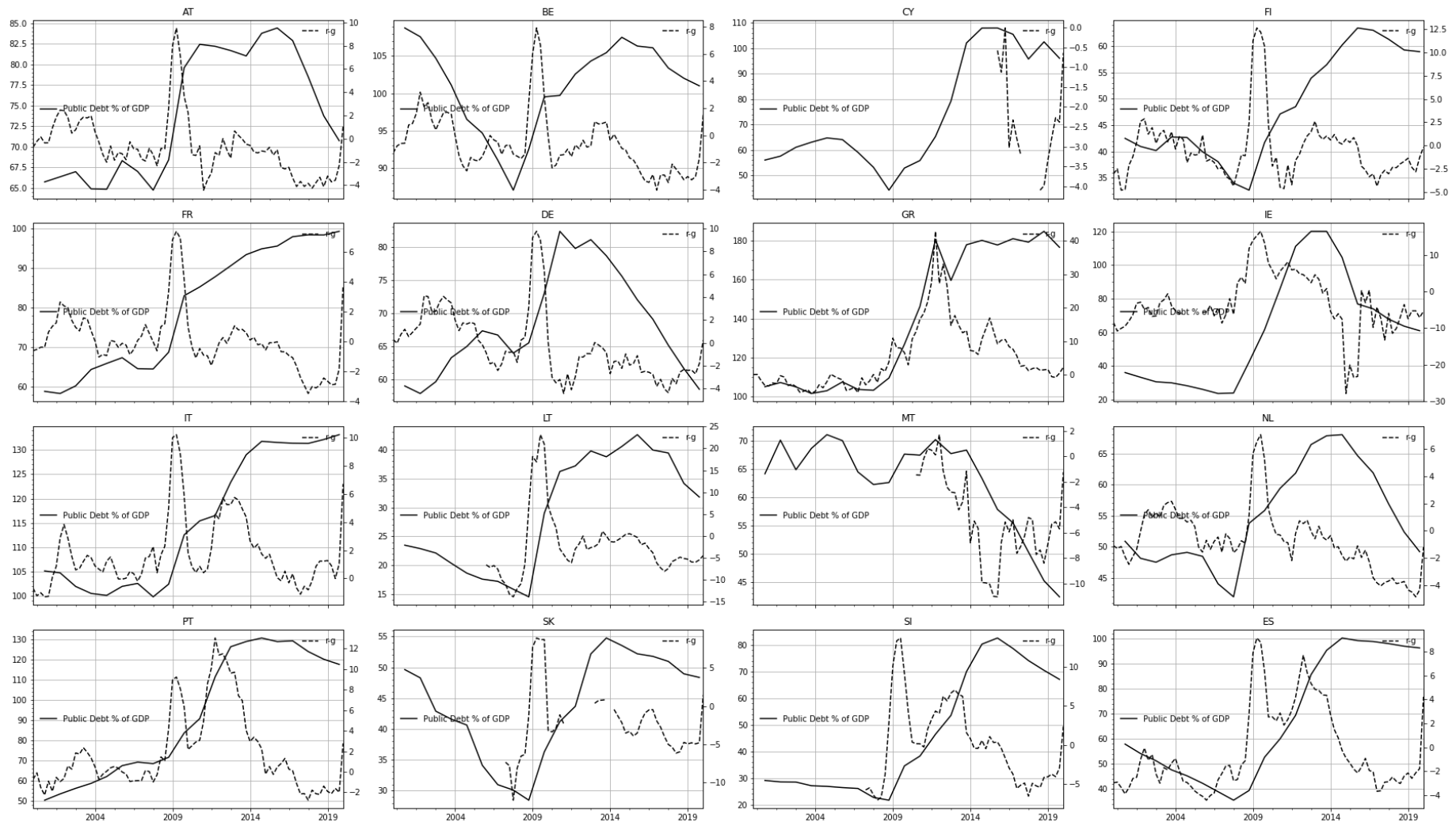
Note: Quarterly data from Markit; Thomson Reuters Refinitiv (Eikon API).

Figure 1b. Government Bond Yield Spreads over 10-Year Germany Yields



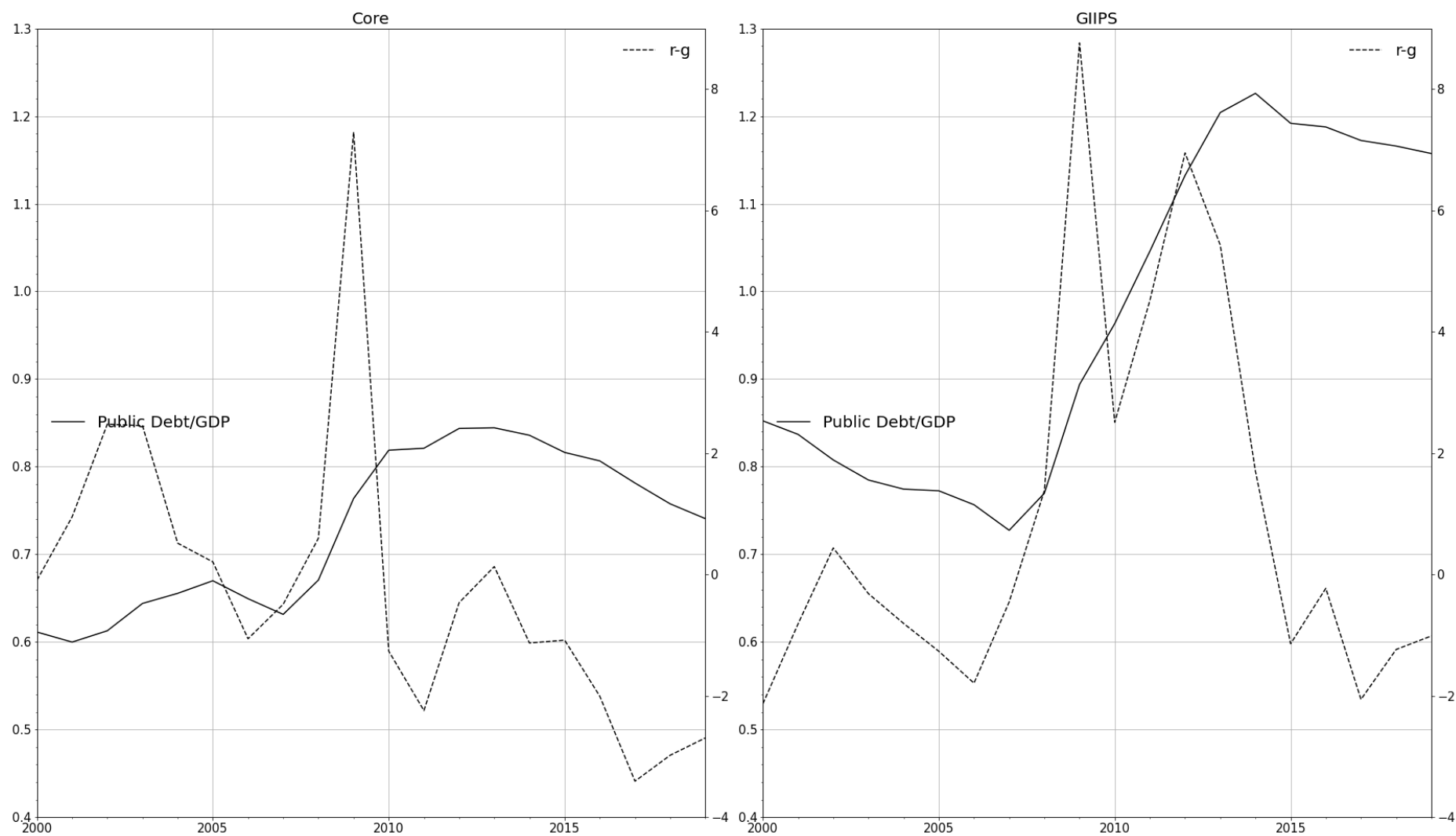
Note: Quarterly data from Thomson Reuters Refinitiv (Eikon API).

Figure 1c. Public Debt, Interest Rate, and Growth.



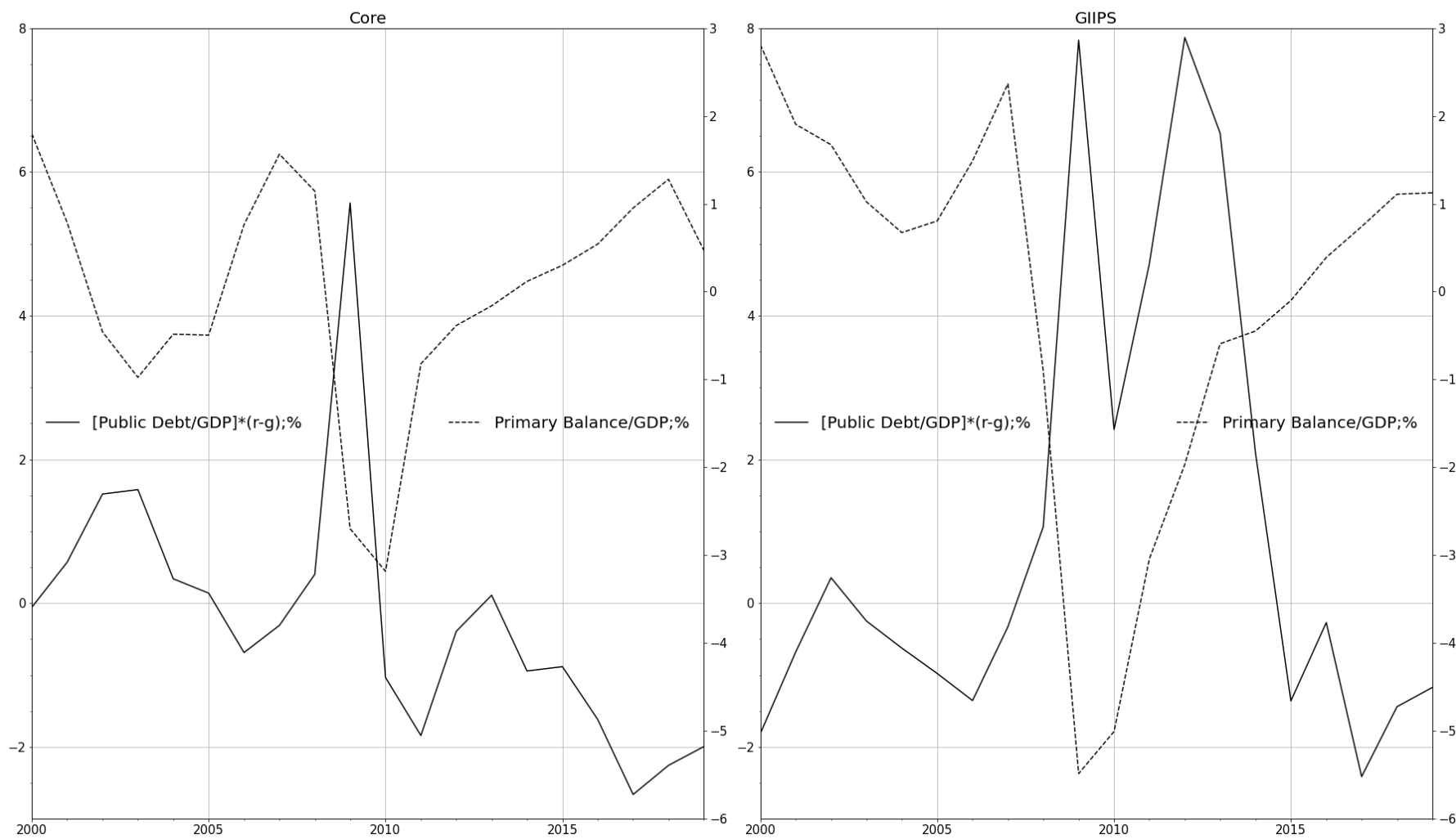
Note: WEO, Thomson Reuters Refinitiv (Eikon API).

Figure 1d. Public Debt, r-g: Eurozone Core and GIIPS.



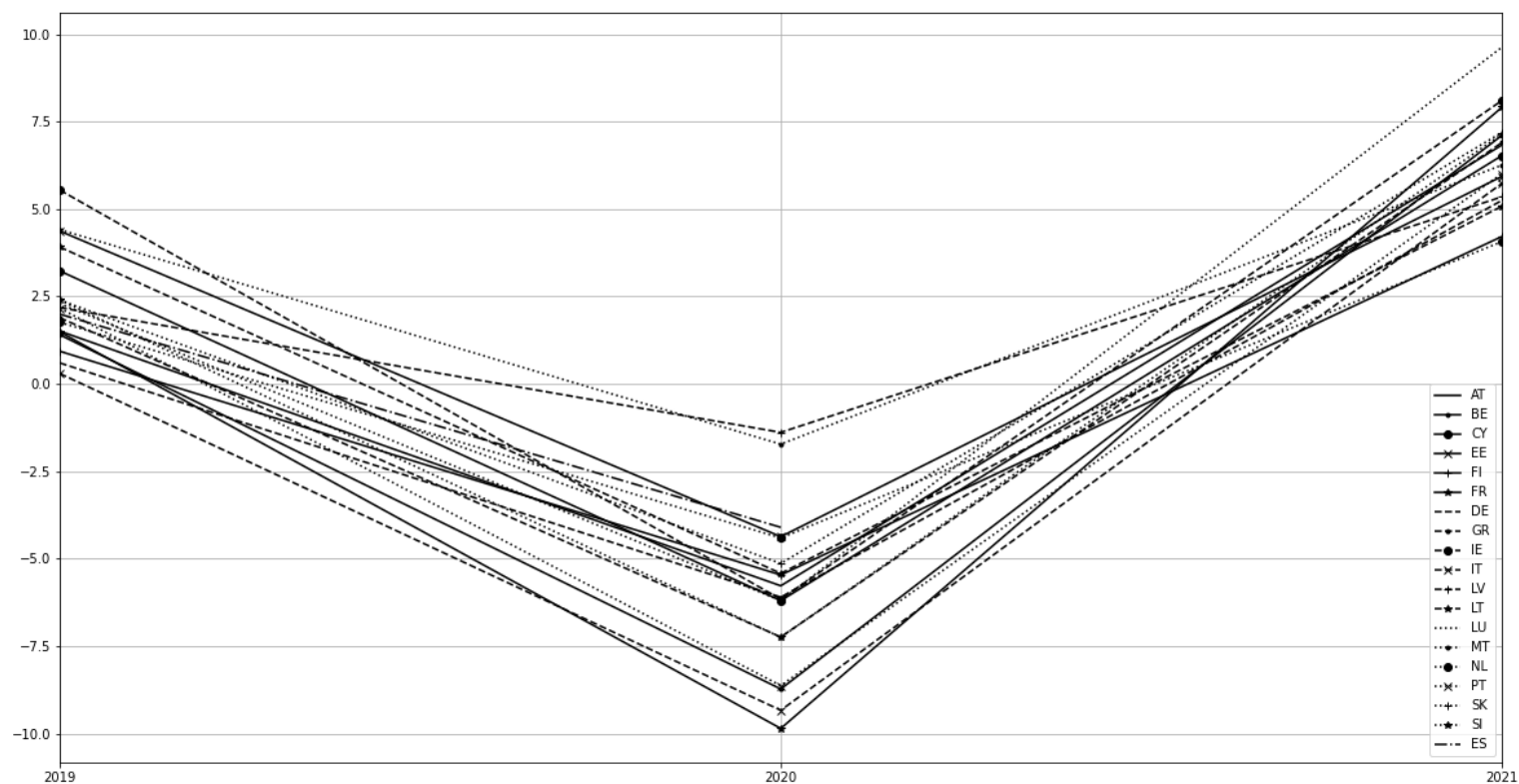
Note: WEO, Thomson Reuters (Eikon API); Core: Belgium, France, Germany, Netherlands; GIIPS: Greece, Ireland, Italy, Portugal, Spain.

Figure 1e. $[\text{Public Debt/GDP}] \cdot (r-g)$ and Primary Balance/GDP: Eurozone Core and GIIPS; %GDP'.



Note: WEO, Thomson Reuters (Eikon API); Core: Belgium, France, Germany, Netherlands; GIIPS: Greece, Ireland, Italy, Portugal, Spain.

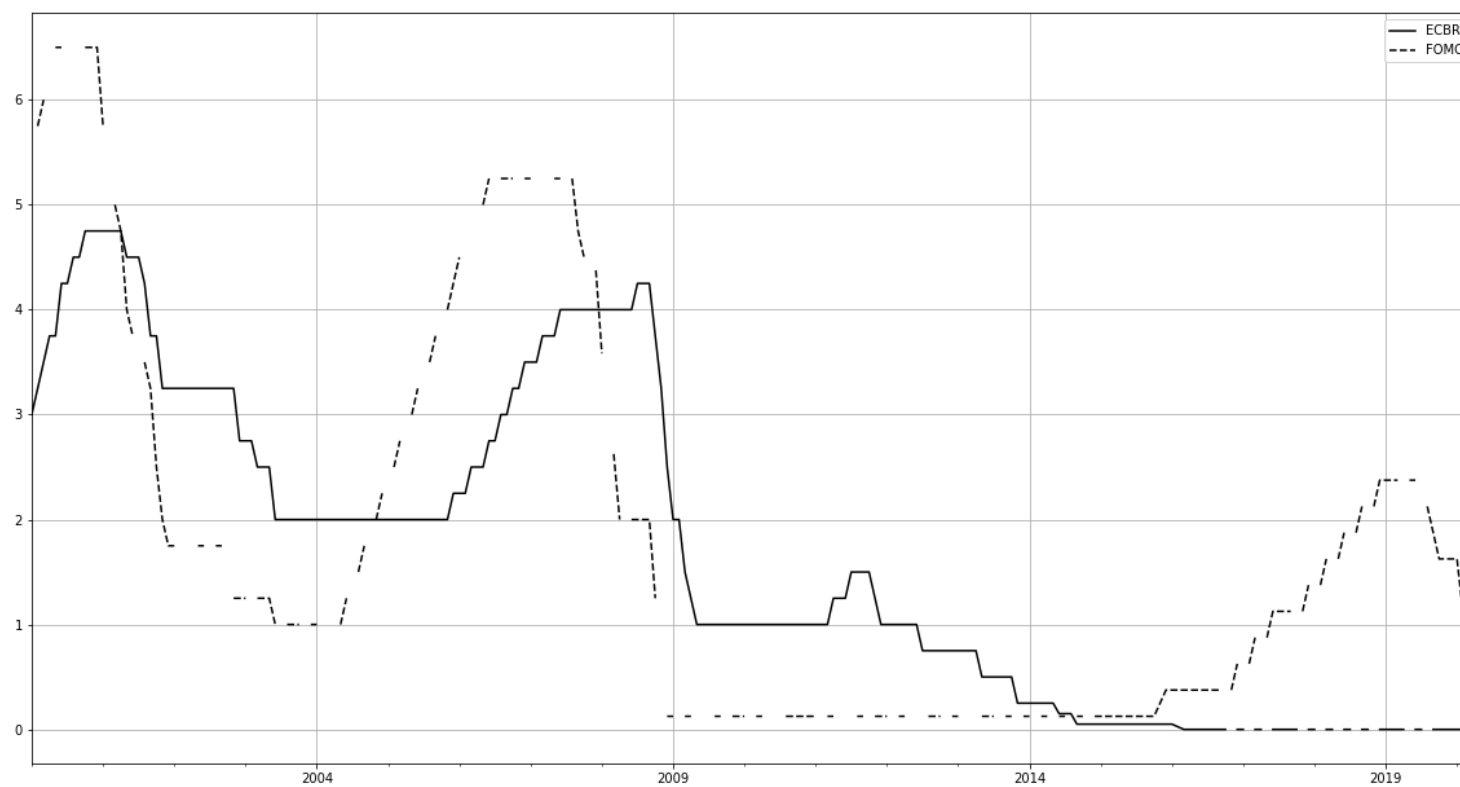
Figure 1f. GDP Forecasts.



Note: Oxford Economics, INE (Spain); Thomson Reuters Refinitiv (Eikon API).

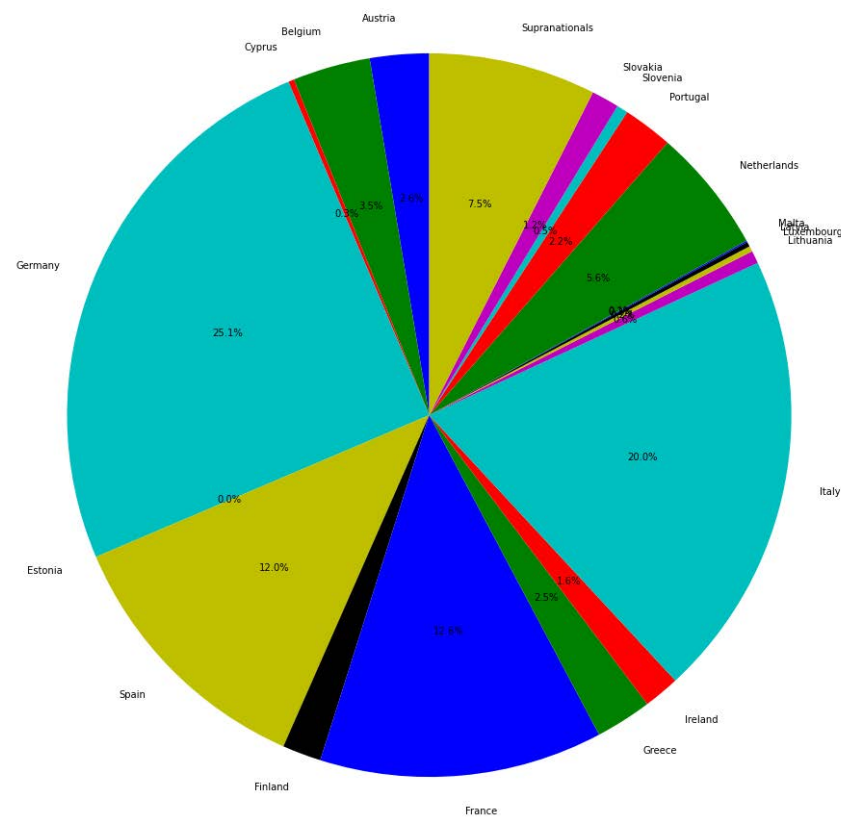
Covid-19 wreaked havoc on both domestic and external demand in France, Italy and Spain, while contractions in smaller Eurozone economies were sizeable but less severe. With the exception of Malta, the forecast range is $[-5.5\%, -9\%]$, based on [FocusEconomics Forecast](#) (accessed 6/20/2020).

Figure 2a. ECB Rate and FOMC decisions.



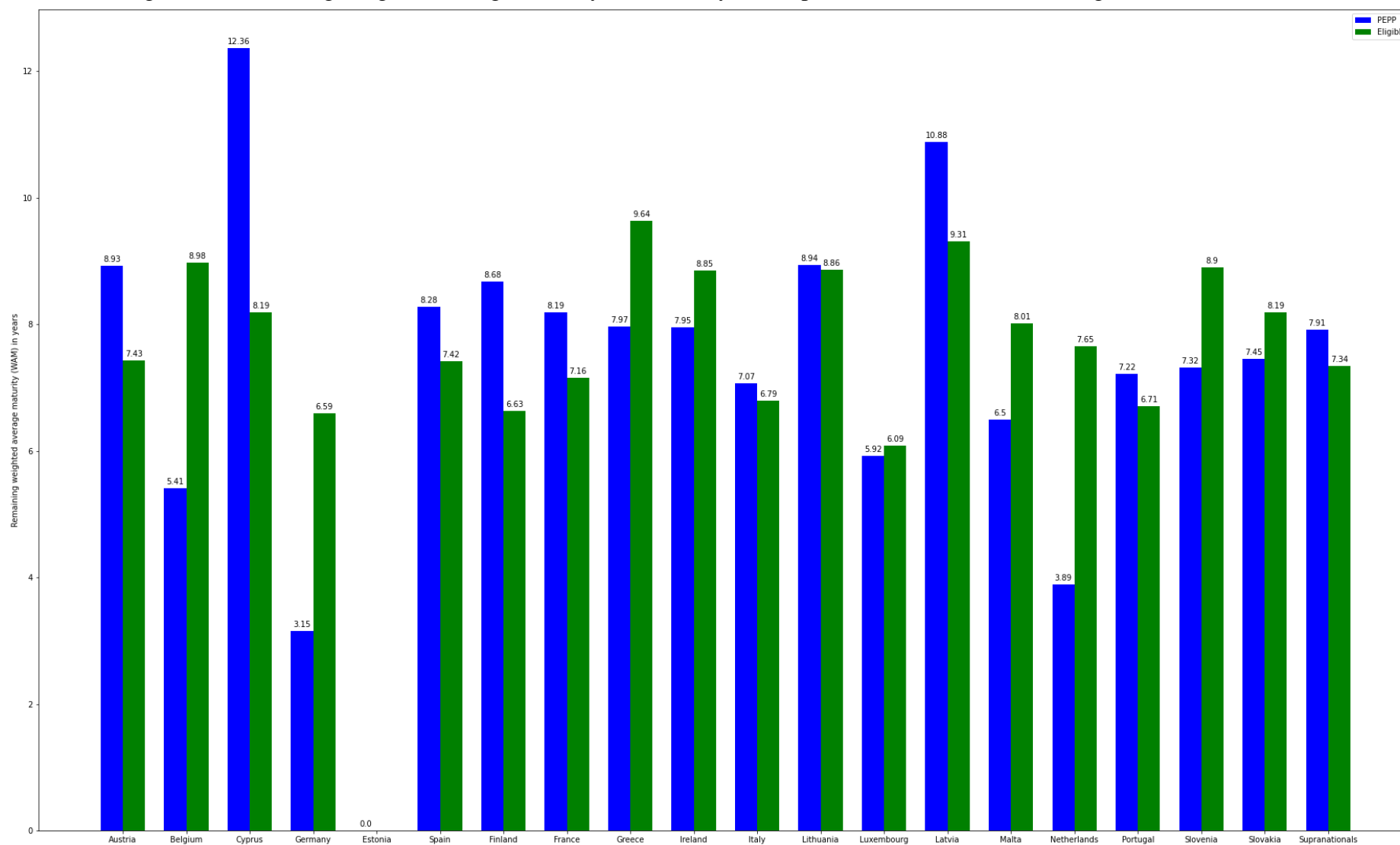
Note: Monthly data from Thomson Reuters Refinitiv (Eikon API).

Figure 2b. Pandemic Emergency Purchase Programme: Net Purchases March-May 2020.



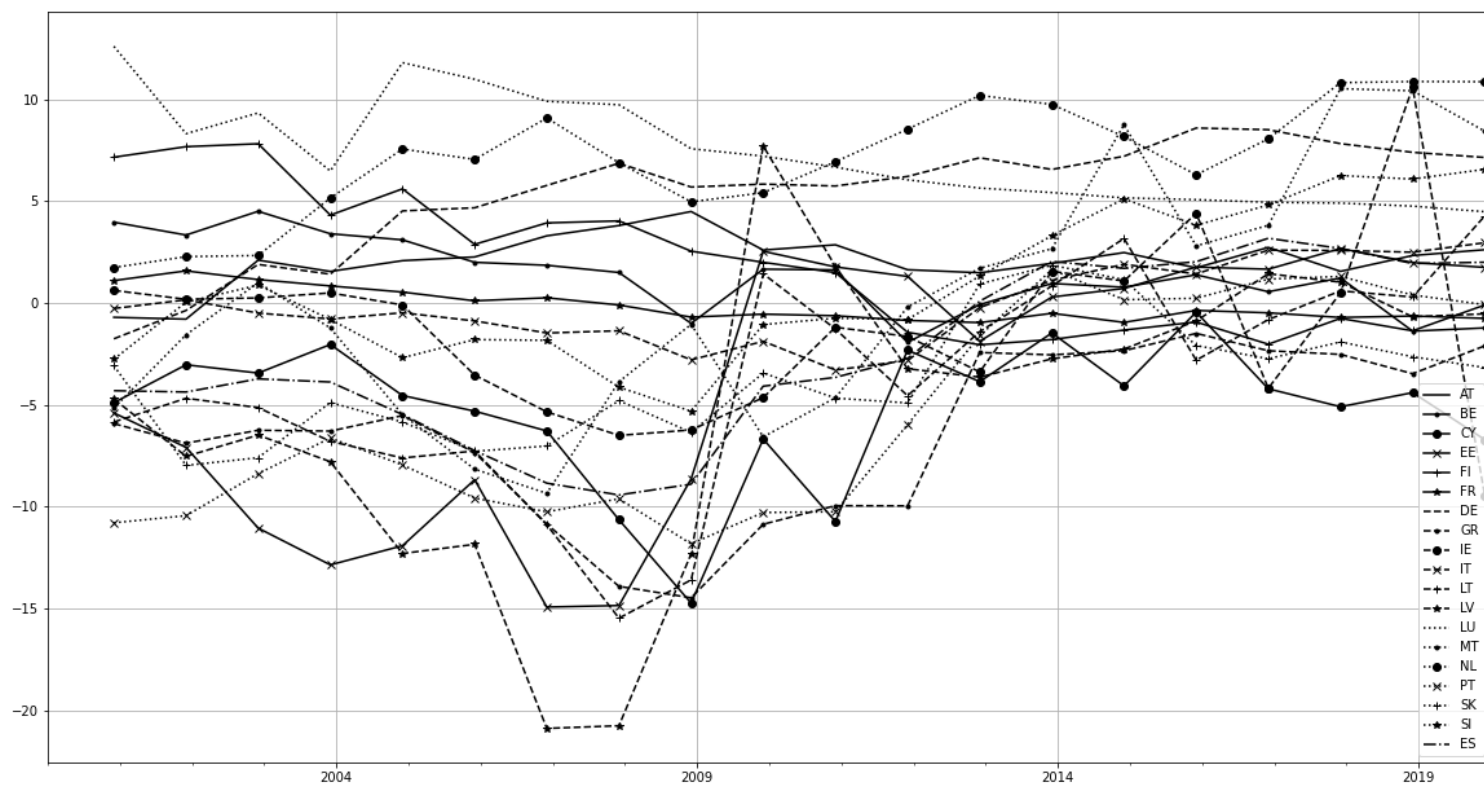
Note: Based on ECB statistics (<https://www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html>)

Figure 2c. Remaining weighted average maturity (WAM) in years of public sector securities holdings under ECB-PEPP.



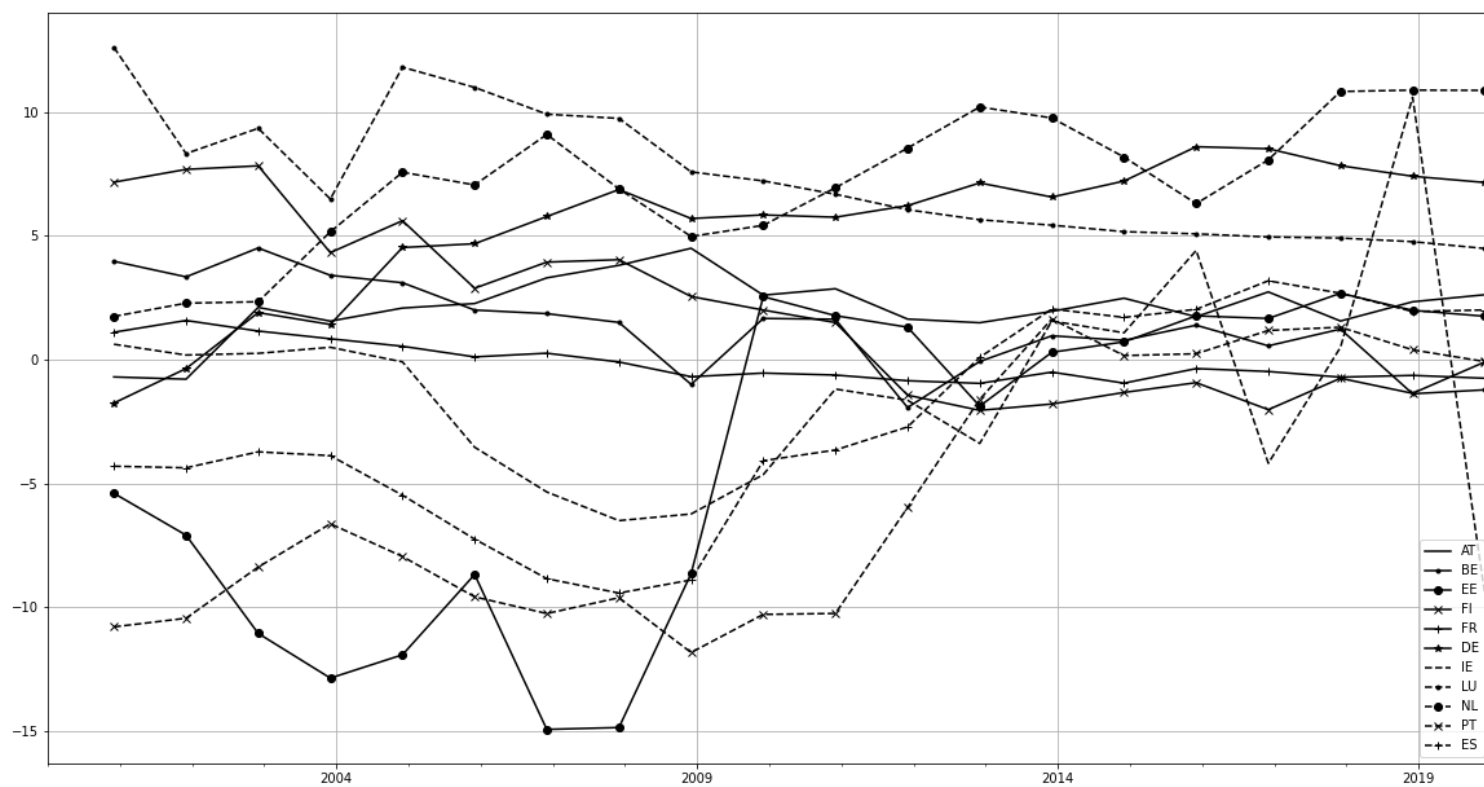
Note: Based on ECB statistics (<https://www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html>)

Figure 3a. Current Account Balance % of GDP.



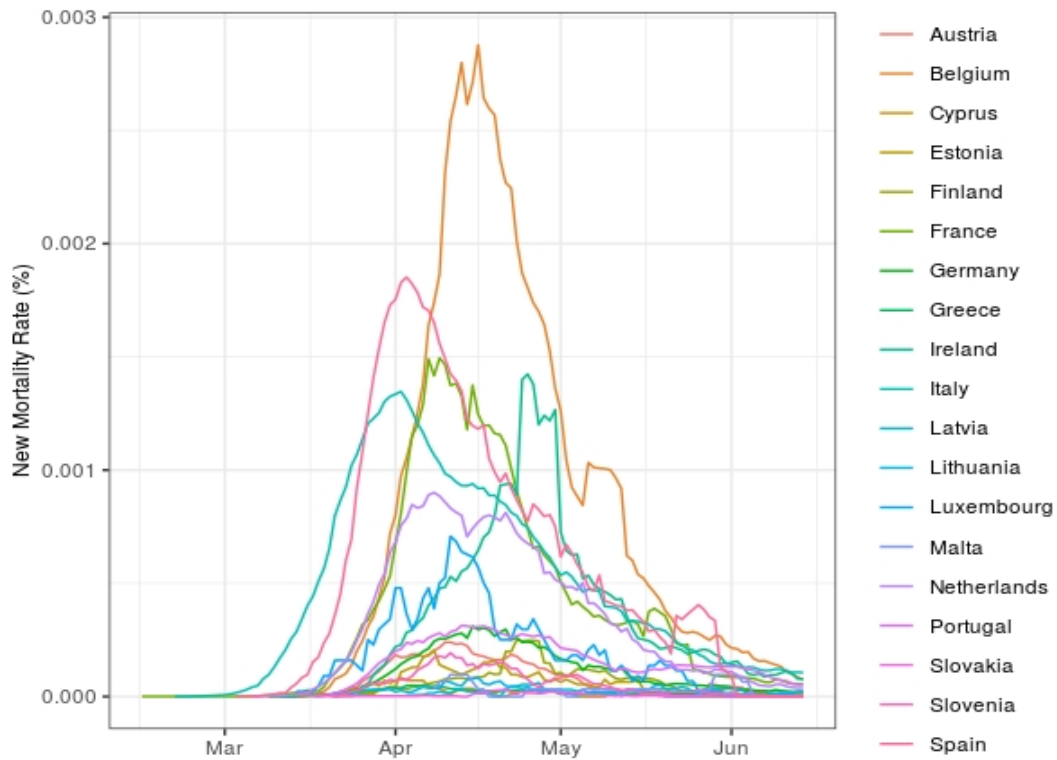
Note: WEO; Thomson Reuters Refinitiv (Eikon API).

Figure 3b. Composite Leading Indicators in Business Cycles.



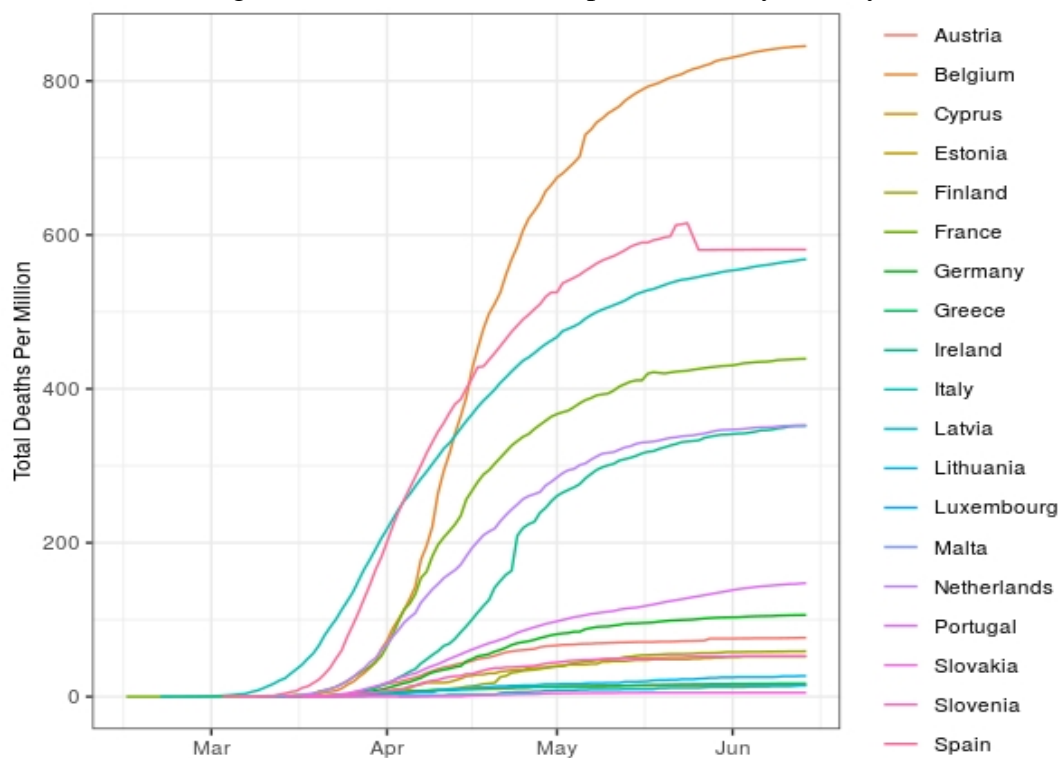
Note: OECD Main Economic Indicators CLI, Thomson Reuters Refinitiv (Eikon API).

Figure 4a. COVID-19 mortality rate curves, by country



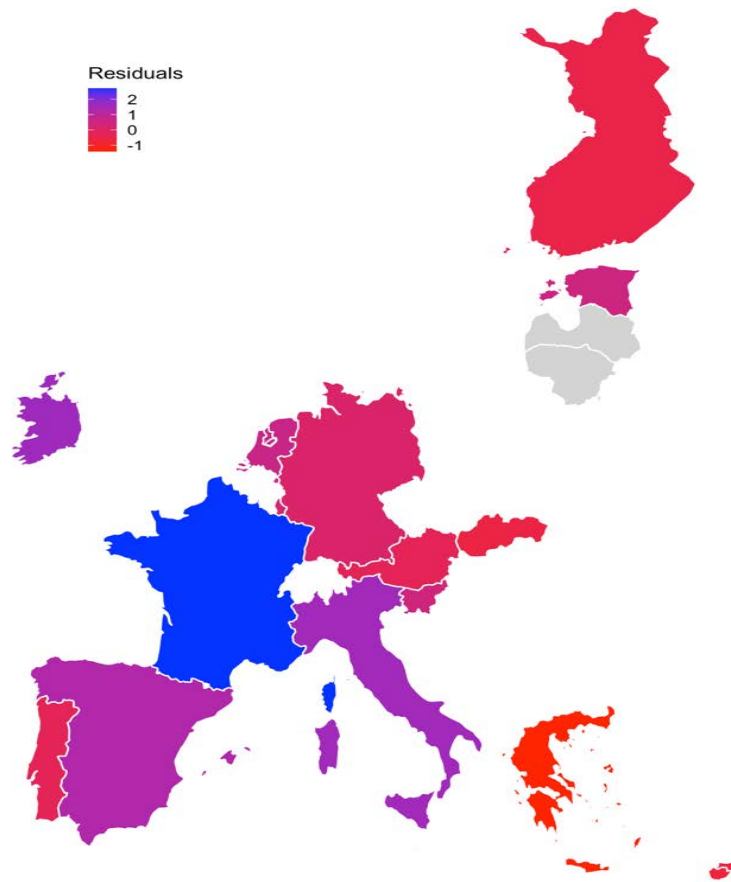
Note: New Mortality Rate, as 7-day rolling averages.

Figure 4b. COVID-19 deaths per million, by country



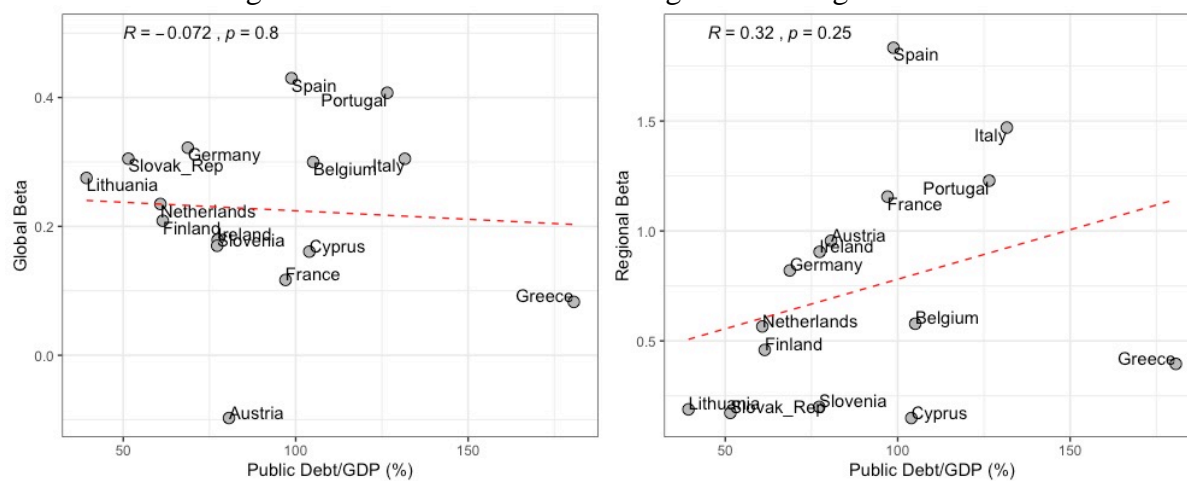
Note: Calculated as COVID-19 deaths per million residents.

Figure 5. Patterns of Over/Under Predicted Mortality Rates in the Eurozone.



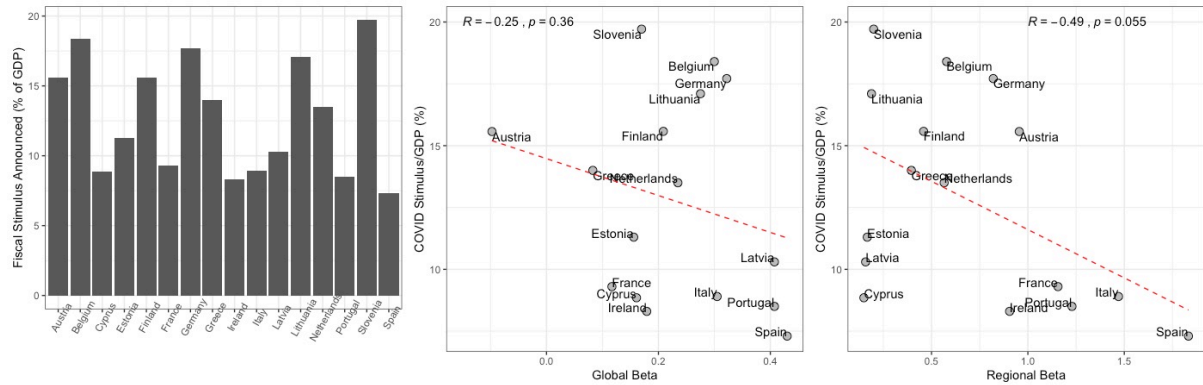
Note: The peak new mortality rates of France, Belgium, Ireland, Italy, and Spain were overpredicted. At the same time, those of Greece, Cyprus, Slovak Republic, Finland, and Portugal were underpredicted (Jinjarak et al., 2020).

Figure 6. Public Debt/GDP versus global and regional betas.



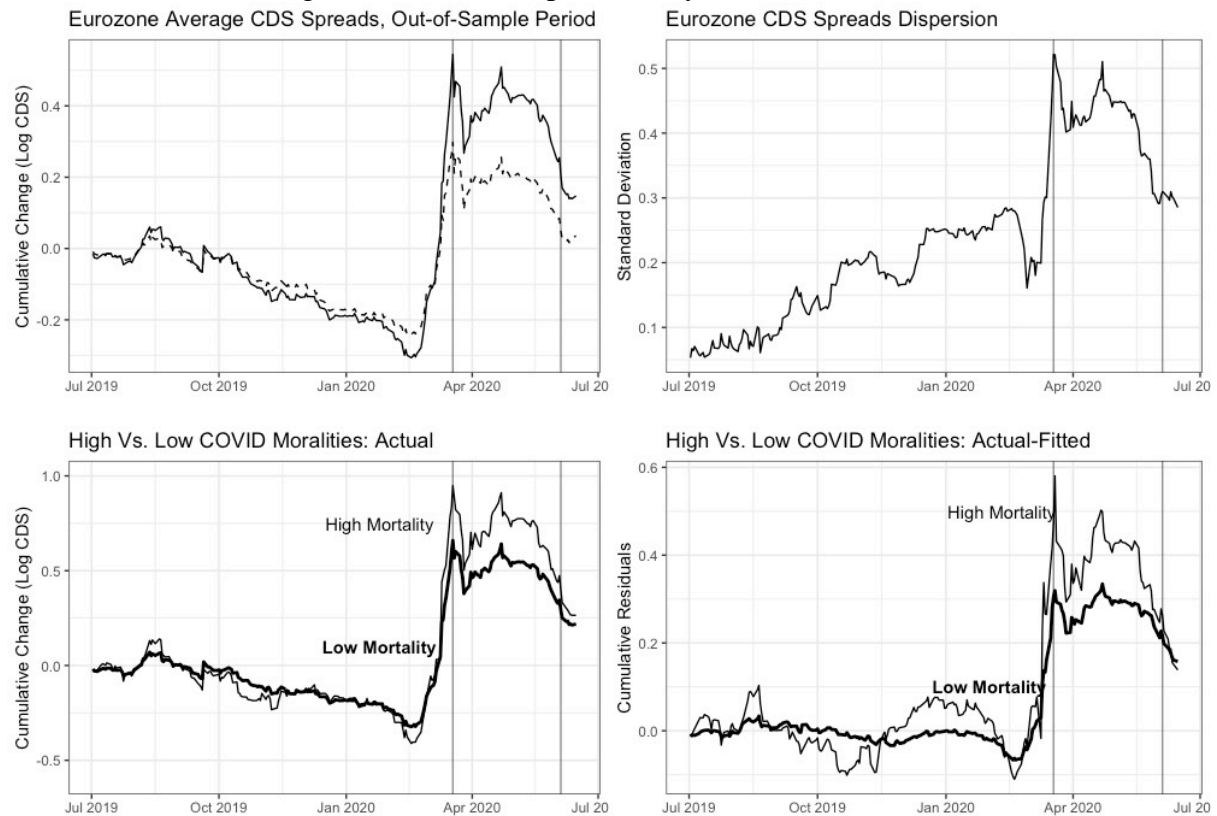
Note: Public debt measures are the 2014-2018 average. Betas are estimated during the pre-COVID period, Jan 2014 – June 2019.

Figure 7. Announced 2020 COVID-related fiscal stimulus versus global and regional betas.



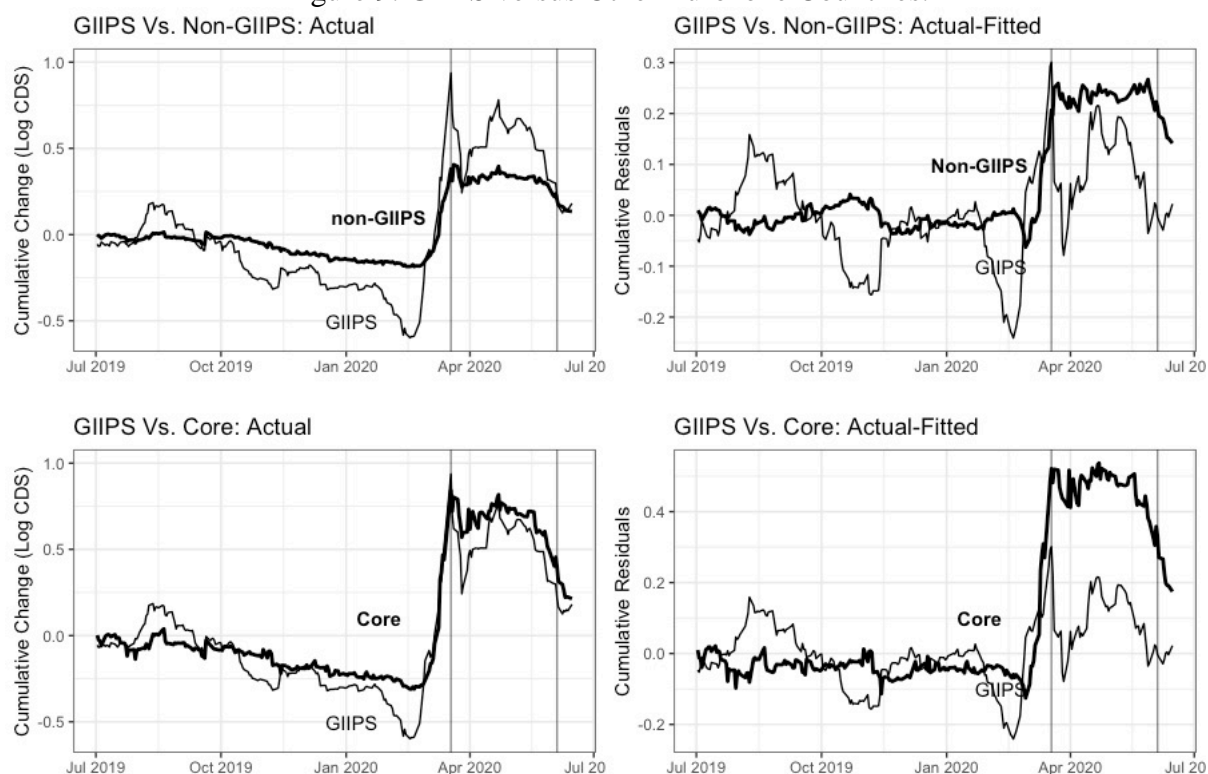
Note: COVID-19 fiscal stimulus data taken from the IMF COVID policy tracker. Betas are estimated during the pre-COVID period, Jan 2014 – June 2019.

Figure 8. Eurozone Spreads, July 2019 – June 2020.



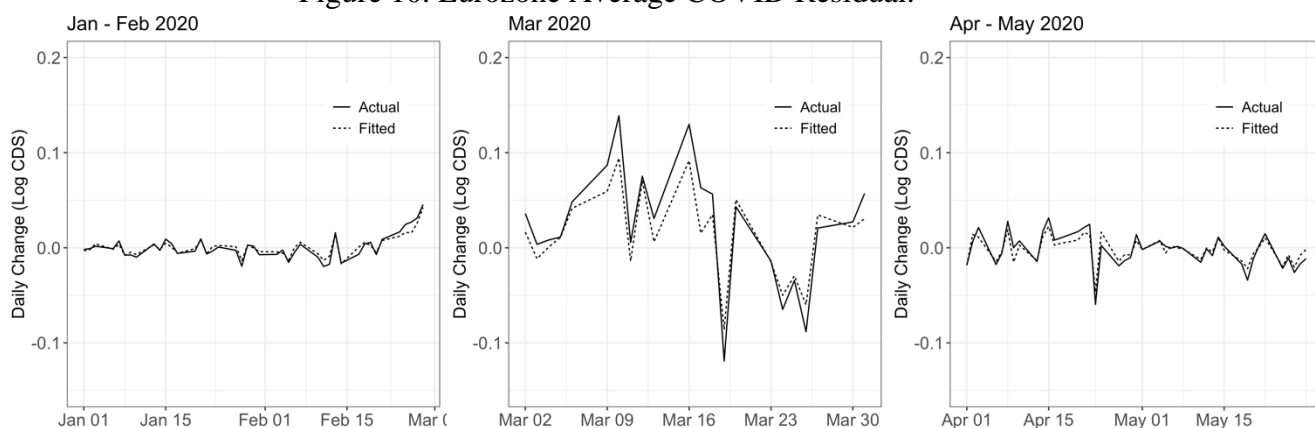
Note: Dashed line in upper-left figure reflects model-implied values. Vertical lines reflect May 18th and Jun 4th. Lower-right figure, Actual-Fitted reflects the cumulative COVID residual, where the model was fitted to Jan 2014 – June 2019 data.

Figure 9. GIIPS versus Other Eurozone Countries.



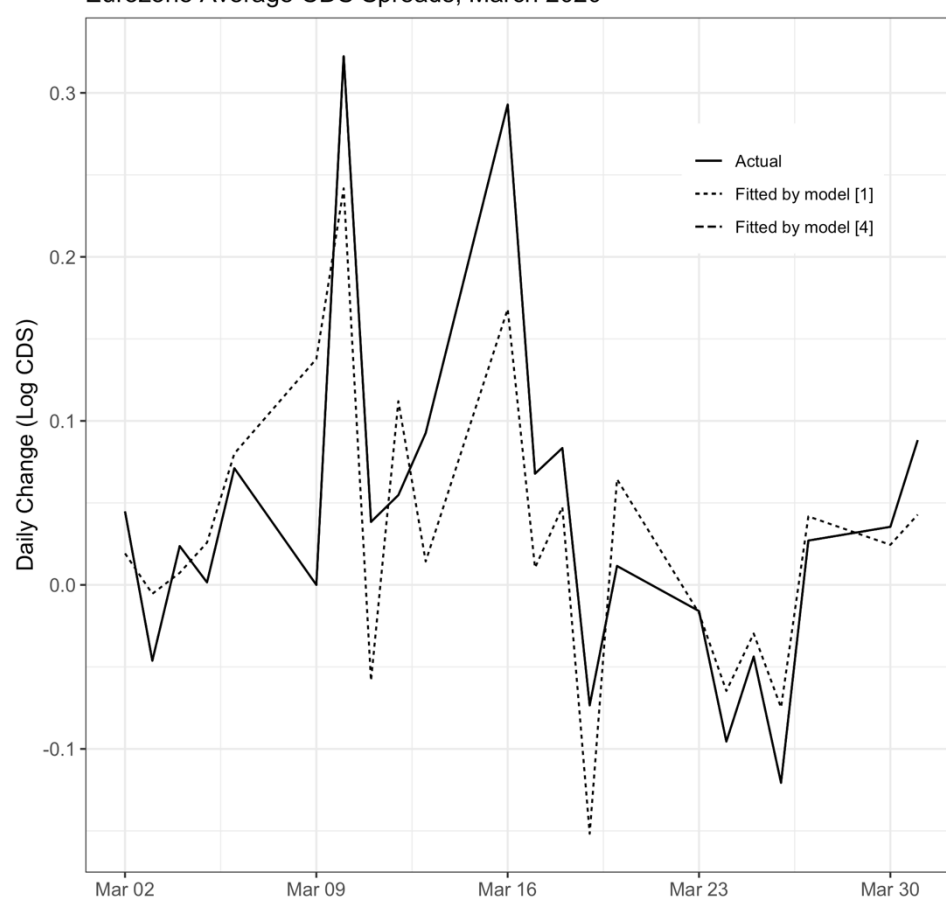
Note: Vertical lines reflect May 18th and June 4th. RHS figures, Actual-Fitted reflects the cumulative COVID residual, where the model was fit to Jan 2014-June 2019 data.

Figure 10. Eurozone Average COVID Residual.



Note: COVID Residual: the difference between the actual CDS adjustment and the change implied by the model, at both the individual country and aggregate EZ levels over the pandemic period. Realized (solid) and fitted (dashed, factor model estimated on 2014-2019 data from Equation [1]) daily EZ average CDS changes, separated by 2020 time periods.

Figure 11. COVID-Related Risks and Factors Accounted for Eurozone Average CDS.
Eurozone Average CDS Spreads, March 2020



Note: Solid lines reflect the realized daily average EZ CDS spreads changes. Dashed lines reflect predicted average EZ CDS spreads changes implied by the specifications [1] and [4] of Table 2, respectively.

Table 1. Sovereign Spread COVID Residual, Pandemic Sample

	<i>Dependent variable:</i>		
	Sovereign Spread COVID Residual		
	(1)	(2)	(3)
New Mortality Rate	0.0096** (0.0043)	0.0102* (0.0055)	0.0108* (0.0056)
New Mortality Rate Growth	0.0033*** (0.0008)	0.0035*** (0.0010)	0.0033*** (0.0010)
Total Mortality Rate	-0.0004 (0.0006)	-0.0004 (0.0008)	-0.0004 (0.0008)
Total Mortality Rate Growth	-0.0456 (0.0433)	-0.0510 (0.0482)	-0.0510 (0.0492)
Mobility		0.0004 (0.0006)	0.0003 (0.0006)
SI Growth		0.0093 (0.0553)	0.0141 (0.0567)
Country Fiscal Policy Dummy			0.0394* (0.0219)
EU Fiscal Policy Dummy			-0.0065 (0.0647)
ECB Policy Dummy			0.0323 (0.0696)
Fed Policy Dummy			0.0414 (0.0747)
Fixed effects?	Y	Y	Y
Observations	156	149	149
R ²	0.0416	0.0423	0.0600
F Statistic	1.2362	0.7883	0.6569

Note:

COVID Residual: the difference between the actual CDS adjustment and the change implied by the model, at both the individual country and aggregate EZ levels over the pandemic period. *, **, *** correspond to 10%, 5% and 1% significance, respectively. HAC robust standard errors, clustered by country. Time and Country FEs.

Table 2. Panel Analysis on Daily CDS Spread Change, Pandemic Sample (March-May 2020).

	<i>Dependent variable:</i>			
	Daily CDS Spread Change			
	(1)	(2)	(3)	(4)
Fitted Daily CDS Spread Change	0.3689** (0.1797)	-0.4345** (0.1912)	-0.4707** (0.1954)	-0.5135*** (0.1856)
New Mortality Rate		0.0086** (0.0034)	0.0087* (0.0047)	0.0094* (0.0050)
New Mortality Rate Growth		0.0038*** (0.0008)	0.0038*** (0.0011)	0.0029*** (0.0010)
Total Mortality Rate		-0.0005 (0.0004)	-0.0005 (0.0006)	-0.0004 (0.0006)
Total Mortality Rate Growth		-0.0169 (0.0407)	-0.0151 (0.0478)	-0.0135 (0.0473)
Mobility			0.00002 (0.0008)	-0.0001 (0.0007)
SI Growth			0.0044 (0.0464)	0.0069 (0.0407)
Country Fiscal Policy Dummy				0.0475** (0.0218)
EU Fiscal Policy Dummy				-0.0138 (0.0584)
ECB Policy Dummy				-0.0261 (0.0678)
Fed Policy Dummy				-0.0509 (0.0558)
Fixed effects?	Y	Y	Y	Y
Observations	374	156	149	149
R ²	0.0206	0.0812	0.0866	0.1184
F Statistic	7.0406***	1.9975*	1.4351	1.2448

Note:

COVID Residual: the difference between the actual CDS adjustment and the change implied by the model, at both the individual country and aggregate EZ levels over the pandemic period. *, **, *** correspond to 10%, 5% and 1% significance, respectively.

HAC robust standard errors, clustered by country. Time and Country FEs.