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.
Term spreads and the COVID-19 pandemic: Evidence from international sovereign bond markets

Adam Zaremba\textsuperscript{a,b,c,*}, Renatas Kizys\textsuperscript{d}, David Y. Aharon\textsuperscript{e}, Zaghum Umar\textsuperscript{f,g}

\textsuperscript{a} Montpellier Business School, 2300 Avenue des Moulins, 34185 Montpellier cedex 4, France
\textsuperscript{b} Montpellier Research in Management, University of Montpellier, Montpellier, France
\textsuperscript{c} Poznan University of Economics and Business, Institute of Finance, Department of Investment and Financial Markets, al. Niepodleglosci 10, 61-875 Poznan, Poland
\textsuperscript{d} University of Southampton, Southampton Business School, Department of Banking and Finance, Room 1013, Building 4, Highfield Campus, Southampton SO17 1BJ, United Kingdom
\textsuperscript{e} Ono Academic College, Faculty of Business Administration, Tzahal St 104, Kiryat Ono, Israel
\textsuperscript{f} Zayed University, College of Business, P.O. Box 144534, Abu Dhabi, United Arab Emirates;
\textsuperscript{g} South Ural State University, Chelyabinsk, Russian Federation

ARTICLE INFO

JEL codes:
G01
G12
G15
G18
E43

Keywords:
COVID-19 pandemic
Coronavirus
Policy responses
Government bonds
Sovereign bond
Term spread
Term structure
Interest rates

ABSTRACT

We explore the impact of the COVID-19 pandemic on the term structure of interest rates. Using data from developed and emerging countries, we demonstrate that the expansion of the disease significantly affects sovereign bond markets. The growth of confirmed cases significantly widens the term spreads of government bonds. The effect is independent of government policy and monetary responses to COVID-19 and robust to many considerations.

1. Introduction

The recent COVID-19 pandemic wreaked havoc on global financial markets (Baker et al. 2020a). While its influence on equities, commodities, or cryptocurrencies has been thoroughly scrutinized, government bond markets’ response is an unchartered land—a mission we wish to rectify. He et al. (2020), who examine U.S. Treasuries, Arellano et al. (2020), Gubareva (2020), and Sene et al. (2020), who focus on emerging market bonds, Hartley and Rebucci (2020), who examine the impact of the post-pandemic quantitative

We thank Mouhamad M. Allaya, Badar Nadeem Ashraf, Richard Kima, and Martin Martens for helpful comments and suggestions. All errors remain ours. Adam Zaremba acknowledges the support of the National Science Centre of Poland [Grant No. 2015/19/B/HS4/00378].

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

https://doi.org/10.1016/j.frl.2021.102042
Received 5 November 2020; Received in revised form 8 March 2021; Accepted 31 March 2021
Available online 5 April 2021
1544-6123/© 2021 Elsevier Inc. All rights reserved.
easing in 21 bond markets, and Zaremba et al. (2020), who find that more stringent government responses are conducive to lower sovereign bond volatility, are exceptions. Joining this line of very scarce studies, we are the first to investigate the effect of COVID-19 on government bond term spreads around the world.

The bond yield curve reflects the expectations about the future path of short-run rates (the "Expectations Hypothesis") and perceived future risk contained in the risk premia. The link between term spread and uncertainty is also embedded in the Keynesian liquidity preference theory, dating back to Keynes (1936). High levels of uncertainty may induce an increase in demand for speculative and precautionary cash holdings, since liquidity provides a safety cushion and allows to react quickly to unforeseen market developments. Empirical evidence lends support to the links between bond spreads, economic uncertainty, and global and local shocks (Beber et al., 2009; Sgherri and Zoli, 2009; Augustin 2018). In consequence, the spread also contains information about expectations of future economic conditions, including output and growth (Ang et al., 2006; Favero et al., 2012; Rudebusch and Wu, 2008).

The term spread/COVID-19 nexus can manifest through several channels. First, enormous economic costs of COVID-19 may impair a country’s financial position, which translates into higher default risk (Arellano et al., 2020). This COVID-inflated economic uncertainty (Baker et al., 2020b; Altig et al., 2020) may steepen the curve. Thus, in the sovereign bond market, investors may require a higher risk premium on investment in the bonds of affected countries or overreact to pandemic-related news (Sene et al., 2020). Second, the liquidity risk channel implies that bond market investors may rebalance their fixed income portfolios by increasing exposure to more liquid shorter-term Treasury securities (Vissing-Jorgensen and Krishnamurthy, 2011). Specifically, the buying pressure may drive down the yields on short-term securities (Push, 2012). The same argument may lead to liquidity-induced sales of long-term Treasury securities, raising the yields on long-term bonds. The ensuing rise in the relative supply of longer-term government bonds can amplify the spread. Third, according to the preferred habitat/duration risk channel (Vayanos and Vila, 2021), a decrease in the short-term interest rate should trigger purchases of longer-term securities by arbitrageurs, which translates into higher prices, hence lower yields and term premia on these securities. However, due to short-selling restrictions or a credit crunch in the market for short-term loanable funds, the moderating term premium effects of the duration risk channel can be limited. Fourth, if bond market investors anticipate an unconventional monetary expansion in response to the COVID-19-induced business-cycle recession, they may revise up their inflationary expectations. They will be willing to invest in longer-term Treasury securities only if their yields are sufficiently high.

To sum up, these channels predict that the spread, which reflects the composite premium of multidimensional risk (default, duration, liquidity and inflation) in bond markets, increases in response to COVID-19 growth.

However, from a behavioral perspective, the spread may remain unchanged or even decrease. Specifically, waves of pessimism in financial markets amid COVID-19 growth can trigger the so-called "flight to safety" phenomenon, when government bonds are regarded as the only safe investment vehicle (Ben-Rephael, 2017). This may potentially lead to a higher demand for bonds of all maturities—as opposed to riskier asset classes—and, hence, lower or unchanged spreads on a broad cross-section of bonds, effectively flattening the curve. However, investors may be reluctant to trade due to other behavioral motives such as: a) the "ostrich effect" (Galai and Sade, 2006; Karlsson et al., 2009), b) the "information overload" effect (Agnew and Szykman, 2005), or c) merely bad experience (Thaler and Johnson, 1990). As a result, the spread can remain unchanged. Likewise, it can remain unchanged due to fundamental reasons. For instance, if investors anticipate that the reserve channel commands the term structure effects of COVID-19 infections and sovereign bond prices (see, e.g., Christensen and Krostrup, 2019), the term premium can increase, decrease or remain constant. This is because an increase in the supply of central bank reserves may put an upward pressure on asset prices across a broad spectrum of maturities.

Furthermore, if bond market investors expect an aggressive monetary policy expansion in response to the COVID-19-induced business-cycle recession, the term premium on Treasury securities might decline through at least two channels. First, long-term yields and hence term premia should decrease, in agreement with the signalling channel, according to which large-scale asset purchases affect medium- and long-term rates by signalling low future monetary policy rates (Bauer and Rudebusch, 2014; Christensen and Rudebusch, 2012). Second, the portfolio balance channel (see, e.g., Christensen and Krostrup, 2019) – which arises from the reduction in the relative supply of the assets purchased – implies that large-scale asset purchases will translate into higher prices of the assets purchased, and, subsequently, a lower cost of funding for the sovereign borrower.

The importance of the term structure of government bonds cannot be overestimated. Practitioners closely follow and use it as an economic barometer by policy-makers. It has predictive powers of economic activity and asset returns (Campbell, 1987; Wheelock and Wohar, 2009). Hence, understanding the spread/COVID-19 nexus is of essential importance.

To evaluate the impact of COVID-19 on spreads, we examine data from 30 developed and emerging markets from January to September 2020 employing panel regressions. We provide evidence that COVID-19 significantly affects the spreads. Growth in the number of infections induces an increase in the spread. The effect is independent of policy interventions or monetary measures and is robust to a broad range of model specifications.

The remainder proceeds as follows. Section 2 presents data and methods. Section 3 summarizes the results. Finally, Section 4 concludes.
2. Data and methods

We examine data from 30 developed and emerging markets (Table A1, Online Appendix). The COVID-19 study period runs from January 1, 2020, to September 12, 2020. We retrieved data from Datastream, Federal Reserve Bank of St. Louis\(^1\), and the Oxford COVID-19 Government Response Tracker\(^2\) (Table A2, Online Appendix).

Our primary dependent variable is the term spread, \(\text{TERM}\), calculated as the 10-year government bond yield minus the three-month interest rate. Sovereign bonds of 10-year maturity are typically most liquid with the broadest international coverage and are commonly used in the asset pricing literature (e.g., Baltussen et al., 2020; Ilmanen et al., 2019). The yields are calculated based on Datastream 10-Year Government Bond Total Returns. Furthermore, following Martens et al. (2019), we represent the short-term rate by a three-month interbank rate. Given borrowing restrictions and availability limitations, interbank rates are more relevant from a practical perspective than analogous Treasury bill rates.

To explore the role of COVID-19 on spreads, we run the following panel data regression:

\[
\text{TERM}_{i,t} = \alpha + \gamma_{\Delta CC} \Delta \text{CC}_{i,t} + \sum_{c=1}^{C} \gamma_c K_{c,i,t} + \epsilon_{i,t}
\]

(1)

where \(\text{TERM}_{i,t}\) denotes the spread in country \(i\) on day \(t\), \(\alpha\), \(\gamma_{\Delta CC}\), and \(\gamma_c\) are estimated coefficients, and \(\epsilon_{i,t} = u_i + v_{i,t}\) is the composite random disturbance term, which consists of two components, the unobserved country-specific effect, \(u_i\), and the idiosyncratic shock term, \(v_{i,t}\). \(\Delta \text{CC}_{i,t}\) is our main predictor, i.e., the change in the number of COVID-19 infections. Our choice of the number of cases (over COVID-19 deaths) is informed by Ashraf (2020). However, our findings are robust to the inclusion of fatalities. \(K_{c,i,t}\) represents the set of control variables: quantified sovereign rating score (\(\text{CRED}\)), adjusted duration of the index portfolio (\(\text{DUR}\)), its convexity (\(\text{CX}\)), and market value (\(\text{MV}\)) in U.S. dollars. Furthermore, to disentangle the effects of government interventions from COVID-19 itself, we incorporate also both the broad Government Response Index (\(\text{GVT}\)) by Hale et al. (2020), as well as its components, which reflect containment, closure, and health policies (\(\text{Containment and Health Index, CTNT}\)) and economic support interventions (Economic Response Index, \(\text{ECON}\)).\(^3\) Additionally, following Hilscher and Nosbusch (2010), we include a set of global variables that influence sovereign bond markets: CBOE Volatility Index (\(\text{VIX}\)), default spread (the yield difference of Baa and Aaa-rated corporate bonds, \(\text{DEF}\)), TED spread (the difference between the three-month U.S. LIBOR rate and the three-month T-Bill rate, \(\text{TED}\)), and the U.S. 10-year government bond yield (\(\text{YLD}\)).

The year 2020 witnessed an unprecedented scale of unconventional monetary policy measures implemented by central banks worldwide. These measures sought i) to provide liquidity to the market, and ii) to ensure financial stability during the extraordinary circumstances. Whereas the consequences of these actions are already partly reflected in the short-term rates and should lead to flattening rather than steepening of the yield curve, we introduce an additional control variable to account for the role of monetary policy.

Our principal monetary policy measure entails the relative rate of change in the central bank balance sheet total assets (\(\text{CBTA}\)). Arguably, changes in total assets can measure the stance of both conventional (e.g., open market operations) and unconventional monetary policy (e.g., quantitative easing). However, the latter can be regarded as a more effective policy measure during the COVID-19-induced business cycle recession, when the former is exhausted by the central bank, as short-term rates hit the zero-lower bound and can cause a liquidity trap, a deflationary spiral and thus can limit the central bank’s capacity to stimulate the economy and financial markets. The data on the central bank total assets are obtained from Bloomberg, which sourced them directly from central banks and the International Monetary Fund. Since the data are recorded on a weekly or monthly basis, we use interpolation to transform into daily data. Specifically, we employ linear, forward, cubic, spline, piecewise cubic Hermite, inverse distance weighted, and nearest neighbour interpolation methods. The use of a range of different interpolation techniques assures the robustness of our research findings. In Table 1, we only provide the coefficient estimates of \(\text{CBTA}\), obtained by means of linear interpolation. The results obtained with the other interpolation methods, which are available from the authors upon request, remain qualitatively similar.

Finally, we also include weekday dummies to control for seasonality (Barth and Bennett, 1975). Tables A2 and A3 display data information and statistical properties, respectively.

Following the Hausman tests, we employ the random-effects method. For robustness, we consider several alternative specifications, which are summarized at the end of Section 3.

3. Results

Results are summarized in Table 1. We find that COVID-19 infections exert a positive and significant effect on \(\text{TERM}\). This effect remains robust to the model specifications that comprise the primary (1) or extended (2) set of bond-related variables, the global business cycle stance (3-4), or weekday seasonality effects (5).

Notably, the effect of COVID-19 is not subsumed by the impact of government interventions. The policy responses, measured either as a comprehensive government response index (4-5) or by its components (containment and closer or economic stimuli, 6), do not

---

\(^1\) https://fred.stlouisfed.org/

\(^2\) https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker.

\(^3\) We also control for changes (rather than levels) in the policy response indices; this modification has no visible effect on our conclusions.
Our findings are validated by several robustness checks. First, we incorporate the difference in deaths instead of infections. Second, controlling for central bank policies also reveals a soothing effect of government economic policies. This may be interpreted as a stabilizing impact of the economic interventions that alleviate the concerns about the economy’s future state.

4. Concluding remarks

We study the impact of COVID-19 on the sovereign bond yield spreads around the world. We demonstrate that the change in the number of infections widens the spread. Moreover, the government responses to COVID-19 do not materially influence the spreads.

### Table 1: COVID-19 and Term Spreads: Panel Regression Results

The table summarizes panel data regressions. The dependent variable is the spread ($TERM$), and the explanatory variables are: change in the number of COVID-19 infections ($\Delta CC$), duration ($DUR$), sovereign rating ($CRED$), convexity ($CX$), market value ($MV$), VIX volatility index ($VIX$), U.S. default spread ($DEF$), TED spread ($TED$), the yield on U.S. government bonds ($YLD$), Government Response, Economic Support, and Containment and Health indexes ($GVT$, $ECON$, $CTNT$), relative rate of change in central bank total assets ($CBTA$), and weekday dummies. We use linear interpolation to obtain daily observations of the central bank total assets. Results obtained with other interpolation methods are not reported by are available from the authors upon request. $R^2$ is the 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 *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. #Countries and #Obs. indicate the total number of countries and country-day observations available in a given specification. The coefficients for $\Delta CC$ and $MV$ are multiplied by 100,000 and one billion, respectively. The study period is from 01/01/2020 to 12/09/2020. The research sample comprises 30 countries. The specifications (7) and (8) exclude Czechia and New Zealand due to data limitations.

|     | (1)       | (2)       | (3)       | (4)       | (5)       | (6)       | (7)       | (8)       |
|-----|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| $\Delta CC$ | 0.699***  | 0.688***  | 0.437**   | 0.394**   | 0.402**   | 0.376**   | 0.423**   | 0.403**   |
|     | (0.114)   | (0.132)   | (0.197)   | (0.196)   | (0.196)   | (0.188)   | (0.188)   | (0.199)   |
| $DUR$ | 0.060     | -0.454    | 0.076     | 0.083     | 0.070     | 0.047     | 0.115     | 0.066     |
|     | (0.098)   | (0.930)   | (0.679)   | (0.687)   | (0.692)   | (0.665)   | (0.720)   | (0.693)   |
| $CRED$ | 0.226***  | 0.237***  | 0.222***  | 0.221***  | 0.221***  | 0.221***  | 0.208***  | 0.207***  |
|     | (0.047)   | (0.059)   | (0.054)   | (0.054)   | (0.054)   | (0.054)   | (0.007)   | (0.005)   |
| $CX$ | 0.029     | -0.001    | -0.002    | -0.001    | 0.000     | -0.039    | -0.037    |          |
|     | (0.051)   | (0.037)   | (0.037)   | (0.038)   | (0.036)   | (0.051)   | (0.050)   |          |
| $MV$ | 0.984     | -3.470    | -3.520    | -3.500    | -3.220    | -3.680    | -3.250    |          |
|     | (1.580)   | (2.570)   | (2.590)   | (2.590)   | (2.600)   | (2.550)   | (2.580)   |          |
| $VIX$ | -0.002    | -0.002    | -0.002    | -0.002    | -0.003    | -0.001    | -0.001    |          |
|     | (0.000)   | (0.002)   | (0.002)   | (0.003)   | (0.003)   | (0.003)   | (0.002)   | (0.002)   |
| $DEF$ | 0.083     | 0.005     | 0.008     | 0.006     | 0.017     | 0.017     | 0.012     |          |
|     | (0.000)   | (0.070)   | (0.133)   | (0.134)   | (0.136)   | (0.136)   | (0.137)   |          |
| $TED$ | 0.075     | 0.072     | 0.072     | 0.071     | 0.068     | 0.068     |          |          |
|     | (0.000)   | (0.079)   | (0.081)   | (0.082)   | (0.081)   | (0.087)   |          |          |
| $YLD$ | -0.311**  | -0.186    | -0.189    | -0.229    | -0.140    | -0.198    |          |          |
|     | (0.000)   | (0.133)   | (0.238)   | (0.239)   | (0.234)   | (0.250)   |          |          |
| $GVT$ | 0.003     | 0.003     | 0.003     | 0.003     | 0.003     |          |          |          |
|     | (0.000)   | (0.003)   | (0.003)   | (0.000)   | (0.000)   |          |          |          |
| $CTNT$ |          |          |          |          |          |          |          | 0.004    |
|     |          |          |          |          |          |          | (0.000)  | 0.004    |
| $ECON$ |          |          |          |          |          |          | -0.001   | -0.002*  |
|     |          |          |          |          |          |          | (0.001)  | (0.000)  |
| $CBTA$ | -13.710** |          |          |          |          |          | -13.070**| (5.819)  |
|     | (-9.000) |          |          |          |          |          |          |          |

Our findings are validated by several robustness checks. First, we incorporate the difference in deaths instead of infections. Second, we experiment with bond maturities ranging from 2 to 30 years. Third, we employ fixed effects and pooled OLS as alternative estimation methods. None of these robustness checks qualitatively affects our overall conclusions. For brevity, we do not report the results, which are available upon request.

4. Concluding remarks

We study the impact of COVID-19 on the sovereign bond yield spreads around the world. We demonstrate that the change in the number of infections widens the spread. Moreover, the government responses to COVID-19 do not materially influence the spreads.
Our conclusions are consistent with the composite premium of multidimensional risk, which implies that the term premium should increase in response to changes in the reported COVID-19 infections through higher perceived levels of the risk and uncertainty of investments in the sovereign bond market. The balance of demand and supply forces leads to an increase of the term spread, which makes the yield curve steeper. Furthermore, our findings do not lend support to the behavioral perspective, which predicts a negative term premium effect of COVID-19 infections. We also find that an increase in the relative rate of change in the central bank balance sheet total assets exerts a negative effect on the term spread.

Our findings matter for fixed-income investors with an international mandate. Specifically, we provide insights into risks and opportunities arising from COVID-19. Also, our results bear policy implications. Policy-makers should undertake stringent actions to curb the spread of the disease. While these actions do not generally affect the spreads, an uncontrolled pandemic may translate into higher debt financing costs.

Future studies on the topics discussed could be extended to new developments affecting the global pandemic and potentially the bond market. Consideration of the emergence of the vaccines, new coronavirus strains, novel policies, and fresher data could provide further valuable insights.

CRediT authorship contribution statement

Adam Zaremba: Conceptualization, Methodology, Investigation, Data curation, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition. Renatas Kizys: Conceptualization, Methodology, Software, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing. David Y. Aharon: Conceptualization, Methodology, Investigation, Data curation, Writing – original draft, Writing – review & editing. Zaghum Umar: Conceptualization, Methodology, Writing – original draft, Writing – review & editing.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.frl.2021.102042.

References

Agnew, J.R., Seykman, L.R., 2005. Asset allocation and information overload: the influence of information display, asset choice, and investor experience. J. Behav. Finance 6 (2), 57–70.

Altig, D., et al., 2020. Economic uncertainty before and during the COVID-19 pandemic. J. Public Econ. 191 (2020), 104274.

Ang, A., Piazzesi, M., Wei, M., 2006. What does the yield curve tell us about GDP growth? J. Econom. 131 (1-2), 359–403.

Arellano, C., Bai, Y., Mihalache, G.P., 2020. Deadly debt crises: COVID-19 in emerging markets. NBER Working Paper No. 27275.

Augustin, P., 2018. The term structure of CDS spreads and sovereign credit risk. J. Monet. Econ. 96, 53–76.

Augustin, P., 2018. The term structure of CDS spreads and sovereign credit risk. J. Monet. Econ. 96, 53–76.

Baker, S.R., Davis, S.J., 2020a. The Unprecedented Stock Market Reaction to COVID-19. Rev. Asset Pricing Stud. forthcoming.

Baker, S.R., et al., 2020b. “COVID-induced economic uncertainty.” NBER Working Paper No. w26983. https://www.nber.org/papers/w26983.

Baltussen, G., Swinkels, L., van Vliet, P., 2020. Global factor premiums. Available at SSRN. https://doi.org/10.2139/ssrn.3235720.

Bauer, M.D., Rudebusch, G.D., 2014. The signaling channel for federal reserve bond purchases. Int. J. Cent. Bank. 10 (3), 233–289.

Barth, J.R., Bennett, J.T., 1975. Seasonal variation in interest rates. Rev. Econ. Stat. 57 (1), 80–83.

Beber, A., Brandt, M.W., Kavajecz, K.A., 2009. Flight-to-quality or flight-to-liquidity? evidence from the euro-area bond market. Rev. Financ. Stud. 22 (3), 925–957.

Ben-Rephael, A., 2017. Flight-to-liquidity, market uncertainty, and the actions of mutual fund investors. J. Financ. Intermed. 31, 30–44.

Campbell, J.Y., 1987. Stock returns and the term structure. J. Financ. Econ. 18 (2), 373–399.

Christensen, J.H.E., Krostrup, S., 2019. Transmission of quantitative easing: the role of central bank reserves. Econ. J. 129 (617), 249–275.

Christensen, J.H.E., Rudebusch, G.D., 2012. The response of interest rates to US and UK quantitative easing. Econ. J. 122 (564), F385–F403.

Ilmanen, A.S., Ronen, R., Moskowitz, T.J., Thapar, A.K., Wang, F., 2019. How do factor premia vary over time? A century of evidence. Available at SSRN. https://doi.org/10.2139/ssrn.3400998.

Karlsson, N., Loewenstein, G., Seppi, D., 2009. The Ostrich effect: selective attention to information. J. Risk Uncertain 38 (2), 95–115.

Augustin, P., 2018. The term structure of CDS spreads and sovereign credit risk. J. Monet. Econ. 96, 53–76.

Keynes, J.M., 1936. The General Theory of Employment, Interest and Money. Macmillan, London.

Kuznets, S., 1971. Perceived economic uncertainty and real economic behavior. J. Law Econ. 14 (1), 1–14.

Kuznets, S., 1971. Perceived economic uncertainty and real economic behavior. J. Law Econ. 14 (1), 1–14.

Vissing Jorgensen, A., Krishnamurthy, A., 2011. The effects of quantitative easing on interest rates: channels and implications for policy. Brook. Papers Econ. Act. 43 (2), 215–287.

Martens, M., Beekhuizen, P., Duyvesteyn, J., Zomerdijk, C., 2019. Carry investing on the yield curve. Financial Anal. J. 75 (4), 51–63.

Pusch, T., 2012. The Role of Uncertainty in the Euro Crisis - a Reconsideration of Liquidity Preference Theory. Universität Hamburg. ZÖSS Discussion Paper, 31.

Hamburg, https://nbn-resolving.org/urn:nbn:de:0168-soar-95841-5.

Rudebusch, G.D., Wu, T., 2008. A macro-financial model of the term structure, monetary policy and the economy. Econ. J. 118 (530), 906–926.

Séne, B., Mbengue, M.L., Allaya, M.M., 2020. Overshooting of sovereign emerging eurobond yields in the context of COVID-19. Financ. Res. Lett. forthcoming.

Sherri, S., Zoli, E. 2009. Euro area sovereign risk during the crisis. IMF Working Papers, No. W.P./09/222.
Thaler, R.H., Johnson, E.J., 1990. Gambling with the house money and trying to break even: the effects of prior outcomes on risky choice. Manage. Sci. 36 (6), 643–660.

Vayanos, D., Vila, J.-L., 2021. A preferred-habitat model of the term structure of interest rates. Econometrica 89 (1), 77–112.

Wheelock, D.C., Wohar, M.E., 2009. Can the term spread predict output growth and recessions? A survey of the literature. FED St. Louis Rev. 91 (5), 419–440.

Zaremba, A., Kizys, R., Aharon, D.Y., 2020. Volatility in international sovereign bond markets: The role of government policy responses to the COVID-19 pandemic. Financ. Res. Lett. forthcoming https://doi.org/10.1016/j.frl.2021.102011.