

The Effect of Bond Maturity and Structural Factors on Government Bond Market Size in Tanzania

Stephen Mnyawi¹, Ellinami Minja² and Eric Mkwizu³

Abstract

This study examines the effect of bond maturity and structural factors on Government Bond Market (GBM) size in Tanzania. In particular, it tested the direct effects of structural factors on GBM size and examines whether bond maturity moderates these relationships. The study is informed by Market Microstructure Theory (MMT) and Transaction Cost Economics (TCE) theory and used annual time-series data covering the period from 1997 to 2024. It analyses the effects of structural factors namely transaction costs, market participants, and Treasury bond uptake on GBM size in Tanzania, as well as the moderating effect of bond maturity on these relationships. The data were analysed using the Generalised Method of Moments (GMM) through E-Views 13.0 computer software. The findings indicate that market participants contribute positively to the expansion of the GBM, while high transaction costs constrain market growth.

The results further show that increased Treasury bond purchases raise the stock of outstanding debt but do not enhance market liquidity, highlighting the weak linkage between the number of bond issues and market expansion. In addition, the study finds that bond maturity moderates the relationship between structural factors (transaction costs, market participants, and Treasury bond uptake) and GBM size. This suggests that the GBM size respond differently across short-, medium-, and long-term horizons. To enhance GBM size, the study offers policy recommendations that include expanding long-term issuance, reducing transaction frictions, broadening the investor base, and aligning debt management practices with capital market reforms. The study contributes to the literature by establishing bond maturity as a moderating variable in sovereign bond market analysis, providing empirical evidence from an understudied African market, and proposing a triangular interaction model linking structural factors to GBM size.

Keywords: Government Bond Market, Transaction cost, Market Participants, Treasury bond uptake, and Bond Maturity.

Introduction

Government bond markets (GBMs) at the global level are cornerstones of contemporary financial systems, as they facilitate domestic financing, macroeconomic stabilisation, the transmission of monetary policy, and financial sector development (World Bank, 2023). Empirical evidence

¹ University of Dar es salaam Business School, Tanzania

Email: petermundolosi@gmail.com

² University of Dar es salaam Business School, Tanzania

³ University of Dar es salaam Business School, Tanzania

indicates that a healthy GBM within a country supports the formation of an effective yield curve, thereby enhancing fiscal planning, lowering the cost of sovereign borrowing, and promoting financial stability through improved collateral and liquidity management (World Bank, 2023). Theoretical perspectives, particularly Transaction Cost Economics (TCE) and Market Microstructure Theory (MMT), emphasise that high transaction and operational costs reduce market participation (Williamson, 1985), while information asymmetries and unstable market structures undermine liquidity, price discovery, and trading efficiency (O'Hara, 1995). Evidence further shows that developing economies are increasingly turning to domestic bond markets to finance long-term growth and reduce exposure to external debt pressures. However, the Tanzanian government bond market remains small, with limited investor diversification, a thin secondary market, and weaker market infrastructure compared with regional peers such as Kenya and South Africa (FSB2022; Soumaré, Kanga & Faye, 2021). Most empirical studies have focused on macroeconomic variables, including inflation, interest rates, and fiscal balances, while structural market drivers such as investor behaviour, transaction efficiency, and liquidity constraints have received limited attention (Burger et al., 2022).

In addition, bond maturity has not been sufficiently examined, with most empirical studies treating maturity as a descriptive attribute rather than as a behavioural mechanism capable of moderating the influence of structural factors on GBM size. Consequently, little is known about whether structural constraints affect short-, medium-, and long-term bonds differently, particularly in the Tanzanian context. This gap constrains understanding of how maturity structure shapes liquidity formation, market segmentation, and investors' decision-making. To address these gaps, the present study examines the role of structural factors in determining the size of Tanzania's GBM and assesses how bond maturity moderates the relationship between structural factors and GBM size. The analysis employs a dynamic system GMM estimation approach to account for endogeneity, persistence, and thin-market characteristics (Arellano & Bover, 1995; Blundell & Bond, 1978). Bond maturity is incorporated as a moderating variable to generate policy-relevant insights for improving issuance strategies, market design, and the sequencing of reforms in Tanzania's government bond market (World Bank & IMF, 2020; World Bank, & IMF 2023; BIS, 2024).

Literature Review

The study is guided by two theories: Market Microstructure Theory (MMT) and Transaction Cost Economics (TCE). MMT explains the effects of trading mechanisms, information asymmetry, and market structure on liquidity, transaction costs, price formation, and overall market efficiency. It emphasises that markets are not frictionless, and that trading behaviour, order flow, and market infrastructure determine asset pricing and market depth, making the theory applicable to the analysis of the Tanzanian government bond market. Seminal studies by Scholes (1972), Glosten and Milgrom (1985), Kyle (1985), Engle (2000), and O'Hara (1995) demonstrate that liquidity conditions, asymmetric information, and trading strategies influence market outcomes. These principles explain how structural features, high transaction costs, weak trading systems, and low levels of investor diversification shape preferences for short-, medium-, and long-term bonds in emerging markets. Transaction Cost Economics (TCE), developed in 1937 by Coase (1993) and extended by Williamson (1981, 1985), complements this perspective by showing how monitoring, enforcement, and negotiation costs, asset specificity, and uncertainty affect investment choices. In bond markets, costs tend to rise with longer maturities, as more institutional coordination is required and market stability becomes more critical. The combined

insights of MMT and TCE explain why structural deficiencies constrain long-term bond investment and limit the development of the GBM. Evidence from Tanzania (1997–2024) suggests that investor preference for short-term instruments is reinforced by persistent market frictions.

Previous studies on government bond markets have largely employed aggregate models to explain their evolution (Bua et al., 2020; Hearn et al., 2019). This study adopted a more focused framework to examine the influence of structural variables namely transaction costs, market participation, and Treasury bond uptake on market size in Tanzania, while also accounting for the moderating role of bond maturity. The relevance of these dynamics to public finance management lies in the fact that well-functioning government bond markets promote investment, reduce reliance on external borrowing, and improve risk diversification. Transaction costs are particularly significant, as high costs deter investors, reduce liquidity, and widen bid–ask spreads, while lower costs encourage participation and enhance price discovery. Market participation reflects the breadth and diversity of investors in the bond market. A broader and more active investor base increases competition, transparency, and liquidity. According to Blankespoor et al. (2020), active participation is associated with lower volatility, reduced order imbalance, and greater market efficiency. By contrast, limited participation can lead to market concentration, weak liquidity, and underdeveloped secondary markets. Diversity in the investor base enhances market stability and expands trading opportunities, thereby supporting GBM growth.

Another structural factor influencing GBM development is Treasury bond uptake. Chiesa and Barua (2019) argue that bond market performance depends on the interaction between security supply and investor demand. Strong demand for Treasury securities signals investor confidence and supports market growth, whereas weak uptake can constrain liquidity and intensify price volatility. In the Tanzanian context, low adoption may exacerbate market instability and restrict market expansion. Bond maturity is also a key element of sovereign debt management. Maturity structure shapes financing practices, liquidity conditions, and investor behaviour. Long-term bonds are typically targeted at institutional investors with stable, long-horizon mandates, such as pension funds, whereas commercial banks and other risk-averse investors tend to prefer shorter maturities due to lower duration risk and more predictable liquidity (Ko, 2019). Mega and Widayat (2019) argue that aligning interest rates with maturity structures can reduce borrowing costs and default risk. Kim and Ostry (2020) show that long-term debt linked to GDP growth supports fiscal sustainability by stabilising debt ratios. The importance of maturity design is further supported by studies such as Baker et al. (2003) and the Bank of Thailand (2020), which show that long-term maturities carry higher risk and volatility premiums than short-term instruments. Varirahartia and Marsoem (2022) also demonstrate a strong relationship between yield and bond maturity, indicating that maturity plays a critical role in shaping investor behaviour and market dynamics. Based on these insights, the present study hypothesises that bond maturity moderates the influence of structural determinants on GBM size.

Summary of Hypotheses:

H1: Transaction cost has no effect on the government bond market size in Tanzania.

H2: The level of market participants has no effect on the government bond market size in Tanzania

H3: The Treasury bond uptake has no effect on the government bond market size in Tanzania.

H4a: Bond maturity does not moderate the effect of the transaction cost on government bond market size in Tanzania.

H4b: Bond maturity does not moderate the effect of the level of market participants on the government bond market size in Tanzania.

H4c: Bond maturity does not moderate the effect of the Treasury bond uptake on the government bond market size in Tanzania.

Conceptual Framework

Basing on the theoretical and empirical literature, the conceptual framework (Figure 1) assumes that structural determinants affect GBM size directly and indirectly via the moderating action of bond maturity. The structural variables, such as transaction costs, market participation patterns, and Treasury bond uptake, should have discriminated effects at both short-, medium-, and long-term maturity. GBM size is an endogenous variable, which is the ratio of outstanding domestic government bonds and GDP, a technique that is commonly accepted in the past research (Burg et al. 2018) Leonard, 201; Aman, 2020; Musah et al,2019; Khalid & Rajaguru, 2018; Agbo & Odo, 2020). This framework helps enable an intra porous analysis of the combination of structural factors and maturity structures in the evolution of the GBM of Tanzania.

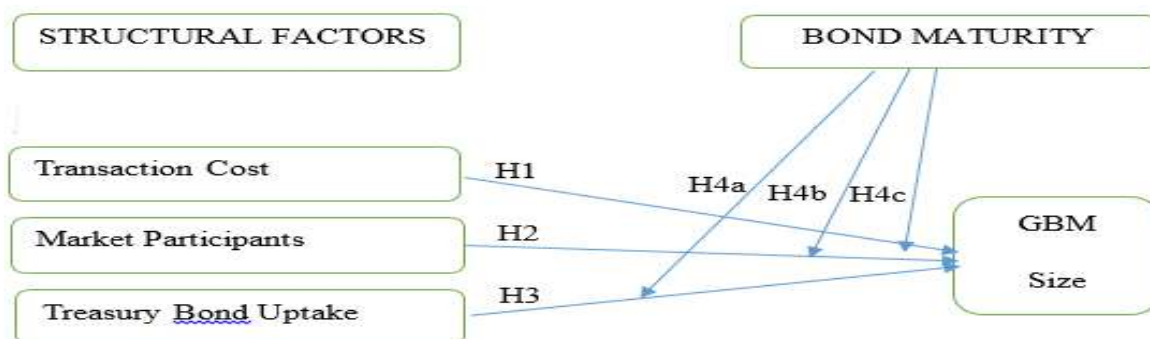


Figure 1: Conceptual Model

Source: Researcher’s Conceptualisation (2023).

Methodology and Approaches

The study is guided by a positivist philosophy, which assumes that the behaviour of the bond market can be measured and analysed objectively through quantitative methods. This approach is appropriate for examining market dynamics over the period 1997 to 2024, as the relationships under study can be tested statistically through hypothesis development and empirical testing. The study is informed by Market Microstructure Theory, which contends that transaction costs, liquidity, information asymmetry, and participant behaviour shape market outcomes. Drawing on this theoretical framework, hypotheses are formulated regarding the relationship between structural and macroeconomic variables and the size of the GBM. A deductive approach is adopted, moving from theory to empirical testing. Bond maturity is included as a moderating variable, recognising that structural factors do not affect short-, medium-, and long-term securities uniformly. The study employs an explanatory research design and a quantitative methodology, allowing for causal analysis. Annual time-series data covering the period 1997–2024 were obtained from the Bank of Tanzania (BoT), the Ministry of Finance and Planning (MoFP), now the Ministry of Finance (MoF), and the National Bureau of Statistics (NBS). The Generalised Method of Moments (GMM) is applied to address endogeneity and dynamic relationships within the data. Diagnostic tests are conducted to assess data quality and model validity. The variables include GBM size, transaction costs, market participation, fiscal balance, external debt, bond

maturity, and key macroeconomic indicators, all of which are operationalised into measurable forms for hypothesis testing (Table 1).

Table 1: Operationalization and Measurement Variables

Variables	Indicators	Conceptualization	Measure	Notation	Source
Dependent Variable	Government Bond Market (GBM) Size	The value of the outstanding domestic government bonds.	The ratio of the value of outstanding domestic bonds to GDP	$(TVGBs/GDP) \times 100$	Nkwenda (2020)
Independent Variables: Structural Factors	Transaction Cost (TC)	Refer to the logistics behind trading <u>assets</u> and <u>securities</u> , regardless of the type of market. With sellers.	Transaction Cost Value	$BID-ASK SPREADY_t - BID-ASK SPREADY_{t-1} / BID-ASK SPREADY_{t-1} \times 100$	De Santis (2020). Gregorio (2017).
	market Participants (MP)	Are traders or investors who buy securities	Total number of successive buyers or	Total number of successive buyers or bidders.	Pham and Huynh (2020).
	Treasury Bonds Uptake (TB)	the increase or decrease of the treasuries bonds purchase/sell	Percentage of bonds sold	(Total Issued Bonds/Subscriptions Bonds) x 100	Low and Yong (2011)
Moderator	Bond Maturity (BM)	This is the time when the bond issuer must repay the original bond value to the bondholder.	Weighted Average Yield for short (ST), medium (MT), and long (LT)-term (T) based on bond maturity in years	WAY_{ST} for ST (i.e., less than 5 years), WAY_{MT} for MT (i.e., 5 - less than 10 years), & WAY_{LT} for LT (i.e., from 10 to 25 years)	Aitken and Comerton-Forde (2003)

Source: Researcher’s Computation (2024).

Data Collection Methodology

A systematic quantitative data collection approach was adopted to compile reliable time-series data on the structural determinants of Tanzania’s Government Bond Market (GBM) for the period 1997–2024. To ensure accuracy and comparability, all data were obtained exclusively from authoritative secondary sources. Annual observations were extracted, organised, and validated in

a structured Microsoft Excel data sheet (MEDS) to ensure consistent variable definitions, identify missing values, and prepare the dataset for econometric analysis using Stata 17 and the two-step system GMM technique. Key financial variables, including interest rates, transaction costs, market participation, Treasury bond uptake, maturity structure, and GBM size, were obtained from the Bank of Tanzania (BoT). Macroeconomic indicators, including GDP and inflation, were sourced from the National Bureau of Statistics (NBS), while the Ministry of Finance (MoF) provided data on fiscal balance, public debt, and bond issuance schedules. Cross-verification was conducted using international databases, namely the World Development Indicators (WDI), African Development Bank (AfDB), and IMF International Financial Statistics (IMF-IFS). In cases of discrepancy, BoT data were prioritised. Data reliability was strengthened through triangulation across sources, checks for temporal consistency, inflation adjustment to constant 2015 prices, and descriptive diagnostics to identify outliers. Missing values were addressed through interpolation where necessary. Study variables were classified as dependent (GBM size), independent (transaction costs, market participation, Treasury bond uptake, fiscal balance, and external debt), moderating (bond maturity), and control variables. The suitability of the dataset for dynamic GMM estimation was assessed using the Sargan test, the Arellano–Bond test, and the Jarque–Bera test.

Data Analysis and Model Estimation

Generalised Method of Moments (GMM) of the E-Views 13.0 software was used to perform descriptive and inferential analysis in the study. Assessing variable distributions was done using descriptive statistics, Jarque Bera test. The two-step Difference GMM (ArellanoBond) was used to inferential analyze the effect of structural factors on Governing of the Government Bond Market (GBM) in Tanzania and test the moderating effect of bond maturity. Difference GMM has been chosen because it is strong in terms of endogeneity, unobserved heterogeneity and serial correlation. The instrument validity was proved by Hansen and Sargan tests, whereas the model consistency was ensured by AR(1) and AR(2) tests. Interaction terms captured maturity-based moderating effects.

$$(1) Y_{k,t} = \gamma_0 + \gamma_1 TC_{k,t} + \gamma_2 MP_{k,t} + \gamma_3 TB_{k,t} + \gamma_4 W_{k,t} + \pi'2_{k,t} + \pi1_{k,t}.....(5.1)$$

whereby

$Y_{i,t}$ = Dependent variable (Government bond market size-GBM size) at time period ‘t’

Structural factors= Independent variables such that TC, MP, and TB.

TC = Transaction Cost

MP = Market Participants

TB = Treasury Bonds Uptake

W = Estimated unobservable variable:

k = indicators

$\gamma_0, \gamma_1, \gamma_2, \gamma_3$, are parameters to be estimated.

$\pi'2$ & $\pi'2$ Are the estimated and non-estimated error terms,

$$(Y_{k,t} = \gamma_0 + \gamma_1 TC_{k,t} + \gamma_2 MP_{k,t} + \gamma_3 TB_{k,t} + \gamma_4 TC_{j,t} ST_BM_{j,t} + \gamma_5 TC_{j,t} MT_BM_{i,t} + \gamma_6 TC_{j,t} LT_BM_{i,t} + \gamma_7 MP_{j,t} ST_BM_{j,t} + \gamma_8 MP_{j,t} MT_BM_{i,t} + \gamma_9 MP_{j,t} LT_BM_{i,t} + \gamma_{10} TB_{j,t} ST_BM_{j,t} + \gamma_{11} TB_{j,t} MT_BM_{i,t} + \gamma_{12} TB_{j,t} LT_BM_{i,t} + \gamma_{13} BM_{i,t} + \gamma_{14} W_{k,t} + \pi'2_{k,t} + \pi1_{k,t}.....(Eqn 5.2)$$

where by

BM= Moderating factor (Bond Maturity)

ST_BM =Short Term Bond Maturity

MT_BM =Medium Term Bond Maturity

LT_BM = Long Term Bond Maturity

Results

Descriptive Analysis

The descriptive statistics presented in Table 2 provide initial insights into the structure of Tanzania’s Government Bond Market (GBM). The average GBM size is 0.0678, indicating a shallow market. This finding is consistent with earlier studies suggesting that Tanzania remains at an early stage of market deepening rather than at a mature phase of bond market development. The wide gap between the minimum and maximum values points to uneven market development, influenced by irregular issuance patterns and shifts in fiscal and monetary policy. Market participation (MP) shows a high mean value (2019.39) relative to the median (773.50), together with a large standard deviation (2185.5), indicating a highly dispersed and right-skewed distribution. This suggests limited participation by a broad investor base, with market activity dominated by a small number of large institutions, mainly pension funds and commercial banks. Periodic spikes are likely during episodes of large issuances or regulatory adjustments, resulting in inconsistent engagement over time. Transaction costs (TC) display low variability (standard deviation of 8.93) and moderate right skewness, reflecting a relatively stable but inflexible cost structure typical of thinly traded bond markets. TC, TB, and most other variables exhibit platykurtic distributions (kurtosis < 3), indicating an absence of extreme values.

Treasury bond uptake (TB) shows comparatively low variation, with mean and median values closely aligned. This suggests that bond uptake is driven more by policy requirements and institutional mandates than by speculative motives or secondary-market activity. Its low skewness (0.23) and kurtosis of approximately 2 further point to stable, non-volatile demand. Analysis of bond maturity indicates gradual growth across short-term (ST), medium-term (MT), and long-term (LT) tenors. Skewness declines from ST (0.138) to MT (0.037) and becomes slightly negative for LT (-0.478), implying a wider distribution of short-term securities and more concentrated holdings in long-term bonds. This pattern suggests a degree of duration aversion, whereby investors participate in longer maturities with caution. Similar standard deviations for ST (3.66), MT (4.01), and LT (3.86) indicate comparable volatility across segments, although the marginally lower volatility in LT implies more stable long-term investment behaviour.

Table 2: Descriptive Analysis

	GBM_SIZE	MP	TC	TB	ST	MT	LT
Mean	0.068	2019.393	87.173	1.524	11.056	11.854	13.642
Median	0.047	773.500	84.809	1.453	9.852	12.199	14.660
Maximum	0.195	6558.000	103.552	2.715	17.467	18.174	18.664
Minimum	0.0000	123.000	74.151	0.666	5.138	6.422	7.686
Std. Dev.	0.054	2185.549	8.925	0.543	3.663	4.017	3.861
Skewness	0.767	0.975	0.382	0.234	0.138	-0.069	-0.479
Kurtosis	2.491	2.418	1.928	2.366	1.807	1.611	1.840
Jarque-Bera	3.045	4.833	2.019	0.725	1.749	2.273	2.640

Probability	0.218	0.089	0.364	0.696	0.417	0.321	0.267
Observations	28	28	28	28	28	28	28

Source: Researcher’s Computational (2025)

Normality Test

A normality test is a statistical method used to determine whether a set of data follows a normal distribution. The study employs the Jarque-Bera test and normal probability plot to check if the error terms are normally distributed or not. The Jarque-Bera test is chosen for normality testing because it tests for both skewness and kurtosis, which are two common deviations from normality. The test compares the sample skewness and kurtosis to the expected values under the assumption of normality. The null hypothesis for the Jarque-Bera test is that the data follows a normal distribution, whereas the alternative hypothesis is that the data does not follow a normal distribution. The study findings, as per Figure 2, indicate that the variables exhibit normal distribution patterns since their p-values are greater than 0.05. Specifically, the Jarque-Bera test results show that the p-values for each variable are above the significance level of 0.05. As a result, we fail to reject the null hypothesis, concluding that the data follows a normal distribution. This finding implies that the assumptions of normality are met for the variables in the study.

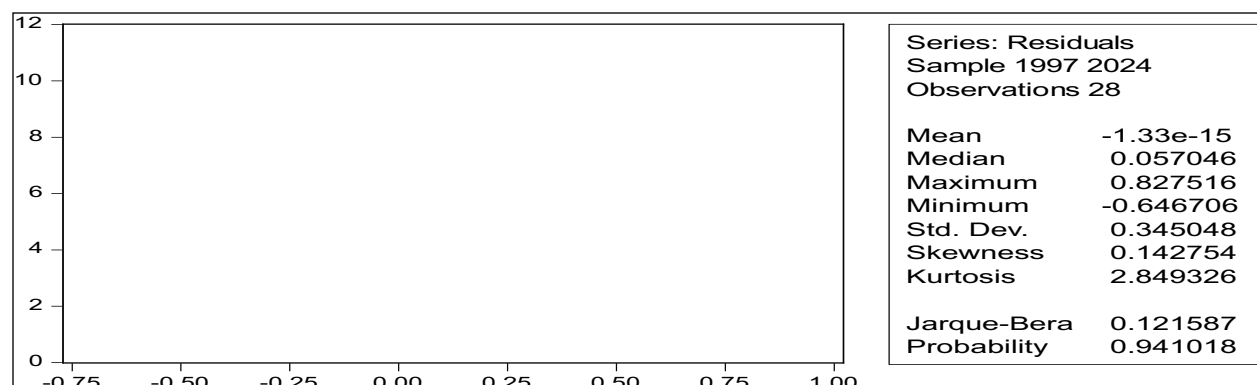


Figure 2: Normality Test
Source: E-View Outputs (2025)

Variance Inflation Factors

The analysis used Variance Inflation Factors (VIFs) to determine the presence of multicollinearity between independent variables, which is as a result of two or more variables being highly correlated. The centred VIFs offer the right measure since uncentered VIFs are distorted by the intercept. Acceptable centred VIF is a value of 10 and ideal is 5. A majority of the variables had VIFs that were far below 5 meaning that multicollinearity was low. Market participation (8.49) and transaction costs (6.23) have high VIFs but are not very dangerous. This correlation is also anticipated in the sovereign bond markets, where increased engagement is usually correlated with tightening of spread and reducing (Table 3).

Table 3: Variance Inflation Factors

	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
ST	0.349	42.327	3.291
MT	0.892	21.801	2.592

LT	0.341	27.410	2.414
MP	0.518	81.391	8.487
TB	0.301	43.963	3.555
TC	0.479	60.245	6.226
C	0.933	10.034	NA

Source: E-View Outputs (2025)

Breusch-Godfrey Serial Correlation LM Test:

The Breusch Godfrey (BG) test measures the serial correlation of the residuals of the estimated model. Autocorrelation or serial correlation occurs when there is correlation between the components of error at different time periods and this may contaminate standard errors creating biases to the statistical inference of time-series econometric analysis. Table 4 shows the given findings $F(1,20) = 0.3167$ and $F(1)$ Chi-square = 0.236, both of which exceed the standard 5% significance level. The null hypothesis which claims that there is no serial correlation cannot therefore be rejected.

Table 4: Breusch-Godfrey Serial Correlation LM Test

F-statistic	1.055	Prob. F (1,20)	0.317
Obs*R-squared	1.403	Prob. Chi-Square (1)	0.236

Source: E-View Outputs (2025)

Heteroskedasticity Test: Breusch-Pagan-Godfrey

The Breusch-Pagan-Godfrey test is used to determine the consistency of the change in residual variance which is constant (homoscedastic) or changes in a consistent manner with the explanatory variables (heteroscedastic). In the event that heteroscedasticity exists, it might misrepresent the standard errors and give wrongful hypothesis testing. In Table 5, it is seen that $\text{Prob. F}(6,21) = 0.313$, $\text{Prob. Chi-Square}(6) = 0.281$ and the Scaled Explained SS p-value = 0.220 all fell above the conventional 5% level of significance. This shows that the null hypothesis of homoscedasticity has not been disproven.

Table 5: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.270	Prob. F(6,21)	0.313
Obs*R-squared	7.453	Prob. Chi-Square (6)	0.281
Scaled explained SS	6.600	Prob. Chi-Square (6)	0.220

Source: E-View Outputs (2025)

The Correlogram – Q-Statistics (Autocorrelation Test)

The results of the correlogram in Table 6 reveal whether there is no serial correlation in the residuals of the model calculated. The AC and PAC results show P values greater than 0.05 very small coefficients across all 12 lags, indicating no autocorrelation in the residuals. The Ljung-Box Q-statistics confirm this, as all p-values exceed the 5% significance level, meaning the null hypothesis of no serial correlation cannot be rejected. Although a few minor spikes appear at lags 7 and 9, they are statistically insignificant and do not suggest model misspecification or instability. Overall, there is no evidence of residual autocorrelation.

Table 6: Correlogram – Q-Statistics

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*	
. .	. .	1	-0.035	-0.035	0.034	0.854
. * .	. * .	2	-0.199	-0.201	1.198	0.549
. ** .	. ** .	3	-0.254	-0.281	3.180	0.365
. .	. * .	4	-0.034	-0.126	3.217	0.522
. * .	. .	5	0.117	-0.013	3.678	0.597
. .	. * .	6	-0.010	-0.120	3.681	0.720
. ** .	. *** .	7	-0.329	-0.422	7.731	0.357
. .	. * .	8	-0.012	-0.178	7.737	0.460
. *** .	. * .	9	0.355	0.188	13.065	0.160
. * .	. .	10	0.166	0.011	14.299	0.160
. .	. .	11	-0.058	-0.062	14.460	0.209
. ** .	. * .	12	-0.268	-0.124	18.201	0.110

Source: E-View Outputs (2025)

Unit Root Test

To determine the stationarity of the variables within the empirical model, the Augmented Dickey Fuller (ADF) unit root test was used to test the variables. The Augmented Dickey Fuller test in Table 7 indicates that there are mixed orders of integration between the variables. GBM size, TC, ST, MT and LT are first difference stationary, and thus of order one integrability, and MP and TB stationary only after the second difference, and thus of order two integrability. This is not a pure integration structure so OLS and Johansen tests of cointegration would be inappropriate and this would justify dynamics GMM estimation, which allows variables with varying stationarity in its estimation.

Table 7: Augmented Dickey-Fuller test statistic

Variable	t-Statistic	Prob.*
GBM Size (1 st Difference -Intercept)	-4.246	0.003
MP (2 nd Difference -Intercept)	-5.080	0.000
TB (2 nd Difference -Intercept)	-3.505	0.019
TC (1 st Difference -Intercept)	-5.039	0.000
LT (1 st Difference -Intercept)	-3.847	0.007
MT (1 st Difference -Intercept)	-3.118	0.038
ST (1 st Difference -Intercept)	-5.107	0.000

Source: E-View Outputs (2025)

Regressors Endogeneity Test

The difference-in-J statistics test was used to determine whether the regressors of the model were endogenous and the instruments selected were appropriate. The null hypothesis is that the suspected regressors are exogenous and have no relation with the error term. The test value of difference-in-J as presented in Table 8 gives a statistic of 0.337 and a p-value of 0.987 which is much higher than the 5% mark where the null hypothesis is rejected. The difference in the J-statistic (limited) 7.753 and the unconstrained one 7.416 is not significant, which implies that further restrictions would not corrupt the model. On the whole, the instruments are valid and

System GMM estimates are robust and no endogeneity bias.

Table 8: Difference in J-Statistics Test-Direct Influence

	Value	df	Probability
Difference in J-stats	0.337	4	0.987
J-statistic summary:			
	Value		
Restricted J-statistic	7.753		
Unrestricted J-statistic	7.416		

Source: E-View Outputs (2025)

Difference-in-J Statistics Test (Moderation Influence)

The difference-in-J statistics test was used to determine whether endogeneity in the model was added through bond maturity moderation terms. In the null hypothesis, all regressors together with the interaction terms are exogenous and not related to the error term. The calculated difference-in-J value was 0.062 (df = 1) and the p-value of 0.804, which is far above the 5% level, does not reject the null. In this way, endogeneity was not due to the moderation terms. The difference between limited J-statistic (12.781) and unconstrained J-statistic (12.719) is not significant, which proves that no extra restrictions affect the model performance. In general, the modulating effects of the bond maturity are exogenous, the instruments are valid and the GMM estimates are sound (Table 9).

Table 9: Difference in J-Statistics Test-Moderation Influence

	Value	Df	Probability
Difference in J-stats	0.062	1	0.804
J-statistic summary:			
	Value		
Restricted J-statistic	12.781		
Unrestricted J-statistic	12.719		

Source: E-View Outputs (2025)

Hypotheses Testing for Direct Influence

The study sought to examine the effects of structural variables on the size of the Government Bond Market (GBM) in Tanzania. The empirical analysis was based on four hypotheses (H1–H4), which tested the direct effects of transaction costs, market participation, and Treasury bond uptake, as well as the moderating role of the bond maturity structure. The direct-effects model indicates that GBM performance is largely shaped by three key structural factors: transaction costs, the extent of market participation, and Treasury bond uptake. The results provide the basis for the formal testing of Hypotheses H1, H2, and H3. The study aimed at determining the role of transaction costs on GBM size in Tanzania. The null hypotheses that were tested in this research are as follows:

H1: Transaction cost has no effect on the government bond market size in Tanzania.

The results reported in Table 9 show that transaction costs are statistically significant and negatively related to GBM size, with a coefficient of -0.902 and a $p < 0.001$. A one-unit increase in transaction costs is associated with a 0.902 reduction in GBM size. These findings provide clear empirical evidence that high transaction frictions reduce market depth by lowering trading incentives, limiting investor turnover, and constraining price discovery in the secondary market. Accordingly, H1 is rejected, supporting the conclusion that high transaction costs constitute a structural barrier to GBM development. The second objective was to examine the effect of market participation on GBM size in Tanzania. The null hypotheses that were tested in this research included:

H2: The number of market participants has no effect on the government bond market size in Tanzania.

The results in Table 9 indicate a positive and statistically significant relationship between market participation and GBM size, with a coefficient of 0.056 and a $p < 0.001$. An increase of one unit in market participation leads to a 0.056 increase in GBM size. These findings suggest that a broader investor base enhances market depth by increasing auction competitiveness, diversifying tradable instruments, and strengthening secondary-market activity. On this basis, H2 is rejected, confirming that wider participation is a key driver of market expansion. The following null hypotheses were tested in this research:

H3: The Treasury bond uptake has no effect on the government bond market size in Tanzania.

The results in Table 10 again reject the null hypothesis. The uptake variable has a negative and significant effect with a coefficient of -0.077 and a $p < 0.001$ that affects the GBM size. Increase in Treasury bond uptake reduces GBM size by -0.077 and this means that in as much as the government securities demand is very strong it is largely characterized by a buy and hold policy. This method of accumulation has the effect of liquidity depletion because the assets are not moved out in the secondary market but rather held as institutional balance sheets. Therefore, the H3 is rejected meaning that the market is affected by the acquisition of government bonds through a liquidity lock-in mechanism.

Table 10: Hypotheses Testing Direct Influence

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MP	0.056	0.006	9.200	0.000
TB	-0.077	0.010	-8.177	0.000
TC	-0.902	0.103	-8.774	0.000
ST_BM	0.239	0.053	4.535	0.000
MT_BM	0.263	0.116	2.280	0.035
LT_BM	-0.459	0.103	-4.443	0.000
C	0.318	0.023	13.891	0.000
R-squared	0.730	Mean dependent var		0.072
Adjusted R-squared	0.694	S.D. dependent var		0.056
S.E. of regression	0.034	Sum squared resid		0.020
Durbin-Watson stat	1.714	J-statistic		7.482

Instrument rank	22	Prob(J-statistic)	0.943
-----------------	----	-------------------	-------

Source: Researcher's Computational (2025)

Regression Analysis

This section examines how structural factors influence the size of the Government Bond Market (GBM) in Tanzania, both with and without the moderating role of bond maturity. The analysis is based on four hypotheses (H1–H4), which test the direct effects of transaction costs, market participation, and Treasury bond acquisition, as well as the moderating effect of the bond maturity structure. The direct-effects model confirms that three core structural factors transaction costs, the breadth of market participation, and Treasury bond uptake play a significant role in shaping GBM performance. These results provide the basis for the formal testing of Hypotheses H1, H2, and H3. The study further examines how bond maturity, particularly longer maturities, influences the relationship between structural factors (transaction costs, market participation, and Treasury bond uptake) and GBM size in Tanzania. The fourth hypothesis (H4) tests whether bond maturity has no effect on the relationship between these structural factors and GBM size. The moderation results reported in Table 11 indicate that maturity-based transmission effects differ across maturities, and that the structure of the yield curve particularly beyond the medium-term segment has a substantial influence on how structural determinants translate into market performance. The subsequent analysis focuses on the specific effects of transaction costs on GBM size in Tanzania. The null hypotheses tested in this section are presented below:

H1: transaction cost has no effect on the government bond market size in Tanzania.

According to the results in Table 11, the transaction costs have a significant negative correlation with the size of GBM, with a coefficient of -0.488 (p -value < 0.001). This implies that an increase in transaction costs by one unit will cause a change in the size of GBM to fall by -0.488 . Also, the findings offer strong empirical support that an increase in transaction friction leads to a decrease in market depth through less trading incentive, restricts investor turnover, and the inability to discover prices in the secondary market. H1 was thus rejected, and it confirmed that high transaction costs are a structural constraint to the development of GBM. Further, with respect to specific objective four (a), this research was aimed at testing the relationship between bond maturity and the relationship between the transaction costs and the GBM size in Tanzania. The null hypotheses tested in this study were:

H4a: Bond maturity does not moderate the effect of the transaction cost on the size of Tanzania's government bond market.

Findings in Table 11 indicate that the interaction of transaction costs with short-, medium- and long-term bond maturities has an overall negative and significant impact on GBM size. It has a negative correlation with GBM of -0.181 ($p < 0.001$), -0.143 ($p = 0.010$), and -0.134 ($p = 0.013$) at short, medium, and long term. Such results show that transaction costs reduce GBM size in all maturity segments, which proves that bond maturity organization has a significant influence on the relationship. This fact is also part of the objectives of the study to determine the effect of the participation in the market on the size of the GBM in Tanzania. The following were the null hypotheses considered in this research:

H2: The level of market participants has no effect on the government bond market size in Tanzania.

Table 11 illustrates a positive and statistically significant correlation between the market participants, with the coefficient of 0.250 and a $p < 0.001$ affecting the GBM size. This means that the increase in the number of market participants by one unit leads to an increase in the size of GBM by 0.250. This observation suggests that the larger the investor base, the better the market depth is achieved in terms of auction competitiveness, growth in the number of assets to be transacted and increased number of secondary-market transactions. Therefore, H2 is dismissed, which confirms the statement that the high level of participation is an essential factor that leads to the growth of the market. Also, regarding the fourth objective (b) of the present study, the question that was to be addressed was how the bond maturity moderates the relationship between the level of market participants and GBM size in Tanzania. The null hypotheses of the study were the following ones:

H4b: Bond maturity does not moderate the effect of the level of market participants on the government bond market size in Tanzania.

Table 11 results indicate that market participation and short-term bond maturity exert a strong positive influence on GBM size (0.362, $p < 0.001$). There is also a positive and significant impact on medium-term maturities (0.174, $p = 0.008$). Long-term maturities, on the contrary, affect it negatively and insignificantly ($= -0.024$, $p = 0.654$). In general, this implies that long-term maturities reduce, whereas short and medium-term maturities reinforced the connection between market participation and the size of the GBM. Addition of players in the market increases GBM size primarily by short and medium term bonds. The results also address the third objective of the study that aimed to examine the impact that Treasury bond uptake has on the GBM level of Tanzania.

H3: The Treasury bond uptake has no effect on the government bond market size in Tanzania.

The results in table 11 reject the null hypothesis. The uptake variable has a statistically significant positive effect that has a coefficient of 0.156 and a $p < 0.001$, which affects GBM size. A one unit rise in Treasury bond purchase will lead to a positive change of 0.156 in the size of the GBM, which suggests strong demand of government securities, with a majority of the actions being buy-and-sell behaviour. H3 is therefore rejected therefore showing that buying Treasury bonds has an effect on the market through a liquidity lock-in process. The study examines the relationship between bond maturity and the relationship between Treasury bond uptake and the size of GBM in Tanzania. The null hypotheses assessed in this study are the following:

H4c: Bond maturity does not moderate the effect of the Treasury bond uptake on the government bond market size in Tanzania.

The findings of Table 11 indicate a consistent and significant moderating effect of short-term maturity on Treasury bond uptake affecting GBM size to a negative ($= -0.604$, $p < 0.001$). There is also a negative effect of medium-term maturity ($= -0.489$), but not significant ($= 0.173$) and negative but non-significant effect of long-term maturity ($= -0.654$). Comprehensively, uptake decreases the GBM size in all maturities, which implies that higher issues issue is expanding debt

stocks, but not enhancing liquidity. Short- and medium-term bonds are used as conduits of liquidity whereas long term bonds are used as sinks of liquidity because of the buy and hold behavior. The rise of adjusted R² with the addition of the interaction terms to 0.752 confirms maturity to be a significant moderator and the H4 hypothesis was rejected.

Table 11: Moderation Role

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MP	0.250	0.013	19.679	0.000
MP_ST_	0.362	0.025	14.224	0.000
MP_MT_	0.174	0.055	3.199	0.008
MP_LT_	-0.024	0.051	-0.459	0.654
TB	0.156	0.008	20.537	0.000
TB_ST_	-0.604	0.051	-11.835	0.000
TB_MT_	-0.489	0.051	-9.617	0.000
TB_LT_	-0.013	0.009	-1.449	0.173
TC	-0.488	0.011	-45.038	0.000
TC_ST_	-0.181	0.017	-10.431	0.000
TC_MT_	-0.143	0.046	-3.082	0.010
TC_LT_	-0.134	0.046	-2.904	0.013
C	-2.109	0.052	-40.381	0.000
R-squared	0.776	Mean dependent var	0.072	
Adjusted R-squared	0.752	S.D. dependent var	0.056	
S.E. of regression	0.037	Sum squared resid	0.017	
Durbin-Watson stat	1.927	J-statistic	12.874	
Instrument rank	25	Prob(J-statistic)	0.378	

Source: Researcher's Computational (2025)

Discussion of the Findings

The study sought to evaluate the impact of structural factors on the size of the Government Bond Market (GBM) in Tanzania and to establish whether these effects differ across bond maturities. The findings indicate that GBM size is influenced by transaction costs, market participation, and Treasury bond uptake. These results are consistent with Market Microstructure Theory (Glosten & Milgrom, 1995; O'Hara, 1995) and Transaction Cost Economics (Williamson, 1985), both of which highlight that market performance is shaped by trading frictions, information constraints, and the structure of market participants. As expected, higher transaction costs inhibit trading, whereas broader market participation and increased subscriptions foster market development, in line with prior evidence on sovereign bond market efficiency (Burger et al., 2018; Hearn et al., 2019; Soumaré et al., 2021). When bond maturity is included as a moderating factor, the findings suggest that the GBM in Tanzania operates as a segmented market. Structural factors affect short-, medium-, and long-term maturities differently, reflecting international evidence that maturity structure influences liquidity conditions and the risks undertaken by investors (Baker et al., 2003; Ko, 2019). This study therefore extends existing literature by demonstrating that maturity is not merely descriptive but actively shapes the impact of structural factors on market development. Transaction costs consistently show a negative correlation with GBM size, with stronger effects observed in shorter maturities due to more frequent trading. This aligns with microstructure literature, which shows that increased frictions reduce liquidity and slow price discovery (Scholes,

1972; Engle, 2000). Negative effects at the long end of the curve reflect higher risk premia and rollover challenges, as noted in prior research (Varirahartia & Marsoem, 2022; Kim & Ostry, 2020). Market participation has a strong positive effect on GBM size, confirming that a diverse investor base enhances competitiveness and secondary-market activity (Blankespoor et al., 2020; Musah et al., 2019). Under maturity moderation, however, these positive effects are concentrated in the short- and medium-term segments, with long-term maturities exhibiting weaker or negative effects due to limited liquidity and greater risk aversion. This reflects the relative shallowness of long-term markets in emerging economies (Mega & Widayat, 2019; Soumaré et al., 2021). The direct effect of Treasury bond uptake on GBM size is positive, indicating that higher subscriptions can expand nominal market size, as also observed by Chiesa and Barua (2019) and Agbo and Odo (2020). However, when moderated by maturity, uptake has negative effects across all segments, suggesting that larger issuance volumes do not improve liquidity due to buy-and-hold behaviour by institutional investors. This mirrors broader African trends, where issuance has outpaced secondary market development (Bua et al., 2020; Hearn et al., 2019).

Conclusions

Government bond markets play a critical role in economic development by supporting government financing, promoting investment, and mobilising long-term capital. Market expansion enhances liquidity, opens investment opportunities, and reduces reliance on external borrowing. This study concludes that structural factors determine the size of Tanzania's GBM and that their effects vary across different maturity structures. Market participation positively affects GBM size in the short- and medium-term but is weak or negative for long-term maturities. Treasury bond uptake has a positive direct effect on GBM size, yet negative effects are observed under short- and medium-term maturities, and long-term effects are negative but insignificant. Transaction costs consistently exhibit a negative impact across all maturities.

Contributions

The study contributes theoretically by confirming the applicability of Market Microstructure Theory and Transaction Cost Economics in Tanzania, showing that structural factors operate differently across short-, medium-, and long-term maturities and that the GBM is segmented by maturity. Methodologically, it highlights the value of treating maturity as a moderating variable, confirms the suitability of two-step difference GMM for long-span single-country data, and improves measurement by distinguishing between issuance-based and liquidity-based indicators. Empirically, the study provides the first evidence from Tanzania that structural determinants vary across maturities, clarifies the distinction between nominal and functional market deepening, and demonstrates that structural factors impose stronger constraints on GBM development than macroeconomic conditions.

Recommendations

The study recommends four key policy priorities:

- i. The Ministry of Finance should incorporate liquidity considerations into issuance plans, align the maturity structure with market absorption capacity, and promote long-term domestic securities supported by liquidity mechanisms.
- ii. The Bank of Tanzania should reinforce primary dealer obligations, consolidate benchmark bonds, and support repo-market development.
- iii. CMSA and the DSE should strengthen trading infrastructure, enhance post-trade transparency, and introduce incentives for market-making.

- iv. Institutional investors should shift from buy-and-hold strategies to more active portfolio management through repos, securities lending, and mark-to-market valuation.

References

- Agbo, F. U., & Odo, S. I. (2020). Stock market development and economic growth in Sub-Saharan Africa. *Journal of Economic Studies*, 47(6), 1303–1320. <https://doi.org/10.1108/JES-12-2018-0424>
- Aitken, M., & Comerton-Forde, C. (2003). How should liquidity be measured? *Pacific-Basin Finance Journal*, 11(1), 45–59. [https://doi.org/10.1016/S0927-538X\(02\)00061-8](https://doi.org/10.1016/S0927-538X(02)00061-8)
- Aman, A. (2020). Institutional quality and government bond market development in Sub-Saharan Africa. *Journal of Financial Regulation and Compliance*, 28(3), 347–367. <https://doi.org/10.1108/JFRC-03-2020-0021>
- Arellano, M., & Bover, O. (1995). Another look at instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29–51. [https://doi.org/10.1016/0304-4076\(94\)01642-D](https://doi.org/10.1016/0304-4076(94)01642-D)
- Baker, M., Greenwood, R., & Wurgler, J. (2003). The maturity of debt issues and predictable variation in bond returns. *Journal of Financial Economics*, 70(2), 261–291. [https://doi.org/10.1016/S0304-405X\(03\)00145-8](https://doi.org/10.1016/S0304-405X(03)00145-8)
- Bank for International Settlements. (2024). BIS quarterly review (March 2024).
- Bank of Thailand. (2020). *Bond market report 2020*. <https://www.bot.or.th>
- Blankespoor, E., deHaan, E., & Zhu, C. (2020). Capital market effects of retail investor participation. *The Accounting Review*, 95(4), 27–55. <https://doi.org/10.2308/accr-52569>
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143. [https://doi.org/10.1016/S0304-4076\(98\)00009-8](https://doi.org/10.1016/S0304-4076(98)00009-8)
- Bua, G., Prasad, A., & Wang, X. (2020). Deepening African financial markets (IMF Working Paper). International Monetary Fund.
- Burger, J. D., & Warnock, F. E. (2022). Local currency bond markets in emerging economies: Fundamentals and drivers. *Journal of International Money and Finance*, 120, 102539.
- Burger, J. D., Warnock, F. E., & Warnock, V. C. (2018). Bond markets in emerging economies: Macro fundamentals and institutional frameworks. *Emerging Markets Review*, 34, 1–15. <https://doi.org/10.1016/j.ememar.2017.09.005>
- Chiesa, G., & Barua, R. (2019). *Bond market dynamics in East Africa: Constraints and reforms*. World Bank Policy Paper.
- Coase, R. H. (1993). The nature of the firm (1937). *The nature of the firm: origins, evolution, and development*, 18-33.
- De Santis, R. A. (2020). The role of transaction costs in sovereign bond markets. European Central Bank Working Paper Series, 2451.
- Engle, R. F. (2000). The econometrics of ultra-high-frequency data. *Econometrica*, 68(1), 1–22. <https://doi.org/10.1111/1468-0262.00091>
- Financial Stability Board. (2022). Liquidity in core government bond markets. <https://www.fsb.org/2022/10/liquidity-in-core-government-bond-markets/>
- Glosten, L. R., & Milgrom, P. R. (1985). Bid, ask and transaction prices in a specialist market with heterogeneously informed traders. *Journal of Financial Economics*, 14*(1), 71–100. [https://doi.org/10.1016/0304-405X\(85\)90044-3](https://doi.org/10.1016/0304-405X(85)90044-3)
- Gregoriou, A. (2017). *The handbook of post-crisis financial modelling*. London, UK: Palgrave Macmillan.

- Hearn, B., Piesse, J., & Strange, R. (2019). Markets, institutions, and financial development in Africa. *Review of Development Finance*, 9(2), 75–87.
- International Monetary Fund (IMF). (2023a). United Republic of Tanzania: Staff Report for the 2023 Article IV Consultation. Washington, DC
- International Monetary Fund. (2023b). Global financial stability report. <https://doi.org/10.5089/9798400249686.082>
- Khalid, A. M., & Rajaguru, G. (2018). Investigating the determinants of domestic bonds: the role of socio-economic and institutional factors. *Applied Economics*, 50(1), 35–50.
- Kim, Y., & Ostry, J. (2020). Debt maturity and fiscal risks in emerging markets. IMF Working Paper No. 20/53. Washington, DC: International Monetary Fund. <https://doi.org/10.5089/9781513531258.001>
- Ko, Y. (2019). The effect of short-term debt on financial stability: Evidence from Asian sovereign markets. *Asia-Pacific Journal of Financial Studies*, 48(2), 248–270. <https://doi.org/10.1111/ajfs.12246>
- Kyle, A. S. (1985). Continuous auctions and insider trading. *Econometrica*, 53(6), 1315–1335. <https://doi.org/10.2307/1913210>
- Leonard, T. (2018). Public debt management and fiscal coordination in sub-Saharan Africa. *African Economic Review*, 10(2), 45–60.
- Low, S. W., & Yong, D. G. (2011). Determinants of government bond yields in Malaysia. *International Journal of Economics and Management*, 5(1), 123–136.
- Mega, A., & Widayat, R. (2019). Bond maturity and debt management: Lessons from emerging markets. *Journal of Financial Regulation and Compliance*, 27(1), 56–72. <https://doi.org/10.1108/JFRC-03-2018-0041>
- Musah, A., Badu-Acquah, B., & Adjei, E. (2019). Factors that influence bond markets development in Ghana. *Jurnal Perspektif Pembiayaan Dan Pembangunan Daerah*, 6(4), 461–476.
- Nkwenda, A. (2020). Determinants of domestic government bond market development in sub-Saharan Africa. *African Development Review*, 32(S1), 76–89. <https://doi.org/10.1111/1467-8268.12443>
- O'Hara, M. (1995). Market microstructure theory. Blackwell.
- Pham, L., & Huynh, T. L. D. (2020b). Trading behaviour of bond market participants: Evidence from emerging markets. *Emerging Markets Finance and Trade*, 56(9), 2148–2162.
- Scholes, M. (1972). The market for securities: Substitution versus price pressure and the effects of information on share prices. *Journal of Business*, 45(2), 179–211. <https://doi.org/10.1086/295444>
- Soumaré, I., Kanga, D., & Faye, I. (2021). Bond market liquidity in Sub-Saharan Africa. *Review of Development Finance*, 11(3), 215–229. <https://doi.org/10.1016/j.rdf.2021.07.002>
- Varirahartia, M., & Marsoem, S. (2022). Yield to maturity determinants in emerging bond markets. *Asian Journal of Economics and Finance*, 14(3), 45–58. <https://doi.org/10.1108/AJEF-2022-0567>
- Williamson, O. E. (1981). The economics of organization: The transaction cost approach. *American journal of sociology*, 87(3), 548–577.
- Williamson, O. E. (1985). *The economic institutions of capitalism*. Free Press.
- World Bank & International Monetary Fund (IMF). (2023). Developing government bond markets in Africa. <https://www.worldbank.org>
- World Bank, & International Monetary Fund, (2024). *Quarterly public sector debt (QPSD) database: Methodology and data*, Washington.

World Bank. (2023). *Developing government bond markets in emerging economies*. World Bank.
<https://www.worldbank.org>

World Bank. (2024). Outstanding domestic public debt securities to GDP (%) — South Africa (Series DDDM04ZAA156NWDB) [Data set]. Federal Reserve Bank of St. Louis.
<https://fred.stlouisfed.org/series/DDDM04ZAA156NWDB>