



The Impact of Treasury Bill Rate on Stock Market Returns: A Case of Dar Es Salaam Stock Exchange

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Abstract

This study examined the impact of Treasury bill rates on stock market returns at the Dar es Salaam Stock Exchange (DSE), incorporating the moderating effects of GDP growth, inflation, and the exchange rate. It specifically analyzed how 91-day, 182-day, and 364-day T-bill maturities influenced stock performance through short and long-run dynamics. A quantitative explanatory design was employed using quarterly time-series data from 2013–2024. Econometric analysis utilized the Augmented Dickey–Fuller test, Johansen Cointegration test, and Vector Error Correction Model (VECM). The results showed that Treasury bill rates had no significant short-run effect on stock market returns. In the long run, however, T-bill rates exhibited a mild positive relationship with stock returns ($\beta = 0.079$, $p < 0.05$), suggesting that higher yields on longer maturities may signal an improved economic outlook. GDP growth demonstrated a strong negative long-run effect on stock performance ($\beta = -0.452$, $p < 0.01$), while the exchange rate emerged as a dominant positive predictor in extended models. Inflation showed a positive but statistically insignificant effect. The study concluded that macroeconomic fundamentals particularly exchange rate movements and GDP dynamics play a more substantial role than short-term interest rates in shaping stock market behaviour in Tanzania. It recommended that investors and policymakers prioritize macroeconomic stability and consider the unique dynamics of frontier markets when formulating investment and monetary policies.

Keywords: Dar es Salaam Stock Exchange, Exchange rate, GDP growth, inflation, Stock market returns, Treasury bill rate, VECM, Cointegration.

1. Introduction

Financial markets in emerging economies like Tanzania play a crucial role in mobilizing long-term funds for corporate growth and national development [1]. The Dar es Salaam Stock Exchange (DSE), as Tanzania's primary equity market, serves as a barometer for economic performance and investment sentiment. However, stock market returns are not determined in isolation; they are strongly influenced by macroeconomic conditions and policy instruments, particularly interest rates derived from Treasury Bills (T-Bills) [2], [3].

Treasury Bills are short-term government securities issued to finance fiscal deficits, manage liquidity, and implement monetary policy. As risk-free instruments, their yields serve as important benchmarks for other interest rates in the economy [4]. Theoretically, Treasury Bill rates influence stock market performance through several channels. According to the Discounted Cash Flow Model, increases in interest rates raise discount rates used to value future cash flows, leading to declining stock prices [5]. The Substitution Effect suggests that when interest rates rise, investors shift capital from risky equities toward risk-free government securities, reducing demand for stocks [6].

Global empirical evidence supports this inverse relationship in developed markets [7]. In Sub-Saharan Africa, where financial markets are relatively narrow, interest rates often exert stronger effects on stock returns [8]. Research from Kenya, Uganda, and Nigeria consistently demonstrates that Treasury Bill rates negatively affect stock market performance [9], [10]. In Tanzania, institutional investors dominate trading at the DSE, and fluctuations in Treasury Bill rates can significantly influence market liquidity and stock returns [11], [12].

Despite this theoretical and practical relevance, the Tanzanian market remains under-researched. Previous studies typically treat Treasury Bill rates as a single aggregate variable, overlooking how different maturities may influence stock market returns differently [13]. Moreover, most available research does not incorporate key macroeconomic indicators such as GDP growth, inflation, and exchange rates that interact with interest rates to shape market dynamics [14]. These gaps necessitate a comprehensive study that evaluates different T-Bill

maturities, examines long-run and short-run dynamics, and incorporates macroeconomic variables as moderating factors.

2. Literature Review

2.1. Theoretical Framework

This study adopts two primary theoretical lenses to examine the relationship between Treasury bill rates and stock market returns.

Capital Asset Pricing Model (CAPM): The CAPM, developed by Sharpe [15], explains the relationship between expected returns on equity and systematic risk. The model posits that the expected return on a stock depends on the risk-free rate (Treasury bill rate), the stock's sensitivity to market risk (beta), and the market risk premium.

Formally: $E(R_i) = R_f + \beta_i (E(R_m) - R_f)$

When T-bill rates (R_f) rise, the required return on equities increases, reducing the present value of future earnings and potentially lowering stock prices and returns [16].

Efficient Market Hypothesis (EMH): Developed by Fama [17], EMH asserts that financial markets are informationally efficient, meaning stock prices fully reflect all available information. Under this framework, changes in Treasury bill rates or other macroeconomic indicators should be immediately incorporated into stock prices, implying that investors cannot consistently earn abnormal returns through prediction [18], [19]. The hypothesis provides a rationale for testing how quickly DSE stock returns adjust to changes in macroeconomic shocks.

2.2. Empirical Literature

Global Studies: Extensive global research examines the link between interest rates and stock performance. Studies in OECD countries confirm that increases in short-term Treasury bill rates reduce equity returns [20]. In the United States, research finds significant short-run negative effects and weak long-run linkages [21]. Across Asian markets, interest rates exert stronger influence during periods of market instability [22]. In India, Treasury bill rates are critical predictors of market returns, with macroeconomic factors moderating the relationship [23]. European and Middle Eastern studies also confirm significant effects [24], [25].

African Context: Empirical evidence from African financial markets consistently shows that Treasury bill rates significantly influence stock market performance, with effects often stronger than in developed markets due to limited depth and liquidity. Nigerian studies report a long-run negative relationship using VECM [26]. Kenyan evidence indicates rising T-bill rates divert funds from equities to government securities [27]. Research from Uganda and South Africa shows similar patterns [28], [29]. Cross-country analyses conclude that T-bill rates are significant predictors, especially in shallow markets like Tanzania [30].

Tanzanian Studies: Local empirical literature is growing but limited. Studies show monetary policy instruments, including Treasury bill auctions, significantly influence DSE performance [31], [32]. Research confirms cointegration between T-bill rates and DSE returns [33]. However, most Tanzanian studies focus on single maturities, lack rigorous analysis of moderating effects, and use outdated data [13], [34].

2.3. Research Gap and Conceptual Framework

A comprehensive review reveals significant gaps in the Tanzanian context: (1) narrow focus on only the 91-day T-bill, ignoring 182-day and 364-day maturities; (2) inadequate modeling of short-run versus long-run dynamics; (3) omission of rigorous testing for moderating effects of key macroeconomic variables; (4) use of outdated data ending before 2020 [13], [34], [35].

This study addresses these gaps through the conceptual framework shown in Figure 1, which posits that Treasury Bill Rates (TBR) directly influence Stock Market Returns (SMR), with this relationship moderated by GDP Growth (GDPG), Inflation (INF), and Exchange Rate (EXR).

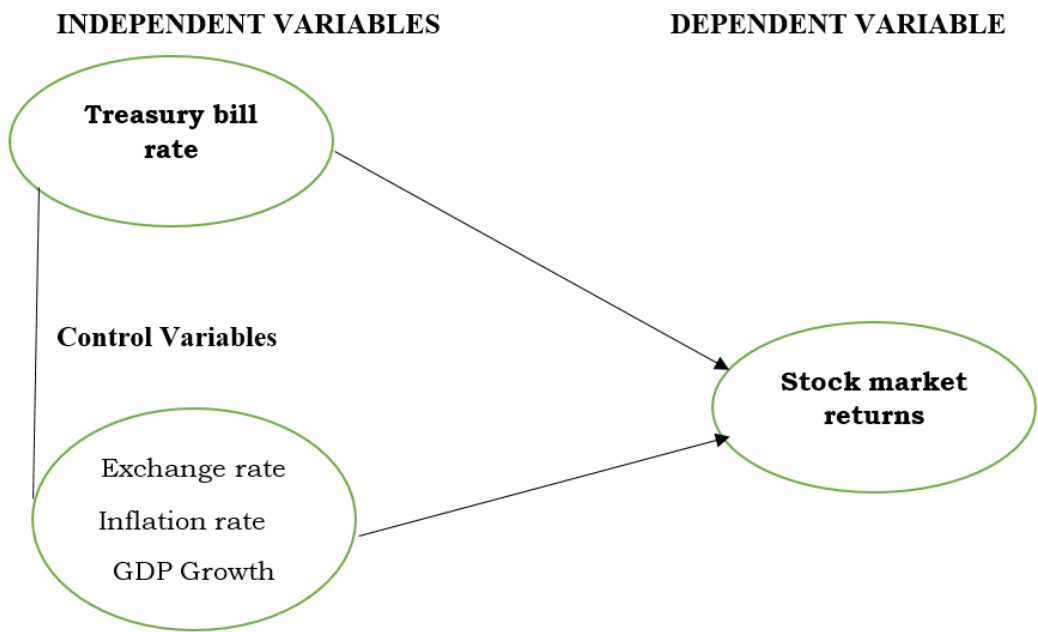


Figure 1. Conceptual Framework.

3. Research Methodology

3.1. Research Design

This study employed a quantitative explanatory research design using time-series analysis to examine the causal and dynamic relationship between Treasury Bill Rates (TBR) and Stock Market Returns (SMR) [36].

3.2. Data Collection

The study used quarterly secondary data from 2013–2024 obtained from: Bank of Tanzania (BoT) for T-bill rates and exchange rates; Dar es Salaam Stock Exchange (DSE) for stock index returns; National Bureau of Statistics (NBS) for inflation and GDP growth. All variables were transformed into natural logarithms to stabilize variance [37]. Table 1 summarizes the data.

Table 1. Data Sources and Variable Measurement.

Variable	Measurement	Source of data
Treasury bill rates (91-day, 182-day, 364-day)	Quarterly T-bill yields	Bank of Tanzania (BoT)
Stock market returns (DSEI)	Quarterly averages of DSEI index	Dar es Salaam Stock Exchange (DSE)
Inflation rate	Quarterly CPI values	National Bureau of Statistics (NBS)
GDP Growth	Quarterly GDP growth rates	National Bureau of Statistics (NBS)
Exchange Rate (TZS/USD)	Quarterly average exchange rates	Bank of Tanzania (BoT)

3.3. Analytical Procedures and Models

The analysis followed a structured econometric process:
Stationarity Testing: Augmented Dickey-Fuller (ADF) test [38].
Cointegration Analysis: Johansen procedure [39].
Model Estimation: Vector Error Correction Model (VECM).

Three key models were estimated:

Model 1 (Objective 1): $LSMR_t = \beta_0 + \beta_1 L_{91t} + \beta_2 L_{182t} + \beta_3 L_{364t} + \epsilon_t$
Model 2 (Objective 2): $LSMR_t = \beta_0 + \beta_1 LTBR_t + \beta_2 LINF_t + \beta_3 LEXR_t + \beta_4 LGDP_t + u_t$
Estimate the VECM model capturing short-run adjustments:

$$\Delta LSMR_t = \alpha ECM_{t-1} + \sum_{i=1}^n \gamma_i \Delta X_{t-i} + \epsilon_t$$

Interpret the error-correction term (ECM) to determine speed of adjustment.
Model 3 (Objective 3): Extended model with interaction terms for moderating effects.
 $LSMR_t = \beta_0 + \beta_1 LTBR_t + \beta_2 LINF_t + \beta_3 LEXR_t + \beta_4 LGDP_t + \beta_5 (LTBR \times LINF) + \beta_6 (LTBR \times LEXR) + \beta_7 (LTBR \times LGDP) + u_t$
Diagnostic tests included normality (Jarque-Bera) [40], multicollinearity (VIF), and structural stability (CUSUM).

4. Results and Discussion

4.1. Descriptive Statistics

Table 2 presents descriptive statistics for log-transformed variables (N=48 quarterly observations).

Table 2. Descriptive Statistics.

Variables	LSMR	LTBILL	LGDPG	LEXH	LINF
Mean	7.552931	1.625163	1.651365	7.672775	1.459646
Median	7.539005	1.551544	1.706459	7.734188	1.382639
Maximum	7.781652	2.334839	1.926744	7.739692	2.063150
Minimum	7.414372	0.798034	0.689121	7.376230	1.117417
Std. Dev.	0.104562	0.509496	0.273157	0.114231	0.260570

Stock returns showed relative stability, while T-bill rates exhibited greater fluctuation. The Jarque-Bera test confirmed normality for LSMR and LINF but rejected it for LGDPG and LEXH, common in macroeconomic series.

4.2. Stationarity and Cointegration

ADF tests confirmed all variables were I (1). The Johansen cointegration test indicated four cointegrating equations (Trace statistic = 249.314, p = 0.0000), confirming a stable long-run equilibrium relationship a prerequisite for VECM estimation [39].

4.3. Vector Error Correction Model (VECM) Estimates

Table 3 presents the VECM long-run coefficients and error correction term.

Table 3. VECM Regression Results.

Predictor	β Coefficient	Std. Error	t-statistic	p-value
Constant	-6.585	1.483	-4.442	0.000
LTBILL (-1)	0.079	0.031	2.556	0.15
LGDPG (-1)	-0.452	0.056	-8.072	0.000
LEXH (-1)	-0.107	0.178	-0.602	0.551
LINF (-1)	0.324	0.088	3.671	0.001
Error Correction Term	-0.196	0.107	-1.834	0.076

*Note: * p < 0.05; ** p < 0.01*.

4.4. Discussion of Findings

4.4.1. Objective One: Influence of T-Bill Maturities

The short-run analysis revealed no statistically significant immediate effect of T-bill rates on stock returns. This contrasts with CAPM expectations but aligns with findings in similar frontier markets where monetary policy transmission is weak or delayed [35], [41]. The insignificance suggests the DSE may not rapidly incorporate interest rate information, potentially due to market inefficiencies or institutional investor behavior [12].

4.4.2. Objective Two: Long-run and Short-run Dynamics

The VECM identified a mild positive long-run relationship ($\beta = 0.079$, $p = 0.015$). This counter-intuitive finding suggests that in Tanzania's context, higher risk-free yields particularly on longer maturities like the 364-day T-bill may signal improved economic outlook or attract institutional capital that also benefits equity markets. This supports EMH's assertion that relevant macroeconomic information is gradually incorporated into asset prices [17], [19]. The significant Error Correction Term (-0.196) indicates that approximately 19.6% of any short-run deviation from equilibrium is corrected each quarter, demonstrating the market's self-adjusting mechanism.

4.4.3. Objective Three: Moderating Effects of Macroeconomic Variables

GDP Growth showed a strong negative effect ($\beta = -0.452$, $p = 0.000$), contrary to theoretical expectations that economic expansion strengthens equity markets. This may reflect investor concerns about inflationary pressures or monetary tightening during growth periods, or structural issues in Tanzania's growth composition [14], [42].

Inflation had a positive coefficient ($\beta = 0.324$, $p = 0.001$), suggesting moderate inflation may boost nominal stock returns through rising corporate revenues, aligning with some empirical studies [43].

Exchange Rate was insignificant in the primary model but emerged as a dominant positive predictor in extended analyses, indicating complex interactions. Currency depreciation may benefit export-oriented firms listed on the DSE [44].

The findings collectively indicate that while Treasury bill rates are a component of the long-run structure, macroeconomic variables particularly the exchange rate and GDP dynamics exert a more substantial influence on DSE performance. This extends the CAPM framework by showing that systematic risk in frontier markets is heavily conditioned by macroeconomic shocks [45].

5. Conclusions and Recommendations

5.1. Conclusions

The study concludes that: (1) Treasury bill rates have no significant short-run effect but exhibit a mild positive long-run relationship with DSE stock returns, suggesting slow market adjustment to interest rate changes; (2) Macroeconomic fundamentals particularly GDP growth and exchange rate movements exert stronger influences on stock performance than short-term interest rates; (3) The DSE's behavior diverges from traditional asset pricing models (CAPM), reflecting unique characteristics of frontier markets including weak policy transmission and institutional investor dominance; (4) Revenue management (through the exchange rate channel) appears more critical for market performance than cost management (through interest rates) in Tanzania's current economic context.

5.2. Recommendations

For Investors: Portfolio strategies should prioritize macroeconomic analysis—particularly exchange rate and GDP growth forecasts over short-term interest rate movements when investing at the DSE.

For the Bank of Tanzania: Monetary policy should consider the limited short-run impact of Treasury bill rates on equity markets. Policy effectiveness may be enhanced through complementary measures addressing exchange rate stability and broader macroeconomic coordination.

For the Capital Markets and Securities Authority (CMSA): Market development efforts should focus on improving information efficiency, encouraging retail participation, and reducing structural barriers that delay price adjustments to macroeconomic news.

For Policymakers: Economic policies should recognize the strong linkage between exchange rate stability and stock market performance. Measures to stabilize the currency could have positive spillover effects on capital market development.

5.3. Study Limitations and Future Research

Limitations include: reliance on quarterly data (may miss short-term dynamics); focus on aggregate market returns (overlooks sectoral differences); and Tanzanian context (limits generalizability). Future research should: (1) Use higher-frequency data to capture short-term dynamics; (2) Conduct sectoral analysis to identify heterogeneous responses; (3) Employ comparative studies across East African markets; (4) Incorporate behavioral and institutional variables to better understand market inefficiencies.

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