

# REGULATING FINANCIAL MARKETS IN THE FACE OF DEMOGRAPHIC SHIFTS: THE ROLE OF LABOR PARTICIPATION AND ECONOMIC GROWTH IN GOVERNMENT BOND YIELDS

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## Abstract

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This study examines the influence of labor force participation and demographic dynamics on government bond yields in Indonesia, focusing on the mediating role of economic growth. Understanding these relationships is essential for maintaining market stability and informing fiscal policy in emerging markets (Pinho & Barradas, 2021). Using quarterly data (2009–2023), this study employs regression, Sobel tests, cointegration, and impulse response analysis to examine effects on one, five, and ten-year bond yields. The findings reveal that while labor participation and demographic shifts do not have direct effects, economic growth significantly mediates their impact on short-term bond yields. The cointegration results confirm the existence of long-term equilibrium relationships across all tenors. Additionally, short-term yields demonstrate higher sensitivity to macroeconomic shocks compared to medium- and long-term yields (Michelson & Stein, 2023). These results highlight the critical role of promoting stable economic growth and managing demographic risks to sustain the performance and competitiveness of government bond markets in developing economies.

**Keywords:** Bond Yields, Macroeconomic Factors, Labor Force Participation, Economic Growth, Old Age Dependency Ratio, Emerging Markets

**Authors' individual contribution:** Conceptualization — A.F., T.A.G., J.S., and E.H.; Methodology — A.F., T.A.G., J.S., and E.H.; Investigation — A.F.; Resources — A.F.; Writing — A.F.; Supervision — T.A.G., J.S., and E.H.

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## 1. INTRODUCTION

In recent decades, the issuance of government bonds has emerged as a captivating subject of study due to governmental capital needs, especially in developing countries (Tjandrasa et al., 2020). Understanding the determinants influencing the evolution of government bond yields over time is crucial, not only for policymakers in shaping policies and budgetary decisions but also for investors assessing potential gains or losses in their investment portfolios that include government bonds (Pinho & Barradas, 2021). Indonesia has witnessed an annual bond market growth of 17.4%, one of the highest in the Association of Southeast Asian Nations (ASEAN) (Asian Development Bank, 2024).

According to the Ministry of Finance (2024), Indonesia's efforts to expand its bond market have increased individual investor ownership of domestic bonds from under 3% in 2019 to nearly 8% by March 2024. This shows that the bond market plays a strategic role in supporting national fiscal policies and long-term economic planning. This is in line with the view that capital markets serve as a foundation for economic development by facilitating the circulation of capital for productive use (Safitri et al., 2023). Demographic factors such as labor productivity and a favorable demographic situation, with a high productive-age population, can contribute to economic stability and attract investor interest. Population growth is a key demographic factor shaping global megatrends. Although it was once viewed as a primary engine of economic expansion in the 20th century, it is increasingly recognized as a major risk to the socio-economic landscape in the 21st century (Posza & Csapi, 2021).

According to news from the Secretariat of the Cabinet of Indonesia (2021), Indonesia is experiencing what is called a demographic bonus, where the majority of the population is in the productive age group (15–64 years old), which reached 70.72%, according to the 2020 Population Census. Meanwhile, the elderly age group (65 years old and over) accounts for only 5.95% and the young age group (0–14 years old) for 23.33%. This indicates a decline in the birth rate, where the young age group continues to decrease from before, while the productive age group has significantly increased from 53.39% in 1971. The head of Statistics Indonesia emphasizes that the peak of this demographic bonus is expected to occur this year, presenting opportunities and challenges for the Indonesian economy (Secretariat of the Cabinet of Indonesia, 2021).

Population aging will affect government fiscal balances but also has the potential to affect financial markets through other channels (Poterba, 2004). Weak empirical results contrast with most theoretical models that consider how demographic changes will affect asset prices and yields. Poterba (2004) indicates that major demographic shocks have the potential to affect asset prices and yields, although the magnitude of these effects is still unclear. On the other hand, Gozluklu and Morin (2019) state that demographic changes, especially the age structure of the population, affect the real bond yields that can be observed through the life cycle patterns in saving behavior. This causes real stock yields and nominal bond yields to move in conjunction with changes in the age structure of the population.

Pinho and Barradas (2021) reveal that increased labor productivity negatively impacts the government bond yields of Portugal. They also found that the demographic situation has a negative impact on the government bond yields of Portugal, where improving demographic conditions tend to lower bond yields. Michelson and Stein (2023) show that a high age dependency ratio (DR) (an indicator of an aging population) and high gross domestic product (GDP) per capita tend to lower the natural interest rate, which then leads to a reduction in government bond yields.

However, findings differ as revealed by Posza and Csapi (2021), who state that demographic variables, especially the age distribution of the population, have a positive impact on bond yields. They argue that younger adults invest heavily in stocks, while older individuals sell assets to finance retirement, impacting the rise in bond yields. Macroeconomic performance has an ambiguous effect on government bond yields. A healthy and growing economy usually signals to investors that the government is capable of repaying its debt. Pinho and Barradas (2021) state that the government bond yields of Portugal have strong persistence, where macroeconomic performance, foreign borrowing, and inflation rate are positive determinants of the government bond yields of Portugal.

However, different results are revealed by Pappas and Kostakis (2020), who show that economic growth has a significant negative relationship with long-term government bond yields. They argue that improved macroeconomic performance, particularly strong growth, is associated with lower yields. Meanwhile, Zhou (2021) shows that economic growth has a negative impact on long-term government bond yields, where increased economic activity increases investor confidence and reduces their risk perception. Ichiue and Shimizu (2012) measure the risk of partial or total default of sovereign bonds and typically assess it through six different factors, especially macroeconomic performance, fiscal conditions, foreign borrowing, inflation rate, labor productivity, and demographic situation (aging population).

Based on the above discussion, this study seeks to answer the following research questions:

*RQ1: Does the labor participation rate (LPR) influence economic growth?*

*RQ2: Does the demographic character influence economic growth?*

*RQ3: Does economic growth influence government bond yields?*

*RQ4: Does the LPR influence government bond yields?*

*RQ5: Does the demographic character influence government bond yields?*

*RQ6: Do the LPR, demographic character, and the mediating role of economic growth affect government bond yields?*

This demographic phenomenon is an important backdrop in understanding and evaluating financial market dynamics, including the evolution of government bond yields, which are influenced not only by macroeconomic conditions but also by structural changes in population demographics. The relationship between labor participation, population aging, and government bond yields in emerging markets is complex. This research offers uniqueness in exploring the role of labor productivity and demographic conditions on government bond yields at short, medium, and long

tenors, focusing on emerging markets, namely, Indonesia. In addition, this research also examines the role of economic growth as a mediator in assessing how labor market dynamics and demographic conditions can stimulate economic growth, which in turn affects bond yields.

This study offers two primary contributions to the existing literature. First, it advances the theoretical understanding of how labor force participation and demographic transitions influence sovereign bond markets in emerging economies, a context that remains underexplored compared to developed markets. By integrating the life cycle and asset demand theories, this research provides a nuanced perspective on the interplay between labor dynamics, demographic pressures, and fiscal market behavior. Second, the study delivers practical insights for policymakers by emphasizing the mediating role of economic growth in shaping bond yield movements. This insight is particularly relevant for governments seeking to design macroeconomic and demographic policies that stabilize financial markets and reduce borrowing costs. Together, these contributions address both theoretical gaps and practical needs in emerging market policy frameworks.

The remainder of this paper is organized as follows. Section 2 presents a comprehensive review of relevant theoretical frameworks and recent empirical findings, followed by the development of research hypotheses. Section 3 outlines the data sources, variable measurements, and methodological approaches employed in this study, including regression analysis, mediation testing, and cointegration analysis. Section 4 reports and interprets the empirical findings, including descriptive statistics, hypothesis testing, and impulse response analysis. Section 5 discusses the implications of these findings in light of existing literature and market dynamics. Finally, Section 6 concludes the study by summarizing the main insights, outlining policy recommendations, and suggesting avenues for future research.

## 2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

### 2.1. Life cycle theory

The life cycle theory posits that individuals plan their consumption and savings to stabilize their consumption throughout their lives. Changes in demographic structures, such as increased life expectancy and age DRs, can impact national savings rates and bond demand, thereby affecting government bond yields. According to Holzmann (2005), aging as a demographic transition is prevalent in developed countries globally.

The theory linking individual age to consumption and saving decisions stems from the permanent income hypothesis (Friedman, 2018) and the life cycle hypothesis (Ando & Modigliani, 1963; Modigliani & Brumberg, 1954). The main body of research considers the relationship between demographic factors and asset returns based on the life cycle investment hypothesis (Modigliani & Brumberg, 1954). This hypothesis generally suggests that people borrow in youth, accumulate in middle age, and decumulate in old age to fund retirement. The changing proportion of these age intervals among the total population will alter asset accumulation trends and affect asset prices. Posza

and Csapi (2021) state that with the increasing average age of the population, the patterns of asset accumulation and decumulation are likely to differ significantly from the past. Stock markets are expected to rise, while housing markets should decline as people's lifespans increase. Bakshi and Chen (1994) assert that variables describing the average age of the population positively influence equity premiums, indicating that risk tolerance decreases with age.

### 2.2. Asset demand theory

Developed by renowned economists like Hicks (1946), Tobin (1958), and Baumol (1965), asset demand theory provides a comprehensive framework for understanding how individuals and institutions allocate their wealth among various assets (Tsiang, 1969). Subsequently, the theory of demand with varying consumer preferences, developed by Basmann (1956), offers a framework to address asset selection issues within traditional demand analysis (Bierwag & Grove, 1968). Mishkin (2019) posits that before analyzing supply and demand in the bond and money markets, it is essential to understand the factors determining asset demand. An asset is part of property that stores value, including money, bonds, stocks, art, land, houses, agricultural equipment, and manufacturing machinery.

Asset demand theory refers to the idea that individuals and institutions allocate their wealth across different types of assets based on factors such as return expectations, risk tolerance, and liquidity preferences. This theory is often applied in finance to understand how people choose between holding different assets like stocks, bonds, or cash, balancing risk and return to maximize their utility.

Specifically, when considering government bonds, asset demand theory suggests that the demand for bonds, particularly "safe assets" like government securities, plays a critical role in determining their yields. Major factors influencing the demand for government bonds include perceptions of safety, interest rates, and economic conditions. Government bonds are often considered the safest asset because they are backed by the government. Investors tend to demand these bonds in times of uncertainty due to their low risk. This increased demand lowers bond yields, as observed during economic turmoil when investors shift to safe assets, pushing bond prices up and yields down (He et al., 2016).

### 2.3. Hypotheses development

#### 2.3.1. Labor participation rate and economic growth

The labor participation rate serves as a key variable linking workforce availability, productivity, and economic output. Labor participation acts as a mechanism through which human capital and productivity interact to drive growth. Increased labor productivity within the service sector in East Asia significantly boosts overall economic productivity and sustains economic growth (Asada, 2020). Labor force engagement, along with investments, significantly impacts GDP growth in developing economies (Soava et al., 2020).

*H1: Labor participation rate influences economic growth.*

### 2.3.2. Demographic characteristics and economic growth

Population ageing is a global challenge that puts pressure on existing social and policy systems, especially in countries that are ageing before becoming economically prosperous, making it harder to provide adequate income, healthcare, and long-term care support (Kudrna et al., 2023). Aging reduces the proportion of the working-age population, leading to a decline in labor supply and productivity. This effect is significant in Taiwan and China, where the old-age DR negatively impacts GDP growth (Huang et al., 2019; Liu, 2023). Higher public spending on health and pensions strains government budgets in aging economies such as Malaysia and China (Ong & Mohd-Audi-Tye, 2022). Retired populations tend to save less, reducing aggregate savings and hampering capital formation, as seen in Japan and other aging societies (Hsu & Lo, 2019). In China, aging promotes technological innovation, which drives high-quality economic development, particularly in developed regions (Gao et al., 2023). Aging positively impacts income growth in emerging markets through increased savings and investment in capital, but also imposes costs that balance these gains (Kiziltan, 2021).

*H2: Demographic characteristics influence economic growth.*

### 2.3.3. Economic growth and government bond yields

La Porta and Shleifer (2008) regard GDP per capita as the strongest predictor for the size of the informal economy and an expression of underdevelopment. Research by Bouis et al. (2014) identified key macroeconomic and structural factors — including inflation expectations, monetary policy, and global demand for safe assets — as significant determinants of long-term government bond yields in Organisation for Economic Co-operation and Development (OECD) countries, aligning with findings from Pinho and Barradas (2021) that showed the persistency of government bond yields in Portugal and macroeconomic performance as a positive determinant of these yields.

Conversely, Pappas and Kostakis (2020) observed that in terms of macroeconomic variables, GDP growth has a significant negative relationship with long-term government bond yields for 19 economies of the European Monetary Union (EMU), linking better macroeconomic performance, particularly strong growth, with lower yields. Ahwireng-Obeng and Ahwireng-Obeng (2020) also found that GDP per capita has a negative relationship with sovereign bonds in Sub-Saharan Africa (SSA). Increased economic activity boosts investor confidence and reduces their risk perception (Zhou, 2021). Strong economic growth enhances government revenue and debt repayment capacity, which can lower bond yields.

*H3: Economic growth influences government bond yields.*

### 2.3.4. Labor participation rate and government bond yields

Research by Ichiue and Shimizu (2012) found that growth in labor productivity has a statistically significant effect, with expected increases in

productivity growth leading to increases in long-term forward rates in most cases. Labor productivity is expected to have a positive impact on government bond yields. Pinho and Barradas (2021) argue that increased labor productivity contributes to wage rises, which strengthen inflation expectations and consequently lead to higher government bond yields.

*H4: Labor participation rate influences government bond yields*

### 2.3.5. Demographic characteristics and government bond yields

Ichiue and Shimizu (2012) report that the expected growth rate coefficient of the working-age population ratio, used as a proxy for demographics, is significantly positive. Roy et al. (2012) observe a positive effect of 10-year government bond yields on the Yuppie-Nerd ratio, with bond yields tending to rise as the Yuppie/Nerd ratio increases and vice versa. Research by Posza and Csapi (2021) examines the relationship between bond yields and demographic trends in Hungary, finding a strong positive correlation between the 10-year government bond yields and the Yuppie/Nerd ratio from 1999 to 2020.

Conversely, Pinho and Barradas (2021) present opposite findings where demographic situations negatively impact the government bond yields in Portugal. Michelson and Stein (2023) also revealed that a higher age DR (reflecting increased life expectancy and low natural population growth trends) leads to lower natural interest rates on long-term government bonds in OECD countries, consequently reducing long-term interest rates.

Another perspective from Poterba (2004) evaluates the impact of the population's age structure on the real yields of Treasury bills, long-term government bonds, and corporate stocks. However, the results show limited effects, inconsistent with theoretical model predictions that baby booms should increase asset values and decrease yields. Davis and Li (2003) analyze real bond yields across three demographic intervals. The coefficient for ages 40–64 years old is significantly negative across all OECD countries, while the 20–39 years old age interval is significantly positive, increasing yields. Gozhluklu and Morin (2019) demonstrate that the strength of demographic effects on real yields explains differences among countries in the joint movements between stock and bond markets.

*H5: Demographic characteristics influence government bond yields.*

### 2.3.6. The mediating role of economic growth

Government bond yields are influenced by factors such as labor participation, an aging population, and economic growth, as these elements shape economic stability and fiscal policy, impacting investor behavior and bond demand. An aging population in developing economies, like those in ASEAN countries, increases DRs and pressures on economic growth and public spending. This may decrease labor participation and increase fiscal demands, potentially leading to higher government bond yields due to increased borrowing needs (Manansala et al., 2022). Countries experiencing rapid demographic transitions may also see declines in bond yields due to increased government intervention and market adjustments (Bouis et al., 2014).

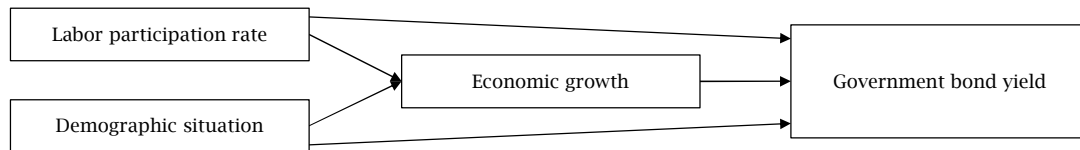
Increased labor participation, especially among the older population, can help offset some of the adverse effects of aging on economic growth by maintaining workforce productivity. This dynamic can stabilize fiscal demands and government bond yields (Ramely et al., 2022). Higher economic growth in developing markets, driven by structural reforms and demographic shifts, generally supports lower government bond yields due to increased investor confidence and reduced credit risk (Trinugroho et al., 2020). In rapidly aging developing countries, extended labor participation by the elderly positively impacts economic productivity, influencing

international capital flows. This interaction can moderate bond yields by reducing external financing pressures (Inagaki, 2021). Increased public health and pension expenditures with an aging population may lead to fiscal deficits in developing economies, often correlating with higher bond yields due to perceived fiscal risks (Pham & Vo, 2021).

*H6: Labor participation rate, demographic characteristics, and the mediating role of economic growth influence government bond yields.*

From the literature and hypotheses outlined above, the research model is depicted in Figure 1.

Figure 1. Research model



Source: Authors' elaboration.

### 3. RESEARCH METHODOLOGY

In this study, the variables under examination are measured and analyzed using statistical and econometric techniques to identify relationships and effects among variables within the context of demographic and economic impacts on Indonesian government bond yields. The labor force participation rate (*LFPR*) is measured as the percentage of the working population from the total working-age population, reflecting active economic participation. Demographic situation proxied by the old-age *DR* is calculated as the ratio of the population aged 65 years old and over to the working-age population (15–64 years old), indicating a greater potential economic burden on social and economic systems. These measurements follow the studies of (Michelson & Stein, 2023; Posza & Csapi, 2021). Economic growth (*GDP*), serving as a mediating variable, is measured through annual GDP growth rate, following the calculations of (Boubaker et al., 2019; Habib et al., 2020; Pappas & Kostakis, 2020; Pinho & Barradas, 2021).

The Indonesian government bond yield (*Yield*), as the dependent variable, is measured over short (1 year), medium (5 years), and long (10 years) tenures, reflecting the returns obtained by investors from these bonds. The study uses quarterly secondary data from the first quarter of 2009 to the fourth quarter of 2023, sourced from the Circular Economy Indicators Coalition (CEIC) Global Economic Data, Indicators, Charts & Forecasts.

For data analysis, this research applies various methods. Firstly, regression analysis is used to estimate the direct impact of the *LFPR* and old-age *DR* on bond yields (*Yield*). Subsequently, the Sobel test is employed to assess the mediating effect of economic growth on the relationship between the independent and dependent variables. Additionally, cointegration analysis is utilized to explore long-term relationships between these variables, and the impulse response function (IRF) is

used to identify how variables respond to economic shocks. This analysis is conducted using the statistical software EViews and Microsoft Excel for data collection.

In addition to the primary regression analysis, several diagnostic tests were conducted to ensure the reliability of the model. These included normality tests using the Jarque-Bera statistic, linearity tests via the Ramsey regression equation specification error test (RESET), multicollinearity checks using variance inflation factors (VIFs), heteroscedasticity tests using the Breusch-Pagan-Godfrey method, and autocorrelation tests using the Breusch-Godfrey Lagrange multiplier (LM) test. The normality assumption was satisfied after the removal of identified outliers, with the Jarque-Bera test showing non-significant results ( $p > 0.05$ ). The Ramsey RESET test confirmed that the model specification was linear across all regressions ( $p > 0.05$ ). Multicollinearity diagnostics showed that all VIF values were below the threshold of 10, ranging from 1.4 to 7.6, indicating acceptable levels of multicollinearity. The Breusch-Pagan-Godfrey tests showed no significant heteroscedasticity ( $p > 0.05$ ), and the Breusch-Godfrey LM test indicated no evidence of autocorrelation ( $p > 0.05$ ). These diagnostic outcomes support the robustness of the estimated models, providing confidence in the validity of the empirical findings derived from the regression analyses.

### 4. RESEARCH RESULTS

#### 4.1. Descriptive statistics of research data

To provide a foundational understanding of the dataset used in this study, Table 1 below displays the descriptive statistics for summarizing key metrics such as the mean, maximum, and minimum values, which facilitate an initial analysis of the variables under investigation.

**Table 1.** Descriptive statistics

| <i>Statistic</i> | <i>LFPR</i> | <i>DR</i> | <i>GDP</i> | <i>Yield_1yr</i> | <i>Yield_5yr</i> | <i>Yield_10yr</i> |
|------------------|-------------|-----------|------------|------------------|------------------|-------------------|
| Mean             | 67.45667    | 9.425076  | 5.337126   | 5.929018         | 6.959327         | 7.481730          |
| Maximum          | 69.48000    | 10.31618  | 6.476968   | 7.946514         | 9.156809         | 10.13650          |
| Minimum          | 65.76000    | 8.881528  | 4.740315   | 3.328240         | 4.689546         | 5.475502          |
| Std. dev.        | 1.017162    | 0.421006  | 0.465420   | 1.100192         | 1.084981         | 1.015016          |
| Skewness         | 0.227463    | 0.869935  | 0.922551   | -0.654352        | -0.260818        | 0.124568          |
| Kurtosis         | 2.412742    | 2.593376  | 2.582448   | 2.625446         | 2.293651         | 2.802910          |
| Jarque-Bera      | 1.103662    | 6.384984  | 7.157502   | 3.705995         | 1.542065         | 0.201826          |
| Probability      | 0.575894    | 0.041069  | 0.027911   | 0.156767         | 0.462535         | 0.904012          |
| Obs.             | 48          | 48        | 48         | 48               | 48               | 48                |

Source: Authors' elaboration using EViews based on data from CEIC Global Economic Data, Indicators, Charts & Forecasts for 2009–2023.

The descriptive statistics of the data reveal key findings relevant to the dynamics of the economy and the Indonesian government bond market. The average *LFPR* of 67.46% reflects a relatively high level of workforce engagement during the 2009–2023 period. Meanwhile, the old-age *DR* averaged 9.43%, indicating a relatively low economic burden from the elderly population on the working-age populace.

Economic growth (*GDP*) averaged 5.34%, indicating relatively high stability over the period. The range of economic growth was between 4.74% and 6.48%, with a standard deviation of 0.46, indicating small variability and consistency in growth achievement. The average *Yield* of government bonds varies by tenure. For a 1-year tenure, the average yield was 5.93% with a range from 3.33% to 7.95%, showing moderate volatility with a standard deviation of 1.10. The medium-term (5 years) yield averaged 6.96%, ranging from 4.69% to 9.16%, with a standard deviation of 1.08. The long-term (10 years) yield had the highest

average of 7.48%, with a range from 5.48% to 10.14% and a standard deviation of 1.01, indicating slightly lower volatility compared to other tenures. The distribution of long-term yields is close to normal with almost zero skewness (0.12) and a Jarque-Bera p-value of 0.904. The descriptive statistics show stable trends across variables, with *LFPR* and *GDP* demonstrating normal to near-normal distributions. *DR* indicates a slight demographic shift, while bond yields display moderate volatility, especially in short tenors.

#### 4.2. Johansen cointegration test results

The Johansen cointegration test was conducted to determine if there is a long-term relationship between the independent variables (*LFPR*, *DR*, *GDP*) and the bond yields for each tenure (1 year, 5 years, 10 years). The summary of the cointegration test results is presented in Table 2.

**Table 2.** Johansen cointegration test results

| <i>Tenure</i> | <i>Trace test results</i>                                                     | <i>Max-eigen test results</i>                                                     | <i>Conclusion</i>                                   |
|---------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------|
| 1 year        | Trace statistic: 56.34161<br>Critical value (5%): 47.85613<br>p-value: 0.0065 | Max-eigen statistic: 33.23818<br>Critical value (5%): 27.58434<br>p-value: 0.0084 | There is one significant cointegration relationship |
| 5 years       | Trace statistic: 53.74713<br>Critical value (5%): 47.85613<br>p-value: 0.0126 | Max-eigen statistic: 34.77081<br>Critical value (5%): 27.58434<br>p-value: 0.0050 | There is one significant cointegration relationship |
| 10 years      | Trace statistic: 53.25826<br>Critical value (5%): 47.85613<br>p-value: 0.0143 | Max-eigen statistic: 34.68669<br>Critical value (5%): 27.58434<br>p-value: 0.0052 | There is one significant cointegration relationship |

Source: Authors' elaboration using EViews based on data from CEIC Global Economic Data, Indicators, Charts & Forecasts for 2009–2023.

The Johansen cointegration test confirms a significant long-term relationship between *LFPR*, *DR*, economic growth (*GDP*), and bond yields across all tenors — 1, 5, and 10 years. For each tenor, both trace and max-eigen statistics indicate cointegration at the 5% level, with p-values consistently below 0.015. These results suggest that demographic and economic fundamentals exert lasting influence on Indonesia's bond yields. Thus, maintaining stability in labor markets, managing demographic

transitions, and sustaining economic growth are crucial for the long-term credibility and attractiveness of the bond market.

#### 4.3. Impulse response factor

Below is a summary of the IRF test results for the three bond tenors (1 year, 5 years, and 10 years), as presented in Table 3 below.

**Table 3.** Impulse response function results for the three bond tenors (Part 1)

| <i>Panel A: Response of D(Yield_1yr)</i> |                |              |               |                     |
|------------------------------------------|----------------|--------------|---------------|---------------------|
| <i>Period</i>                            | <i>D(LFPR)</i> | <i>D(DR)</i> | <i>D(GDP)</i> | <i>D(Yield_1yr)</i> |
| 1                                        | 0.027708       | -0.339779    | 0.024043      | 0.604708            |
| 2                                        | -0.020364      | 0.022512     | 0.012398      | 0.194063            |
| 3                                        | -0.013428      | -0.024746    | -0.006498     | 0.063051            |
| 4                                        | -0.005831      | -0.003747    | 0.005448      | 0.020735            |
| 5                                        | 0.000506       | -0.001519    | -0.001878     | 0.006290            |
| 6                                        | -0.001111      | -0.000394    | 0.000922      | 0.002204            |
| 7                                        | 0.000182       | -0.000208    | -0.000327     | 0.000635            |
| 8                                        | -0.000159      | -2.14E-05    | 0.000152      | 0.000234            |
| 9                                        | 3.77E-05       | -2.73E-05    | -5.81E-05     | 6.30E-05            |
| 10                                       | -2.48E-05      | -3.07E-07    | 2.60E-05      | 2.54E-05            |

**Table 3.** Impulse response function results for the three bond tenors (Part 2)

| <b>Panel B: Response of D(Yield_5yr)</b>  |                |              |               |                      |
|-------------------------------------------|----------------|--------------|---------------|----------------------|
| <b>Period</b>                             | <b>D(LFPR)</b> | <b>D(DR)</b> | <b>D(GDP)</b> | <b>D(Yield_5yr)</b>  |
| 1                                         | 0.032132       | -0.216396    | 0.048191      | 0.535062             |
| 2                                         | -0.126937      | 0.128408     | 0.004716      | 0.174541             |
| 3                                         | -0.179536      | 0.228463     | 0.013785      | 0.000624             |
| 4                                         | -0.068885      | -0.070917    | -0.073021     | -0.003087            |
| 5                                         | -0.042160      | -0.060006    | -0.026136     | 0.041666             |
| 6                                         | 0.002115       | 0.029920     | 0.019192      | 0.025172             |
| 7                                         | -0.002631      | 0.028493     | -0.011656     | 0.005904             |
| 8                                         | -0.018857      | -0.007191    | -8.20E-06     | -0.002495            |
| 9                                         | -0.002900      | -0.008354    | -0.001322     | 0.008150             |
| 10                                        | -0.000328      | 0.004085     | -0.003130     | 0.002296             |
| <b>Panel C: Response of D(Yield_10yr)</b> |                |              |               |                      |
| <b>Period</b>                             | <b>D(LFPR)</b> | <b>D(DR)</b> | <b>D(GDP)</b> | <b>D(Yield_10yr)</b> |
| 1                                         | 0.037607       | -0.131821    | 0.083177      | 0.500545             |
| 2                                         | -0.135592      | 0.108976     | -0.008506     | 0.113420             |
| 3                                         | -0.192661      | 0.160657     | 0.009437      | -0.003009            |
| 4                                         | -0.050297      | -0.078528    | -0.070135     | -0.000442            |
| 5                                         | -0.033075      | -0.034740    | -0.024951     | 0.020364             |
| 6                                         | 0.004749       | 0.025766     | 0.022473      | 0.016088             |
| 7                                         | 0.001642       | 0.013110     | -0.013016     | 0.009664             |
| 8                                         | -0.017936      | -0.004607    | 0.001849      | -0.004035            |
| 9                                         | -0.001428      | -0.003830    | 4.93E-05      | 0.005234             |
| 10                                        | 0.000364       | 0.001913     | -0.004399     | 0.000441             |

Source: Authors' elaboration using EViews based on data from CEIC Global Economic Data, Indicators, Charts & Forecasts for 2009–2023.

The IRF results show that shocks to *GDP* consistently generate an initial increase in bond yields across all tenors, which fades over time — indicating that economic growth first raises yield expectations but later contributes to stability. Demographic shocks, especially from the old-age *DR*, have a strong negative short-term impact, reflecting fiscal pressure, while *LFPR* has a modest, short-lived positive effect.

Across all tenors, yields exhibit high self-responsiveness in the initial periods, diminishing exponentially thereafter. The larger and more persistent impact on short-term yields indicates their higher sensitivity to economic shocks, consistent with the findings of Kudrna et al. (2022). Meanwhile, demographic shocks, particularly from

the old-age *DR*, exert a negative impact on yields in the early periods, reflecting increased fiscal pressures. The reversal and fading of these effects over time suggest that the market gradually adjusts to demographic trends, particularly in the medium and long term.

#### 4.4. Hypotheses testing results

##### 4.4.1. Hypotheses H1 and H2

The results for *H1* and *H2*, which examine the role of labor productivity levels and demographic characteristics on economic growth, are summarized in Table 4 below.

**Table 4.** Hypothesis testing results for *LFPR* and *DR* on *GDP*

| <b>Hypothesis</b>     | <b>Coefficient</b> | <b>p-value</b> | <b>R-squared</b> | <b>Conclusion</b>                                 |
|-----------------------|--------------------|----------------|------------------|---------------------------------------------------|
| <i>H1: LFPR → GDP</i> | 0.4159             | 0.000          | 0.862            | Significant (+): <i>LFPR</i> increases <i>GDP</i> |
| <i>H2: DR → GDP</i>   | -1.1713            | 0.000          | 0.862            | Significant (-): <i>DR</i> decreases <i>GDP</i>   |

Source: Authors' elaboration using EViews based on data from CEIC Global Economic Data, Indicators, Charts & Forecasts for 2009–2023.

The analysis shows that *LFPR* has a strong positive effect on economic growth (coef. = 0.4159,  $p < 0.01$ ), while the old-age *DR* has a significant negative impact (coef. = 1.1713,  $p < 0.01$ ). Both models explain 42.1% of *GDP* variation ( $R^2 = 0.862$ ), confirming that workforce expansion enhances growth, while rising demographic burdens suppress it.

##### 4.4.2. Hypothesis testing results for 1-year bond tenor

Below are the hypothesis testing results for each independent variable concerning the yield of short-term (1-year) bonds, summarized in Table 5 below.

**Table 5.** Hypothesis testing results for the 1-year bond tenor

| <b>Relationship</b>       | <b>Coefficient</b> | <b>p-value</b> | <b>Conclusion</b>                                     |
|---------------------------|--------------------|----------------|-------------------------------------------------------|
| <b>Direct effect</b>      |                    |                |                                                       |
| <i>LFPR → Yield</i>       | 0.2067             | 0.593          | Not significant                                       |
| <i>DR → Yield</i>         | -1.8065            | 0.093          | Not significant                                       |
| <i>GDP → Yield</i>        | -1.7164            | 0.044          | Significant (-): <i>GDP</i> decreases <i>Yield</i>    |
| <b>Indirect effect</b>    |                    |                |                                                       |
| <i>LFPR → GDP → Yield</i> | -0.7138            | 0.0403         | Significant (-): <i>GDP</i> mediates from <i>LFPR</i> |
| <i>DR → GDP → Yield</i>   | 2.0104             | 0.0397         | Significant (+): <i>GDP</i> mediates from <i>DR</i>   |
| R-squared (Adjusted)      | 0.257              |                | Model explains 25.7% of <i>Yield</i> variance         |

Source: Authors' elaboration using EViews based on data from CEIC Global Economic Data, Indicators, Charts & Forecasts for 2009–2023.

*LFPR* and *DR* do not have significant direct effects on 1-year bond yields. However, *GDP* shows a significant negative effect ( $p = 0.044$ ), suggesting that stronger economic growth lowers short-term

yields. Mediation analysis confirms that *GDP* significantly mediates the effects of both *LFPR* and *DR* on bond yields, indicating indirect but substantial influences through economic growth.

#### 4.4.3. Hypothesis testing results for 5-year bond tenor

Below are the hypothesis testing results for each independent variable with respect to the yield of medium-term (5-year) bonds, summarized in Table 6.

None of the variables — *LFPR*, *DR*, or *GDP* — has significant direct effects on 5-year bond yields. Additionally, Sobel tests show no significant mediation through *GDP*, indicating limited macroeconomic influence on medium-term yields.

**Table 6.** Hypothesis testing results for the 5-year bond tenor

| Relationship                            | Coefficient | p-value | Conclusion                                    |
|-----------------------------------------|-------------|---------|-----------------------------------------------|
| <b>Direct effect</b>                    |             |         |                                               |
| <i>LFPR</i> → <i>Yield</i>              | 0.1174      | 0.765   | Not significant                               |
| <i>DR</i> → <i>Yield</i>                | -1.5391     | 0.157   | Not significant                               |
| <i>GDP</i> → <i>Yield</i>               | -1.3446     | 0.117   | Not significant                               |
| <b>Indirect effect</b>                  |             |         |                                               |
| <i>LFPR</i> → <i>GDP</i> → <i>Yield</i> | -0.5592     | 0.1124  | Not significant                               |
| <i>DR</i> → <i>GDP</i> → <i>Yield</i>   | 1.5749      | 0.1118  | Not significant                               |
| R-squared (Adjusted)                    | 0.211       |         | Model explains 21.1% of <i>Yield</i> variance |

Source: Authors' elaboration using EViews based on data from CEIC Global Economic Data, Indicators, Charts & Forecasts for 2009–2023.

#### 4.4.4. Hypothesis testing results for 10-year bond tenor

Below are the hypothesis testing results for each independent variable concerning the yield of long-term (10-year) bonds, summarized in Table 7 below.

*LFPR*, *DR*, and *GDP* have no significant direct effects on 10-year bond yields. Mediation analysis also shows no significant indirect effects via *GDP*, indicating a weak macroeconomic influence on long-term yields.

**Table 7.** Hypothesis testing results for the 10-year bond tenor model

| Relationship                            | Coefficient | p-value | Conclusion                                    |
|-----------------------------------------|-------------|---------|-----------------------------------------------|
| <b>Direct effect</b>                    |             |         |                                               |
| <i>LFPR</i> → <i>Yield</i>              | 0.1314      | 0.728   | Not significant                               |
| <i>DR</i> → <i>Yield</i>                | -1.4639     | 0.162   | Not significant                               |
| <i>GDP</i> → <i>Yield</i>               | -1.0001     | 0.223   | Not significant                               |
| <b>Indirect effect</b>                  |             |         |                                               |
| <i>LFPR</i> → <i>GDP</i> → <i>Yield</i> | -0.4159     | 0.2189  | Not significant                               |
| <i>DR</i> → <i>GDP</i> → <i>Yield</i>   | 1.1714      | 0.2279  | Not significant                               |
| R-squared (Adjusted)                    | 0.164       |         | Model explains 16.4% of <i>Yield</i> variance |

Source: Authors' elaboration using EViews based on data from CEIC Global Economic Data, Indicators, Charts & Forecasts for 2009–2023.

## 5. DISCUSSION

The results of *H1* confirm that *LFPR* significantly boosts *GDP*, supporting the view that an active labor force enhances national productivity. This aligns with Asada (2020), who noted that labor productivity sustains economic growth, and Soava et al. (2020), who found that labor force engagement significantly impacts *GDP* in developing economies. For *H2*, the old-age *DR* shows a significant negative effect on *GDP*, indicating that demographic burdens suppress growth through higher fiscal costs. This supports findings by Huang et al. (2019), Liu (2023), and Ong and Mohd-Audi-Tye (2022), who emphasized the fiscal strain from aging populations on pensions and healthcare systems.

These results suggest *LFPR* fosters economic stability, while *DR* poses structural risks that must be addressed through productivity and fiscal reforms. Both variables underpin long-term dynamics relevant to bond yield movements, explored further by tenor (1-year, 5-year, 10-year) through regression, mediation, cointegration, and IRF analyses.

For the 1-year tenor, *GDP* significantly reduces bond yields (coef. = -1.7164, *p* = 0.044), supporting asset demand theory, which posits that economic stability lowers risk perception and yields. *LFPR* and *DR* show no direct effect, though their coefficients suggest opposite relationships.

Mediation analysis confirms *GDP* as a significant mediator. The *LFPR* → *GDP* → *Yield* path is significant (coef. = -0.7138, *p* = 0.0403),

indicating that higher *LFPR* boosts growth, which then lowers yields — reflecting improved investor confidence in line with asset demand theory. Conversely, the *DR* → *GDP* → *Yield* path shows that a rising *DR* suppresses growth and indirectly raises yields (coef. = 2.0104, *p* = 0.0397), as demographic burdens increase fiscal pressure and market risk, especially for short-term bonds.

These findings emphasize the increasing pressure that demographic shifts place on Indonesia's fiscal stability, particularly through rising *DR*s and social expenditure needs. As noted by Kudrna et al. (2022), improving workforce skills and accelerating the formalization of employment are critical strategies to sustain economic growth and ensure stable revenue streams in the coming decades. This demographic transition, combined with Indonesia's evolving economic landscape, highlights the urgent need to strengthen the country's social protection framework, particularly to support the aging population. Without substantial and sustainable policy efforts, there is a heightened risk of increased economic vulnerability among older cohorts, posing long-term challenges to fiscal sustainability and social equity. Addressing these challenges requires not only a comprehensive understanding of the labor force and demographic profiles but also the development of consistent economic models to evaluate alternative social protection designs that can ensure resilience and inclusivity.

For 5- and 10-year tenors, neither direct nor mediating effects were significant, though cointegration and IRF results indicate long-term

linkages and macroeconomic sensitivity. These tenors are more influenced by structural factors such as fiscal sustainability and inflation expectations, rather than short-term growth dynamics. The significant *GDP* mediation in the 1-year tenor highlights economic growth as a crucial link between labor, demographics, and short-term yields. Thus, policies that boost labor participation and manage demographic burdens are essential to support growth and mitigate short-term bond market risks.

The hypothesis testing results show consistent coefficient directions for each independent variable across all tenors. *LFPR* demonstrates a positive relationship with yields, although not significant for the 5- and 10-year tenors, reflecting the potential impact of increasing active labor force on economic pressures that may raise yield expectations. *DR* consistently exhibits a negative relationship across all tenors, suggesting that increasing demographic burdens tend to reduce yields through their impact on larger fiscal allocations. These results align with the studies by Pinho and Barradas (2021), which confirm that inflation expectations lead to increased government bond yields, and Michelson and Stein (2023), which found that higher old-age DRs, reflecting increased life expectancy and declining natural population growth, lead to lower natural interest rates on long-term government bonds.

Economic growth consistently shows a negative relationship, with a significant effect only for the 1-year tenor, highlighting the importance of economic growth in supporting the stability of the short-term bond market, while its influence weakens for medium- and long-term tenors. These findings are consistent with the research by Pappas and Kostakis (2020), which demonstrated that GDP growth has a significant negative relationship with long-term government bond yields, linking better macroeconomic performance, particularly strong growth, to lower yields. Ahwireng-Obeng and Ahwireng-Obeng (2020) also found that GDP per capita negatively affects sovereign bonds, while Zhou (2021) notes that increased economic activity enhances investor confidence and reduces perceived risks. Countries with strong economic growth generally have robust fiscal positions, enabling them to meet obligations consistently. Strong economic growth boosts government revenue and debt repayment capacity, which can reduce bond yields. Higher economic growth in emerging markets, driven by structural reforms and demographic shifts, typically supports lower government bond yields due to improved investor confidence and reduced credit risk (Trinugroho et al., 2020).

The findings of this study align with the growing body of literature that highlights the complex interaction between demographic shifts and financial market outcomes. Michelson and Stein (2023) emphasize that demographic changes, particularly population ageing, contribute to a structural decline in the natural interest rate, which in turn suppresses long-term bond yields. This finding complements the present study's observation that economic growth acts as a mediating factor through which demographic shifts influence government bond yields in Indonesia. Similarly, Pinho and Barradas (2021) demonstrate that demographic conditions, along with fiscal and liquidity risks, significantly impact

bond yield dynamics, reinforcing the importance of incorporating demographic variables into macro-financial models.

Moreover, as Posza and Csapi (2021) point out, demographic transitions affect asset prices not only through direct fiscal channels but also by altering saving and investment behaviors across different age cohorts. In the Indonesian context, this dynamic is particularly relevant given the high rate of informal employment and limited formal pension coverage (Kudrna et al., 2022). These structural characteristics suggest that without targeted policies to improve labor market formalization and expand social protection, the demographic transition could amplify fiscal pressures and financial market vulnerabilities.

Overall, the analysis results indicate that macroeconomic variables have a more significant relationship with short-term bond yields compared to medium- and long-term tenors. These findings support the life cycle and asset demand theories, where stable economic growth and healthy demographic structures play key roles in determining bond market stability. Governments should focus on increasing labor force participation to support economic growth, which can reduce bond yields, particularly for short-term tenors. Additionally, demographic risk management should be conducted through sustainable fiscal policies to mitigate the negative impact of DR on long-term bond market stability. For GDP, governments need to maintain stable and inclusive economic growth, given its significant influence on the short-term bond market, while ensuring long-term stability to manage medium- and long-term bond markets.

## 6. CONCLUSION

This study highlights the critical role of economic growth in mediating the relationship between demographic dynamics — specifically, labor force participation and the old-age DR — and government bond yields in Indonesia. The findings reveal that while demographic shifts do not exert direct effects on bond yields, their influence is transmitted through economic growth, particularly on short-term yields. The cointegration analysis further confirms long-term equilibrium relationships across various bond tenors, emphasizing the structural interconnectedness between macroeconomic fundamentals and financial market outcomes.

These insights have significant implications for policy and practice. Promoting labor force participation, enhancing workforce productivity, and managing demographic risks are essential strategies for ensuring fiscal sustainability and financial market stability. Moreover, the high prevalence of informal employment and limited pension coverage in Indonesia underscores the urgent need for inclusive social protection policies, particularly as the population ages and fiscal pressures intensify.

Government policymakers should prioritize policies that boost labor force participation, improve workforce skills, and accelerate the formalization of employment sectors to sustain long-term economic growth and fiscal stability.

Financial market regulators need to strengthen regulatory frameworks to ensure transparency and resilience in government bond markets, considering the potential long-term impact of demographic shifts on investor behavior and risk premiums.

Social protection agencies must develop inclusive social protection schemes, including non-contributory pensions, to mitigate the socio-economic risks posed by an aging population, especially among informal workers who lack retirement security.

Investors and financial institutions should incorporate demographic risk assessments into their investment strategies, recognizing that population aging may influence long-term yield structures and asset allocation preferences.

Despite offering valuable insights, this study has several limitations that future research could address. First, the analysis focuses exclusively on domestic macroeconomic variables, without incorporating external factors such as global interest rates, monetary policy spillovers, or exchange rate volatility, which are highly relevant in an open

economy like Indonesia. Second, while this study employs multiple regression and cointegration analyses, more dynamic methods such as structural vector autoregression or generalized method of moments could provide deeper insights into causal relationships and short-term dynamics.

Future research could expand the model by including international variables or applying alternative econometric techniques to validate and generalize the findings across other emerging markets. Additionally, a sectoral analysis of labor market dynamics could offer more targeted policy recommendations for specific industries. Addressing these areas would enhance the understanding of how macroeconomic and demographic factors jointly influence government bond markets, thereby contributing to more robust financial policy design in emerging economies.

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