# RELATIONSHIPS BETWEEN FINANCIAL MARKETS AND INTEREST RATES

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**Abstract:** This paper investigates the multi-scale relationship among interest rates, exchange rates, and stock prices using wavelet transform analysis. Specifically, we employ the maximum overlap discrete wavelet transform (MODWT) on interest rates, exchange rates, and stock prices in the US from January 1990 to December 2008. We utilize wavelet variance, wavelet correlation, and cross-correlation definitions to examine the association and lead/lag relationships between these series across various time scales. Our findings indicate that the relationship between interest rates and exchange rates is not significantly different from zero across all scales. Conversely, the relationship between interest rate returns and stock index returns is significantly different from zero only at the highest scales. The analysis sheds light on the dynamic interactions between these financial variables at different frequencies.

**Keywords:** Wavelet analysis, Interest rate, Stock price, Wavelet cross-correlation, Granger causality.

## Annotation

The article discusses the growing significance of stock markets in global economies, highlighting their role as indicators of a country's economic health. It explores the relationship between interest rates and stock price fluctuations, noting the theoretical negative correlation due to the impact of interest rates on present value and borrowing costs. Additionally, it discusses the expected negative relationship between interest rates and exchange prices according to parity conditions, anticipating a positive coefficient between exchange and stock prices. However, empirical studies present conflicting findings on causality between stock prices and economic variables. Mok (1993) found independence between daily interest rates, exchange rates, and stock prices in Hong Kong, while Hashemzadeh and Taylor (1988) identified bi-directional causality between money supply and stock returns but inconclusive results regarding interest rates. The article underscores the complexity of understanding these relationships in financial markets. [1]

Solnik (1987) identified a weak positive relationship between real stock return differentials and changes in the real exchange rate, suggesting that a growth in the stock market positively influences the exchange rate. This paper examines the interplay between interest rates, exchange rates, and stock prices using a time-series technique based on wavelet analysis. The study applies wavelet cross-correlation, employing the maximum overlap discrete wavelet transform (MODWT) families of wavelets. By decomposing time series on a scale-by-scale basis, the analysis unveils structures at different time horizons, providing insights into the relationship dynamics. The wavelet transform

offers alternative measures, such as wavelet variance, which can be generalized for multivariate time series analysis. Standard measures of association, like cross-covariance and cross-correlation, are defined using coefficients from the wavelet transform, enabling the analysis of multivariate relationships. [2]

**Litrature view:**

In Kenya, Irungu (2013) conducted a study to assess the impact of interest rate spread (IR) on the performance of commercial banks. The findings revealed a significant association between IR and financial performance (FP) of banks. Specifically, the spread of IR affected the performance assets of banks by influencing the cost charged on loans, which in turn impacted non-performing assets. Lukas & Ferrell (2000) also examined the effects of IR on the productivity of the investment sector in Kenya, concluding that IR significantly influenced the performance of banks using both direct and indirect data analysis methods. [3]

Similarly, Sheriff & Amoako (2014) investigated the relationship between IR and macroeconomic factors in Ghana using vector error correction (VEC) cointegration and auto-regressive distributed lag (ARDL) models. Their findings indicated a current association between IR and macroeconomic factors, suggesting a significant impact on future trends. Samahiya & Kaakunga (2014) conducted a study in Namibia, analyzing the factors influencing IR spread in commercial banks using panel data analysis. They identified liquidity levels, operating expenses, and market share as key determinants of IR spread. [4]

These studies collectively examine the impact of interest rates on bank profitability across different regions using various measurement factors and methodologies. However, limited research has explored the determinants and consequences of high IR spread on both national and bank profitability. This paper contributes to the existing literature by employing a bank-specific variable to measure FP and utilizes the Panel PMG approach to analyze the impact of IR on FP. The Panel PMG estimator offers several advantages, including the ability to obtain both short-term and long-term estimates regardless of the integration properties of the variables and provides robust results for heterogeneous panels.

**Table 1. Descriptive Statistics for returns series**

|  | min | max | mean | std.dev | skewness | kurtosis |
|---|---|---|---|---|---|---|
| Interest rate | -1.85 | 0.3 | -0.02 | 0.17 | -7.37 | 68 |
| Stock index | -0.06 | 0.08 | 0 | 0.02 | 0.14 | 0.16 |
| Exchange rate | -0.18 | 0.11 | 0 | 0.04 | -0.88 | 2.04 |

The analysis utilized monthly data spanning from January 1990 to December 2008, encompassing 228 observations in total. The dataset includes the interest rate of American Treasury securities with a 3-month constant maturity, obtained from the Federal Reserve, along with the exchange rate between USD and EURO. The closing S&P500 index serves as an indicator of stock price fluctuations.[5]
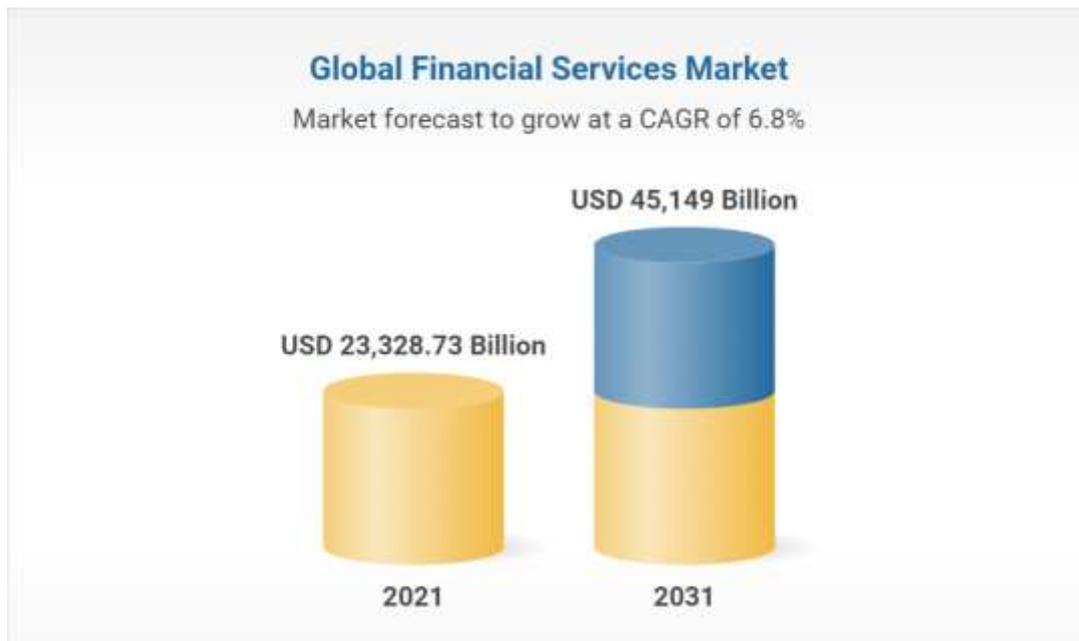
Table I presents summary statistics for the returns series of interest rate, exchange rate, and stock index. Several observations can be made from the table: (a) The mean of the returns series is zero for all series. (b) Interest rate returns exhibit a higher standard deviation compared to exchange rate and stock index returns, indicating greater volatility in interest rates. (c) Monthly interest rate returns display high excess kurtosis, suggesting significant deviations from a normal distribution.

Overall, both interest rate and exchange rate series share similar characteristics in terms of

mean and variation. However, a more comprehensive understanding can be gained through multi-scale analysis. [6]



## Financial market development 2012-13
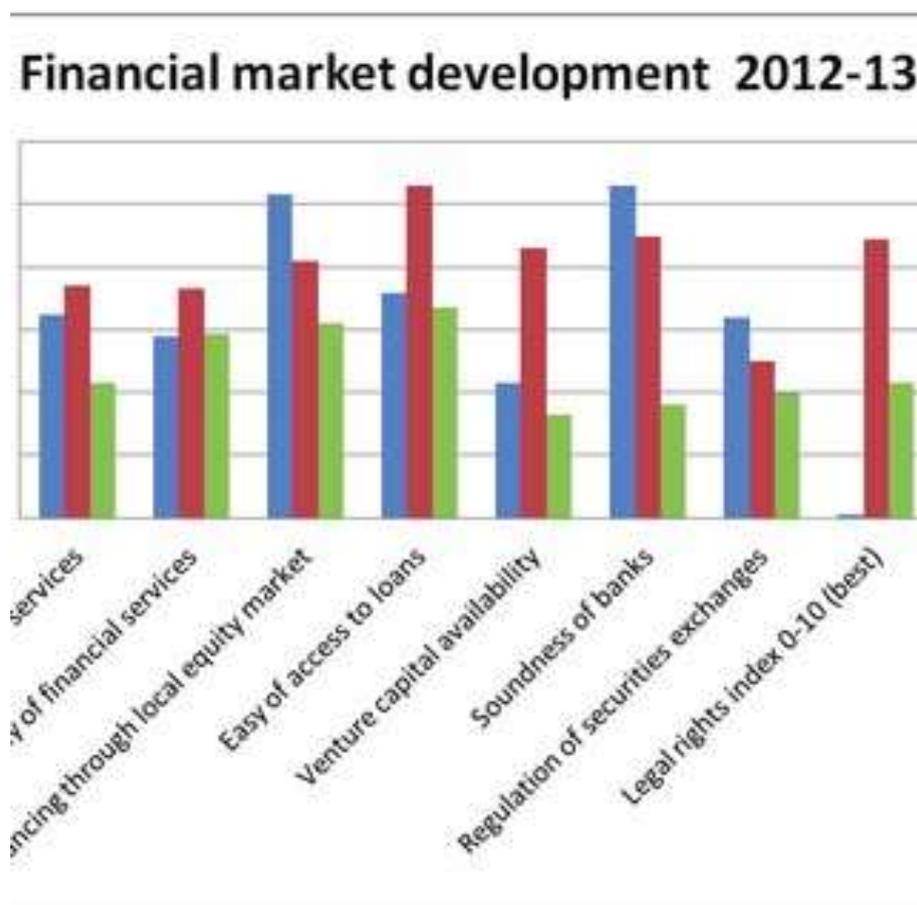
In order to assess the impact of interest rates on the financial performance (FP) of banks between 2000 and 2017, it is crucial to test whether there is cross-sectional dependence among the variables within the panel dataset. Cross-sectional dependence among variables in a panel time-series dataset necessitates the inclusion of panel unit root tests and panel cointegration tests in the analysis. This paper analyzed cross-sectional independence among the variables using the CD test proposed by Pesaran (2004) and the CDLmadj test by Pesaran & Yamagata (2008). [7] Following the assessment of cross-sectional dependence, the study further examined the integration properties of the variables using panel unit root tests developed by Pesaran (2007), including the Cross-sectional CADF and CIPS tests. After confirming the cross-sectional conditions and identifying non-stationary variables, the analysis proceeded to test for the presence of underlying long-run relationships among the variables using the Pedroni cointegration test (Pedroni, 2004) and the Westerlund-Edgerton bootstrap panel cointegration test (Westerlund & Edgerton, 2007b). Finally, the study employed the Pooled Mean Group estimator through Autoregressive Distributed Lag (ARDL) modeling to determine both the long-term and short-term relationships among the variables utilized in the analysis.

**Global Financial Services Market**
Market forecast to grow at a CAGR of 6.8%

USD 45,149 Billion

USD 23,328.73 Billion

2021    2031

The financial services market experienced substantial growth, reaching a value close to $23,328.73 billion in 2021, representing a Compound Annual Growth Rate (CAGR) of 3.5% since 2016. Projections suggest further expansion, with the market expected to increase to $33,313.50 billion by 2026, at a robust growth rate of 7.4%. Subsequently, the market is anticipated to maintain its upward trajectory, growing at a CAGR of 6.3% from 2026 onwards, ultimately reaching $45,149.00 billion by 2031. [8]

The analysis demonstrates the significant role of interest rates in influencing the financial performance of banks. Through various studies across different regions, it becomes evident that interest rate spreads have notable implications for bank profitability. Factors such as macroeconomic conditions, market features, and bank-specific variables play crucial roles in shaping the relationship between interest rates and financial performance.

Furthermore, employing advanced econometric techniques such as panel data analysis allows for a comprehensive understanding of these dynamics, accounting for cross-sectional dependencies and non-stationary factors. The findings underscore the importance of considering both long-term and short-term effects when assessing the impact of interest rates on bank profitability.

In conclusion, the relationship between interest rates and financial performance is complex and multifaceted, influenced by a myriad of factors. A nuanced understanding of these interactions is essential for policymakers, regulators, and financial institutions to make informed decisions and navigate the dynamic landscape of the financial services industry effectively.

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