



(RESEARCH ARTICLE)



DETERMINANTS OF AVERAGE TRANSACTION SIZE IN MOBILE FINANCIAL SERVICES: EVIDENCE FROM BANGLADESH

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ABSTRACT

Mobile Financial Service (MFS) have expanded rapidly in Bangladesh, but existing research focuses on adoption, financial inclusion and aggregate transaction values, leaving the average size of each transaction largely unexamined. In order to fill this gap, the current study focuses on determinants of Average MFS Transaction Size (AMTS). For this reason, AMTS is computed as the ratio of total transaction value per month to the total number of transactions. With the help of 38 monthly observations ranging from January 2022 to February 2025 obtained from Bangladesh Bank, this research will employ descriptive statistics, correlation, Augmented Dickey Fuller (ADF) test, OLS regression analysis along with residual tests, Newey-West HAC standard errors and ARDL bounds test for the analysis. The result of this research suggests that there has been an increase in AMTS from BDT 2,125 in January 2022 to BDT 2,454 in February 2025. Upon conducting the OLS regression analysis on the baseline model, it was observed that the only significant factor determining the AMTS was the formal inward remittance which increases it by 16.9 BDT for every BDT 1,000 crore change in it. Both active accounts and exchange rate were found statistically insignificant and perhaps the reason is a very high correlation between them (0.90). The ARDL bounds test failed to provide any conclusive evidence; furthermore, there is no statistical significance in long run coefficients while short run estimates suggest that an increase in the number of active accounts is associated with decrease in AMTS due to the same behavior of new users. All results must be interpreted as associations and not causations due to data limitations, lack of controls and seasonal effect.

Keywords: Mobile financial services, Average transaction size, Remittance, Exchange rate, ARDL, Bangladesh

1 INTRODUCTION

There has been significant growth in the use of Mobile Financial Services (MFS) in Bangladesh in performing financial transactions and inward remittances. (Jubair Bin Sharif et al., 2024a) MFS growth has led to financial inclusion, but there is an increase in significance of transaction value and usage patterns. (Md Ali Ashraf, 2022a) Additionally, MFS transactions per month have been applied for examining the relationship between transactions and economic variables. (Rashid, 2024a) Financial innovations and foreign exchange rate have been included in the monetary policy of Bangladesh. (INOUE & IMAM, 2026a)

There are studies conducted in Bangladesh that explored mobile financial services from various perspectives including financial inclusion, transactional behavior, expansion of services, and the relationship between MFS and economy. (Md Ali Ashraf, 2022a; Rashid, 2024a) The growth of the number of accounts and transactions in the MFS has been analyzed alongside the development of MFS sector. (Nabir Hossain & Masudur Rahman, 2023) In addition, financial innovations and foreign exchange rates were considered in the context of money demand in Bangladesh. (INOUE & IMAM, 2026a)

However, there are no numerous studies focusing specifically on the factors influencing the average transaction amount. (Rashid, 2024b) , in Impact of COVID-19 Movement Restrictions on Mobile Financing Services (MFSs) in Bangladesh, looked at person-to-person transactions, utility payments, and inward remittances, rather than transaction size. (Ashraf, 2022) in “The Impact of Mobile Financial Services on the Usage Dimension of Financial Inclusion: An Empirical Study from Bangladesh” studied the registered user and the MFS agent, not the mean amount per transaction. Therefore, the connection between active MFS accounts, formal inward remittance and the exchange rate of USD/BDT and average transaction amount needs to be explored further by empirical study.

The main objective of this empirical investigation is to examine the major macroeconomic factors that affect the mean MFS transaction value in Bangladesh using a strong data set consisting of 38 monthly observations ranging from January 2022 to February 2025. The current research contributes to the prevailing academic literature in terms of moving out of conventional measures such as transaction volume, usage of accounts, and overall financial inclusion. (Md Ali Ashraf, 2022a; Rashid, 2024a) In particular, the focus of this research is placed on the mean MFS transaction value which can be calculated by dividing the total value of MFS transactions by their quantity.

The objectives of the study include:

- To examine and analyse the trend of average MFS transaction value in Bangladesh
- To examine whether the increase in active MFS accounts influences the average transaction size
- To examine the association between formal inward remittance and average MFS transaction size.
- To analyze the effect of exchange rate of USD to BDT on average transaction amount via descriptive and correlation analysis, ADF unit root test, and OLS regression, alongside the diagnostic analysis and ARDL bounds test

2 LITERATURE REVIEW

The current literature on services in Bangladesh mainly focuses on user perceptions and adoption. 63.9% of the papers reviewed focus, on these aspects of services; the papers reviewed highlight the services aspects. Fewer papers examine transaction data or provide descriptive reviews. This gap points to a lack of understanding of actual mobile financial service usage patterns. (Amin et al., 2026) (Rizvee et al., 2025) (Nisa Nipa et al.,) (Sumi et al., 2025) (Rahman, n.d.) (Rashid, 2024c) (Salah Uddin & Begum, 2023) (Md Ali Ashraf, 2022b) (Datta, 2026) (INOUE & IMAM, 2026b) (Rouf, 2024) (Sultana et al., n.d.; Uddin, 2022) The survey studies largely agree that usefulness, trust, service quality and facilitating conditions shape adoption, but they rely on convenience samples and self-reports, and they cannot show how large each transaction is.

The aggregate studies are similar, to this study's design. However, the aggregate studies disagree with each other on supply-side expansion. (Rashid, 2024d) applies ARDL to 66 monthly observations (December 2016 to May 2022) and finds that the lockdown raised person-to-person and bill-payment values in the long run, yet the coefficient on the number of agents is significantly negative for person-to-person transfers. (Md Ali Ashraf, 2022c) , using a vector autoregression on 2017–2020 data, finds no significant relationship between agents and registered users. Conversely, (INOUE & IMAM, 2026b) find that a composite of agents, accounts and transaction value is positively related to money demand. These findings concern totals, composites or user counts. None treats value per transaction as the dependent variable, so evidence that total value rose cannot be read as evidence that average size rose.

These findings relate to totals, averages, or customer numbers. There is no data that considers transaction value as the dependent variable, and therefore an increase in the total value does not necessarily suggest an increase in the average

transaction size. Descriptive studies provide clues about the nature of the dependent variable. According to Hossain and Rahman (2023), active accounts increased from 272.05 to 642.97 lakh from June 2018 to June 2022, and the number and value increased by around 140% and 184%, respectively. Dividing the reported value by the reported number of accounts provides an average ticket value of BDT 1,725 and 2,043. Sharif et al. (2024) report around BDT 2,372 in April 2024 and BDT 2,423 in June 2024. (Jubair Bin Sharif et al., 2024b) . This suggests a modest nominal increase, but it is interpretation rather than tested evidence, and it is confounded by inflation and by regulation: the same sources report repeated increases in transaction and balance caps. (Jubair Bin Sharif et al., 2024b) (Hossain, 2026)

Remittances and exchange rates are the weakest links. Remittances appear as one MFS product among many. (Rashid, 2024c) finds the long-run remittance effect statistically insignificant (Rashid, 2024c) , and (Jubair Bin Sharif et al., 2024b) report MFS remittance disbursement of about BDT 856–949 crore monthly against total MFS value above BDT 141,000 crore, roughly 0.6% (author's calculation). (Aktar, 2025) notes that most surveyed bKash users do not use the remittance service. National remittance flows are described as economically large (Moutusi Tanha et al., 2024) (Sumiyaa et al., 2026) , and (Sumi et al., 2025) cite Ugandan evidence that mobile money users receive remittances more often, but that is secondary evidence from another country. For the exchange rate, only (INOUE & IMAM, 2026b) include it, finding a positive effect on M2 demand but not on M3, and they note that theory allows either sign. No reviewed study links USD/BDT movements to MFS transaction size.

Methodologically, the literature is thin on stationarity and omitted variables. Only (Rashid, 2024c) reports unit-root tests, and its variables are integrated of order one, which warns that levels regressions of trending series risk spuriousness. Samples are short (53 to 66 monthly observations), (Rashid, 2024c) acknowledges missing cost data, and some significance markers in its Table 2 do not match the reported t-values. Several sources are of uncertain quality (Jubair Bin Sharif et al., 2024b) . (Shaikh et al., 2023) (Shen et al., 2026) (Author et al., 2026) (Hossain, 2026) (Golam et al., 2025) (Istiaq et al., 2026) (Nusrat, n.d.)

Together these strands establish the gap: no available study explains average MFS transaction size with account expansion, formal remittance and the exchange rate in a stationarity-aware monthly framework.

2.1 Evidence-based justification of each hypothesis

2.1.1 H1 – Active MFS accounts have a significant positive effect on AMTS

2.1.1.1 Supporting evidence (indirect)

(INOUE & IMAM, 2026b) : a financial-innovation composite (agents, accounts, MFS value) is significantly positive for money demand. It includes transaction value, so it is not a clean test, and it concerns money demand, not ticket size.

2.1.1.2 Contradicting evidence

- (Md Ali Ashraf, 2022c) : no significant link between agents and registered users (VAR, Johansen, Granger; short 2017–2020 window).
- (Rashid, 2024e) : the agent's coefficient is significantly negative for person-to-person values in the long run, and mixed in the financial-inclusion models. Supply expansion does not reliably raise value
- (Shen et al., 2026) : mobile wallet access is concentrated among men, and gaps relate to education and income. *(Interpretation: if growth in accounts brings in lower-income, lower-education users, average ticket could fall, a dilution effect that works against a positive H1.)*

H1 predicts an effect, supported by network effects and descriptive trends but remains unproven; no study links active accounts to transaction value.

2.1.2 H2 – Total formal inward remittance has a positive effect, on AMTS

2.1.2.1 Supporting evidence (indirect)

- (Jubair Bin Sharif et al., 2024b) : Remittances can be sent to MFS wallets. The limit, for an expatriate to send remittances is Tk 2.5 lakh. The maximum balance that a wallet can hold is Tk 3 lakh. Large single transfers are possible.
- (Rashid, 2024d) festival timing is significant for remittances, and remittance coefficients are positive but statistically insignificant for the lockdown effect.
- (Moutusi Tanha et al., 2024) : Remittances contribute 11% of Bangladesh's GDP, while Sumi et al. (2025) cite secondary evidence from Uganda linking remittances and money transfers.

2.1.2.2 Contradicting evidence

- (Jubair Bin Sharif et al., 2024b) : MFS remittances only make up 0.6 percent of the MFS value. Because of this share MFS remittances have limited direct effect, on national averages.
- (Rashid, 2024e) : I notice the long-run remittance effect is not significant and remittance growth, through MFS is slower.
- (Aktar, 2025) : most sampled bKash users do not use the remittance service.

H2's positive effect is plausible but weakly supported, as national remittances indirectly influence MFS transactions; no study tests their relationship with average transaction size.

2.1.3 H3 – The USD/BDT exchange rate has an impact on AMTS

2.1.3.1 Supporting evidence

- (INOUE & IMAM, 2026c) : I observe that a study from December 2018 to June 2023 shows the rising USD/BDT exchange rate when M2 expands but the not linked to M3. This observation supports the two-sided claim, in H3.
- Indirect evidence comes from (Moutusi Tanha et al., 2024) who studied remittance importance. They suggest that when the USD/BDT exchange rate falls the value of transactions in terms could rise because more taka flows in and prices go up; this idea has not yet been tested.

H3 calls for a test because no study that we have looked at connects the USD/BDT exchange rate, to the size of MFS transactions.

3 METHODOLOGY

3.1 Research design and data

The research will use a quantitative, explanatory time-series design where each month is considered an observation unit. This research aims to find out if active MFS accounts, formal inward remittance, and USD/BDT mid-rate are related to the average value of MFS transactions in Bangladesh. The research methodology is based on previous studies on MFS usage and financial inclusion (Ashraf, 2022) and the effect of the pandemic on them (Rashid, 2024b) yet this study focuses solely on the value of the average transaction rather than on its adoption or total volume.

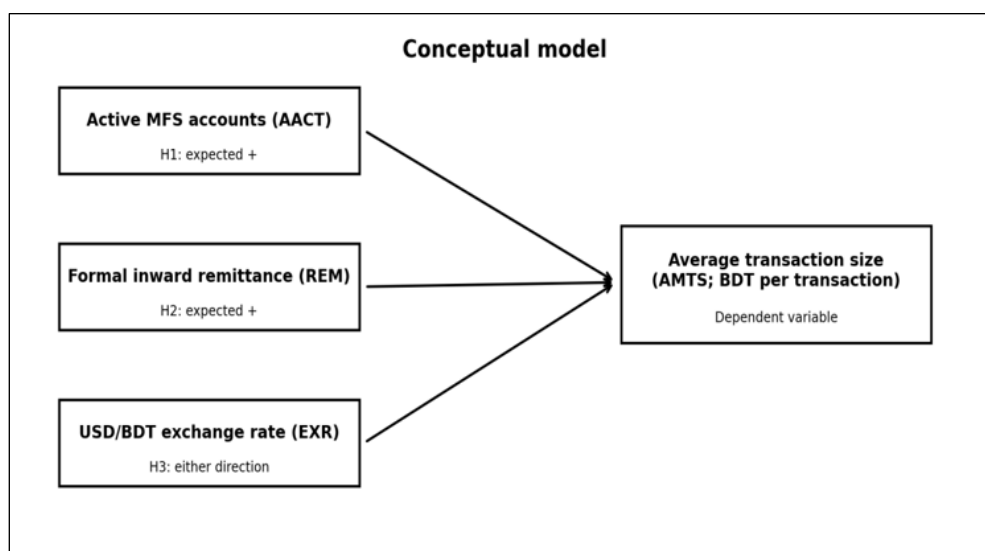


Figure 1: Conceptual framework. Arrows represent hypothesised associations; they do not imply identified causal effects.

The estimation period consists of 38 months between January 2022 and February 2025. Transaction value, transaction count, and number of active accounts data are taken from the MFS comparative summary statements provided on the Bangladesh Bank's official website (Bangladesh Bank, n.d.). Data on formal inward remittance and USD/BDT mid-rate are taken from the macro-financial series of Bangladesh Bank. 38 months of the data are the only period for which it is

possible to verify the values for all four variables at the same time on the Bangladesh Bank website, and any extension of the period would require the inclusion of unverifiable or incomparable numbers.

Figure 1 presents the conceptual framework. Arrows denote hypothesised associations only; they do not claim identified causal effects

3.2 Variables and measurement

Average MFS transaction size (AMTS) is constructed as monthly MFS transaction value divided by transaction count. Since the value is stated in terms of crore BDT, it is initially converted into BDT per unit using a multiplication factor of 10,000,000. Active accounts (AACT) are stated in lakh, formal inward remittance (REM) is stated in terms of crore BDT, and the exchange rate (EXR) is stated in BDT per US dollar (see Table 1). REM includes all forms of formal routes, including those that do not fall under MFS; therefore, it is considered a macro-finance indicator.

Table 1: Variable definitions and measurement

Variable	Operational definition	Unit	Role
AMTS	MFS transaction value $\times$ 10 000 000 $\div$ transaction count	BDT per transaction	Dependent
AACT	Number of active MFS accounts	Lakh accounts	Explanatory
REM	Total formal inward remittance	Crore BDT	Explanatory
EXR	USD/BDT mid-rate	BDT per USD	Explanatory

3.3 Model specification and hypotheses

The baseline model is estimated in levels so that coefficients retain their original units:

$$AMTS_t = \beta_0 + \beta_1 AACT_t + \beta_2 REM_t + \beta_3 EXR_t + \varepsilon_t$$

Hypotheses are stated as directional associations at the 5 per cent significance level:

- H1: $\beta_1 > 0$ (wider access may support larger transfers);
- H2: $\beta_2 > 0$ (remittances enter the country in big volumes);
- H3: $\beta_3 \neq 0$ (depreciation increases nominal remittances while reducing their real value, therefore the sign is not known).

All the parameters are treated as conditional relationships.

3.4 Estimation strategy and diagnostics

Analysis proceeds in the sequence shown in Figure 2. Analysis is done on descriptive statistics, time series graph, and Pearson's correlation. Afterwards, Augmented Dickey-Fuller tests (ADF test) (Dickey & Fuller, 1979, 1981) will be performed on the variables in levels (intercept and trend) and first differences. Because ADF power is limited in small samples, classifications are treated as indicative only. The model is estimated by ordinary least squares (OLS) with variance-inflation-factor (VIF) screening. Residual diagnostics comprise the Breusch–Pagan and White tests for heteroskedasticity (Breusch & Pagan, 1979; White, 1980), the Breusch–Godfrey and Durbin–Watson tests for serial correlation (BREUSCH, 1978), Ramsey's RESET for functional form (Ramsey, 1969), and the Shapiro–Wilk test for normality (SHAPIRO & WILK, 1965). Newey–West standard errors serve as a sensitivity check (Newey & West, 1987).

Given the mixed orders of integration, an ARDL bounds test (Pesaran et al., 2001) is reported as a supplementary check. The test accommodates I(0)/I(1) mixtures but not I(2) series. Following (Narayan, 2005), bounds results are interpreted cautiously in small samples. Log transformations and seasonal dummies were not estimated and remain avenues for future work.

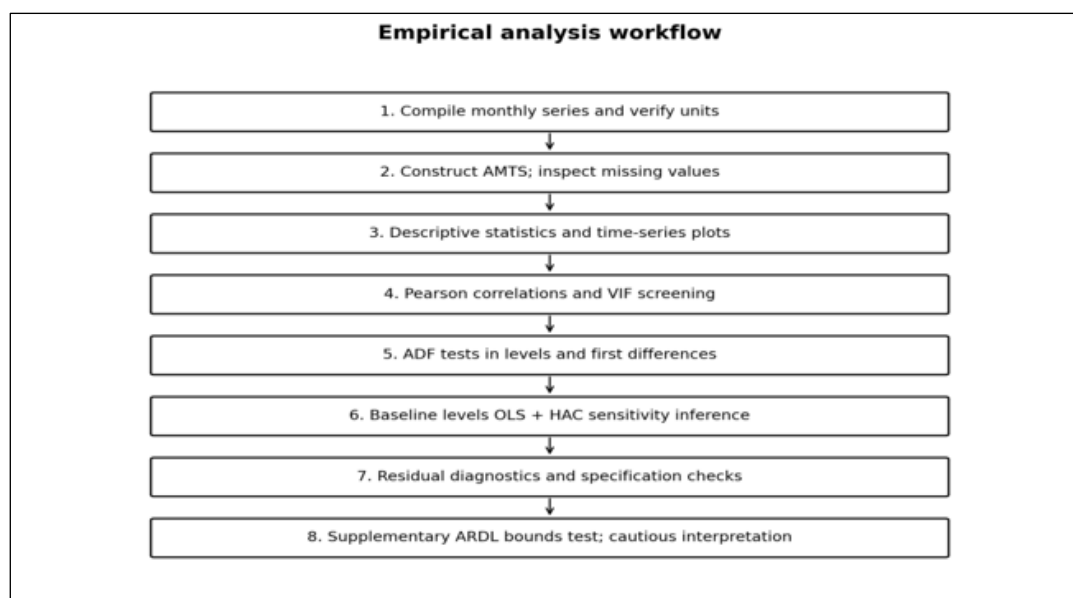


Figure 2: Sequence of the empirical analysis.

3.5 Limitations and reproducibility

The principal limitations arise directly from the data environment. To begin with, the 38 months' sample represents the entire range of available contemporary verified data reported by the Bangladesh Bank; an increase in the time range would have required data without verification and thus was impossible. The short window reduces ADF power and consumes degrees of freedom in the ARDL specification, helping to explain why the bounds statistic falls in the inconclusive zone. Secondly, active-account growth and the depreciation of the taka were positively correlated from 2022 to 2024 with a 0.90 correlation coefficient, which increases standard errors and makes it difficult to isolate effects individually. Thirdly, REM is a measure of overall remittances made formally and not through MFS only, while AMTS is an aggregate ratio measure. Fees and Eid-related seasonality are omitted; their absence is a plausible contributor to residual outliers and to the ARDL RESET rejection. All results are to be considered as associations and not as estimates of cause-effect relationship. All data sources, unit conversions and codes will be kept intact for independent verification.

4 RESULTS AND EMPIRICAL FINDINGS

4.1 Descriptive patterns

Summary statistics are provided in Table 2 for the 38-month span of time. The AMTS was on average 2,249 BDT (SD = 148) in value with its minimum being 1,863 BDT in May 2022 and maximum reaching 2,506 BDT in March 2024. Figure 3 demonstrates that there was a noticeable upward bias from 2,125 BDT in January 2022 to 2,454 BDT in February 2025. According to the fitted linear trend line, on average, the AMTS increased by 9.5 BDT per month ($p < .001$). It is clear that there was greater volatility during 2022-2023, especially the peak in April 2022 and valley in May, than after.

Table 2: Descriptive statistics (n = 38, January 2022–February 2025)

Variable	Mean	Min	Max	SD
AMTS (BDT per transaction)	2 249.30	1 863.35	2 505.60	148.08
AACT (lakh accounts)	723.08	425.23	918.13	158.16
REM (crore BDT)	21 221.82	12 852.44	31 665.00	4 935.96
EXR (BDT per USD)	107.07	86.00	122.00	10.83

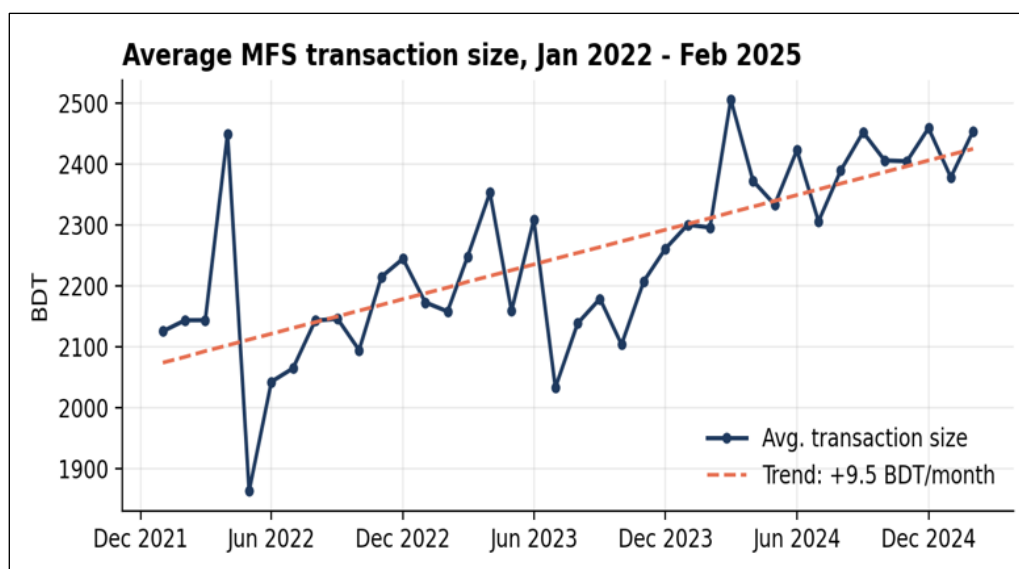


Figure 3: Monthly AMTS with fitted linear trend and sample mean.

From Figure 4, with January 2022 set at 100, it is clear that all three explanatory variables tend to move in the same direction. The number of active accounts more than doubled, with a clear spike occurring in the middle of 2022. The exchange rate increased by about 40 percent (86 to 122). Remittance was moving upwards, with seasonal spikes.

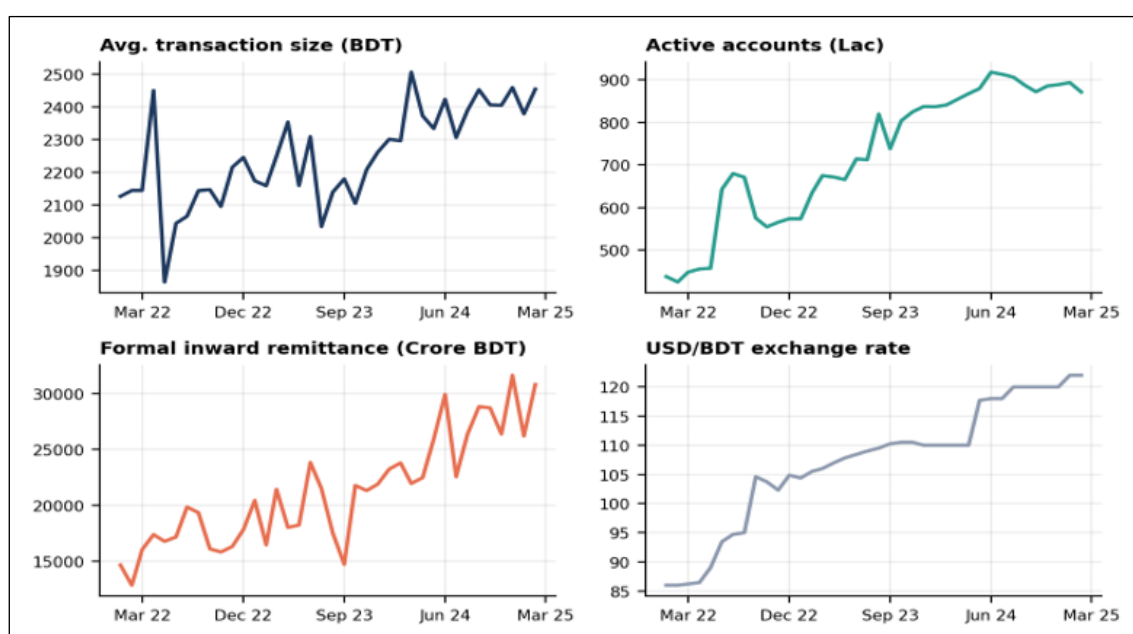


Figure 4: Explanatory-variable trends (active accounts, formal remittance, USD/BDT exchange rate)

4.2 Correlations

Positive correlation can be seen between all the three variables and AMTS; that is, REM (0.70), EXR (0.62), and AACT (0.61) (refer to Figure 5). Bivariate scatter plot shows mostly linear relationship, with May 2022 showing as an outlier (refer to Figure 6). It is interesting that AACT and EXR show strong relationship with each other of 0.90, while REM correlates highly with both of them (correlation is 0.80 and above).

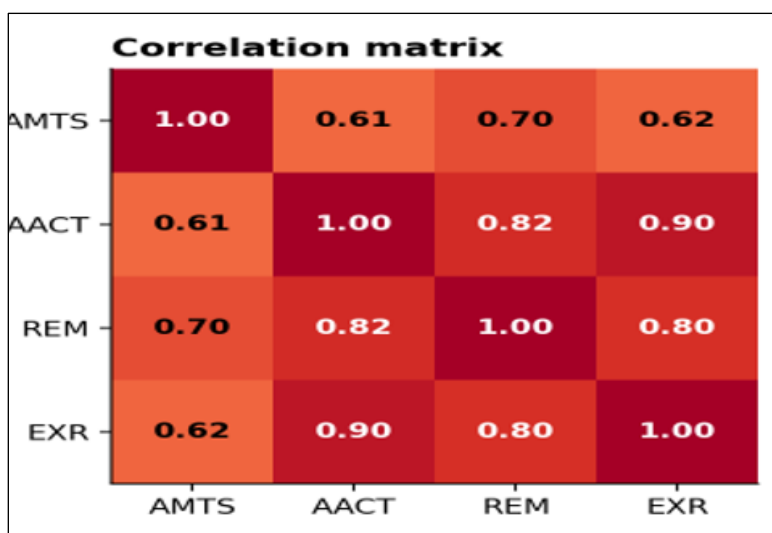


Figure 5: Pearson correlation matrix for the four model variables.

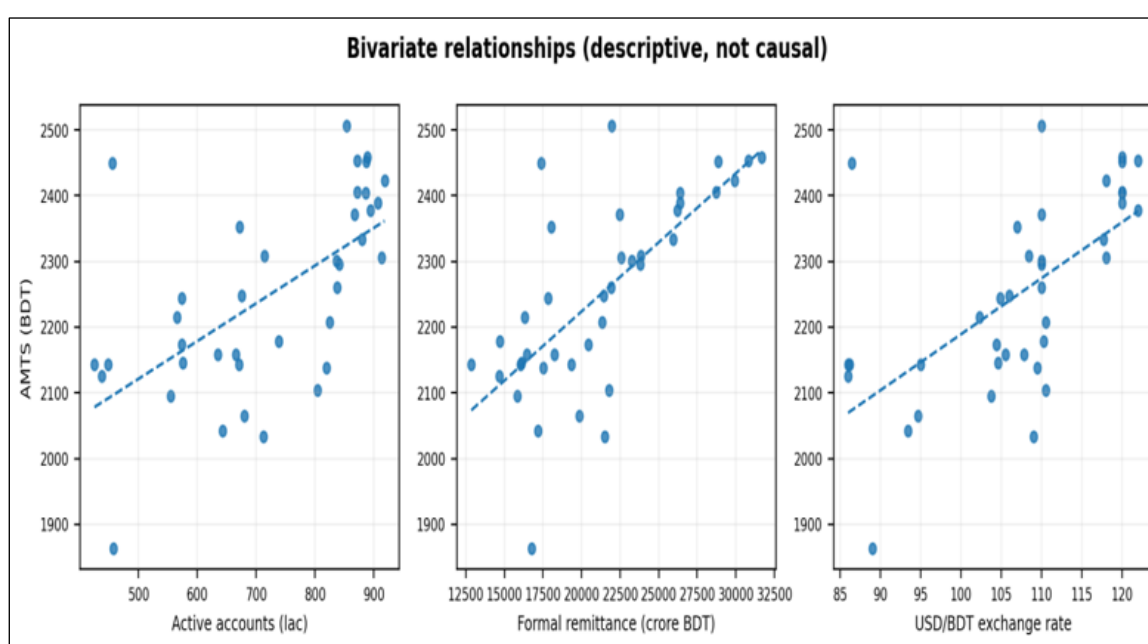


Figure 6: Bivariate scatter plots of AMTS against each regressor, with fitted linear lines (descriptive, not causal).

4.3 Stationarity

Table 3: Augmented Dickey–Fuller unit-root tests

Variable	Levels ADF	p	First-diff. ADF	p	Order
AMTS	-3.58	0.031	-6.97	0.000	I(0)
AACT	-2.43	0.364	-4.06	0.001	I(1)
REM	-4.03	0.008	-7.32	0.000	I(0)
EXR	-2.13	0.528	-5.11	0.000	I(1)

Note. Levels test includes intercept and trend with one lag; first-difference test includes an intercept with one lag

From the Augmented Dickey Fuller tests, it can be seen that AMTS (ADF = -3.58; $p=0.031$) and REM (ADF = -4.03; $p=0.008$) are stationary at level, while AACT (ADF = -2.43; $p=0.364$) and EXR (ADF = -2.13; $p=0.528$) have unit roots and become

stationary only after being first differenced ($p \leq .001$) (Table 3). As such, the series are made up of a mixed $I(0)/I(1)$ structure with no $I(2)$ structure. Figure 7 below shows the validity of the above classification as the differenced series move around the zero line, and the exchange rate moves in discrete policy actions. The results of AMTS and REM become marginal when using 2 lags.

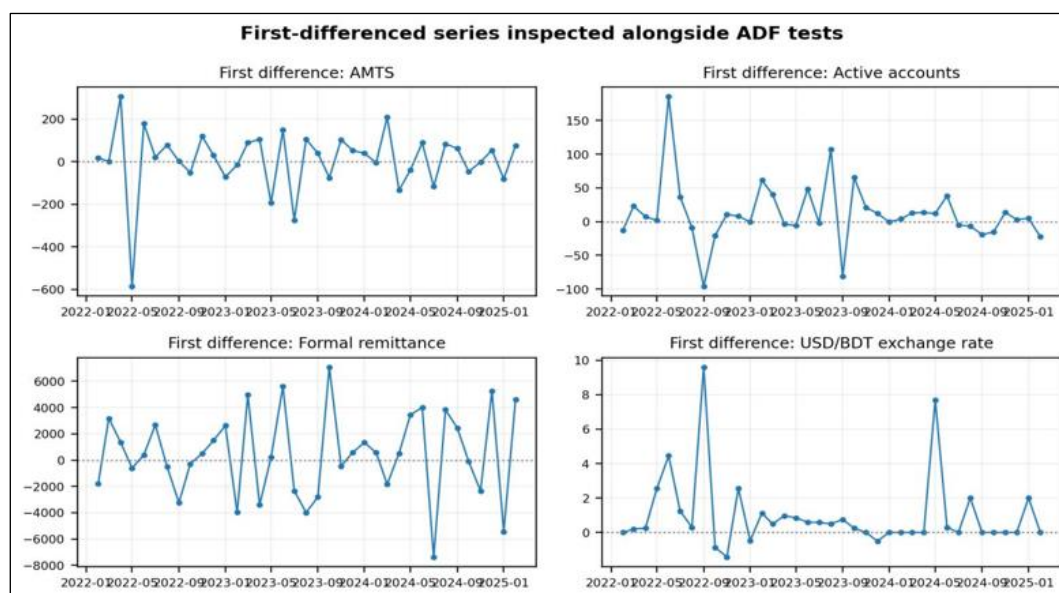


Figure 7: First differences of the model variables (visual diagnostic only).

4.4 Baseline OLS estimates

The results of the OLS levels model are jointly significant ($F(3,34) = 11.39$, $p < .001$; $R^2 = .501$, adjusted $R^2 = .457$) (Table 4). REM is the only variable that proves to be statistically significant ($\beta = 0.0169$, $SE = 0.0065$, $p = .014$). Thus, a 1,000 crore BDT increment in monthly formal remittance is linked to a 16.9 BDT increase in the mean transaction amount (standardized $\beta \approx 0.56$). Hence, H2 is accepted. Both AACT ($\beta = -0.0088$, $p = .975$) and EXR ($\beta = 2.44$, $p = .543$) fail to be statistically significant. This implies that H1 and H3 are rejected. Recalculating the model using Newey–West standard errors does not alter the results: REM is still statistically significant ($p < .001$) whereas AACT and EXR remain insignificant (Newey & West, 2014). Economically, remittances received may be sent out or cashed in sizable amounts; however, the actual cause-and-effect relationship remains unstudied, and the finding is to be interpreted as an association only. In turn, the insignificance of AACT and EXR cannot be regarded as conclusive proof of their zero influence on MTSA due to high 0.90 correlation.

Table 4: Baseline OLS estimates (dependent variable: AMTS)

Variable	Coefficient	Std. error	t	p	NW p	VIF
Constant	1 634.64	258.09	6.33	0.000	—	—
AACT	-0.0088	0.282	-0.03	0.975	0.97	6.19
REM	0.0169	0.0065	2.59	0.014	<0.001	3.24
EXR	2.441	3.976	0.61	0.543	0.56	5.76

Note. $n = 38$; $R^2 = .501$; adjusted $R^2 = .457$; $F(3,34) = 11.39$ ($p < .001$). NW p = Newey–West p-value; VIF = variance inflation factor.

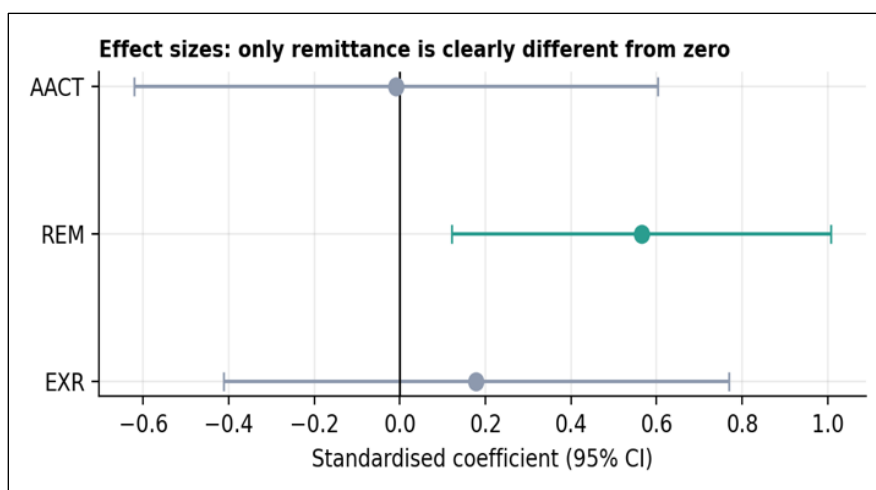


Figure 8: Standardised coefficients from the baseline OLS model (only remittance is clearly different from zero).

4.5 Diagnostic checks

Table 5: Residual diagnostics: baseline OLS and ARDL(2,1,1,1)

Test	Baseline OLS	ARDL(2,1,1,1)
Breusch–Pagan	$\chi^2 = 6.95$, $p = .073$	$p = .056$
White	$p = .111$	—
Breusch–Godfrey (1 / 2 lags)	$p = .971$ / $.872$	$p = .150$ / $.322$
Durbin–Watson	1.986	2.216
Ramsey RESET	$p = .497$	$p = .003$
Shapiro–Wilk	$p = .0046$	$p = .053$
CUSUM stability	—	$p = .998$ (stable)

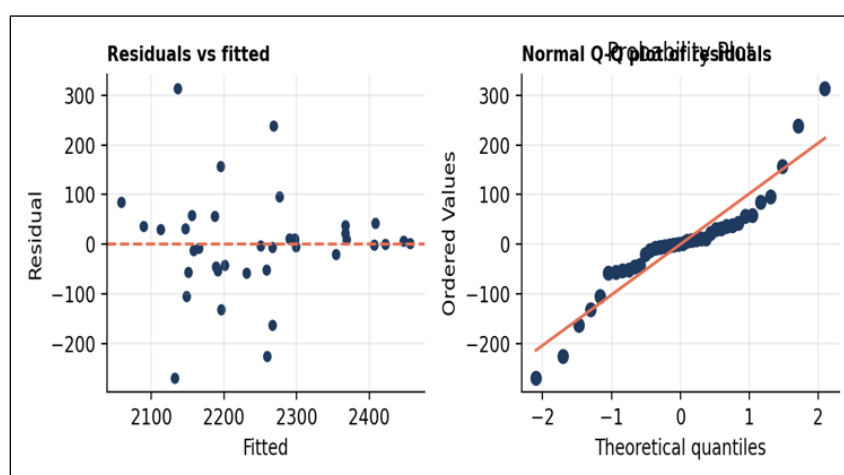


Figure 9: Residual diagnostics from the baseline OLS model (residuals vs fitted and normal Q–Q plot).

The baseline specification passes most of the common diagnostic tests (refer to Table 5). The Breusch-Pagan test has marginal results at the 10% significance level ($\chi^2 = 6.95$, $p = 0.073$), while the White test cannot reject the hypothesis ($p = 0.111$). There is no serial correlation in the data, as shown by the Breusch-Godfrey ($p = 0.971$ / 0.872) and Durbin-Watson = 1.986 tests. There is no functional form misspecification, as indicated by Ramsey's RESET ($p = 0.497$). However, the Shapiro-Wilk test suggests a rejection of the hypothesis of normality of residuals ($p = 0.0046$) on the basis of only a few outliers from some particular months, especially April-May 2022.

4.6 ARDL robustness check

In light of the fact that the data set consists of $I(0)$ and $I(1)$ variables, the $ARDL(2,1,1,1)$ model was estimated with 36 observations. The lag lengths show only small deviations from the model that has the minimum AIC. The F-bounds test shows that F-statistic equals 2.92 and lies within the intervals of lower and upper critical values of 2.88 to 4.01 and 2.46 to 3.52, respectively, at the significance level of 5% and 10%; hence, the null hypothesis cannot be rejected (see Table 6).

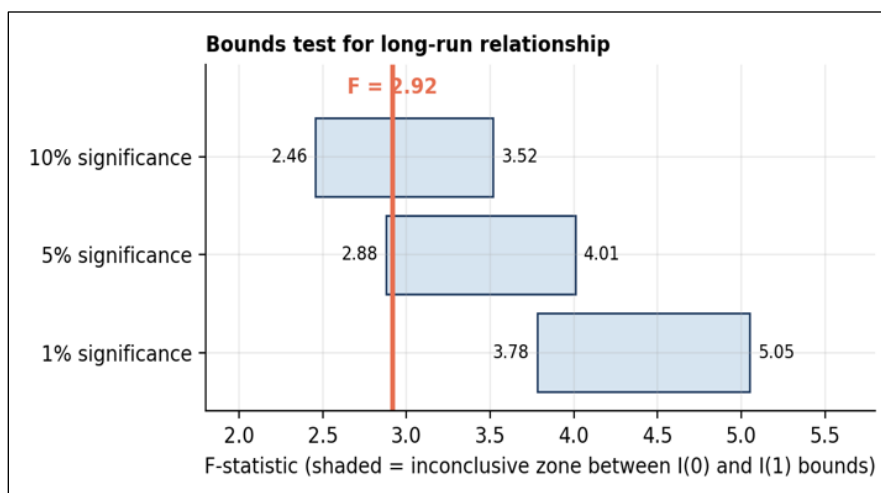


Figure 10: ARDL bounds test for a long-run relationship ($F = 2.92$ falls in the inconclusive zone).

All long-run coefficients are statistically insignificant: AACT 0.468 ($p = .431$), REM 0.0178 ($p = .163$), and EXR -6.34 ($p = .466$). While the coefficient on REM preserves the positive sign and is close in size to the OLS estimate (17.8 versus 16.9 BDT per 1,000 crore), it lacks statistical significance. Thus, the OLS remittance result is only suggestive rather than definitive. In the short run, the error-correction term is -0.679 ($p = .016$) and $\Delta AACT$ is -1.33 ($p = .034$). Growth in active accounts is linked with lower transaction amounts, which is in line with the conjecture that the transactions made by new users tend to be small. Both ΔREM and ΔEXR are insignificant at standard levels. ARDL tests look good, except for the RESET, which fails ($p = .003$) suggesting some kind of functional form misspecification. Since both the bounds test and the RESET have rejected their respective nulls, the error correction term cannot be taken as adjustment toward equilibrium.

Table 6: ARDL(2,1,1,1) bounds test, error-correction and long-run estimates ($n = 36$)

Term	Coefficient	Std. error	p
Bounds F-statistic = 2.92	10%: 2.46–3.52	5%: 2.88–4.01	Inconclusive
Error-correction term (AMTS, lag 1)	−0.679	0.265	0.016
$\Delta AMTS$ (lag 1)	−0.566	0.240	0.026
$\Delta AACT$ (short run)	−1.329	0.594	0.034
ΔREM (short run)	0.0119	0.0074	0.118
ΔEXR (short run)	−19.82	10.57	0.072
Long run: AACT	0.468	0.586	0.431
Long run: REM	0.0178	0.0124	0.163
Long run: EXR	−6.34	8.58	0.466

Note. Error-correction form: $R^2 = .623$, adjusted $R^2 = .511$, $F = 5.57$ ($p = .0003$).

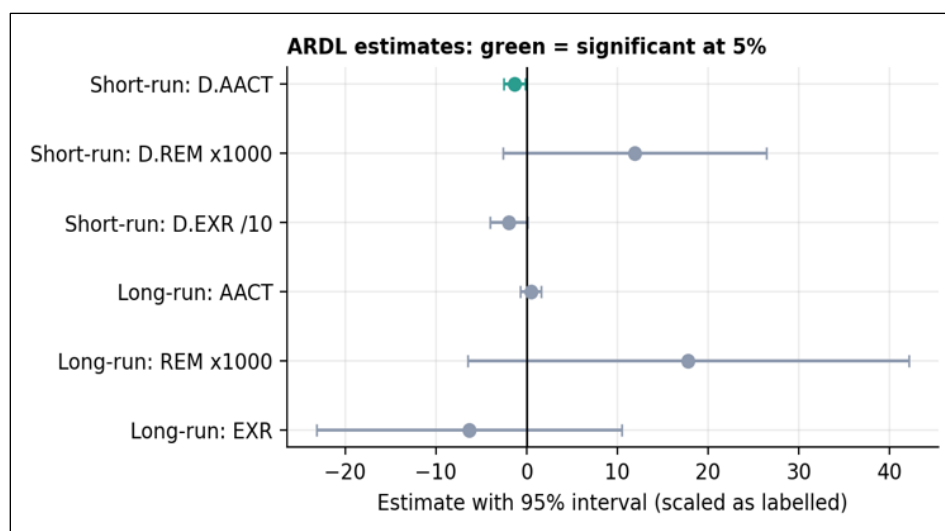


Figure 11: ARDL short-run and long-run coefficient estimates with approximate 95 % intervals.

4.7 Limitations and why they arise

Several limitations must be kept in view when interpreting the results. They are not incidental; each is a direct consequence of the data and modelling environment.

- **Sample size.** The 38 observations represent the unique verified contemporaneous dataset available at Bangladesh Bank. Any extension of the period under study would involve including non-verified numbers. The small number of observations makes the ADF test less powerful, the selection of lags important, and the ARDL bounds test indeterminate due to a lot of degrees of freedom loss.
- **Collinearity.** Both expansion of accounts and taka depreciation followed the increasing path during 2022–24. Their approximately 0.90 correlation coefficient is responsible for increased standard errors and can hide the true effect, which is the reason why the REM remains the only variable significant in levels OLS regression.
- **Mixed integration.** Levels OLS with $I(1)$ regressors carries a risk of spurious inference. Newey–West standard errors correct for uncertainty but do not remedy a potentially misspecified mean. The ARDL check was therefore indispensable, yet its own inconclusiveness and RESET rejection further caution against strong claims.
- **Measurement and omitted factors.** REM covers all formal channels, not only MFS. AMTS is a ratio of aggregates and conceals transaction mix and provider differences. Fees and Eid seasonality are omitted; their absence is a plausible source of the 2022 outliers and of the ARDL RESET failure.
- **Inference.** All the coefficients reported are the estimates of the conditional associations, not the causal effects. Future research should include extending the time series with more verified months available at Bangladesh Bank and applying logarithmic transformations and seasonal dummies.

5 CONCLUSION

The reason behind writing this paper is that there was a necessity to conduct empirical research to identify the determinants of average transaction amounts in Mobile Financial Services (MFSs) in Bangladesh. Though previous researchers have done some work on MFS use, financial inclusion, and transactions, the average amount per transaction has not been studied extensively. (Md Ali Ashraf, 2022d; Rashid, 2024b) Under this scenario, the current research makes use of time-series data from the months of January 2022 to February 2025 to examine the effect of active MFS accounts, formal inward remittance, and USD/BDT exchange rate on the average transaction size of MFSs.

From the results, there is an observed general upward trend in the average transaction size over the period of study. The basic OLS regression results reveal that total formal inward remittances exhibit a positive and statistically significant relationship with the average transaction size, but not active MFS accounts or the USD/BDT exchange rate. Nevertheless, the results from the ARDL bounds test present inconclusive evidence of the existence of any long-run relationship among the variables. The findings, therefore, suggest that formal inward remittances are possibly associated with changes in the average MFS transaction size, although the evidence provided is not enough to demonstrate a long-run relationship or causality. These results also have to be considered in the context of the short period of data and high correlation between active MFS accounts and the exchange rate.

In light of the fact that MFS continues to remain an important vehicle for digital financial inclusion in Bangladesh, gaining clarity about the transaction size can be helpful for the analysis of changes in the usage pattern over time for both academics and policymakers. Nonetheless, the study suffers from some shortcomings. Firstly, remittance variable is measured by the sum of all formal inward remittances and not the remittances received via the MFS channel only. Secondly, the summary measure of average transaction size does not consider the variation in average transaction sizes according to different services as well as transaction categories. More work in the future can be done for longer duration as well as for different seasons using comparable time-series data and other economic variables. Moreover, the data related to average MFS remittance can also be analyzed in future. In any case, this study presents some empirical insights into the determinants of average MFS transaction size in Bangladesh.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Disclosure of conflict of interest

The authors declare no conflict of interest.

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