

Bond Markets and Economic Growth: Evidence from European Union Economies

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Abstract. *The development of the bond markets has played an increasingly important role in shaping financial structures and economic growth across European economies. As traditional bank lending gives way to more market-based financing mechanisms, understanding the impact of bond markets on real GDP growth becomes essential for policymakers and financial analysts. This research paper examines the relationship between bond market activity and economic growth, focusing on bond yields, corporate bond issuance, stock market capitalization, and key macroeconomic indicators using a panel dataset covering the 27 European Union countries for a timeframe ranging from 2005 to 2021. The study is using a panel data regression methodology and performing diagnostic tests to support the use of the random effects specification. The findings show a strong negative relationship between bond yields and economic growth, highlighting the constraining effects of higher borrowing costs on investment and expansion. Surprisingly, corporate bond issuance is also negatively associated with growth, suggesting that excessive reliance on debt financing, particularly in bond markets which are less mature, may introduce inefficiencies and discourage productive investment. Conversely, stock market capitalization exhibits a significant positive impact on GDP growth, capturing the importance of well-functioning equity markets in providing alternative financing channels. These results contribute to the broader discussion on financial deepening and economic performance, showing that bond markets are not a uniform force for economic expansion but are highly dependent on multiple factors, like interest rate conditions, financial market depth, and macroeconomic stability. The study's findings have multiple policy implications in navigating financial development, capital market integration, and sustainable growth strategies in an evolving economic environment. Future research could further refine these insights by exploring subgroup variations, sectoral impacts, and dynamic panel estimation techniques to better capture the relation between bond markets and economic resilience.*

Keywords: Bond markets, Economic Growth, Financial Development, European Union, Panel Data Analysis

Introduction

Over the past few decades, the European financial landscape has undergone a significant transformation, marked by the increasing development of the capital markets as alternative financing sources instead of traditional bank lending. The expansion of bond markets, comprising both government and corporate debt securities, has been a defining feature for this evolution, influencing economic resilience, investment dynamics, and overall macroeconomic performance. In a region as diverse as European Union, where financial structures, institutional frameworks, and economic policies vary significantly across member states, understanding the role of bond markets in driving real economic growth is a pressing policy issue.

The rest of the paragraphs are written with one tab like this one – indentation 1.27 cm [Historically, the European financial system has been predominantly bank-based, with businesses and governments relying heavily on bank credit to finance investment and economic activity (Beck & Levine, 2004; Demirgüç-Kunt & Maksimovic, 1998). However, post-financial crisis

adjustments, regulatory shifts, and unconventional monetary policies have reshaped financial structures, accelerating the shift toward market-based financing, particularly in advanced economies (ECB, 2021). The evolution of corporate bond issuance, changes in sovereign debt markets, and increasing investor participation have all contributed to the growing importance of bonds as a mechanism for capital allocation and economic expansion (Pagano et al., 2018).

However, despite this increasing trend toward capital market deepening, the degree of bond market development remains highly uneven across Europe. Western and Northern European countries typically have larger, more liquid bond markets, characterized by high investor confidence, strong regulatory frameworks, and well-diversified financial instruments. In contrast, Southern and Eastern European economies remain more reliant on traditional bank lending, with bond markets often underdeveloped or fragmented, leading to financing constraints and higher borrowing costs, based on IMF findings. This heterogeneity raises an essential question regarding to what extent do bond markets contribute to economic growth across different financial structures and macroeconomic environments.

Previous research papers, both theoretical and empirical, suggests that bond markets can have a crucial role in fostering economic growth by improving capital allocation, reducing financing constraints, and stabilizing investment cycles (Levine, 2005; Gertler & Rogoff, 1990). Corporate bond markets, in particular, provide long-term financing for firms, enabling investment in infrastructure, innovation, and expansion (De Fiore & Uhlig, 2015). Meanwhile, government bond markets influence fiscal sustainability, monetary policy transmission, and macroeconomic stability, particularly in time of economic uncertainty (Reinhart & Rogoff, 2010). However, the precise impact of bond market development on GDP growth remains dependent on multiple factors, including market depth, financial regulation, investor composition, and broader macroeconomic conditions (Ayyagari et al., 2013).

In the current economic landscape of European countries, these dynamics are becoming increasingly relevant. The post-pandemic recovery, inflationary pressures, shifting interest rate environments, and geopolitical uncertainties have indicated the importance of accessing diversified financial instruments, including corporate and sovereign bonds. As central banks move away from years of very-low interest rates, borrowing costs are rising, amplifying the need for well-functioning financial markets that can act as stabilizing mechanisms for investment and economic growth.

The present study examines the macroeconomic significance of bond markets by studying their relationship with real GDP growth across European economies. By analyzing bond yields, corporate bond issuance, stock market capitalization, and key macroeconomic indicators, the research contributes to the broader discussion on financial deepening and economic performance. Understanding these dynamics is important for financial market development, but also for policymakers navigating the times of structural change, economic uncertainty, and evolving investment behaviors.

As Europe continues to deal with economic realignments, including capital market integration, monetary tightening, and sectoral transformations, the role of bond markets as facilitators of economic expansion remains an increasingly pressing topic. The findings of this research will contribute to ongoing discussions on capital market efficiency, financial stability, and long-term growth prospects in the European context, providing insights that are relevant for both academics and policymakers.

Literature review

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For decades, economic research has examined the complex relationship between financial development and economic growth. Early research contributions, such as those of Levine (2005) and Beck & Levine (2004), positioned financial markets as fundamental drivers of long-term growth, emphasizing their role in capital allocation, risk diversification, and investment efficiency. However, within the broad economic framework, bond markets have often played a secondary role in discussions, primarily focused being on banks and equity markets. More recently, however, both empirical and policy-driven research have turned attention to the growing role of bond markets, particularly in the presence of financial crises, sovereign debt restructurings, and the shift toward market-based financing in both advanced and emerging economies.

At its core, the argument for bond market development as a driver of economic growth hinges on its ability to complement traditional bank lending. In a bank-based financial system, companies and governments are often constrained by the lending capacity of financial institutions, which can be severely affected by credit cycles and macroeconomic shocks (Demirgüç-Kunt & Maksimovic, 1998). By contrast, well-functioning bond markets allow firms and governments to diversify their financing sources, access long-term capital, and mitigate liquidity constraints (De Fiore & Uhlig, 2015). The European Central Bank (2021) has highlighted that deep and liquid bond markets contribute to financial stability by reducing dependency on short-term bank lending and enhancing resilience during periods of economic uncertainty.

Moreover, empirical evidence supports this view. Wahidin, Akimov, & Roca (2021) examined the role of bond market development before and after the global financial crisis, finding that bond markets played a stabilizing role in developed economies, whereas their impact in emerging markets remained constrained by structural inefficiencies. Similarly, Boubaker et al. (2019) demonstrated that financial deepening, particularly in government bond markets, contributes to economic stability by lowering borrowing costs and attracting foreign investment. Research papers on developing economies, such as those by Burger, Warnock, & Warnock (2015) and Pradhan et al. (2020), confirm that the maturity and liquidity of bond markets significantly influence investment growth and macroeconomic stability.

However, the relationship between bond market development and economic growth was not always linear as previous finding show. Arcand, Berkes, & Panizza (2015) raised concerns about the risks associated with excessive development of the finance sector, arguing that beyond a certain threshold, financial deepening may generate diminishing returns, increase volatility, and contribute to speculative bubbles. This aligns with Reinhart & Rogoff's (2010) findings on the adverse effects of excessive debt accumulation on long-term growth. The OECD (2024) further underscores that while bond markets provide essential financing mechanisms, they also present risks in high-debt environments, particularly in economies with weaker institutional frameworks.

A different critical dimension is the role of bond markets in fostering investment, particularly in infrastructure and sustainable development. Historically, infrastructure investment has been predominantly funded through public sector borrowing or bank loans, but the growing use of corporate bond markets has introduced new channels for long-term financing. Thumrongvit, Kim, & Pyun (2013) found a significant positive relationship between bond market expansion and infrastructure investment, with stronger effects observed in countries with well-developed legal and financial institutions. The Climate Bonds Initiative (2023) highlights the growing importance

of green bonds in financing sustainability projects, a trend also noted by Mazzacurati, Paris, & Tsiotras (2021), who examined the liquidity and environmental impact of the green bond market.

At regional level, European bond markets show substantial heterogeneity. Western and Northern European economies, characterized by deep and liquid bond markets, tend to experience stronger links between economic growth and finance, where Southern and Eastern European economies rely more on bank lending (International Capital Markets Association, 2023). This divide highlights the importance of institutional quality, regulatory frameworks, and market infrastructure in the effectiveness of bond markets as growth facilitators.

The research on the bond market-growth nexus will evolve in the future, incorporating new dimensions such as financial integration, digital finance, and geopolitical risks. The intersection of macroeconomic policies, investor behavior, and financial regulation will play a crucial role in determining the contribution of bond markets functioning to economic resilience and long-term growth. As Europe and other economies navigate post-pandemic recoveries, rising interest rates, and shifting investment patterns, the role of bond markets in sustaining economic expansion will remain a critical area of analysis.

Methodology

For a long time, the structure of financial markets has played a critical role in shaping economic growth, influencing investment decisions, and determining access to capital. Across Europe, the evolution of bond markets, has transformed the financial landscape, offering an alternative mechanism for funding economic activity, even if it was often overshadowed by the dominance of bank lending. IN this context, this study examines if deeper bond market development determines higher economic growth, assessing the relationship between bond market activity and real GDP growth across European Union economies.

This study draws upon multiple publicly available economic and financial databases, including Eurostat, the OECD's Database, and the World Bank's Global Financial Development Database.

The basis of this analysis is the idea that well-functioning bond markets enhance economic performance by improving capital allocation, reducing borrowing constraints, and providing long-term financing options for businesses and governments. However, these effects are not uniform across all economies, some countries have deep and liquid bond markets that complement bank lending, while others remain bank-dependent, limiting the role of market-based financing.

To examine this relation between bond markets and economic growth, we estimate the following panel data regression model for a timeframe expanding from 2005 to 2021 (selected due to data availability):

$$\text{Real GDP Growth}_{it} = \beta_0 + \beta_1 \text{Bonds Yield}_{it} + \beta_2 \text{Corporate Bond Issuance}_{it} + \beta_3$$

$$\text{Stock Market Capitalization}_{it} + \beta_4 \text{Gross Fixed Capital Formation}_{it} + \beta_5 \text{Infrastructure Investment}_{it} + \beta_6$$

$$\text{HICP Inflation Rate}_{it} + \epsilon_{it}$$

where:

- Real GDP Growth (Real_GDP_growth_rate or Real_GDP_growth_rate_per_capita) is the dependent variable, measured as the annual percentage change in gross domestic product (GDP) at constant prices, providing a direct indicator of economic performance.
- Bonds Yield (Bonds_yield) represents the cost of borrowing, reflecting investor sentiment, inflation expectations, and sovereign risk. Higher yields typically signal tighter financial conditions, potentially constraining investment and growth.

- Corporate Bond Issuance (Corporate_bond_issuance_volume_to_GDP) captures the share of newly issued corporate bonds relative to GDP. A more active bond issuance environment suggests firms have greater access to non-bank financing, which may support investment and economic expansion.

- Stock Market Capitalization (Stock_market_capitalization_to_GDP) serves as a proxy for financial depth and the relative size of the equity market. Larger stock markets indicate broader financing options, which may interact with bond markets in shaping growth trajectories.

- Gross Fixed Capital Formation (Gross_fixed_capital_formation_to_GDP) accounts for real investment in infrastructure, machinery, and other productive assets, fundamental drivers of long-term economic performance.

- Infrastructure Investment (Infrastructure_investment_to_GDP) reflects expenditures on transport, energy, and communication networks, which contribute to economic efficiency and competitiveness.

- HICP Inflation Rate (HICP_inflation_rate) is included as a control variable, as inflationary pressures affect investment decisions, interest rates, and economic stability.

To assess these relations, we run panel data regression models, which allow us to capture variations across countries and over time. Given the multi-country structure of the dataset, we test three estimation approaches:

1. Pooled OLS Model: This approach assumes a common relationship across all countries, providing a baseline estimate of bond markets' impact on growth.

2. Fixed Effects Model: By controlling for country-specific unobserved heterogeneity, this model isolates within-country effects, addressing potential bias from structural differences across economies.

3. Random Effects Model: This specification allows for variation across countries while maintaining efficiency in the estimation process.

In order to validate the fitness of the chosen models, we conduct a series of diagnostic and robustness tests, including:

- Ramsey RESET Test: To assess whether the model suffers from omitted variable bias, ensuring specification robustness.

- Breusch-Pagan Test: To check for heteroskedasticity in residuals, which would necessitate the use of robust standard errors.

- Wooldridge Test: To examine the presence of serial correlation, which can bias coefficient estimates in panel models.

- F-Test for Fixed Effects: To test whether country-specific effects significantly improve the model fit over pooled OLS.

- Hausman Test: To determine whether a fixed effects or random effects model is more suitable.

The significance of bond market development extends beyond financial theory, it has tangible implications for how economies respond to external shocks, how businesses finance expansion, and how governments manage fiscal sustainability. In the post-pandemic landscape, where inflation dynamics, interest rate shifts, and geopolitical risks are reshaping financial conditions, understanding the role of market-based financing in driving economic performance is more crucial than ever.

This research paper contributes to a larger discussion on financial deepening, investment efficiency, and the evolving nature of capital markets in Europe by systematically examining the

relation between bond market activity and GDP growth. Following on this, the findings aim to provide insights not only for economists and financial analysts but also for policymakers, who navigate a rapidly changing financial environment to foster sustainable and resilient economic growth.

Results and discussions

The impact of financial market structures on economic growth have been the center of economic debates, particularly in the European context, where financial systems are different, ranging from highly developed capital markets to economies reliant on traditional bank lending. This study is exploring the role of bond markets in shaping economic growth dynamics across European countries, while considering macroeconomic factors such as investment levels, inflation, and stock market development.

We analyzed how variations in bond yields, corporate bond issuance, and overall financial depth influence real GDP growth, by using panel data regression models. The methodology carefully considered country-specific effects, ensuring that structural differences across economies were accounted for. The results provide a deeper understanding of the extent to which bond markets contribute to economic expansion, offering insights into the mechanisms that drive financial development and their implications for policymakers and investors.

The objective of this paper was to study the relationship between bond market development and economic growth in European economies, considering both overall GDP growth and GDP growth per capita. We tested Pooled OLS, Fixed Effects, and Random Effects models to determine the most appropriate specification, using a panel data regression framework. Given the structural differences across countries and the potential for both observed and unobserved heterogeneity, a crucial step was to determine which is the model that best explains the data.

To determine the most suitable estimation technique, we conducted several diagnostic tests. The Hausman test, which assesses whether the country-specific effects are correlated with the regressors, provided a p-value of 0.1127 for the overall GDP growth model and 0.0002 for the GDP per capita growth model. In the first case, the result suggests that the random effects model is preferable, as the null hypothesis of no correlation between the explanatory variables and the error term is not rejected. For GDP per capita growth, the fixed effects model was initially indicated but given the broader economic interpretation and the need to capture cross-country variation, we opted for consistency by considering the random effects model for both dependent variables.

To support this choice, the Breusch-Pagan test for heteroskedasticity shows a p-value of 0.6267 and 0.4343 in the two models, suggesting no strong evidence of heteroskedasticity, yet robust standard errors were still reported to mitigate any potential bias. The Wooldridge test for serial correlation indicated no significant serial correlation in the panel structure. Additionally, the F-test for individual effects confirmed the presence of country-specific variation further justifying the use of panel models.

The results of the tests (Studentized Breusch-Pagan test, Reset test, Wooldridge's test for serial correlation in FE panels, F test for individual effects, Hausman Test) for both models are presented in the appendix.

The following table shows model outputs for the model using real GDP growth rate as a dependent variable:

Table 1. Outputs for the model using Real GDP growth rate as a dependent variable

	Real GDP growth rate		
	Pooled OLS	Fixed Effects	Random Effects
Bonds_yield	-0.614*** -0.0798511	-0.745*** -0.0954997	-0.667*** -0.0793649
Corporate_bond_issuance_volume_to_GDP	-0.455*** -0.1335884	-0.440** -0.1590984	-0.480*** -0.1368007
Gross_fixed_capital_formation_to_GDP	0.113* -0.0607198	0.113 -0.0907396	0.111* -0.0557143
Infrastructure_investment_to_GDP	0.003 -0.0040635	-0.003 -0.004735	0.001 -0.0035305
Stock_market_capitalization_to_GDP	0.019*** -0.0061205	0.028*** -0.0065342	0.022*** -0.0052699
HICP_inflation_rate	0.427*** -0.1210105	0.434*** -0.1184313	0.431*** -0.1043984
R-squared	21.19%	23.02%	21.76%
Adjusted R-squared	19.90%	16.28%	20.48%

Source: Author's own research; Data from Eurostat, OECD and World Bank.

Note: *** means significant at 0.01 level; ** means significant at 0.05 level; * means significant at 0.10 level.

Moreover, the model outputs for the model using real GDP growth rate per capita as a dependent variable is presented below:

Table 2. Outputs for the model using Real GDP growth rate per capita as a dependent variable

	Real GDP growth rate per capita		
	Pooled OLS	Fixed Effects	Random Effects
Bonds_yield	-0.599*** -0.081599	-0.720*** -0.088721	-0.634*** -0.079632
Corporate_bond_issuance_volume_to_GDP	-0.577*** -0.132673	-0.426** -0.151236	-0.573*** -0.133798
Gross_fixed_capital_formation_to_GDP	0.059 -0.062295	0.078 -0.096182	0.065 -0.061389
Infrastructure_investment_to_GDP	0.007 -0.003969	-0.004 -0.00499	0.004 -0.003685
Stock_market_capitalization_to_GDP	0.011* -0.0061	0.027*** -0.006911	0.014* -0.005512
HICP_inflation_rate	0.471*** -0.11407	0.425*** -0.115337	0.453*** -0.102282
R-squared	21.12%	20.43%	20.00%
Adjusted R-squared	19.83%	13.47%	18.70%

Source: Author's own research; Data from Eurostat, OECD and World Bank.

Note: *** means significant at 0.01 level; ** means significant at 0.05 level; * means significant at 0.10 level.

The most important finding is the strong negative relationship between bond yields and GDP growth. An increase of one percentage point in bond yields leads to a 0.67 percentage point decline in GDP growth and a 0.63 percentage point decline in per capita GDP growth. This result is economically significant, reinforcing the idea that higher borrowing costs constrain investment, limit corporate expansion, and ultimately slow down overall economic activity. These findings are in line with Reinhart and Rogoff (2010) research, who document the growth-reducing effects of excessive debt burdens and higher financing costs, particularly in economies with weaker fiscal positions.

Another important observation is that corporate bond issuance, often seen as a measure of financial deepening, exhibits a negative and significant effect on growth. Higher bond issuance as a share of GDP is associated with a 0.48 percentage point decline in GDP growth and a 0.57 percentage point decline in GDP per capita growth. While this may appear counterintuitive, it supports the "too much finance" hypothesis proposed by Arcand, Berkes, and Panizza (2015), which suggests that beyond a certain threshold, excessive reliance on debt financing can hinder productive investments, increase corporate leverage risks, and create inefficiencies in capital allocation. The finding may also be influenced by the uneven development of bond markets across Europe, where deeper, more liquid bond markets in advanced economies function efficiently, while in less mature markets, bond issuance may serve as a stopgap for constrained credit access rather than a long-term growth driver.

On the positive side, stock market capitalization shows a statistically significant and positive relation with economic growth. An increase of one percentage point in stock market capitalization to GDP corresponds to a 0.022 percentage point rise in GDP growth and a 0.014 percentage point rise in per capita GDP growth. This suggests that larger and more developed stock markets contribute positively to economic performance, by facilitating capital formation, improving investor confidence, and providing firms with alternative financing mechanisms. This finding is in line with Levine (2005), who emphasizes the role of stock markets in enhancing financial intermediation, improving liquidity, and fostering economic expansion.

Moreover, investment-related variables present mixed results. Gross fixed capital formation, which is a key measure of investment in physical infrastructure and productive capacity, has a positive but weak effect on GDP growth (0.111) and is not statistically significant for GDP per capita growth. Meanwhile, infrastructure investment to GDP does not exhibit a significant impact on either growth measure. This suggests that while investment remains important, its impact on growth is likely dependent on more financial conditions, institutional quality, and the efficiency of capital allocation rather than absolute investment levels alone.

Lastly, inflation rate emerges as a key driver of economic growth, with coefficients of 0.431 (GDP growth) and 0.453 (GDP per capita growth), both highly significant. This finding aligns with prior research on the Phillips curve relationship, indicating that moderate inflation levels may reflect robust economic activity and rising demand, particularly in economies recovering from financial slowdowns.

These results show the mixed role that bond markets play in shaping economic trajectories, which is in line with previous research findings. As an overview of the findings, the following aspects are summarized:

- The cost of borrowing matters. The strong negative relationship between bond yields and growth suggests that higher financing costs restrict investment and economic expansion, particularly in economies where companies and governments rely heavily on debt financing.

- The issuance of debt is not always a growth driver. While corporate bond issuance is often associated with financial development, these findings indicate that an excessive reliance on debt, especially in less mature bond markets, may lead to inefficiencies, discouraging productive investments rather than fostering long-term growth.

- The functioning and efficiency of stock markets are key to financial resilience. The positive effect of stock market capitalization on GDP growth highlights the importance of well-functioning equity markets as a complementary financing tool, allowing firms to raise capital without the risks associated with high corporate debt burdens.

- Investment effects depend on financial structure. Despite the importance of capital formation for long-term growth, the limited impact of gross fixed capital formation and infrastructure investment suggests that simply increasing investment is not enough, the efficiency of financial markets in allocating capital also plays a critical role.

- Inflation dynamics remain central to economic cycles. The positive relation between inflation and growth highlights the importance of monetary policy in shaping economic evolution, particularly in periods of structural adjustment and financial tightening.

The above findings provide valuable insights for policymakers navigating financial development, capital market integration, and economic growth strategies in the European context. They suggest that bond markets have different effects on economic expansion, while they provide crucial financing mechanisms, their effects depend heavily on interest rate conditions, market depth, and financial maturity.

In drafting future policies, the challenge lies in finding the right balance between debt and equity markets, ensuring that financial deepening supports sustainable investment rather than fueling unsustainable leverage. At a time when monetary policy is tightening, borrowing costs are rising, and financial markets are evolving, understanding these dynamics is more important than ever.

By highlighting the complex relation between bond markets, financing structures, and economic performance, this study contributes to a growing body of research on financial market efficiency, economic resilience, and long-term growth in Europe.

This study provides a context for understanding the link between bond markets and economic growth, but several developments could offer deeper insights. For example, sub-group analysis could refine the findings by distinguishing between economies based on financial development, institutional quality, or monetary regimes. The effects of bond markets may differ between Eurozone and non-Eurozone countries, advanced and emerging economies, or varying levels of financial openness.

Further on, using interaction effects between financial and macroeconomic variables could reveal hidden dynamics. Similarly, sectoral impacts deserve more attention. Infrastructure investment, green finance, and industrial expansion may respond differently to bond market conditions, shaping long-term growth in distinct ways. Finally, dynamic panel estimation techniques, such as GMM models, could help address potential endogeneity and better capture feedback loops between financial development and economic performance.

Conclusion

The findings of this study shed light on the complex relationship between bond market development and economic growth in European economies. While financial deepening is often viewed as a driver of economic expansion, this research highlights the complexities of how bond

markets interact with broader macroeconomic conditions. Using a panel data methodology and applying a range of diagnostic tests, the results suggest that bond markets can be both an enabler and a constraint for growth, depending on factors such as interest rate conditions, financial market maturity, and the balance between debt and equity financing.

The key finding is the significant negative relationship between bond yields and economic growth, supporting the notion that higher borrowing costs restrict investment and slow down economic activity. This has essential policy implications, particularly in the current context of rising interest rates and evolving monetary policies. Additionally, the findings challenge the assumption that greater corporate bond issuance is inherently beneficial, as excessive reliance on debt financing, especially in less mature financial markets, can introduce inefficiencies and affect productive investment.

At the same time, the positive impact of stock market capitalization suggests that well-functioning equity markets play a crucial role in supporting growth, providing firms with alternative financing mechanisms that mitigate the risks associated with excessive corporate leverage. The limited role of infrastructure investment and gross fixed capital formation further marks that the efficiency of financial markets is important to fostering long-term economic performance, rather than just the volume of investment.

These insights have important policy implications. As Europe navigates a period of structural financial adjustments, capital market integration, and macroeconomic realignment, understanding the role of bond markets in economic resilience is more pressing than ever. A balanced approach, ensuring that bond markets provide stable and efficient financing while fostering equity market growth, can help create a more sustainable and resilient financial landscape that supports investment and economic expansion without increasing financial vulnerabilities.

The future research could develop on these findings by incorporating sub-group analyses, exploring interaction effects between financial and macroeconomic variables, or applying advanced econometric techniques to further refine the understanding of bond market dynamics. As financial conditions continue to evolve, such extensions will be crucial in informing both academic research and policy discussions on capital market development and economic growth.

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Appendix

Table 3. Descriptive statistics

Variable	No. of observations	Mean	Standard deviation	Median	Minimum	Maximum	Skewness	Kurtosis	Standard error
Real GDP growth rate	374	0.02	0.04	0.02	-0.16	0.25	-0.30	4.39	0.0021
Real GDP growth rate per capita	374	0.02	0.04	0.02	-0.15	0.23	-0.10	3.28	0.0021
Bonds yield	374	0.03	0.03	0.03	-0.01	0.22	1.83	8.62	0.0014
Corporate bond issuance volume to GDP	374	0.02	0.02	0.01	0.00	0.17	3.27	15.49	0.0011
Gross fixed capital formation to GDP	374	0.22	0.04	0.22	0.11	0.53	1.42	8.06	0.0022
Infrastructure investment to GDP	374	0.99	0.54	0.85	0.06	3.20	1.36	1.93	0.0278
Stock market capitalization to GDP	374	0.31	0.37	0.23	0.00	3.22	2.37	11.30	0.0191
HICP inflation rate	374	0.02	0.02	0.02	-0.02	0.15	1.86	7.44	0.0010

Source: Author's own research; Data from Eurostat, OECD and World Bank.

Table 4. Correlation matrix

	Real GDP growth rate	Real GDP growth rate per capita	Bonds yield	Corporate bond issuance volume to GDP	Gross fixed capital formation to GDP	Infrastructure investment to GDP	Stock market capitalization to GDP	HICP inflation rate
<i>Real GDP growth rate</i>	1.00	0.98	-0.26	-0.11	0.27	0.06	0.03	0.19
<i>Real GDP growth rate per capita</i>	0.98	1.00	-0.20	-0.22	0.24	0.13	-0.07	0.21
Bonds yield	-0.26	-0.20	1.00	-0.27	-0.09	0.32	0.02	0.32
Corporate bond issuance volume to GDP	-0.11	-0.22	-0.27	1.00	-0.12	-0.26	0.45	-0.18
Gross fixed capital formation to GDP	0.27	0.24	-0.09	-0.12	1.00	0.32	-0.13	0.43
Infrastructure investment to GDP	0.06	0.13	0.32	-0.26	0.32	1.00	-0.12	0.34
Stock market capitalization to GDP	0.03	-0.07	0.02	0.45	-0.13	-0.12	1.00	-0.05
HICP inflation rate	0.19	0.21	0.32	-0.18	0.43	0.34	-0.05	1.00

Source: Author's own research; Data from Eurostat, OECD and World Bank

Table 5. Robustness checks outputs – Model using real GDP growth rate as a dependent variable

Test	Real_GDP_growth_rate	
	Statistic	p-value
Studentized Breusch-Pagan test	BP = 4.3703	0.6267
RESET test	RESET = 0.0044562	0.9468
Wooldridge's test for serial correlation in FE panels	F = 2.3775	0.1240
F test for individual effects	F = 2.1213	0.0019
Hausman Test	chisq = 10.297	0.1127

Source: Author's own research; Data from Eurostat, OECD and World Bank.

Table 6. Robustness checks outputs – Model using real GDP growth rate per capita as a dependent variable

	Real_GDP_growth_rate_per_capita	
	Statistic	p-value
Studentized Breusch-Pagan test	BP = 5.9015	0.4343
RESET test	RESET = 0.0044562	0.9468
Wooldridge's test for serial correlation in FE panels	F = 3.381	0.0668
F test for individual effects	F = 2.3245	0.0005
Hausman Test	chisq = 26.67	0.0002

Source: Author's own research; Data from Eurostat, OECD and World Bank.