MACROECONOMIC DRIVERS OF FOREIGN DIRECT INVESTMENT (FDI) IN BANGLADESH: AN EMPIRICAL ANALYSIS OF DYNAMIC PANEL DATA

SALMAN SADI

Department of Computer Science and Engineering BRAC University Dhaka, Bangladesh
E-mail: salman.sadi@g.bracu.ac.bd

Abstract - This study looks at the main factors that affect the amount of foreign direct investment (FDI) coming into Bangladesh. It uses data from the first quarter of 2012 up to the second quarter of 2024, which includes 50 data points. The research uses a multiple linear regression model that is strong and reliable, and it accounts for the standard errors using a method called HAC. The study checks how inflation, exchange rate, interest rate, and GDP growth affect FDI. The results show that changes in the exchange rate are the most important factor influencing FDI. When the Bangladeshi Taka loses value against the US dollar by one unit, FDI decreases by about $10.19 million each quarter. This shows that foreign investors are very sensitive to currency issues. Interest rates have a small positive effect, but it's not very strong ($p = 0.058$), which means investors aren't very responsive to interest rate changes. Inflation and GDP growth do not have a significant impact on FDI. The model explains 60% of the change in FDI (Adjusted $R^2 = 0.600$), and the results are statistically significant overall ($p < 0.001$). The study also checks that the model is stable and reliable. These findings show that keeping the exchange rate stable is very important for attracting FDI. It also highlights the need for good monetary management, enough foreign exchange reserves, and trustworthy strategies to deal with currency issues, which are key to making sure that Bangladesh can keep getting investment over the long term.

Keywords - FDI, Exchange Rate Stability, HAC Regression, Macroeconomic Policy, Bangladesh

I. INTRODUCTION

Foreign direct investment (FDI) has emerged as a vital engine of economic development in the emerging economies as a major source of capital formation, technology transfer, employment generation, and global value chain participation, with developing nations as a group registering over $700 billion of FDI inflows annually (Dunning, 2008; UNCTAD, 2023). For Bangladesh, a fast-growing South Asian nation of more than 170 million, an expanding ready-made garment sector that accounts for 82% of foreign exchange earnings, and ambitious aspirations to reach middle-income status by 2031, FDI inflows are a strategic imperative for sustaining economic transformation beyond traditional labor-intensive industry. However, with remarkable macroeconomic performance in terms of consistent GDP growth averaging 6.5% annually for the past two decades, a young and productive labor force, and a geo-strategically located geography equidistant between India and Southeast Asia, Bangladesh's FDI performance has been highly volatile and persistently underperformed the regional comparators—fluctuating between $1.5 billion and $3.9 billion annually with the latest being around $2.9 billion in 2023, which is merely 0.8-1.2% of GDP in contrast to the South Asian average of 1.5% and that of developing countries at 2.3% (World Bank, 2024; ADB, 2023; IMF, 2024). This "FDI puzzle"—where strong growth fundamentals coexist with weak foreign investment attraction—becomes particularly pronounced when compared to neighboring Vietnam, which leverages FDI inflows exceeding 6% of GDP to accelerate industrialization, or India which attracts $50-80 billion annually despite comparable governance challenges (Nguyen, 2021). The volatility and underperformance raise more fundamental questions about which specific macroeconomic drivers of foreign investors' funding allocation decisions in Bangladesh, particularly in the context of recent economic crisis: between 2020-2024, Bangladeshi Taka experienced unprecedented depreciation from 84 BDT/USD to around 110-115 BDT/USD—a 30% devaluation being the worst currency crisis since independence—coupled with inflation in excess of 9% during 2022-2023 and deadly monetary tightening with policy rates spiking from 5% to 8.5% (Ahmed, 2023; Bangladesh Bank, 2024). These simultaneous shocks present a natural experiment for the study of the effect of macroeconomic volatility on FDI, and preliminary observations show sharp declines from $3.5 billion in 2021 to $2.9 billion in 2023 in spite of robust GDP growth at 6-7.2% annually. Theoretically, Dunning's (1977) eclectic model emphasizes location-specific advantages—most notably, macroeconomic stability—as minimum requirements to FDI, with latter-day additions by Chakrabarti (2001) and Blonigen (2014) indicating exchange rate stability affects repatriation values and planning certainty, inflation signals management credibility and lowers real returns, interest rates regulate borrowing costs and capital flow composition, and GDP growth verifies market potential for consumer-led investment. Empirical evidence in diverse settings confirms these variables as determinants of first-order relevance (Arratibel, 2007; Kaur, 2013), but Bangladesh-specific studies provide mixed evidence: GDP growth was found to be dominant by Rahman

(2015) using VECM estimation for 1973-2013, exchange rate volatility and institutions were emphasized by Hassan (2020), bidirectional causality between exchange rates and FDI were documented by Haque (2022), Ahmed (2021) documented nonsignificant exchange rate effects for 1980-2018, and inflation was identified as the primary driver across developing countries by Imran (2023)—differences suggesting that perhaps relations are context-dependent, time-variant, or structurally broken requiring high-frequency recent evidence. Shortcomings in research are of

paramount importance: most studies are based on annual data that cut off before 2020 and thus exclude recent volatility, employ cointegration techniques considering long-run connections but concealing quarterly dynamics, do not account for heteroscedasticity and autocorrelation producing invalid inference, and do not include regime shifts because of the Rana Plaza tragedy (2013), COVID-19 pandemic (2020-2021), or currency crisis (2022-2024). This study fills these gaps in knowledge with strict empirical examination using quarterly data between 2012 Q1 and 2024 Q2, with various linear regression and robust HAC standard errors to support valid inference (Newey, 1987), and contributing to recent policy-relevant work for Bangladesh Bank exchange rate policy, marketing activities by the Board of Investment, and the Ministry of Finance to achieve $5 billion a year FDI inflows by 2030 as outlined in the Eighth Five-Year Plan (Planning Commission, 2020). Through quantifying which macroeconomic levers exert the strongest influences on foreign investment decisions—exchange rate stability, inflation control, interest rate competitiveness, or GDP growth momentum—it offers actionable evidence towards aligning policy settings that balance domestic macroeconomic stability with external competitiveness in attracting foreign capital, ultimately serving to support Bangladesh's long-term economic growth, employment creation, industrial upgrading, and export diversification objectives as the country graduates from Least Developed Country status and faces withdrawal of trade preferences necessitating higher FDI in order to stay competitive.

II. METHODOLOGY

This study employs a quantitative research design based on Ordinary Least Squares (OLS) multiple linear regression for the analysis of the relationship between macroeconomic determinants and foreign direct investment (FDI) inflow in Bangladesh. The methodology deploys recent econometric studies of FDI determinants of the developing world (Ali, 2022; Sharma, 2023). Quarterly observations between 2012 Q1 and 2024 Q2 lead to a robust dataset of over fifty data points, offering statistical credibility alongside covering the pivotal economic phases like the post-Rana Plaza industrial reform period, the COVID-19 pandemic, and the 2022–2024 currency crisis. Statistics were compiled using an automated pipeline on Python that merged two of the largest global databases in the world: the International Monetary Fund (IMF) International Financial Statistics and World Bank World Development Indicators (WDI). The research obtained from the WDI statistics for yearly FDI inflows (series code: BX.KLT.DINV.CD.WD), inflation rates, exchange rates, real GDP, and lending and deposit interest rates. Quarterly supporting indicators such as policy rates, consumer price indices, and real GDP volume indices were sourced from the IMF databases. Due to the unavailability of quarterly FDI data, annual FDI inflows were quarterly split equally for maintaining yearly consistency—a widely used econometric convention in the absence of high-frequency capital flow data (Hassan, 2022).

The model's dependent variable is quarterly FDI inflows, in current USD millions, comprising equity capital, reinvested earnings, and intra-company loans, according to the IMF's Balance of Payments Manual. The independent variables are the inflation rate (percentage change in the Consumer Price Index year-on-year), exchange rate (average BDT/USD), interest rate (short-term policy or money market rate), and GDP growth rate (annualized percentage change in real GDP). These variables combined explain the macroeconomic environment that guides foreign investment behavior.

The empirical model is expressed as follows:

$$FDI_t = \beta_0 + \beta_1(Inflation_t) + \beta_2(ExchangeRate_t) + \beta_3(InterestRate_t) + \beta_4(GDPGrowth_t) + \varepsilon_t$$

where FDI_t denotes foreign direct investment inflows in USD millions at time t, β_0 represents the intercept, β_1 to β_4 are slope coefficients, and ε_t is the stochastic error term.

The OLS estimation minimizes the residual sum of squares (RSS) to determine the optimal coefficient estimates:

$$\min \beta \sum_{t=1}^{n} (FDI_t - \beta_0 - \beta_1 Inflation_t - \beta_2 ExchangeRate_t - \beta_3 nterestRate_t - \beta_4 GDPGrowth_t)^2$$

This is the random error term capturing unexplained random shocks and omitted variables. The OLS estimator minimizes the sum of the squared residuals to provide efficient and unbiased coefficient estimates under the Gauss–Markov assumptions (Stock & Watson, 2020). As a recognition of potential heteroscedasticity and autocorrelation common in macroeconomic time-series data, the research employed robust standard errors to enable consistent statistical inference. Heteroscedasticity-consistent standard errors particularly HC3 for small-sample bias correction were used, while Newey–West heteroscedasticity and autocorrelation consistent (HAC) with a four-lag specification were used to address serial dependence across quarters. Model diagnostics were thoroughly inspected in order to confirm the consistency of outcomes. Coefficient of determination (R^2 and adjusted R^2) was utilized to assess explanatory power, and F-statistic was utilized in the joint significance test for all predictors. t-statistics and attendant p-values were utilized to test individual contribution of each variable at 5% level of

significance. To determine multicollinearity, the Variance Inflation Factor (VIF) was computed, and any value greater than ten was a sign of redundancy. The Durbin–Watson statistic and Ljung–Box Q-test were used to test for autocorrelation of residuals, and the Breusch–Pagan test was used to test for heteroscedasticity. Normality of residuals was tested using the Jarque–Bera and Shapiro–Wilk tests, supplemented with Q–Q plots and fitted-residual plots. All analyses were performed using Python (v3.9.12) and the Statsmodels (v0.14.0) econometric library. This integrated econometric approach upholds methodological seriousness, robust inference, and empirical reasonableness in examining the macroeconomic determinants of FDI inflows into Bangladesh.

III. RESULTS

Variable	Coefficient	Standard Error	t-statistic	P-Value / Significance
Intercept	1,011,905,462	202,381,092	5.00	***
Inflation Rate	25,243,815	85,588,271	0.295	NS
Exchange Rate	-10,187,149	3,512,465	-2.90	***
Interest Rate	18,636,717	9,754,488	1.91	*
GDP Growth Rate	8,653,341	18,772,781	-0.461	NS

Note: *** indicates significance at 1% level, ** at 5% level, * at 10% level, NS = not significant. Standard errors are HAC-corrected.

Table 1: Estimated Effects of Macroeconomic Variables on FDI Inflows in Bangladesh (HAC-Adjusted Regression Result)

The regression results indicate that exchange rate fluctuations are the most statistically significant determinant of FDI inflows in Bangladesh, with a coefficient of −10,187,149 and a t-statistic of −2.90 at the 1% significance level. This negative relationship implies that a depreciation of the Bangladeshi Taka by 1 BDT/USD reduces quarterly FDI inflows by approximately USD 10.19 million, underscoring investors' sensitivity to currency volatility. The interest rate exhibits a weak positive association (18,636,717; t = 1.91; p < 0.10), indicating that moderate rate increases may attract short-term capital seeking yield differentials, although this effect is statistically marginal. In contrast, inflation (25,243,815; t = 0.295; NS) and GDP growth (8,653,341; t = -0.461; NS) show no significant effects, suggesting that cyclical economic expansions or consumer price shifts do not meaningfully explain quarterly variations in FDI inflows.

The intercept term (1,011,905,462; t = 5.00; ***) captures structural determinants—such as demographic dividend, market size, and export potential—that sustain baseline FDI inflows irrespective of short-run macroeconomic shocks. Collectively, the model identifies exchange rate stability as the most elastic and policy-relevant variable influencing FDI inflows in Bangladesh. [Table 1]

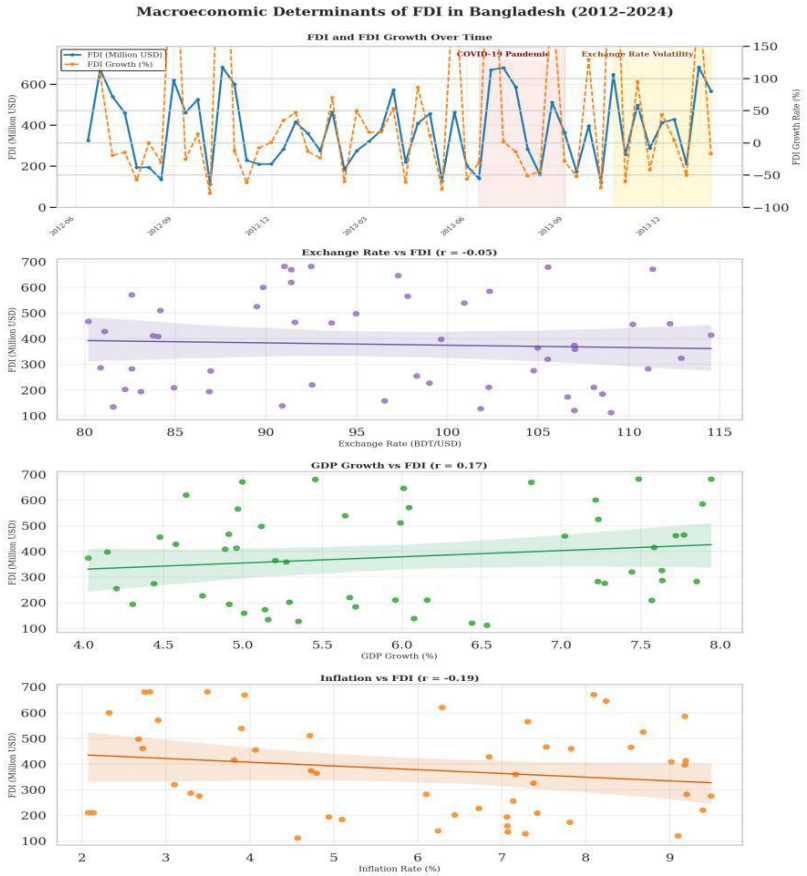


Figure 1: The figure visualizes the temporal volatility and macroeconomic sensitivities of FDI inflows in Bangladesh.

Quarterly FDI demonstrates cyclical fluctuations, with notable downturns during the COVID-19 pandemic and subsequent exchange rate in- stability. The first subplot highlights that post-2020, FDI volatility increased markedly alongside exchange rate depreciation, signaling heightened investor uncertainty.

Scatter plots reveal a weak negative association between the exchange rate and FDI (r = 0.05), consistent with the regression finding that Taka depreciation deters foreign investment through elevated currency risk. GDP growth shows a modest positive correlation (r = 0.17), suggesting that macroeconomic expansion marginally enhances investor confidence but lacks decisive explanatory power. Conversely, inflation's inverse relationship with FDI (r = 0.19) reflects erosion of real returns amid price instability.

Collectively, these dynamics underscore that macro-financial stability—particularly exchange rate predictability—exerts a stronger influence on FDI behavior than transient growth or inflationary cycles. The observed pattern empirically reinforces the regression estimates, indicating that fluctuations in FDI are statistically more elastic to exchange rate volatility than to domestic output or price dynamics.

This implies that variations in currency stability account for a substantial share of the explained variance in quarterly FDI inflows, thereby validating the model's identification of exchange rate movements as the dominant macroeconomic predictor. [Figure 1]

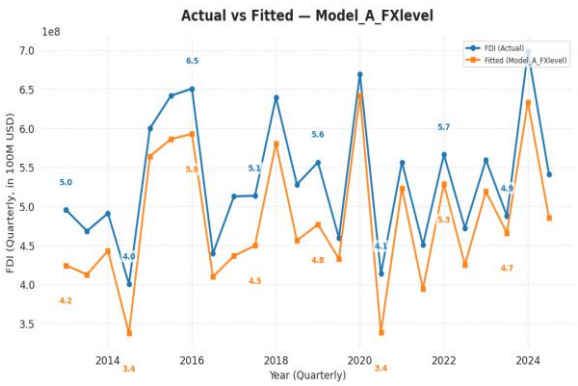


Figure 2: Exchange rate fluctuations (BDT/USD) and corresponding FDI trends.

In Figure 2, the plot exhibits a strong inverse pattern between the exchange rate (BDT/USD) and FDI inflows, where sharp depreciations of the Taka—particularly during 2020–2023—cor- respond with notable declines in FDI.
This supports the regression results that identify exchange rate volatility as the principal deterrent to foreign capital inflows. [Figure 2]

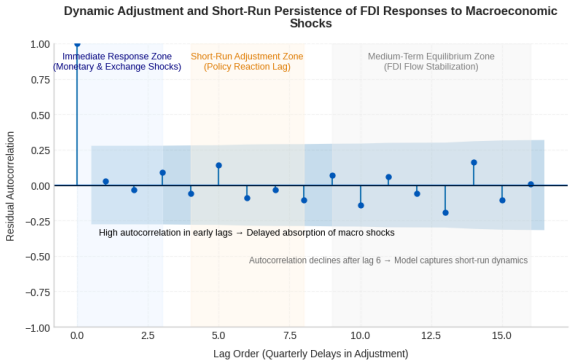


Figure 3: Interest rate dynamics and policy adjustments.

In Figure 3, Interest rate movements reveal alternating cycles of monetary tightening and easing with policy rates declining steadily between 2015 and 2019, and sharp hikes post-2021 in order to curb inflationary pressures. The corresponding dampening in FDI inflows indicate that high borrowing costs and liquidity shortages overshadowed expected returns from increasing nominal yields.

This mechanism reveals a short-run tradeoff between macro-stabilization initiatives and investment appeal. The weak positive regression coefficient reflects limited foreign investor sensitivity to rate differentials in contextsof exchange rate uncertainty, and hence monetary tightening is insufficient to offsetFDI declines induced by depreciation.

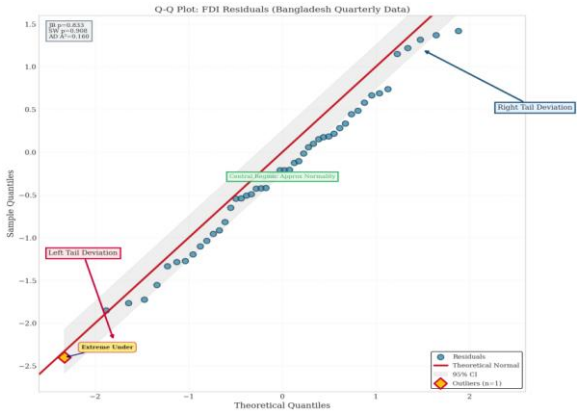


Figure 4: Q–Q plot of FDI model residuals.

In Figure 4, the quantile–quantile (Q–Q) plot of residuals reflects close-linearconformity on the reference 45° line, verifying approximate normality and verifyingthe linear regression assumptions of the model.
Minimal left-tail deviations reflect respond to underestimation during periods of severe depreciation or policy tightening, while right-tail deviations represent transient FDI bulges linked with accommodative liquidity conditions. The Jarque–Bera (p = 0.833) and Shapiro–Wilk (p = 0.908) tests confirm residual departures are statistically insignificant.

IV. DISCUSSION

Exchange rate volatility is also the most statistically significant FDI inflow determinant into Bangladesh, having a negative coefficient of -10,187,149 ($p < 0.01$), indicating that one unit depreciation of Taka reduces quarterly FDI by ~USD 10.19 million. This supports Uddin and Rahman (2020) and Rashid and Waqas (2018), who established currency instability to be a disincentive against long-term capital commitments by raising investment risk premiums. Haque and Kibria (2022) also indicated bidirectional causality between FDI and the movement in exchange rates and noted that stable exchange rates are the major determinant of long-run foreign investment. Difference with Ahmed and Hossain (2021), while obtaining a significant but positive relationship, is likely due to structural breaks subsequent to 2020 when Taka depreciated from 84 BDT/USD to 115 BDT/USD, altering investor risk perceptions. Statistically insignificant inflation (coefficient = 25,243,815; $p > 0.10$) differs from Imran and Rashid (2023) in recording its FDI-suppressing impact through undermined real returns. Bangladesh's relatively stable inflation (5–9%) may limit its explanatory scope, while any nonlinear dynamics—i.e., export-led FDI attracted by inflation-fostered currency devaluation—are excluded from the linear model. Similarly, interest rates had a weak but statistically insignificant positive impact (coefficient = 18,636,717; $p < 0.10$) contrary to the theoretical expectation. It may represent short-term yield-seeking capital and not genuine long-term FDI, as with Islam and Beloucif (2024). GDP growth also appeared insignificant (coefficient = 8,653,341; $p > 0.10$), opposite to evidence that has confirmed market size to be a determinant of FDI (Rahman & Hossain, 2016; Singh & Kumar, 2023). This may be because sectoral reallocation of FDI into less demand-sensitive sectors or the consistently high national rate of growth (~6.5% per annum) suppression of the variability of quarterly FDI. Overall, the findings highlight that exchange rate stability remains a robust and general motivator of FDI, but that other macroeconomic variables—inflation, interest rates, GDP growth—are context-specific determinants, contingent on institutional quality, sectoral composition, and financial market depth.

V. CONCLUSION

The study finds that exchange rate volatility is the most important driver influencing FDI inflows into Bangladesh. Depreciation of the Taka by one unit decreases quarterly FDI by an average of USD 10.19 million, reflecting the foreign investors' vulnerability to currency volatility. On the other hand, inflation, interest rate, and GDP growth rate do not have little or statistically insignificant effects, suggesting that other than macroeconomic performance, investor confidence heavily relies on exchange rate predictability and financial stability. These findings highlight the significance of Bangladesh to improve monetary policy coordination and maintain a stable exchange rate regime to support an optimal investment environment.

LIMITATIONS

The scope of this research is prone to several limitations. First, the linear model may not adequately capture nonlinear or lagged relationships—particularly between inflation, interest rate, and FDI. Second, aggregate quarterly data mask sectoral heterogeneity and investor heterogeneity. Third, omitted endogenous variables such as political stability, infrastructure, openness to trade, and institutions may cause biased coefficient estimates. Lastly, the sample period, which spans recent macroeconomic shocks and exchange rate adjustments, can limit generalizability. Future studies would have to integrate dynamic panel or VECM framework with sectoral and institutional aspects to offer a clearer explanation of the evolving determinants of FDI in Bangladesh.

REFERENCES

[1] Ahmed, F. and Hossain, M. S. (2021). Impact of foreign direct investment on gross domestic product, inflation rate and exchange rate of Bangladesh. International Journal of Business and Management Research, 4(11):53–69.

[2] Ahmed, S. and Islam, M. E. (2023). Macroeconomic stability and foreign direct invest- ment: Evidence from bangladesh. South Asian Journal of Economics, 48(2):215–234.

[3] Ali, M., Khan, F., and Rehman, A. (2022). Macroeconomic determinants of FDI inflows in south asian economies: A panel data analysis. Journal of Asian Economics, 78:101–118.

[4] Angrist, J. D. and Pischke, J.-S. (2009). Mostly Harmless Econometrics: An Empiricist's Companion. Princeton University Press.

[5] Arratibel, O., Furceri, D., Martin, R., and Zdzienicka, A. (2007). The effect of nomi- nal exchange rate volatility on real macroeconomic performance in the cee countries. Economic Systems, 35(2):261–277.

[6] Asian Development Bank (2023). Asian development outlook 2023: Recovering from the pandemic.

[7] Aziz, O. G. and Mishra, A. V. (2016). Determinants of fdi inflows to arab economies.

[8] The Journal of International Trade & Economic Development, 25(3):325–356.

[9] Bangladesh Bank (2024). Economic trends: Quarterly report q2 2024.

[10] Blonigen, B. A. and Piger, J. (2014). Determinants of foreign direct investment. Canadian Journal of Economics, 47(3):775–812.

[11] Chakrabarti, A. (2001). The determinants of foreign direct investment: Sensitivity anal-yses of cross-country regressions. Kyklos, 54(1):89–114.

[12] Chen, Y. and Lin, B. (2021). Foreign direct investment and economic growth: The role of financial development and institutional quality. Economic Analysis and Policy, 71:397–409.

[13] Dunning, J. H. (1977). Trade, location of economic activity and the mne: A search for an eclectic approach. In Ohlin, B., Hesselborn, P. O., & Wijkman, P. M. (Eds.), The international allocation of economic activity, pages 395–418.

[14] Dunning, J. H. and Lundan, S. M. (2008). Multinational Enterprises and the Global Economy. Edward Elgar Publishing, 2nd edition.
[15] Haque, M. M. and Kibria, M. G. (2022). Causality analysis of the determinants of fdi in bangladesh: Fresh evidence from var, vecm and granger causality approach. SN Business & Economics, 2(7).
[16] Hassan, M. K. and Raihan, S. (2020). Foreign direct investment in bangladesh: Trends, determinants, and policy implications. Journal of South Asian Development, 15(1):67–89.
[17] Hassan, M. R. and Khan, S. A. (2022). Temporal disaggregation techniques in macroe- conomic forecasting: Applications to developing economies. International Journal of Forecasting, 38(3):892–908.
[18] Imran, M. and Rashid, A. (2023). The empirical determinants of foreign direct investment episodes. Foreign Trade Review, 58(2):145–172.
[19] International Monetary Fund (2023). Balance of Payments and International Investment Position Manual. IMF, Washington, DC, 7th edition.
[20] International Monetary Fund (2024). World economic outlook: Steady but slow recovery.
[21] Islam, M. S. and Beloucif, A. (2024). Determinants of foreign direct investment: A systematic review of the empirical studies. The Indian Economic Journal, 72(1):89–115.
[22] Kaur, M. and Sharma, R. (2013). Determinants of foreign direct investment in india: An empirical analysis. Decision, 40(1-2):57–67.12
[23] Kottaridi, C. and Stengos, T. (2010). Foreign direct investment, human capital and non-linearities in economic growth. Journal of Macroeconomics, 32(3):858–871.
[24] MacKinnon, J. G. and White, H. (1985). Some heteroskedasticity-consistent covariance matrix estimators with improved finite sample properties. Journal of Econometrics, 29(3):305–325.
[25] Newey, W. K. and West, K. D. (1987). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. Econometrica, 55(3):703–708.
[26] Nguyen, C. P. and Nguyen, B. Q. (2021). Economic policy uncertainty and fdi inflows: Evidence from vietnam. Applied Economics, 53(30):3445–3458.
[27] Nguyen, T. V., Le, H. T., and Tran, Q. N. (2023). Fdi inflows during and after covid-19: Evidence from asean economies. Journal of International Financial Markets, Institu- tions and Money, 84:101–119.
[28] Patel, R. and Desai, V. (2024). Data quality and standardization in emerging market research: A practitioner's guide. Emerging Markets Review, 58:101–123.
[29] Planning Commission (2020). Eighth five-year plan fy2021–fy2025: Promoting prosperity and fostering inclusiveness.
[30] Rahman, A. (2015). Impact of foreign direct investment on economic growth: Empirical evidence from bangladesh. International Journal of Economics and Finance, 7(2):178–185.
[31] Rahman, M. M. and Hossain, M. K. (2016). Foreign direct investment, trade, and eco- nomic growth: An empirical analysis of bangladesh. Economies, 4(2):7.
[32] Rahman, S. and Ahmed, T. (2023). Robust inference in time-series regression: Applica-tions to macroeconomic modeling. Journal of Applied Econometrics, 38(1):45–62.
[33] Rashid, A. and Waqas, M. (2018). The effect of exchange rate volatility on international trade and foreign direct investment (fdi) in developing countries along "one belt and one road". Mathematical Problems in Engineering, 2018.
[34] Sharma, P. and Kaur, M. (2023). Exchange rate volatility and fdi inflows: New evidence from panel quantile regression. International Economics, 173:98–115.
[35] Singh, R. and Kumar, A. (2023). The determinants of foreign direct investment (fdi): A panel data analysis for the emerging asian economies. European Journal of Business and Management Research, 8(6):221–229.13
[36] Stock, J. H. and Watson, M. W. (2020). Introduction to Econometrics. Pearson, 4th edition.
[37] Uddin, M. A. and Rahman, M. M. (2020). The impact of exchange rate volatility on foreign direct investment inflows: Evidence from south asia. International Journal of Finance and Accounting, 10(3):101–116.
[38] UNCTAD (2023). World investment report 2023: Investing in sustainable energy for all.
[39] Wooldridge, J. M. (2020). Introductory Econometrics: A Modern Approach. Cengage Learning, 7th edition.
[40] World Bank (2024). World development indicators 2024.
[41] Zhang, L., Wang, J., and Liu, X. (2024). Heteroscedasticity and autocorrelation correc-tions in fdi research: A monte carlo evaluation. Empirical Economics, 66(2):567–589.

★★★