

# 3 THE IMPACT OF FISCAL POLICY DECISIONS ON GOVERNMENT BOND YIELDS DURING A CRISIS: EVIDENCE FROM THE COVID-19 PANDEMIC

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## Abstract

*This paper analyzes the link between political responses to major crises, based on observations from 18 emerging countries and 27 advanced economies during the COVID-19 period, and sovereign bond yields. Using an unconditional quantile regression approach, we show that the dynamics of sovereign bond yields respond asymmetrically to a series of covariates such as industrial production, interest rates, business confidence, inflation, the exchange rate, and unemployment. The paper highlights a more pronounced effect in advanced economies compared to emerging ones, thereby contributing to the existing literature. Moreover, the decision to postpone tax payments for both individuals and corporations led to an increase in confidence in the solvency of bond-issuing countries, regardless of whether the economies were emerging or advanced.*

**Keywords:** COVID-19, Government Bonds, Unconditional Quantile Regression, Policy Responses to COVID-19

**JEL Classification:** G12, G28, C21

## 1. Introduction

Due to the COVID-19 pandemic, in 2020 all the states of the world faced a significant contraction of the economic activity. In many economies the need for physical distancing to prevent the spread of COVID-19 has led to the so-called "shutdown" effect, which resulted in a sharp

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contraction of demand, followed by a subsequent reduction of supply, short-term and medium-term lack of liquidity at the business level and also at the economy level. Under these circumstances, states' access to finance on international markets has been the key to overcoming this issue when most European Union countries expected significant recessions, especially given that shorter or longer periods of "shutdown" are expected to continue. The most affected economic sectors, according to the European Commission, are transport services, restaurants and tourism, the car industry, oil and gas, but little by little, others have been affected. However, at the level of the EU the response came quickly and generous, through available financial resources to support jobs and economic activity, special rules for state aid schemes and, later on, a comprehensive Mechanism for Resilience and Recovery (MRR) of almost one trillion euros, nearly doubling the budget for the new financial exercise, for restoring the EU economies and strengthening them through a combination of reforms and investments. This program was financed through centralized borrowings at the level of the EU, which helped member states containing the borrowing costs and protecting domestic public finance. Basically, all MSs benefitted of loans for recovery at the cost of a triple-A issuer. Beyond positive fiscal and macroeconomic impact, this premier commonly issuance of public debt has a remarkable significance for the EU, as it is the first such borrowing effort, taking the economic union integration at the next level.

It is clear that Covid-19 period has a major impact on the economic environment, which is why countries have searched for solutions to support the business environment, in order for the businesses to continue and this has often meant the massive subsidy of the affected activities. Also, the government guarantee of the credits for the SMEs or the subsidy from the state budget of the salary costs for the affected entities, things that affected and changed the fiscal policy of the states. All of this required a quick funding so that countries began to attract capital through the issuance of government bonds with far higher returns than in the past.

At the macroeconomic level, several elements have been identified that still need to be addressed, and government support is essential for the stabilization of the economy as soon as possible. First of all, we are talking about (1) a demand deficit and at the same time a supply deficit. This crisis has generated a shock, both in terms of aggregate demand and in terms of aggregate supply. The uncertainty of tomorrow, the restrictions, as well as the state of panic induced by COVID-19 has led to a massive decrease in the demand for certain products and services. The population was interested in purchasing products to meet basic needs (food, medical products, etc.) and, for this reason, the activity of entities that provide goods and services that do not meet these needs has been affected (beauty salons, restaurants, hotels, etc.). At the same time, the supply of products has decreased significantly due to the disruption of distribution chains, because traditional Asian suppliers have reduced production creating gaps that have affected the entire planet. We have seen the effect of these last actions even today when most advanced states have a high inflationary effect, one of the causes being these issues. At the same time, we are talking about (2) the reduction of liquidity and direct investment in the economy which has led to a great need for government funding. Uncertainty often blocks development, with most entities tending to convert their capital rather than risk investing in an uncertain economy.

At the same time, the lack of consumption leads to the lack of liquidity and thus resources to the state budget so necessary in the conditions of macroeconomic recovery. Last but not least (3) The United Nations 2030 agenda for Sustainable Development is intended to be universally applied to all countries in order to achieve the objectives of eradicating poverty and increasing well-being achieved through sustainable development and without adverse effects on the environment. The latter also requires significant government investment, and their sources of funding are of interest to every state.

The purpose of this study is to identify the determinants that can influence the yield of government securities, especially the impact of fiscal policy decisions, in the current economic environment.

The article is organized as follows: in the next section we will present the main aspects of the literature regarding the fiscal-budgetary policy factors that influence the yield of government securities, then we will present the methodology used and aspects of data analyzed, the results and conclusions are being addressed at the end.

## **2. Literature review**

There are studies in the literature that have analyzed the determinants of government bond yields. The yield on government bonds is closely linked to country risk, especially in emerging economies, but also to some possible economic shocks that may exist globally, and the COVID-19 pandemic is no exception. There are many macroeconomic factors that could have an impact on a country's long-term risk. An important influence on the upside or downside of government yields in recent years has been largely based on the importance of fiscal policy discipline, many papers finding that higher fiscal deficits and public debt increase interest rates.

In terms of the inflation rate, it can often be seen as a proxy for the quality of a government's economic management, and as a result, the higher the inflation rate, the higher the bond yield is expected to increase (Haque et al, 1996). At the same time, international developments can influence the internal and external economic performance of a country and can affect the liquidity and solvency of emerging states, but can also have an effect on advanced ones (Edwards, 1986, Sachs, 1985). At any given time, lower budget revenues and a larger current account deficit, can lead to a higher likelihood of short-term liquidity problems and, consequently, debt service difficulties. If, in addition to these aspects, a country has a decrease in the growth rate of industrial production, then we can also speak of an increased risk of long-term insolvency and therefore the ratings of government securities are lower. (Hanson, 1974, Edwards, 1983).

Along with international developments, which in a globalized economy constantly influence the economies of states, external shocks can have a direct and short-term effect on government bond yields. Over time, changes in international interest rates have been a key factor influencing capital flows to emerging countries. Since interest rate affects not only the cost of new government debt but also interest rates, existing debt that is contracted at a higher rate will make countries vulnerable to global financial developments (Barr and Pesaran, 1997; Calvo et al, 1993).

While many studies are focused on United States economy, there are also studies that analyse the situation in the European and OECD countries. Gale and Orszag (2003) find that weaker tax collection increases interest rates. The effect of fiscal policy on interest rates is greater when the fiscal deficit has a negative trend in recent years, rather than the public debt (Faini, 2006, Laubach, 2009). Other studies examine future expectations about fiscal policy and its effects on the yield on government securities, and real debt and deficit values directly impact the interest rate (Haugh et al., 2009).

Many studies analyse the financing costs of emerging economies. The effect of risk aversion on financing costs in emerging economies by identifying the determinants of government bond yields is studied by McGuire and Schrijvers (2003) who find that risk aversion is a significant factor in yield fluctuations, while Eichengreen and Mody (2000) shows that changes in market perspective and sentiment can affect government bond yields to the same extent. Gonzalez-Rozada and Levy-Yeyati (2008) find that, in addition to risk aversion, global liquidity plays a central role, which was also the case in the context of the COVID-19 pandemic.

Recent studies have shown that the level of total public spending does not affect the spreads of government bond yields, but instead there is a compositional effect: a higher increase in public investment leads to a decrease in government bond spreads. This may be due to the fact that government spending is often seen as less efficient (especially in emerging countries) and may be associated with lower growth prospects, leading investors to demand higher yields on

government bonds (Combes et al., 2021). Also, studies suggest that fiscal policy makers face a difficulty to adopt the right type of fiscal expansion, and to find the right time to pivot from short-term stabilisation to fiscal consolidation while protecting investment (Larch et al., 2024).

Moreover, post pandemic studies concluded that pre-existing policy space was more important than characteristics and the extent of “stress” in determining how a country responded to COVID-19 (Bergant and Forbes, 2023). Also, the impact of the monetary policy announcements on 10-year sovereign bond yields was more substantial than on stock market returns and exchange rate returns (Grabowski et al., 2023).

The aim of this paper is to analyse the determinants of government bond yields in comparison between emerging and advanced economies, with a particular focus on the impact of fiscal policy in the context of the COVID-19 pandemic.

### 3. Policy response to COVID-19

The database contains the selection of a representative sample of emerging and advanced countries to analyze the impact of fiscal and monetary policy factors on government bond yields and to highlight whether decisions taken by countries to support business and the economy have had an impact on yield as well. We will consider 18 emerging countries<sup>4</sup> and 27 advanced countries<sup>5</sup> that have been affected by the COVID 19 pandemic in two periods: i) Covid-19 Period: from March 2020 to August 2021 - 18 months of the COVID-19 pandemic; ii) Pre-Covid-19 Period: from November 2018 to February 2020. We did not consider the Covid-19 period after August 2021, as many countries analyzed relaxed the restriction and normalized the situation.

The countries had various solutions to the COVID-19 crisis, solutions that came in support of the business environment. In this article we have focused on 4 of them: postponing the payment of taxes for individuals and entities (deferred payment of taxes), subsidizing wage costs for employees in industries where the activity has been restricted (technical unemployment) postponing monthly payments on loans to the population (deferred payment for credit) and offering grants and state-guaranteed loans with partially or fully subsidized interest to the entities (subsidies for companies and public funds). In Table 1 we have summarized these decisions in the case of emerging countries and if the measure was valid, we also mentioned the number of months in which the measure produced effects in the economy.

**Table 1.** Fiscal policy measures implemented in emerging countries

Country	Deferred Payment of Taxes	Deferred Pay Credit	Unemployment subsidies	Subsidies for SMEs and other companies
Argentina	NO	NO	YES (15)	YES (15)
Bangladesh	NO	NO	YES (9)	YES (6)
Brazil	NO	NO	YES (12)	YES (11)
Bulgaria	YES (10)	YES (9)	YES (17)	YES (17)
Chile	YES (14)	YES (6)	YES (13)	YES (17)
China	NO	YES (18)	YES (10)	YES (10)
Colombia	YES (2)	YES (17)	YES (2)	YES (2)

<sup>4</sup> Argentina, Bangladesh, Brazil, Bulgaria, Chile, China, Colombia, Hungary, India, Indonesia, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand, Turkey, Ukraine.

<sup>5</sup> Germany, France, Italy, Spain, Netherlands, Belgium, Austria, Greece, Portugal, Finland, Ireland, Slovakia, Slovenia, Japan, United Kingdom, Canada, Australia, Sweden, Switzerland, Singapore, Czechia, Norway, Israel, Denmark, New Zealand, USA, Malta

Country	Deferred Payment of Taxes	Deferred Pay Credit	Unemployment subsidies	Subsidies for SMEs and other companies
Hungary	YES (16)	YES (15)	YES (16)	YES (16)
India	NO	NO	YES (11)	YES (13)
Indonesia	YES (15)	NO	YES (15)	YES (15)
Malaysia	YES (12)	YES (6)	YES (13)	YES (17)
Mexico	YES (9)	YES (6)	YES (9)	YES (9)
Pakistan	YES (9)	YES (12)	YES (9)	YES (17)
Peru	YES (13)	NO	YES (12)	YES (14)
Philippines	NO	NO	YES (9)	YES (15)
Poland	YES (7)	YES (3)	YES (7)	YES (17)
Romania	YES (9)	YES (9)	YES (14)	YES (17)
Russia	YES (9)	YES (6)	YES (17)	YES (17)
South Africa	YES (4)	NO	YES (14)	YES (16)
Thailand	YES (9)	NO	YES (8)	YES (13)
Turkey	YES (12)	NO	YES (12)	YES (17)
Ukraine	NO	YES (7)	YES (12)	YES (17)
Venezuela	YES (9)	NO	YES (12)	YES (14)

Note: The measures are responses to the COVID-19 pandemic in emerging countries between March 2020 and August 2021. If the measure has been implemented, the number of months in which the measure produced effects in the economy during the analysis period has been added in brackets.

In Table 2 we have summarized these decisions in the case of advanced countries and if the measure was valid, we also mentioned the number of months in which the measure produced effects in the economy.

**Table 2.** Fiscal policy measures implemented in advanced countries

Country	Deferred Payment of Taxes	Deferred Pay Credit	Unemployment subsidies	Subsidies for SMEs and other companies
Australia	NO	YES (18)	YES (18)	YES (15)
Austria	YES (3)	NO	YES (3)	YES (16)
Belgium	YES (15)	YES (10)	YES (15)	YES (15)
Canada	YES (10)	NO	YES (18)	YES (18)
Czechia	NO	NO	YES (18)	YES (18)
Denmark	YES (16)	NO	YES (16)	YES (16)
Finland	YES (3)	NO	YES (9)	YES (11)
France	YES (17)	NO	YES (17)	YES (17)
Germany	NO	NO	YES (18)	YES (18)
Greece	YES (11)	YES (8)	YES (11)	YES (11)
Hong Kong	YES (9)	NO	YES (9)	YES (17)
Iceland	YES (12)	NO	YES (12)	YES (18)
Ireland	YES (17)	YES (6)	YES (17)	YES (17)
Israel	YES (17)	NO	YES (17)	YES (17)
Italy	YES (17)	NO	YES (17)	YES (17)
Japan	YES (9)	NO	YES (17)	YES (17)
Korea	NO	NO	YES (18)	YES (18)
Malta	YES (17)	YES (16)	YES (17)	YES (17)
Netherlands	NO	YES (6)	YES (18)	YES (18)

Country	Deferred Payment of Taxes	Deferred Pay Credit	Unemployment subsidies	Subsidies for SMEs and other companies
New Zealand	YES (18)	YES (13)	YES (18)	YES (18)
Norway	YES (2)	NO	YES (9)	YES (17)
Portugal	YES (17)	YES (12)	YES (17)	YES (17)
Singapore	NO	YES (18)	YES (13)	YES (18)
Slovakia	YES (17)	YES (12)	YES (17)	YES (17)
Slovenia	YES (17)	YES (12)	YES (9)	YES (17)
Spain	YES (4)	YES (12)	YES (17)	YES (17)
Sweden	YES (12)	NO	YES (8)	YES (16)
Switzerland	YES (4)	NO	YES (10)	YES (17)
Taiwan	NO	YES (18)	YES (10)	YES (18)
UK	YES (9)	YES (6)	YES (13)	YES (17)
United States	YES (8)	YES (12)	YES (12)	YES (17)

Note: The measures are responses to the COVID-19 pandemic in emerging countries between March 2020 and August 2021. If the measure has been implemented, the number of months in which the measure produced effects in the economy during the analysis period has been added in brackets.

## 4. Data Description

As mentioned in the introduction, the aim of this study is to identify how the fiscal or budgetary policy decisions affected the yield of the government bonds in the context of the Covid-19 pandemic. To achieve this, the explanatory matrix contains a series policy dummy variable presented in the previous section, alongside a series of macroeconomic control variables. A detailed description is presented in Table 3.

Table 3. Data description

Variable	Definition	Source
<b>Dependent variable</b>		
Long-term government bond yield	The current yield on a 10 year government bond. The yield on these instruments is typical used as the representative interest rate for a country.	Bloomberg
<b>Control Variable</b>		
Industrial Production	The indicator shows the percent change in the index of industrial production from the same month last year. Industrial production includes mining and quarrying, manufacturing, and electricity production.	Refinitiv Eikon and The global Economy
Business Confidence	The business survey indicator provides information on the amount of optimism or pessimism that business managers feel about the prospects of their companies, based upon opinion surveys on developments in production, orders and stocks of finished goods and the general economic situation of the company. It can be used to monitor output growth and to anticipate turning points in economic activity.	Refinitiv Eikon and The global Economy

Variable	Definition	Source
Deposits Interest Rate	The deposit interest rate is the average interest rate on one-year term deposits offered by the commercial banks to the household sector.	Refinitiv Eikon and the global Economy
Inflation	The percentage change in the CPI from one month to the next.	Refinitiv Eikon and the global Economy
Exchange Rate	The amount of local currency units that can be exchanged for one USD. An increase (decrease) means USD appreciation (depreciation)	Refinitiv Eikon and The global Economy
Unemployment Rate	The unemployment rate represents the share of the labor force that is without work but available for and seeking employment.	Refinitiv Eikon and The global Economy
<i>COVID-19 response variables</i>		
Deferred Payment of Taxes	Dummy variable. Takes value 1 in the months when the response measure was used. Takes value 0 otherwise.	IMF - Policy response to COVID-19
Technical Unemployment	Dummy variable. Takes value 1 in the months when the response measure was used. Takes value 0 otherwise.	IMF - Policy response to COVID-19
Deferred Payment for credit	Dummy variable. Takes value 1 in the months when the response measure was used. Takes value 0 otherwise.	IMF - Policy response to COVID-19
Subsidies for companies / Public funds /	Dummy variable. Takes value 1 in the months when the response measure was used. Takes value 0 otherwise.	IMF - Policy response to COVID-19

Additional details regarding the variables that are used in the study are presented in Table 4 below:

**Table 4.** Descriptive statistic for the entire sample

Variable	Min	Max	Mean	St. Dev
Long-term government bond yield	-0.0105	0.6810	0.0343	0.0618
Industrial Production	-83.9000	125.6800	-1.8600	11.2900
Business Confidence	-90.0000	126.2000	2.6500	26.0900
Deposits Interest Rate	-0.0045	0.5811	0.00374	0.0687
Inflation	-0.0360	0.1358	0.0028	0.0083
Exchange Rate	0.8210	15729.4900	664.7805	2581.2170
Unemployment Rate	0.0092	0.3490	0.06411	0.0416
Deferred Payment of Taxes*	0	1	0.4074	0.4916
Technical Unemployment*	0	1	0.6537	0.4760
Deferred Payment for credit*	0	1	0.2712	0.4448
Subsidies for companies / Public funds *	0	1	0.7768	0.4165

\*Statistic available during COVID19 period

## 5. Data analysis

As mention in the previous section, the baseline specification has the following specification:

$$GOV10Y_{i,t} = \alpha_i + \beta_1 * GOV10Y_{i,t-1} + \beta_2 * Control_{i,t} + \beta_3 * Response_{i,t} + \varepsilon_{i,t}. \quad (1)$$

In Eq. (1),  $i = \overline{1, N}$  and  $t = \overline{1, T}$ , are country and months respectively,  $GOV10Y_{i,t}$  is the dependent variable representing the long-term government bond yield in country  $i$  and month  $t$ . Moreover,  $Control_{i,t}$  is a matrix of control variables summarized in the previous subsection which have been identified in the literature as drivers for long-term government bond yield while  $Response_{i,t}$  captures the policy response to COVID-19 pandemic. Finally,  $\varepsilon_{i,t}$  represents the error term.

To address the potential endogeneity issues in Eq. (1) the general consensus in the literature is the usage of a panel GMM approach. However, this might provide an incomplete picture when investigating the link between long-term government bond yield and other factors, especially during periods with extreme volatility (du Plooy, 2019). To overcome this limitation, we can use the quantile regression proposed by Koenker and Bassett (1978) which allows drawing inferences regarding the observations that rank above or below long-term government bond yield's conditional mean. Since the quantile regression not have any specific restrictions regarding the distribution of error terms, the sensitivity to outliers is less significant in comparison to the mean regression, so it can provide more accurate and robust regression results(Albu, Goran, 2010).

More specific, for any level  $\tau$ , across long-term government bond yield's variable conditional distribution denoted  $y$ , given the set of control and COVID-19 related variables outlined in Eq. (1) and denoted  $x$ , the conditional quantile  $Q_y(\tau|x)$  captures  $inf\{k: C(k|x) \geq \tau\}$  where  $C(*|x)$  represents the cdf of a random variable. To evaluate the impact of a certain factor or event at a particular position throughout long-term government bond yield's distribution, most academic papers are using the conditional quantile regression (CQR) for panel data developed by Koenker (2004):

$$Q_{y_{i,t}}(\tau|x_{i,t}) = \alpha_i + x_{i,t}^T \beta^{CQR}(\tau). \quad (2)$$

In Eq. (2)  $\beta^{CQR}(\tau)$  is the common slope coefficient, and  $\alpha_i$  is a location shift coefficient. To account for the unobserved country heterogeneity, Koenker (2004) treats the fixed effects as nuisance parameters and introduce a penalty factor in the minimization algorithm leading to:

$$\min_{(\alpha, \beta)} \sum_{k=1}^K \sum_{t=1}^T \sum_{i=1}^N w_k \rho_{\tau_k}(y_{i,t} - \alpha_i - x_{i,t}^T \beta(\tau_k)) + \lambda \sum_i |\alpha_i|. \quad (3)$$

In Eq. (3),  $K$  is the quantiles' index,  $\rho_{\tau_k}$  is the quantile loss function and  $w_k$  is the relative weight associated with the  $k^{\text{th}}$  quantile. The penalty term  $\lambda$  is introduced to diminish the individual effects to zero, leading to an improvement in the quality of the estimates of  $\beta$ . However, as Dong et al. (2020) argued, in the conditional quantile regression proposed by Koenker and Bassett (1978) the dependent variable distribution is given conditional on a certain set of factors, and fails to capture the dependence structures in its entirety. Firpo et al. (2009) developed the unconditional quantile regression by using the influence function (IF) and the recentered influence function (RIF). The IF is an approach quantifying the influence of a particular factor on a distributional statistic and is given by:

$$IF(y_{i,t}; v(F_{y_{i,t}})) = \lim_{\varepsilon \rightarrow 0} \left( \frac{v[(1 - \varepsilon)F_{y_{i,t}} + \varepsilon G_{y_{i,t}}] - v(F_{y_{i,t}})}{\varepsilon} \right). \quad (4)$$

In Eq. (4),  $0 \leq \varepsilon \leq 1$ ,  $F_{y_{i,t}}$  represents the cdf of the dependent variable  $y_{i,t}$ ,  $G_{y_{i,t}}$  denotes the distribution that puts mass at the value  $y_{i,t}$ , while  $v(F_{y_{i,t}})$  is the value of the statistic. The RIF represents an estimator  $v$  with a probability distribution  $F$  at point  $y_{i,t}$  and is computed by adding this statistic to its IF:

$$RIF(y_{i,t}; v(F_{y_{i,t}})) = v(F_{y_{i,t}}) + IF(y_{i,t}; v(F_{y_{i,t}})). \quad (5)$$

In Eq. (5), the expected value of the RIF is  $v(F_y)$ , if  $IF(y_{i,t}; v(F_{y_{i,t}}))$  is zero. According to Dong et al. (2020), the conditional expectation of the  $RIF(y_{i,t}; v(F_{y_{i,t}}))$  can be view as a function of the explanatory variables, i.e.,  $E[RIF(y_{i,t}; v(F_{y_{i,t}})) | x_{i,t}] = m_v(x_{i,t})$ . In addition, if we select the  $\tau^{\text{th}}$  quantile as the target statistic and choose to estimate the density functions for each quantile based on Kernel density techniques, the RIF, given  $q_\tau$  is given by:

$$RIF(y_{i,t}; q_\tau; F_{y_{i,t}}) = q_\tau + IF(y_{i,t}; q_\tau; F_{y_{i,t}}) = q_\tau + \frac{\tau - \mathbb{I}\{y_{i,t} \leq q_\tau\}}{f_{y_{i,t}}(q_\tau)}. \quad (6)$$

In Eq. (6),  $q_\tau$  represents the  $\tau^{\text{th}}$  quantile of the unconditional distribution of the long-term government bond yield  $y_{i,t}$ ,  $f_{y_{i,t}}(q_\tau)$  express the pdf of  $y_{i,t}$  evaluated at the  $\tau^{\text{th}}$  quantile based, while  $\mathbb{I}\{y_{i,t} \leq q_\tau\}$  is an indicator function capturing whether  $y_{i,t}$  falls below the  $\tau^{\text{th}}$  quantile or otherwise. Thus, the UQR estimator is the coefficient,  $\beta^{UQR}(\tau)$ , of the RIF given the explanatory variables:

$$RIF(y_{i,t}; q_\tau; F_{y_{i,t}}) = x_{i,t}^T \beta^{UQR}(\tau). \quad (7)$$

In this paper we use as the baseline specification UQR for panel data developed by Borgen (2016) which accounts for country and time fixed effects.

## 6. Results

In Table 5 and Table 6, we present the Panel FE results for a linear specification devoted to identify the factors that influence the monthly dynamic of long-term government bond yields. All the control variables as well as the dependent variables are considered as percentage changes. Furthermore, given this structure both, first and second generation unit root test for panel data (Levin et al., 2002; Pesaran, 2007) reject the null hypothesis of a unit root. Additionally, the correlation coefficients between the explanatory variables, regardless of the model specification, do not exceed the 40% threshold, indicating that serial dependency is less likely to affect the efficiency and the consistency of the estimates<sup>6</sup>.

<sup>6</sup> To assess robustness, we also investigate the Variance Influence Factor (VIF) for all the explanatory variables. All the reported VIFs were lower than 5, indicating that multicollinearity is not affecting the validity of the empirical investigation.

**Table 5.** Linear model FE results for emerging countries (p-values in parenthesis)

Dependent Variables	Pre-Covid-19 Period	Covid-19 Period	Covid-19 Period	Covid-19 Period	Covid-19 Period
	Model 1	Model 2.1	Model 2.2	Model 2.3	Model 2.4
Lagged 10Y Bond Yield	<b>-0.2565</b> <b>(0.0000)</b>	<b>-0.2219</b> <b>(0.0503)</b>	<b>-0.2227</b> <b>(0.0497)</b>	<b>-0.2158</b> <b>(0.0567)</b>	<b>-0.2096</b> <b>(0.0627)</b>
Industrial Production	-0.0004 (0.6843)	0.0001 (0.8860)	0.0001 (0.9634)	0.0001 (0.9670)	-0.0001 (0.7799)
Business Confidence	-0.0002 (0.8293)	-0.0022 (0.6890)	-0.0024 (0.6616)	-0.0032 (0.5705)	-0.0028 (0.6191)
Deposits Interest Rate	<b>0.1114</b> <b>(0.0956)</b>	0.1371 (0.3857)	0.1227 (0.4402)	0.1162 (0.4635)	0.0876 (0.5795)
Inflation	<b>0.0496</b> <b>(0.0000)</b>	-0.0233 (0.4857)	-0.0274 (0.4183)	-0.0339 (0.3181)	-0.0223 (0.5150)
Exchange Rate	<b>1.1159</b> <b>(0.0000)</b>	0.2773 (0.6737)	0.1691 (0.8007)	0.1175 (0.8605)	-0.1379 (0.8382)
Unempl. Rate	-0.0547 (0.5759)	-0.0463 (0.7635)	-0.0311 (0.8414)	-0.0270 (0.8613)	-0.0153 (0.9211)
Deferred Pay Tax			-0.0482 (0.3668)	0.0003 (0.9965)	0.0605 (0.3663)
Deferred Pay Credit				<b>-0.1143</b> <b>(0.0962)</b>	<b>-0.1210</b> <b>(0.0859)</b>
Technical Unemp.					<b>-0.1117</b> <b>(0.0323)</b>
Intercept	-0.0485 (0.0000)	0.0495 (0.0539)	0.0693 (0.0405)	0.0883 (0.0136)	0.1366 (0.0012)
Observations	288	324	324	324	324
R-squared	0.3015	0.0587	0.0611	0.0688	0.0821

In emerging countries, the dynamic of the long-term government bond yield is sensitive to its past evolution, irrespective of the considered time frame (before of during the pandemic). Moreover, during normal market conditions such as the period before the pandemic the yields of the government bonds are sensitive to changes in the banking industry proxied by interest rates (+), to foreign exchange market (+) and also to the inflationary pressures (+). Thus, the increase in deposit interest rates, the depreciation of the exchange rate or the general increase in prices leads to deterioration in the quotations of long-term government bonds. Those result are in line with previous finding such as Barr and Pesaran (1997), and suggest that investors' perceptions of the solvency of an emerging country government relies on some fundamental macroeconomic factors such as those mentioned above. Additionally, the outbreak of the COVID-19 pandemic has dramatically reduced the influence of economic and financial factors on the government bond yields change in emerging countries. On the other hand, a statistically negative and robust relationship can be observed between the dependent variable and the implementation of fiscal and financial measures such as the postponement of credit rates for the population (deferred payment for credit) or subsidization of wage costs for employees in sectors whose activity has been restricted (technical unemployment).

**Table 6.** Linear model FE results for advanced economies (p-values in parenthesis)

Dependent Variables	Pre-Covid-19 Period	Covid-19 Period	Covid-19 Period	Covid-19 Period	Covid-19 Period
	Model 1	Model 2.1	Model 2.2	Model 2.3	Model 2.4
Lagged 10Y Bond Yield	-0.0574 (0.2865)	-0.0599 (0.2033)	-0.0603 (0.2006)	-0.0671 (0.1549)	-0.0755 (0.1245)
Industrial Production	-0.0343 (0.3601)	-0.0081 (0.7170)	-0.0067 (0.7669)	-0.0194 (0.4097)	-0.0170 (0.4860)
Business Confidence	0.0074 (0.1489)	-0.0009 (0.9720)	-0.0013 (0.9580)	-0.0013 (0.9559)	-0.0002 (0.9926)
Deposits Interest Rate	0.2259 (0.5113)	0.1624 (0.5835)	0.1719 (0.5633)	0.2032 (0.4940)	0.2284 (0.4969)
Inflation	-0.0465 (0.8604)	0.3176 (0.5697)	0.3290 (0.5568)	0.2692 (0.6303)	0.2541 (0.6610)
Exchange Rate	-0.0260 (0.8705)	0.2001 (0.2056)	0.2105 (0.1892)	0.1618 (0.3180)	0.1736 (0.3087)
Unempl. Rate	-0.0404 (0.9873)	-2.5812 (0.2330)	-2.5763 (0.2343)	-2.4143 (0.2641)	-2.5960 (0.2449)
Deferred Pay Tax			0.3433 (0.6872)	0.7171 (0.4123)	0.5388 (0.6450)
Deferred Pay Credit				<b>-1.9053</b> <b>(0.0670)</b>	<b>-2.0790</b> <b>(0.0656)</b>
Technical Unemp.					0.7530 (0.6135)
Intercept	-0.0039 (0.9794)	-0.0375 (0.9032)	-0.2160 (0.6892)	0.1745 (0.7632)	-0.2727 (0.7848)
Observations	288	324	324	324	324
R-squared	0.0688	0.0672	0.0676	0.0673	0.0801

Unlike emerging countries, the governments of advanced economies have a greater financial stability and implicitly they can attract funds from the money markets much easier. Thus, the dynamic of the long term bonds yield was not, at least in the pre-pandemic period, linked to macroeconomic or banking-currency fluctuations. Moreover, the results regarding the COVID-19 response are partially valid in the case of advanced countries, where the pressure on the government bond yields has been reduced by decisions to postpone of credit rates for the population (negative sign).

As mentioned in Section 4, a linear approach might provide an incomplete picture when investigating the link between long-term government bond yield and other factors, especially during periods with extreme volatility. In Table 7 and Table 8 we present the unconditional quantile regression results.

**Table 7.** UQR results for emerging economies (p-values in parenthesis)

Dependent Variables	COVID-19 Period				
	Q10	Q25	Q50	Q75	Q90
Lagged 10Y Bond Yield	-0.1627 (0.2960)	<b>-0.1234</b> <b>(0.0000)</b>	<b>-0.1450</b> <b>(0.0000)</b>	<b>-0.1571</b> <b>(0.0000)</b>	<b>-0.1818</b> <b>(0.0000)</b>
Industrial	<b>0.0002</b>	0.0001	0.0001	<b>-0.0001</b>	<b>-0.0003</b>

Dependent Variables	COVID-19 Period				
	Q10	Q25	Q50	Q75	Q90
Production	<b>(0.0002)</b>	(0.2217)	(0.9991)	<b>(0.0930)</b>	<b>(0.0024)</b>
Business Confidence	0.0004 (0.6861)	<b>0.0019</b> <b>(0.0247)</b>	0.0009 (0.5292)	0.0021 (0.1476)	-0.0061 (0.7583)
Deposits Interest Rate	<b>0.2023</b> <b>(0.0000)</b>	<b>0.1801</b> <b>(0.0000)</b>	0.0619 (0.2547)	-0.0081 (0.9351)	-0.0667 (0.2788)
Inflation	0.0191 (0.1465)	<b>0.0089</b> <b>(0.0869)</b>	0.0056 (0.2750)	0.0040 (0.7613)	0.0165 (0.3992)
Exchange Rate	-0.0372 (0.9270)	0.0017 (0.9928)	0.2234 (0.1095)	<b>0.9307</b> <b>(0.0150)</b>	<b>1.9291</b> <b>(0.0007)</b>
Unempl. Rate	-0.1316 (0.2626)	-0.0078 (0.7142)	-0.0200 (0.3104)	<b>-0.0593</b> <b>(0.0314)</b>	<b>-0.1339</b> <b>(0.0259)</b>
Deferred Pay Tax	-0.0036 (0.9285)	<b>-0.0227</b> <b>(0.0929)</b>	<b>-0.0095</b> <b>(0.0794)</b>	0.0114 (0.4957)	<b>0.0426</b> <b>(0.0747)</b>
Deferred Pay Credit	0.0102 (0.7133)	-0.0104 (0.4198)	-0.0077 (0.5122)	-0.0165 (0.3154)	-0.0285 (0.2196)
Technical Unemp.	-0.0183 (0.6516)	<b>-0.0178</b> <b>(0.0857)</b>	-0.0028 (0.7943)	-0.0113 (0.4787)	-0.0501 (0.1878)
Intercept	<b>-0.0924</b> <b>(0.0000)</b>	<b>-0.0167</b> <b>(0.0651)</b>	0.0099 (0.2519)	<b>0.0627</b> <b>(0.0007)</b>	<b>0.1560</b> <b>(0.0000)</b>
Observations	324	324	324	324	324
Pseudo R-squared	0.1095	0.0731	0.0330	0.0327	0.0861

Conventionally, five representative quantities from the probability distribution of the long government bond yields percentage change (Q10, Q25, Q50, Q75 and Q90) are considered. In Q10, for example, which we will call the extreme lower quantile, we have the situations in which government bond yields dynamic exhibit strong negative values (a beneficial case for the government of that country, when short-term financing is done with relatively lower costs relative to the previous month, thus increasing the optimism of investors about the repayment capacity of that country). On the other hand, Q90, which we will call the extreme upper quantile, we have the situation when investors' perception of it deteriorates extremely much compared to last month, so the interest that a government will pay its creditors will be higher.

Table 8. UQR results for advanced economies (p-values in parenthesis)

Dependent Variables	COVID-19 Period				
	Q10	Q25	Q50	Q75	Q90
Lagged 10Y Bond Yield	-0.0021 (0.1558)	<b>0.0026</b> <b>(0.0107)</b>	<b>0.0045</b> <b>(0.0031)</b>	-0.0049 (0.8780)	<b>-0.0320</b> <b>(0.0603)</b>
Industrial Production	<b>-0.0094</b> <b>(0.0320)</b>	-0.0016 (0.4326)	-0.0015 (0.3624)	-0.0036 (0.1625)	-0.0013 (0.8593)
Business Confidence	<b>0.0049</b> <b>(0.0000)</b>	<b>0.0015</b> <b>(0.0241)</b>	0.0018 (0.7078)	-0.0006 (0.5019)	<b>-0.0045</b> <b>(0.0018)</b>
Deposits Interest Rate	<b>-0.0931</b> <b>(0.0000)</b>	<b>-0.0311</b> <b>(0.0074)</b>	-0.0097 (0.5948)	-0.0010 (0.9381)	<b>0.0583</b> <b>(0.0378)</b>
Inflation	-0.0940 (0.4935)	-0.0022 (0.9489)	<b>0.0599</b> <b>(0.0501)</b>	0.0503 (0.2358)	0.0093 (0.9512)
Exchange Rate	0.0132 (0.5999)	-0.0155 (0.1545)	<b>-0.0209</b> <b>(0.0169)</b>	0.0117 (0.4788)	0.0626 (0.1742)

Unempl. Rate	-0.0399 (0.6009)	0.0154 (0.7911)	-0.1231 (0.7376)	-0.1252 (0.0763)	-0.2051 (0.0624)
Deferred Pay Tax	<b>-0.5969</b> <b>(0.0000)</b>	<b>-0.2248</b> <b>(0.0001)</b>	<b>-0.0623</b> <b>(0.0987)</b>	-0.0450 (0.4474)	<b>0.5753</b> <b>(0.0432)</b>
Deferred Pay Credit	0.1327 (0.2366)	0.0245 (0.6435)	-0.0243 (0.2915)	0.0042 (0.9476)	-0.0791 (0.6010)
Technical Unemployment	<b>0.4396</b> <b>(0.0588)</b>	0.1041 (0.1101)	0.0172 (0.7739)	-0.1095 (0.2806)	-0.6078 (0.2785)
Intercept	<b>-0.8573</b> <b>(0.0000)</b>	<b>-0.2387</b> <b>(0.0001)</b>	<b>-0.0387</b> <b>(0.4443)</b>	<b>0.3241</b> <b>(0.0001)</b>	<b>1.0957</b> <b>(0.0415)</b>
Observations	324	324	324	324	324
Pseudo R-squared	0.0272	0.0086	0.0006	0.0006	0.0178

The reported results indicate that the decision to postpone of the payment of taxes for both individuals and entities has increased the confidence in the solvency the governments, in both of emerging and advanced economies. However, this conclusion is valid across 25<sup>th</sup> and 50<sup>th</sup> quantiles, i.e., in the situations where the evolution of the bond yields is positive or at most negligible, in both emerging and advanced countries. However, in the situation where the yield of the long-term government bonds has grown extremely much (90<sup>th</sup> quantile), i.e., investors' perception regarding the solvency of the government deteriorates extremely much compared to last month, the decision to postpone tax payment amplifies these concerns related to loan repayments.

Finally, the technical unemployment has an asymmetric impact on long government bond yields in advanced countries compared to emerging ones. More to the point, the decision to adopt such policy erodes positive dynamic in advanced countries across 10<sup>th</sup> quantile and is detrimental for emerging one across 25<sup>th</sup> quantile.

Overall, the UQR results are complementary to linear regression findings and reveal that under certain circumstances regarding the evolution of the long government bond yields all the policy related to COVID-19 pandemic exhibit a statistically significant influence on this evolution. The values of the Pseudo R-square suggest that in the emerging countries, the evolution of the long government bond yields is more sensitive to the control variables as well as a policy response to COVID-19 variables compared to advanced economies.

## 7. Conclusions

It is clear that all the countries have implemented fiscal measures packages in response to COVID-19 shock and the size and the extend of the fiscal response led to a deterioration in fiscal positions. Decisions had to be taken in order to save businesses and jobs and also to sustain new investments, but all these had to be financed. High levels of public debt and structural changes of expenses have definitely created a challenging and heterogeneity environment for every government.

Our study shows that even if the mix of implemented fiscal responses has a country-specific, there is a direct impact on the confidence in the solvency of governments in both emerging and advanced economies. Many countries faced a rapid change, from a manageable sovereign debt, with low bond yields, to a high level debt, with increased interest rates and vulnerabilities. This is also confirmed in our study that bond yields increased as investors were expecting deterioration in the fiscal positions (as a result of postponing taxes or subsidizing businesses). The impact on long government bond yields is positively amplified also by the decision of offering grants and state-guaranteed loans with subsidized interest to entities (subsidies for companies and public funds). We can assume that there can be some biases as news regarding some fiscal decisions

form an economy could result in some predictable outcomes in government decisions in other economies, but anticipations can only impact our results to only some extent not in general.

Overall, the implication of our study is viable to policymakers and investors in their future investment decisions, but can also show that an economic shock where governments react through fiscal responses can directly impact bond yields.

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