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Flight-to-quality between global stock and bond markets in the COVID era

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ABSTRACT

We investigate the impact of the recent COVID-19 pandemic on the time-varying correlation between stock and bond returns. Using daily data on bond and stock returns for ten countries, covering Europe, Asia, US and Australia regions, we identify flight-to-quality episodes during the COVID-19 global pandemic crisis employing both a panel data specification and a wavelet analysis. Our empirical results demonstrate that flights occur simultaneously across countries and are not country-specific events. This finding suggests that the two largest asset classes offered diversification to investors during the recent crisis, when they actually needed it the most.

1. Introduction

Government bonds tend to rally during stock market crashes, as investors prefer the safety of government obligations. This phenomenon, called "flight-to-quality", has the potential to increase the stability and resiliency of the financial system, as it eases the potential losses that investors suffer in crises periods (Baur and Lucey, 2009). This paper gives new insights about flight-to-quality from stocks to bonds, investigating the dynamics of this phenomenon during the COVID-19 pandemic. In particular, we study the time-varying correlation between stock and bond returns for ten countries during the first quarter of 2020, searching for flight-to-quality episodes occurred during the global pandemic crisis.

The main motivation of this study lies in the fact that co-movement dynamics between stock and bond markets are a key input in asset allocation investment strategies and risk management and control. Investors hold stocks and bonds in their portfolios in order to diversify their risk. Therefore, analyzing how the two largest asset classes behaved during the recent crisis sheds light on whether diversification works when it is actually needed most. In addition, understanding correlations among financial assets is important for policy makers as well. Although authorities do not have explicit price targets for financial assets, such as equities and bonds, they are using financial markets are barometers for investors' economic growth and inflation expectations (Andersson et al., 2008). Therefore, by analyzing the stock–bond return correlation, policy makers may have additional information regarding market participants' views regarding important macroeconomic variables.

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Fig. 1. Stock & bond prices, coronavirus cases, google trend on coronavirus

Notes: This figure presents the benchmark equity and the Thomson Reuters Total Return Bond Indices for ten countries: Germany (DEU), France (FR), Italy (IT), Netherland (NL), United Kingdom (UK), Switzerland (CH), India (IND), Japan (JPN), United States of America (USA) and Australia (AUS). It also includes the COVID cases and the Google Trend search results (GTR) on coronavirus for each country. Our sample period spans from 02 January 2020 to 09 April 2020.

The co-movement between the returns on government bonds and equity indices is extensively investigated in the existing empirical literature using several linear and non-linear time series techniques, including VAR decomposition approaches, multivariate GARCH models, switching regime models and copula methods (see Boucher and Tokpavi, 2019; Selmi et al., 2019; Skintzi, 2019, for a relevant review). The early literature (Campbell and Ammer, 1993; Shiller and Beltratti, 1992) mainly focuses on the relation between stocks and bonds, suggesting that real interest rates and expected inflation are the two main common drivers for equity and bond values (Christiansen and Ranaldo, 2007). Nevertheless, there is substantial time-variation in the relation between stock and bond returns over the short-term (Connolly et al., 2005). More recent efforts attempt to identify various economic forces driving the time-varying stock–bond returns correlation (Yang et al., 2009).

Besides traditional macroeconomic environment dynamics, financial market dynamics and market participants’ perceptions and risk aversion are also having a significant effect on the relationship between stock and bonds (Andersson et al., 2008). Several researchers recognize that there can be important and different dynamics between financial assets and markets in times of stress and turmoil and thus, examine the linkage between stocks and bond prices during periods of extreme movements giving rise to a vibrant “flight to quality” literature (Baur and Lucey, 2009; 2010; Ciner et al., 2013; Ashgharian et al., 2015; Bethke et al. 2017; Aslanidis et al., 2020). There is also an active theoretical academic literature studying such phenomena (see Baele et al., 2020 for a relevant discussion). The flight to quality strand examines the stock–bond return relationship in periods of financial market stress and shows that, although the stock–bond returns correlation is generally positive, the relation might be negative in periods of turbulence, as the equity risk premium demanded by investors increases relative to the respective term premium for bonds (Christiansen and Ranaldo, 2007). In particular, during periods of normal economic conditions, when market participants are optimistic about future prospects, they are likely to enhance their holdings of both stocks and bonds in their portfolios leading to a positive correlation between these two financial assets. Conversely, when investors become pessimistic regarding future economic prospects, they are likely selling their stock holding in favor to bonds, resulting in lower (or even negative) correlation between stocks and bonds (McMillan, 2019).

Motivated by the existing literature, our paper attempts to provide additional stylized facts about flight to quality examining the stock-bond relationship in 10 countries during the COVID-related global sell-off. More specifically, we attempt to answer the following two research questions: (1) In what direction did the global COVID pandemic affect the stock–bond correlations? (2) Do investors still find it rational in an era of record low yields and record high government debt accumulation to rebalance their equity portfolios in favor of bonds in times of stress?

This study contributes to the literature in four ways. First, since the majority of flight-to-quality events are country-specific not global (Baele et al., 2020), the recent coronavirus pandemic offers a clean case of a global event characterized by high turbulence and extreme uncertainty with specific start date. Therefore, we can empirically test in a global scale whether government bonds offer effective diversification during financial crises, at the time diversification is needed most. Second, a large proportion of existing literature on the stock-bond dynamics is based on developed markets, while less attention has been given to emerging markets or to comparative studies (see Dimic et al., 2016 and Selmi et al., 2019 for a relevant discussion). We contribute to the existing empirical evidence by studying the stock–bond return correlation in global markets and investigate whether investors react differently in the 10 countries under review. Third, our paper employs both traditional (panels) and non-traditional (wavelets) finance models in order to capture the stock-bond returns dynamics. Panel data estimation controls for individual heterogeneity and reduces estimation bias, while wavelet coherent analysis allows us to decompose our dataset into several time scales without imposing any assumptions and dropping valuable information. Fourth, our paper evaluates the response of financial markets to the catastrophic event related to the COVID-19 global pandemic, contributing to recent studies that focus on the role played by the pandemic on financial markets reaction and contagion (Akhtaruzzaman et al., 2020; Ashraf, 2020; Conlon and McGee, 2020; Corbet et al., 2020a, 2020b; Goodell and Huynh, 2020; Ji et al., 2020; Sharif et al., 2020; Zaremba et al., 2020; Zhang et al., 2020).

Our empirical findings, using the panel estimation specification, indicate a ‘flight-to-quality’ phenomenon, as the stock-bond correlation has been affected by the COVID-19 outbreak, while the wavelet analysis demonstrates that during the pandemic, bond and stock returns move in opposite directions, with the bond returns lagging the respective equity returns.

2. Data and methodology

Our dataset includes the benchmark equity and 10-year government bond (based on the Thomson Reuters Total Return Bond Indices) returns for ten countries: Australia (AUS), France (FR), Germany (DEU), Japan (JPN), India (IND), Italy (IT), Netherland (NL), Switzerland (CH), United Kingdom (UK), and United States of America (USA). Fig. 1 includes the graphical depiction of the stock and bond indices for each country. Our sample spans from 02 January 2020 to 09 April 2020, which coincides with Easter holiday observance in the US and most European countries.

The basic model estimated in a panel data framework that tests for changes in the level of stock–bond correlation is as follows:
\[ r_{i,b,t} = \alpha + \beta r_{i,s,t} + \gamma r_{t,\text{cases},t} + \delta r_{i,s,t-1} + \epsilon_{i,t} \]  

(1)

in which, for \( i = \{ \text{DEU, FR, IT, NL, UK, CH, IND, JPN, USA and AUS} \} \), \( r_{i,b,t} \) denotes the government bond return for country \( i \) in day \( t \), \( r_{i,s,t} \) is the stock index return for country \( i \) in day \( t \) and \( r_{t,\text{cases},t} \) is the daily logarithmic change in COVID-19 cases in country \( i \) in day \( t \). The level of stock–bond correlation in a crisis period is given by the sum of the parameters \( \beta, \gamma \) and \( \delta \). If \( \gamma / \delta \) are significantly negative, then there is a negative change of the stock–bond correlation during the COVID outbreak compared to the normal correlation given by \( \beta \). If the sum of \( \beta \) and \( \gamma \) is negative, there is flight-to-quality from stocks to bonds, since during the global pandemic crisis stock markets plummeted. Conversely, if \( \gamma / \delta \) are significantly positive and the sum of \( \beta \) and \( \gamma \) is also positive, then there is cross-asset contagion between stocks and bonds (Baur and Lucey, 2009).

Finally, as a sensitivity analysis, we run the above specification using Google trends metrics as a proxy for the attention of the crowd on COVID-19 over this period:

\[ r_{i,b,t} = \alpha + \beta r_{i,s,t} + \gamma r_{t,\text{trends},t} + \delta r_{i,s,t-1} + \epsilon_{i,t} \]  

(2)

in which, \( r_{t,\text{trends}} \) is the daily logarithmic change in Google trends “corona virus” term (specific search term) and theme (a general term concerning health consequences of severe health decease). The metrics reach their highest level (that is one hundred) on the day of the period under examination in which attention is the highest and the remaining days are reported in reference to that.

3. Empirical results

In order to test our “flight-to-quality” hypothesis, we adopt a panel data framework. We, firstly, run a number of panel unit root tests applied on stock and bond returns, as well as on logarithmic changes in COVID cases and Google Trend search results. Our estimates (included in Table 1) indicate strong evidence against non-stationarity for the changes of all series under review.

The estimation results of Eq. (1) are reported in Table 2 including the coefficient estimates, standard errors, z-statistics and p-values for the panel specification. Our empirical findings demonstrate that the bond–stock return correlation is generally positive, but turns negative during the recent pandemic. This finding is consistent with the ‘flight-to-quality’ phenomenon. Government bonds tend to rally during stock market crashes as investors seek the safety of government debt. Hence, the positive correlation between stock-bond returns changes to negative, which means that government bonds offer effective diversification during crises, at the time when diversification is mostly needed. Since the sum of \( \beta \) and \( \gamma \) coefficients is negative, there is flight-to-quality from stocks to bonds, indicating falling stock prices and increasing bond prices.

The respective estimation results of Eq. (2), which are reported in Table 3, demonstrate a similar picture. Google trends seem to capture the crisis characteristics in an effective way. In particular, the cross-term coefficient \( \gamma \) in Eq. (2) is more than three times larger in magnitude compared to the respective coefficient in Eq. (1) and is statistically significant at the 95% confidence interval.

Finally, to check the robustness of these results, we also employ the wavelet coherence analysis, which takes into account non-linear behavior of our series and their coherence characteristics over time and frequency. In Fig. 2, we present the wavelet coherence analysis between equity and bond markets for each country. Although some signs of high coherence exist during the short-run cycle (0-4 days), during the long-run (4-22 days) the series seem to have low or zero coherence. Specifically, the high coherence effects are present during specific time points across the pandemic, mainly at March. In general, most arrows point to the left, meaning anti-cyclical effects (out-of-phase) between the bonds and stock returns (i.e., move in the opposite direction). Also, since the arrows point to the left and down, the first index (the bond returns, in our case) is lagging. In general, the wavelet results support the findings from the panel regression estimation.

4. Conclusions

This present paper is related to the flight-to-quality literature, which examines whether investors move from stocks into bonds when stock markets collapse (see Baur and Lucey, 2009; 2010). As the two largest asset classes, understanding and appreciating the time variation in the stock–bond correlation has important implications for asset allocation and risk management. We examine the effect of the coronavirus-led global stock market crash on the correlation between stock and bond returns. The COVID-19 pandemic has adversely affected the global financial system, putting in danger the fragile financial stability. As a result, the recent crisis renewed interest in systemic risk that is often applied to shocks to various assets, which makes the empirical focus on the structural dynamics of stock-bond returns extremely crucial in order to understand how financial markets responds to shocks. Following Baur and Lucey (2009), we define flight-to-quality from stocks to bonds as a significant decrease in the correlation coefficient between the returns of the two assets.

Our empirical findings from a panel data framework suggest that the correlation between stock and bond returns has been affected
Table 1
Summary of panel unit root tests

| Method                                      | Bond_Returns | Stock_Returns | Cases_changes | GTR_changes |
|---------------------------------------------|--------------|---------------|---------------|-------------|
|                              | Statistic     | Cross-sections | Obs           | Statistic     | Cross-sections | Obs           | Statistic     | Cross-sections | Obs           | Statistic     | Cross-sections | Obs           |
| Null: Unit root (assumes common unit root process) | -18.29***    | 10             | 590           | -23.51***    | 10             | 590           | -33.43***    | 10             | 590           | -15.41***    | 10             | 590           |
| Levin, Lin & Chu t*                        |              |                |               |              |                |               |              |                |               |              |                |               |
| Null: Unit root (assumes individual unit root process) | -17.45***    | 10             | 590           | -20.78***    | 10             | 590           | -29.34***    | 10             | 590           | -16.05***    | 10             | 590           |
| Im, Pesaran and Shin W-stat                | 274.72***    | 10             | 590           | 326.03***    | 10             | 590           | 397.40***    | 10             | 590           | 251.96***    | 10             | 590           |
| ADF - Fisher Chi-square                    | 296.29***    | 10             | 590           | 401.06***    | 10             | 590           | 368.93***    | 10             | 590           | 291.69***    | 10             | 590           |
| PP - Fisher Chi-square                     |              |                |               |              |                |               |              |                |               |              |                |               |

Notes: This table presents the panel unit root tests results for bond and stock daily returns, COVID cases and Google trends (GTR) indicator log changes. **H_0** unit root is present. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.
Table 2
Panel data estimation results for stock-bond returns (against cases)

| Dependent Variable | Bond Returns |
|--------------------|--------------|
|                    | Exp. | Sign | Pooled with PCSE | Fixed Effects with PCSE | Random Effects with PCSE | Pooled OLS with PCSE and AR(1) | Fixed Effects with PCSE and AR(1) |
| Intercept          | +/−  |      | 0.0001           | 0.0002                    | 0.0002                    | 0.0001                        | 0.0001                        |
|                    |      |      | (0.0003)         | (0.0003)                  | (0.0006)                  | (0.0004)                      | (0.0004)                      |
| Stock Returns_{t}  | +    |      | 0.0285           | 0.0423                    | 0.0337                    | 0.0258                        | 0.0262                        |
|                    |      |      | (0.0119)**       | (0.0187)**                | (0.0155)**                | (0.0118)**                    | (0.0119)**                    |
| Stock Return_{t} x Cases changes_{t} | −   |      | -0.1335          | -0.1131                   | -0.1201                   | -0.1437                       | -0.1435                       |
|                    |      |      | (0.0414)**       | (0.0482)**                | (0.0440)**                | (0.0420)**                    | (0.0423)**                    |
| Stock Return_{t} x Cases changes_{t-1} | −  |      | -0.1419          | -0.0755                   | -0.0925                   | -0.1445                       | -0.1475                       |
|                    |      |      | (0.0334)**       | (0.0400)**                | (0.0343)**                | (0.0335)**                    | (0.0338)**                    |
| ρ [AR(1) coeff.]  | +/−  |      | 0.1224           | 0.1133                    | 0.0589*                   | 0.1133                        | 0.0595*                       |
| Country Effects    | No   |      | Yes              | Yes                       | No                         | Yes                           |
| Time Effects       | No   |      | Yes              | Yes                       | No                         | No                            |
| R²                 |      |      | 2.8%             | 27.97%                    | 1.8%                       | 4.0%                          | 3.3%                          |
| F Test             |      |      | 6.47***          | 4.25***                   | 4.53***                   | 6.89***                       | 2.45***                       |
| Durbin-Watson stat.|      |      | 1.79             | 2.17                      | 2.03                      | 2.01                          | 2.01                          |
| N = (ixT)          |      |      | 570              | 570                       | 570                        | 560                           | 560                           |
| Specification tests|      |      | Cross section F-test (pooled OLS vs. FEM) | 0.77 | |
|                    |      |      | Period F-test (pooled OLS vs. FEM) | 234.7*** | |
|                    |      |      | Hausman test (FEM vs REM) Period Random | 3.72 | |
|                    |      |      | Hausman test (FEM vs REM) Cross section Random | 0.00 | |
| Notes: This table reports the estimation results for the pooled, fixed and random effects models regarding Equation (1) during the period 02 January 2020 - 09 April 2020. Standard Errors are in parentheses. *,** and *** indicate statistical significance at the 10%, 5%, and 1% level respectively. |

Table 3
Panel data estimation results for stock-bond returns (against Google trends)

| Dependent Variable | Bond Returns |
|--------------------|--------------|
|                    | Exp. | Sign | Pooled with PCSE | Fixed Effects with PCSE | Random Effects with PCSE | Pooled OLS with PCSE and AR(1) | Fixed Effects with PCSE and AR(1) |
| Intercept          | +/−  |      | 0.0002           | 0.0001                    | 0.0002                    | 0.0002                        | 0.0002                        |
|                    |      |      | (0.0003)         | (0.0003)                  | (0.0006)                  | (0.0004)                      | (0.0004)                      |
| Stock Returns_{t}  | +    |      | 0.0091           | 0.0344                    | 0.0237                    | 0.0065                        | 0.0068                        |
|                    |      |      | (0.0110)         | (0.0175)**                | (0.0147)                  | (0.0108)                      | (0.0109)                      |
| Stock Return_{t} x Google trends changes_{t} | −   |      | -0.0515          | -0.3794                   | -0.2698                   | -0.0794                       | -0.0745                       |
|                    |      |      | (0.1331)         | (0.1898)**                | (0.1506)*                 | (0.1296)                      | (0.1310)                      |
| Stock Return_{t} x Google trends changes_{t-1} | −  |      | -0.1249          | -0.1668                   | -0.1179                   | -0.1460                       | -0.1630                       |
|                    |      |      | (0.2039)         | (0.2294)                  | (0.2144)                  | (0.2024)                      | (0.2051)                      |
| ρ [AR(1) coeff.]  | +/−  |      | 0.1130           | 0.1049                    | 0.0573**                  | 0.1049                        | 0.0579*                       |
| Country Effects    | No   |      | Yes              | Yes                       | No                         | Yes                           |
| Time Effects       | No   |      | Yes              | Yes                       | No                         | No                            |
| R²                 |      |      | 0.0%             | 27.97%                    | 0.0%                       | 0.0%                          | 0.0%                          |
| F Test             |      |      | 0.53             | 4.23***                   | 2.12                      | 2.24*                         | 1.02                          |
| Durbin-Watson stat.|      |      | 1.79             | 2.18                      | 2.06                      | 2.01                          | 2.01                          |
| N = (ixT)          |      |      | 570              | 570                       | 570                        | 560                           | 560                           |
| Specification tests|      |      | Cross section F-test (pooled OLS vs. FEM) | 0.85 | |
|                    |      |      | Period F-test (pooled OLS vs. FEM) | 4.93*** | |
|                    |      |      | Hausman test (FEM vs REM) Period Random | 0.70 | |
|                    |      |      | Hausman test (FEM vs REM) Cross section Random | 1.87 | |
| Notes: This table reports the estimation results for the pooled, fixed and random effects models regarding Equation (2) during the period 02 January 2020 - 09 April 2020. Standard Errors are in parentheses. *,** and *** indicate statistical significance at the 10%, 5%, and 1% level respectively. |
by the COVID-19 pandemic, indicating a ‘flight-to-quality’ phenomenon. In the same line, the wavelet coherence analysis for each country shows that the bonds and stock returns move in the opposite direction during the pandemic period and the bond returns is lagging. Future research should focus on a period covering also the recent financial crises (Global Financial Crisis and European Sovereign Debt Crisis) and comparing the results for each country across different turmoil periods.

CRediT authorship contribution statement

**Stephanos Papadamou**: Conceptualization, Formal analysis, Investigation, Methodology, Writing - original draft, Writing - review & editing. **Athanasios P. Fassas**: Conceptualization, Formal analysis, Investigation, Methodology, Writing - original draft, Writing - review & editing. **Dimitris Kenourgios**: Conceptualization, Formal analysis, Investigation, Methodology, Writing - original draft, Writing - review & editing. **Dimitrios Dimitriou**: Conceptualization, Formal analysis, Investigation, Methodology, Writing - original draft, Writing - review & editing.
Supplementary materials

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