Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Volatility in International Sovereign Bond Markets: The role of government policy responses to the COVID-19 pandemic

Adam Zaremba a,b,c, Renatas Kizys d,*, David Y. Aharon e

a Montpellier Business School, 2300 Avenue des Moulins, 34185 Montpellier cedex 4, France
b Poznan University of Economics and Business, Institute of Finance, Department of Investment and Financial Markets, al. Niepodległości 10, 61-875 Poznań, Poland
c Montpellier Research in Management, University of Montpellier, Montpellier, France
d University of Southampton, Southampton Business School, Department of Banking and Finance, Room 1013, Building 4, Highfield Campus, Southampton SO17 1BJ, United Kingdom
e Ono Academic College, Faculty of Business Administration, Tzahul St 104, Kiryat Ono, Israel

ARTICLE INFO

JEL Codes:
G01
G12
G15
G18
H12
H51
I18

Keywords:
COVID-19 pandemic
Coronavirus outbreak
Government policy responses
Containment and closure
Economic support
Sovereign bonds
Government bond market volatility

ABSTRACT

Effective government policies may reduce uncertainty in sovereign bond markets. Can policy responses help to curb bond market volatility during the COVID-19 pandemic? To answer this, we examine data from 31 developed and emerging markets during the coronavirus outbreak in 2020. We demonstrate that government interventions substantially reduce local sovereign bond volatility. The effect is mainly driven by economic support policies; the containment and closure regulations and health system interventions play no major role.

1. Introduction

The recent outbreak of COVID-19 triggered unprecedented government policy responses around the world to alleviate the economic and non-economic adverse effects of the disease. These exceptional circumstances spurred numerous studies of the impact of government interventions on global stock markets (e.g., Ashraf 2020a; Baig et al. 2020; Haroon and Rizvi 2020; Phan and Narayan 2020; Zaremba et al. 2020a). However, sovereign bonds, which are more directly affected by government actions and expenditures, have largely escaped academic scrutiny. We seek to rectify this gap by exploring the influence of policy responses to COVID-19 on the volatility of sovereign bonds.

* Corresponding author.
E-mail addresses: a.zaremba@montpellier-bs.com, adam.zaremba@ue.poznan.pl (A. Zaremba), r.kizys@soton.ac.uk (R. Kizys), dudi.ah@ono.ac.il (D.Y. Aharon).

https://doi.org/10.1016/j.frl.2021.102011
Received 20 October 2020; Received in revised form 25 January 2021; Accepted 4 March 2021
Available online 9 March 2021
1544-6123/© 2021 Elsevier Inc. All rights reserved.
COVID-19 injected large-scale economic uncertainty into financial markets (Baker et al., 2020a, b; Sharif et al., 2020). There is evidence that increased uncertainty along with unstable business conditions is a major source of bond market volatility (Arnold and Vrugt 2010; Aghaarian et al. 2015; Bansal and Shaliastovich 2013; Beber and Brandt 2009; Ulrich 2012, 2013a; Viceira 2012), but the risks can be reduced by government interventions (Amengual and Xiu 2018; Kizys et al. 2020). Effective policy responses can lower the uncertainty spurred by COVID-19 (Kizys et al. 2020) and, in turn, bond volatility may decline when economic uncertainty is resolved (Amengual and Xiu 2018). Thus, if government interventions decrease the overall uncertainty and improve business expectations, they should make the fixed-income investments less risky (Viceira 2012), specially that bond markets are highly sensitive to macroeconomic news (Jones, Lamont, and Lumsdaine 1998).

An opposite view, advanced by Pastor and Veronesi (2012), indicates that policy change can actually create further uncertainty surrounding the outcomes of the current and future interventions, which is conducive to higher bond volatility. Volatility can rise in at least four scenarios: a) when fiscal stabilization policies raise uncertainty about future tax pressure (Croce et al. 2012); b) when Knightian uncertainty about changes in future inflation dominates Knightian uncertainty about the economic effects induced by government interventions (Ulrich 2012); c) in periods of heightened Knightian uncertainty about both Ricardian equivalence and the size of the government multiplier (Ulrich 2013b); and d) if government interventions involve public spending decisions, which in turn lead to positive bond term premia through a positive correlation between marginal utility and inflation (Breitscher et al. 2020).

Thus, on the one hand, government interventions might provoke heightened uncertainty and surges in bond volatility, which can impair the market value of sovereign bonds and result in financial losses. In this case, although the intention of the government interventions is to improve health outcomes, and to minimize the economic and social costs of COVID-19, such an intention is not necessarily realized. If, however, the sovereign debt market perceives government interventions as stabilizing, volatility might decrease. Thus, our investigation can help policy makers improve their decision making. In the light of these two sides of the barricade, scrutiny of the actual impact of government interventions on sovereign bond volatility is of paramount importance.

Our research findings can provide market participants with insights into how sovereign debt markets respond to a range of government policies, such as health system interventions, containment and closure regulations, and economic interventions. For instance, our research findings can assist policy makers who seek to design and fine-tune their policies to mitigate the effects of COVID-19, and portfolio managers to prepare better for possible government interventions during future epidemics or later in the current one.

To test these two perspectives regarding the role of government responses (closure, health, and economic support policies (henceforth “stimuli”)) on sovereign bond volatility, we examine data from 31 countries during COVID-19 via panel regressions.

We provide evidence that COVID-19 government responses stabilize sovereign bond markets and are instrumental in decreasing volatility. This effect is mainly driven by economic stimuli, such as income support and debt or contract relief.

We contribute to three major fields of research. First, we add to the literature that evaluates the impact of government responses to COVID-19 on financial markets (Ashraf 2020a; Baig et al. 2020; Haroon 2020; Phan and Narayan 2020; Zaremba et al. 2020a). Whereas earlier papers concentrate only on equities, we are the first to consider fixed-income securities.

Second, we extend the discussion on the effect of COVID-19 on sovereign bonds. To the best of our knowledge, only He et al. (2020), who scrutinize the shifts in the term structure of U.S. Treasury yields, Arellano et al. (2020) and Sène et al. (2020), who investigate changes in emerging markets’ Eurobond yields, and Zaremba et al. (2020b), who examine the effect of the COVID-19 pandemic on the term structure of interest rates, have contributed to this discussion to date.

Third, we contribute to the fast-mounting evidence on the effect COVID-19 on asset volatility. Although numerous papers report on such research focusing on equities (e.g., Albulescu 2020; Corbet et al. 2021; Lycosa et al. 2020), commodities (e.g., Bakas and Triantafyllou 2020; Corbet et al. 2020; Umar et al. 2020), or cryptocurrencies (Conlon and McGee 2020; Corbet et al. 2020; Mnif et al. 2020; Umar and Gabireva 2020), no research focuses on sovereign bonds.

The remainder of the paper is structured as follows. Section 2 presents the data and methodology. Section 3 discusses the empirical findings. Finally, Section 4 concludes the paper.

2. Data and Methodology

We study 31 developed and emerging markets from different global regions (North America, Europe, Asia, Africa, Oceania) covered by Datastream. To assure a consistent empirical approach, volatilities are computed from Datastream 10-Year Government Bond Total Returns indices. The 10-year bonds receive the best international coverage and are typically more liquid than bonds of other maturities, so they are a prime choice in recent large-scale studies on global sovereign bonds (e.g., Baltussen, Swinkels, and van Vliet, 2019; Geczy and Samonov, 2017; Ilmanen et al., 2019). The list of countries and the statistical properties of index returns is summarized in Table A1 (Online Appendix). The sample period for daily data covers the time during which the pandemic was first spreading and runs from January 1, 2020 to September 12, 2020.

To guarantee comparability across markets, in our baseline approach we closely follow the standard approach taken in asset pricing studies on international sovereign bonds (e.g., Asness et al. 2013; Geczy and Samonov 2017) that express market data in U.S. dollars. Consistent with this, the risk-free asset for factor models is proxied by the U.S. one-month T-bill rate from French (2020).

To gauge day-to-day changes in volatility, we build on Antonakakis and Kizys (2015) and Khalifa, Miao, and Ramchander (2011), who use absolute measures of daily performance to derive volatility measures. Although one of the common approaches is to use absolute values of daily returns (e.g., Khalifa, Miao, and Ramchander 2011), in a cross-sectional study such measures may be influenced by the variation in systematic risks. To extract the country-specific volatility component, which disinherits the influence of systematic risks, we use residuals in absolute value from several factor models (see Zaremba et al. 2020a). Importantly, unlike in equity studies, there is no “gold standard” or single broadly acknowledged cross-sectional asset pricing model for government bonds.
Therefore, we form an ad-hoc asset pricing model that comprises a battery of factors identified in the fixed-income literature (Asness et al. 2013; Bekti et al. 2020; de Carvalho et al. 2014; Li et al. 2012; Gava et al. 2020; Kang et al. 2019; Luu and Yu 2012; Martens et al. 2019). Specifically, our seven-factor model aims to capture the known multidimensionality of the cross-section of global sovereign bond returns:

$$R_{i,t} = \alpha_i + \beta_{i,t}^{MT} \text{MT}_{i,t} + \beta_i^{DUR} \text{DUR}_{i,t} + \beta_i^{CRED} \text{CRED}_{i,t} + \beta_i^{REV} \text{REV}_{i,t} + \beta_i^{CAR} \text{CAR}_{i,t} + \varepsilon_{i,t},$$  

(1)

where $R_{i,t}$ is the daily return on sovereign bonds in country $i$ on day $t$, $\alpha_i$ is the abnormal return (“alpha”), and $\varepsilon_{i,t}$ denotes the error term. The regression coefficients $\beta_{i,t}^{MT}, \beta_i^{DUR}, \beta_i^{CRED}, \beta_i^{REV}, \beta_i^{CAR}$ measure the exposures to the market risk (MT), duration (DUR), credit risk (CRED), long-term reversal (REV), and carry (CAR) risk factors, respectively. The market risk factor reflects the excess return on the global long-term government bond market portfolio. The remaining factor returns are derived from cross-sectional data and represent long-short portfolios buying (selling) bond baskets with the highest (lowest) adjusted duration (DUR), rating-based credit risk (CRED), long-term yield change (REV), and local yield-based carry (CAR), or with the lowest (highest) market value (SIZE), and short-term yield change (MOM). The use of these factors to explain the cross-section of sovereign bond returns receives support in the above-cited literature. Tables A2 and A3 (see Online Appendix) provide details of the factor construction and statistical properties of the factor returns.

To obtain the look-ahead bias-free absolute daily seven-factor model residuals ($|RR_{7i}|$) for day $t$, we proceed in three steps. First, we estimate Equation (1) using data from the previous five years ending on day $t-1$. Second, we use the coefficient estimates and factor realizations from day $t$ to obtain the expected daily returns. Third, the residual return is calculated as the difference between the realized day $t$ return and the model-implied expected return.

The government policy responses are represented by the Government Responses Index (GVT) of Hale et al. (2020), which is available from OxCGRT (2020). This indicator quantifies and aggregates daily data on a broad range of government policies in response to COVID-19. These responses affect different aspects of social and economic life, which encompass containment and closure (school or workplace closing, restrictions on gatherings, etc.), economic responses (income support, debt relief, fiscal measures), and health system interventions (information campaigns, testing policy, or contact tracing).

We evaluate the effect of policy responses on sovereign bond volatility through the following regressions:

$$
\text{BVOL}_{i,t} = \alpha + \delta_{i,t} \text{GVT}_{i,t} + \sum_{c=1}^{C} \delta_{i,c} \text{K}_{i,c,t} + u_{i,t},
$$

(2)

where $\text{BVOL}_{i,t}$ indicates volatility in country $i$ on day $t$ proxied with $|RR_{7i}|$ (or an alternative measure in our robustness checks), $\text{GVT}_{i,t}$ is the Government Response Index, and $\text{K}_{i,c,t}$ denotes a set of control variables: average adjusted duration and convexity of the index portfolio (DUR, CX), quantified sovereign rating score (CRED), and market value of the index portfolio (MV). We also include the VIX volatility index (VIX) obtained from FRED (2020) to account for the systematic component of global financial markets (Hilscher and Nosbusch 2010). To disentangle the effects of policy responses from those of the pandemic itself, we also control for the most essential pandemic-related variable influencing stock markets (Ashraf 2020b), namely, the daily change in the number of COVID-19 infections ($\Delta$INF). Nevertheless, to consider cross-sectional variation in mortality rates, we supplement certain specifications with the daily change in the number of deaths ($\Delta$DTH). We also incorporate weekday dummy variables to account for seasonality (Kiymaz and Nosbusch 2010).
Table 2
Policy Responses and Bond Market Volatility

The table reports the results of the panel data regressions. The dependent variable is the absolute daily residual from the seven-factor model (|\( R_{it} |\)). The independent variables are the Government Response Index (GVT), Economic Support Index (ECO), Containment and Health Index (CTNT), change in the number of COVID-19 infections (\( \Delta \text{INF} \)), change in the number of COVID-19 deaths (\( \Delta \text{DTH} \)), bond duration (DUR), sovereign rating (CRED), convexity (CX), the market value of a bond index portfolio (MV) in U.S. dollars, VIX volatility index (VIX), and weekday dummy variables. 

\#Obs denotes the number of observations and R² represents an adjusted coefficient of determination. The regressions are run using random-effects models. Coefficient standard errors (in parentheses) are robust to autocorrelation and heteroscedasticity. The asterisks *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All the coefficients are multiplied by 100, except the coefficients for \( \Delta \text{INF} \) and \( \Delta \text{DTH} \) which are multiplied by 100,000, and the coefficients for MV which are multiplied by 100,000,000. The study period runs from January 1, 2020 to September 12, 2020.

| GVT       | ECO     | CNTN    | DUR     | CRED    | VIX     | \( \Delta \text{INF} \) | \( \Delta \text{DTH} \) |
|-----------|---------|---------|---------|---------|---------|----------------|----------------|
|          | (0.038) | (0.038) | (0.038) | (0.038) | (0.038) | (0.038)       | (0.038)       |
| -0.196*** | -0.169*** | -0.187*** | -0.161*** | -0.102** | -0.070** | -0.104**       | -0.073**      |
| (0.038)   | (0.038) | (0.038) | (0.038) | (0.043) | (0.037) | (0.042)        | (0.036)       |
|          | -0.078  | -0.090* | -0.064  | -0.077  |         |                 |                |
|          | (0.052) | (0.051) | (0.051) | (0.050) |         |                 |                |
| -1.000   | 54.600** | -0.965  | 54.900** | -0.903  | 51.900** | -0.864        | 52.000*       |
| (1.690)  | (26.700)| (1.690) | (27.000)| (1.710) | (26.300)| (1.700)       | (26.600)      |
| 2.510*** | 1.260** | 2.490*** | 1.180** | 2.470*** | 1.240** | 2.440***       | 1.230**       |
| (0.869)  | (0.575) | (0.861) | (0.571) | (0.844) | (0.573) | (0.833)        | (0.567)       |
| 1.280*** | 1.260** | 1.280*** | 1.270** | 1.240*** | 1.240** | 1.240***       | 1.240**       |
| (0.162)  | (0.157) | (0.162) | (0.157) | (0.150) | (0.151) | (0.150)        | (0.150)       |
| 0.010*** | 0.096*  | 0.073   | 0.004   | 0.093*  | 0.073   |                 |                |
| (0.000)  | (0.058) | (0.048) | (0.046) | (0.057) | (0.048) |                 |                |
| -3.140** | -3.150**|         | -2.980**|         | -2.980**|                 |                |
| (1.440)  | (1.460) |         | (1.420) |         | (1.440) |                 |                |
| -0.229***| -0.219***|         | -0.217* | -0.204* |         |                 |                |
| (0.000)  | (0.000) |         | (0.000) |         | (0.000) |                 |                |
| -5.400** | -5.110* | -5.880***|         | -5.450**|         |                 |                |
| (2.250)  | (2.690) | (2.170) |         | (2.670) |         |                 |                |
| Weekday  | YES     | YES     | YES     | YES     | YES     | YES            | YES           |
| dummies  |         |         |         |         |         |                 |                |
| # Obs.   | 5,673   | 5,673   | 5,673   | 5,673   | 5,673   | 5,673          | 5,673         |
| R²       | 0.182   | 0.209   | 0.183   | 0.210   | 0.185   | 0.208          | 0.187         |
|          | 0.208   | 0.208   | 0.208   | 0.208   | 0.208   | 0.208          | 0.208         |

The composite random disturbance term, \( u_{it} + \nu_{it} \), consists of two components. The first component is the unobserved country-specific effect, \( u_{it} \), independent and identically distributed over the panels with mean 0 and standard deviation \( \sigma_u \). This country-specific effect varies across countries, albeit not over time. The second component is the idiosyncratic shock term, \( \nu_{it} \), independent and identically distributed with mean 0 and standard deviation \( \sigma_v \). The unobserved country varies both across countries and over time.

Furthermore, our empirical methodology allows us to discern the role of economic and non-economic (containment and health) interventions. To explore this, Equation (3) scrutinizes different types of policies separately:

\[
BVOL_{it} = \alpha + \delta_{\text{ECO}} ECO_{it} + \delta_{\text{CTNT}} CTNT_{it} + \sum_{c=1}^{C} \delta_{c} K_{i,t} + u_{i,t} + \nu_{i,t}. \tag{3}
\]

where ECO and CTNT denote the Economic Response and Containment and Health indices, respectively. These are sub-indices of GVT, reflecting the components linked with economic stimuli (debt or contract relief, income support, etc.) and the containment and health policies. They are obtained from OxCGRT (2020) and constructed using a methodology consistent with GVT. Table A4 provides details of the variables, and Table 1 presents their statistical properties.

Our baseline regressions are estimated by means of the random-effects estimation method. The motivation is at least four-fold: a) random effects differ across markets, whereas fixed effects are constant (Gelman 2005; Krefl and De Leeuw 1998), b) we are interested in the population rather than in unobserved market-specific features per se (Gelman 2005; Searle, Casella, and McCulloch 1992), c) our dataset constitutes only a small fraction of the population (Gelman 2005; Green and Tukey 1960), d) the random-effects approach does not require estimation of country-specific intercepts, which would reduce the number of degrees of freedom. Nevertheless, for robustness, we also employ the fixed-effects and pooled OLS estimation methods. In our regressions, informed by Abadie et al. (2017), Imbens and Kolesár (2016), and Petersen (2009), we use standard errors clustered by country, which are robust to heteroscedasticity and within-country autocorrelation. On the one hand, the volatility of the unanticipated Treasury bond return is notoriously persistent (Jones, Lamont, and Lumsdaine 1998). On the other hand, it is conceivable that the second moment of the volatility of the

\footnote{Importantly, unit root tests of Levin et al. (2002) confirm the stationarity of all major explanatory variables in our regressions (2) and (3). The detailed results are available upon request.}
Finally, we also consider several extensions to our baseline methodology, which are reported in Section 3.

The table reports the results of the regression specifications (5) and (8) in Table 3 with additional modifications to the baseline methodology. By default in the standard approach, the independent variable is the absolute daily residual from the seven-factor model \(|RR_7|\), the independent variables are the Government Response Index (GVT), Economic Support Index (ECO), Containment and Health Index (CTNT), change in the number of COVID-19 infections \((\Delta INF)\), change in the number of COVID-19 deaths \((\Delta DTH)\), bond duration \((DUR)\), sovereign rating \((CRED)\), convexity \((CX)\), the market value of a bond index portfolio \((MV)\) in U.S. dollars, VIX volatility index \((VIX)\), and weekday dummy variables, and the regressions are run using random-effects models. The reported values are coefficients on GVT and ECO multiplied by 100. The modifications to the baseline methodology reported here include: using pooled (1) and fixed-effects (2) regression models instead of the random-effects model; replacing the dependent variable \(|RR_7|\) with alternative volatility measures: absolute residual from the one-factor model \(|RR_1|\), absolute residual from the three-factor model \(|RR_3|\), absolute daily returns in U.S. dollars \((R_{USD})\) and local currencies \((R_{LOC})\); replacing contemporaneous policy variables with one-day lagged policy variables (7), replacing changes in infection numbers with changes in the death count (8), including infections and deaths numbers (9), (10); excluding changes in infection and death counts from the model (11); excluding weekday dummy variables (12), and replacing the CTNT with the Stringency Index (STG) (13). Coefficient standard errors (in parentheses) are robust to autocorrelation and heteroscedasticity. The asterisks *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The study period runs from January 1, 2020 to September 12, 2020.

| No. | Robustness check                                      | GVT      | ECO      |
|-----|-------------------------------------------------------|----------|----------|
| (1) | Pooled regression model                               | -0.215***| -0.206***|
|     |                                                       | (0.027)  | (0.033)  |
| (2) | Fixed-effects regression model                         | -0.156***| -0.080** |
|     |                                                       | (0.038)  | (0.038)  |
| (3) | Volatility based on residuals from the one-factor model| -0.197***| -0.170** |
|     |                                                       | (0.044)  | (0.068)  |
| (4) | Volatility based on residuals from the three-factor model| -0.162** | -0.091** |
|     |                                                       | (0.048)  | (0.040)  |
| (5) | Volatility based on raw USD returns                   | -0.368***| -0.187***|
|     |                                                       | (0.044)  | (0.063)  |
| (6) | Volatility based on raw local returns                 | -0.312** | -0.155***|
|     |                                                       | (0.042)  | (0.052)  |
| (7) | Lagged policy variables                               | -0.177***| -0.090*  |
|     |                                                       | (0.041)  | (0.046)  |
| (8) | Change in death count only included                   | -0.184***| -0.104** |
|     |                                                       | (0.038)  | (0.043)  |
| (9) | Infections levels included                            | -0.169** | -0.070*  |
|     |                                                       | (0.038)  | (0.037)  |
| (10)| Death levels included                                 | -0.173***| -0.070*  |
|     |                                                       | (0.039)  | (0.037)  |
| (11)| Changes in number of infections and deaths excluded   | -0.194***| -0.102** |
|     |                                                       | (0.038)  | (0.043)  |
| (12)| Weekday dummy variables excluded                     | -0.161***| -0.073** |
|     |                                                       | (0.038)  | (0.036)  |
| (13)| Stringency Index included                            | -0.161***| -0.106** |
|     |                                                       | (0.038)  | (0.046)  |

unanticipated Treasury bond return can vary significantly across countries, which is indicative of the presence of heteroscedasticity. Finally, we also consider several extensions to our baseline methodology, which are reported in Section 3.

3. Results

Table 2 reports the results of our panel regressions. Specifications (1)-(4) focus on the overall role of government policies. These results shed light on the stabilizing role of COVID-19 government responses on volatility. This effect is always significant, irrespective of whether we include the growth of COVID-19 cases separately ((1),(2)) or jointly with the death count ((3),(4)), or whether we include the basic ((1),(3)) or an extended ((2),(4)) set of control variables. The estimated partial slope indicates that a 1-point increase in the Government Response index results in a volatility decline of 0.16% to 0.20%, depending on the specification. Summing up, in line with our conjectures, government responses help to reduce risk and stabilize sovereign bond markets.

Which government policies curb sovereign bond risk? Specifications (5) to (8) cast light on this issue. Whereas the ECO coefficients are negative and significant, CTNT does not influence volatility: the estimated effects of CTNT do not reliably differ from zero. Thus, we find that economic stimuli stabilize sovereign bond markets. However, we find no evidence of a similar effect of containment and closures.

To endorse the validity of our findings, we carry out further robustness checks. First, we replace the random-effects method with the pooled OLS and fixed-effects methods. Second, we employ additional measures of volatility. Concretely, we estimate residuals from two alternative factor models; a one-factor model incorporating only the market risk factor \(|RR_1|\), and a three-factor model including only the three best-established bond factors: market risk, duration, and credit risk \(|RR_3|\). We also use raw absolute returns both in U. S. dollars \((R_{USD})\) and local currency \((R_{LOC})\). Third, we use one-day lagged policy variables (from day t-1) rather than contemporaneous variables (from day t). This addresses any look-ahead bias in our study. Fourth, we consider infections in levels instead of daily changes. Fifth, we replace the change in the infection numbers with the change in the death count. Sixth, we estimate the regressions without infections or deaths. Seventh, we exclude the weekday dummy variables. And eighth, we replace the Containment and Health...
index with a related Stringency index, concentrating solely on containment and closures.

Notably, none of these changes plays a major role in our overall conclusions (see Table 3). In all the robustness checks, the coefficients of GVT and ECO remain negative and significant. Thus, we conclude that economic stimuli are reliable stabilizers of sovereign bond markets.

4. Conclusions

Our study is the first attempt to investigate the impact of government responses to COVID-19 on the volatility in sovereign bond markets. We document that government policies help to stabilize international sovereign bond markets. This effect is driven primarily by economic stimuli.

Our conclusions have direct policy implications. Policymakers should be aware that their responses to COVID-19 exert a measurable impact on sovereign bond markets. The ensuing volatility decline may ultimately influence issuer perception and debt financing costs. In addition, portfolio managers can make inferences about future volatility based on economic stimuli.

The major limitation of our study is the freshness and narrowness of the sample. Future exploration of the topics discussed in this paper will enable validation of our findings, also with the use of risk measures derived from fixed-income derivative market. It would be valuable evaluate the role of monetary interventions by major central banks. Moreover, further research of the topics in this article could include investigation of the role of COVID-19 and government response on bond pricing, as well as on the determinants of market reactions around the world. Future studies could also discriminate between “good” and “bad” volatilities (Patton and Sheppard 2015) and scrutinize how each volatility component behaves in the aftermath of specific government policy responses to COVID-19.

CRediT authorship contribution statement

Adam Zaremba: Conceptualization, Formal analysis, Investigation, Resources, Visualization, Writing - original draft, Writing - review & editing. Renatas Kizys: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Writing - review & editing. David Y. Aharon: Conceptualization, Data curation, Formal analysis, Investigation, Resources, Methodology, Writing - original draft, Writing - review & editing.

Declaration of Competing Interest

No.

Acknowledgements

Adam Zaremba acknowledges the support of the National Science Centre of Poland [Grant No. 2015/19/B/HS4/00378].

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.frl.2021.102011.

References

Abadie, A., S. Athey, G.W. Imbens, and J. Wooldridge. 2017. “When should you adjust standard errors for clustering?”. NBER Working Paper No. w24004, https://www.nber.org/papers/w24004.

Albulescu, C.T., 2020. COVID-19 and the United States Financial Markets’ Volatility. Finance Research Letters in press.

Amengual, D., Xiu, D., 2018. Resolution of Policy Uncertainty and Sudden Declines in Volatility. Journal of Econometrics 203 (2), 297–315.

Antonakakis, N., Kizys, R., 2015. Dynamic Spillovers between Commodity and Currency Markets. International Review of Financial Analysis 41, 303–319.

Arelano, C., Y. Bai, and G.P. Mihalache. 2020. “Deadly Debt Crizes: COVID-19 in Emerging Markets.” NBER Working Paper No. 27275. Available at https://www.nber.org/papers/w27275.

Arnold, I.J.M., Vrugt, E.B., 2010. Treasury Bond Volatility and Uncertainty about Monetary Policy. Financial Review 45 (3), 707–728.

Asgharian, H., Christiansen, C., Hou, A.J., 2015. Effects of Macroeconomic Uncertainty on the Stock and Bond Markets. Finance Research Letters 13, 10–16.

Ashraf, B.N., 2020a. Economic Impact of Government Interventions During the COVID-19 Pandemic: International Evidence from Financial Markets. Journal of Behavioral and Experimental Finance 27, 100371.

Ashraf, B.N., 2020b. Stock Markets’ Reaction to COVID-19: Cases or Fatalities? Research in International Business and Finance 54, 101249.

Asness, C.S., Moskowitz, T.J., Pedersen, L.H., 2013. Value and Momentum Everywhere. Journal of Finance 68 (3), 929–985.

Baig, A.S., Butt, H.A., Haroon, O., Rizvi, S.A.R., 2020. Deaths, Panic, Lockdowns, and US Equity Markets: The Case of COVID-19 Pandemic. Finance Research Letters in press.

Bakas, D., Triantafyllou, A., 2020. Commodity Price Volatility and the Economic Uncertainty of Pandemics. Economics Letters 193, 109283.

Baker, S.R., Bloom, N., Davis, S.J., Kost, K., Sammon, M., Viratyosin, T., 2020a. The Unprecedented Stock Market Reaction to COVID-19. Review of Asset Pricing Studies 10 (4), 742–758.

Baker, S.R., N. Bloom, S.J, Davis, and S.J. Terry. 2020b. “COVID-Induced Economic Uncertainty.” NBER Working Paper No. 26983.

Baltussen, G., L. Swinkels, and P. van Vliet. 2019. “Global Factor Premiums.” Available at SSRN: https://ssrn.com/abstract=3325720 or https://doi.org/10.2139/ssrn.3325720.

Bansal, R., Shaliastovich, I., 2013. A Long-Run Risks Explanation of Predictability Puzzles in Bond and Currency Markets. Review of Financial Studies 26 (1), 1–33.

Beber, A., Brandt, M.W., 2009. Resolving Macroeconomic Uncertainty in Stock and Bond Markets. Review of Finance 13 (1), 1–45.
