Copernican Journal of Finance & Accounting

2021, volume 10, issue 4

e-ISSN 2300-3065
p-ISSN 2300-1240

Ashraf, M. A. (2021). The Impact of Mobile Financial Services on the Usage Dimension of Financial Inclusion: an Empirical Study from Bangladesh. Copernican Journal of Finance & Accounting, 10(4), 9–25. http://dx.doi.org/10.12775/CJFA.2021.012

Md Ali Ashraf*
Army Institute of Business Administration

THE IMPACT OF MOBILE FINANCIAL SERVICES ON THE USAGE DIMENSION OF FINANCIAL INCLUSION: AN EMPIRICAL STUDY FROM BANGLADESH

Keywords: MFS, financial inclusion, COVID-19.

J E L Classification: G20, G21, G23, E42, O33.

Abstract: A plethora of studies have investigated how Mobile Financial Services (MFS) induces financial inclusion around the world. However, research in the context of Bangladesh was rather limited. Hence, the primary objective of this paper was to investigate whether there was a statistically significant relationship between MFS and financial inclusion, measured by two time series variables – the number of MFS agents and number of registered MFS users per 100,000 of population, from 2017 to 2020. For analyzing the relationship between these two variables, multiple statistical methods were employed – including Vector Auto Regression, Cointegration and Granger Causality. The analysis revealed that both time series variables had an increasing trend with time. More importantly, the analysis specified that there was no statistically significant relationship between MFS, measured by the number of agents and the 'usage' dimension of financial inclusion, measured by number of registered MFS users in the context of Bangladesh. Moreover, the study was unable to find any significant changes in the trends of these variables that could be attributed to the COVID-19 pandemic in Bangladesh.

Date of submission: May 31, 2021; date of acceptance: August 5, 2021.

* Contact information: mdaliashrafaiba@gmail.com, Army Institute of Business Administration, Jalalabad Cantonment, Sylhet-3104, Bangladesh, phone: +8802996642777; ORCID ID: https://orcid.org/0000-0003-2146-6267.

Introduction

Technological inventions are disrupting the way businesses conduct their activities and, at the same time, transforming the means through which individuals engage in financial transactions. Information technology, combined with innovative communication systems and tools are bringing enormous changes throughout the globe. One of the major changes is occurring in the method people use for completing their financial activities. According to a study by World Bank (2012), only half of the global population maintained accounts with a formal financial institution. One of the commonly reported barriers of accessing financial services was the physical distance of service facilities (Demirguc-Kunt & Klapper, 2012). This is where mobile financial services come into consideration. By using mobile devices and networks, a huge number of unbanked individuals, especially low-income and rural consumers around the globe, are getting access to previously unavailable financial products and services (Kanobe, Alexander & Bwalya, 2017).

To understand how mobile devices are making financial services available to a significant portion of the global population, it is essential to understand two notions – Mobile Financial Services (MFS) and Financial Inclusion.

Mobile Financial Services (MFS) generally refers to the use of mobile or handheld communication devices to access banking services. Bangladesh Bank, the central bank of Bangladesh defines MFS as – "an approach to offering financial and banking services via mobile wireless networks which enables for user to execute banking transactions." (Bangladesh Bank, 2012).

The idea of financial inclusion is to enable mass people to engage in financial activities through official channels. Sarma and Pais (2011) defined financial inclusion as a process that ensures the ease of access, availability and usage of the formal financial system for all members of an economy, whereas Dev (2006) defined financial inclusion as the delivery of banking services at an affordable cost for a massive section of underprivileged members of an economy.

A substantial number of scholarly studies demonstrated that mobile financial services played a vital role in facilitating financial inclusion around the world, specially in underdeveloped and developing countries. This topic has been discussed further in the literature review section. Likewise, to understand how MFS is facilitating financial inclusion, it is imperative to look at some of the indicators that measures the extent of financial inclusion.

Indicators of financial inclusion can measure three dimensions of financial inclusion including 'Usage', 'Access' and 'Quality' (Pearce & Ortega, 2012). Access indicators show the depth of outreach of financial services such as number of bank branches or number of ATMs per 100,000 of the population, whereas usage indicators reflect how clients use financial services by looking at data such as number of adults with an account at a formal financial institution (Sarma, 2008; World Bank, 2015). As this paper will attempt to investigate whether MFS is enabling financial inclusion, a similar access indicator used in this paper will be the number of MFS agents. In terms of usage dimension, the selected indicator will be number of registered MFS users per 100,000 of population. In addition, according to a report by Business Finance for the Poor in Bangladesh (2021), a key policy initiative planned by the authorities of Bangladesh is to increase availability of MFS, or in other words, to increase the number of access points or MFS agents to get more people under a formal financial system. It may be noted at this point that, research on how MFS is contributing to financial inclusion in Bangladesh is rather limited. Hence, one of the objectives of this paper is to investigate whether a particular dimension of MFS, namely the number of agents that provide mobile financial services, can affect the number of users of such services – as indicated by the number of registered MFS users in Bangladesh. For this purpose, four years of monthly time series data starting from January, 2017 of these two variables were used.

An additional objective of this paper is to have a deeper look at the two variables mentioned earlier and their behavior over the same time period in an attempt to discover how the pandemic affected the trends of these variables.

By concentrating on these two objectives, the paper not only aims to provide valuable insights for policy makers and entities that are interested in enhancing financial inclusion, but also helps in understanding the trend of MFS and financial inclusion in Bangladesh, and if the COVID-19 pandemic had an impact on the trend.

Literature Review

Ensuring access to financial services for people from every socio-economic class of a nation is imperative for economic growth. Indeed, it has been shown that financial inclusion has positive effect on the economic growth (Iqbal & Sami, 2017; Kim, Yu & Hasan, 2018; Sharma, 2016). Moreover, financial in-

clusion contributes to the development of society and lessens the gap between people from different financial tiers. In addition, as more people start availing financial services, their transactions boost money flow in the economy (Damodaran, 2013). It has also been argued that the benefits of financial inclusion reach beyond its users. Ozili (2018) stated that MFS providers and government, both benefit from a population that is financially inclusive.

People that remain excluded from financial inclusion suffer from poverty and economic instability. Those who are unable to access financial services, face multi-dimensional social exclusion as well (Devlin, 2005). It has also been shown that people who are unable to access financial services incur additional expenses in managing household resources. Besides, a population facing financial exclusion often have difficulties in getting employment (Corr, 2006). Additionally, businesses often fail to reap the benefits of MFS as it incurs high transaction costs (Kabir, Sadrul Huda & Faruq, 2020).

As discussed earlier, financial inclusion is crucial for economic development, and it is essential to look at how mobile devices are contributing towards financial inclusion. Smartphones are becoming a household item for a significant share of the global population. Along with relatively cheap mobile internet services, smartphone users, particularly individuals fighting with poverty or those from remote areas, are availing banking and financial services that were previously inaccessible. A significant number of studies have shown evidence in favor of this phenomenon. Huge investments have been made in infrastructures and applications that use mobile phones to deliver financial services, in order to bring the poor and unbanked population under the umbrella of financial inclusion (Porteous, 2006; Vodafone, 2007; Bangens & Soderberg, 2008; World Bank, 2012). Likewise, Horne (1985), Frame and White (2004) found that one form of financial innovation is mobile technology, and such innovations have multi-dimensional effects. Innovative mobile technologies improve efficiency and effectiveness of the financial system and thus, improves financial inclusion. Additionally, one study indicated that MFS is responsible for increasing the volume and frequency of remittances received by users, and a small increase in savings by such users (Alampay, Moshi, Ghosh, Peralta & Harshanti, 2017). Kim, Zoo, Lee and Kang (2018), Mbogo (2010) also argued that delivery of financial services by means of mobile devices enables financial inclusion.

Nevertheless, even in this era of information and communication technology, a huge portion of the global population remains unbanked. At the beginning of 21st century, half of the global population had no access to banking services

(Chaia, Dalal, Goland, Gonzalez, Morduch & Schif, 2009). There was no significant change in this parameter as indicated by World Bank (2012). Although a newer survey by World Bank (2018) reported that the number of financially included individuals are increasing, about one-third of the population still remains unbanked. The situation is not very different in the case of Bangladesh. According to World Bank, in 2011, only 31.7% of people in Bangladesh had access to financial services. In 2014, this number declined slightly to 31%, and finally reached 50% in 2018. In contrast, almost 70% people of South Asia had an account that provided financial services in 2018 (World Bank, 2018). Hence, it can be said that there is a huge potential to advance financial inclusion through mobile banking in Bangladesh. As mentioned earlier, policy makers of Bangladesh are emphasizing on creating more access points to integrate more people in a formal financial system. However, a review by Duncombe and Boateng (2009) asked for additional empirical investigation to verify such causal link. Furthermore, a study conducted in Bangladesh by Siddik, Sun, Yanjuan and Kabiraj (2014) pointed out that MFS providers should be more concerned about the factors that affect behavioral intention of people in availing and continuously using such services. In order to get more people under a formal financial system, the suggested policy according to the study was to enhance customer satisfaction through improving and delivering financial services via mobile devices. These studies lay the foundation of the main objective of the study – to check if increasing the number of MFS agents' results in increased number of MFS users.

Methodology

The first task was to examine the trends of the two time series variables pertinent to MFS usage and financial inclusion, by using monthly data from January, 2017 to December, 2020, obtained from Bangladesh Bank MFS dataset (Bangladesh Bank, 2021). These datasets had time series data on variables such as – number of MFS agents, number of registered and number of active MFS users, total number of transactions, the volume of average daily transactions, and product wise information of MFS transactions. To address the objective of this study, only two of the time series variables with 48 observations were selected, the first one being the total number of MFS agents and the second one being the total number of registered MFS users.

Next, it was checked whether there was any statistically significant relation between the time series variables – total number of MFS agents and total number of registered MFS users. Multiple statistical methods including Vector Auto Regression, Cointegration and Granger Causality for analyzing relationship of time series data were used in the process. The statistical application EViews was used for conducting all the analyses.

Stationarity

At the beginning of the analysis, data was checked for stationarity through visual inspection and the Augmented Dickey–Fuller (ADF) test. ADF test is widely used to check for unit roots in time series variables. A preliminary visual inspection revealed increasing trends for both variables. Then, the ADF test checked for unit root in the time series, which was conducted at 90, 95 and 99 percent confidence level on both time series variables at level and at first difference. Lag length for the test was automatically selected based on Schwarz information criterion (SIC). It is imperative to note that both time series had unit roots and were non-stationary with constant, with constant and trend, and without constant & trend, and they became stationary at first difference according to the ADF test (table 1). In other words, the variables were non-stationary at level and integrated of same order - I(1).

Cointegration

Cointegrating variables are said to have long run equilibrium relationship, meaning they will not drift apart if there is disturbance. In empirical literature, cointegration between variables is frequently checked by using the Johansen Cointegration test. Hence, cointegration between the variables under study was checked by using Johansen Cointegration test (Johansen, 1988). Before checking for cointegration, an initial Vector Autoregressive (VAR) model was estimated with both time series at level. It may be mentioned here that VAR is a statistical model to analyze relationship between time series variables. After estimating the initial VAR, tests were conducted to select an appropriate lag length for checking cointegration.

Johansen Cointegration test was then conducted based on five different sets of assumptions for allowing “No deterministic trend”, “Linear deterministic

trend" and "Quadratic deterministic trend" in the cointegrating equation. The test revealed that there was no cointegration between the two time series variables. Table 2 provides a summary of the cointegration test.

Vector Autoregressive Model

Vector autoregression (VAR) is a statistical model that is frequently used to examine the relationship between multiple time series variables.

Impulse response functions were then projected in the context of the developed VAR model by using Cholesky Decomposition method with dof adjusted. Since the main objective of the paper was to investigate whether number of MFS agents can influence the number of MFS users, number of MFS agents was first in Cholesky ordering followed by number of registered MFS users. Then, impulse response graphs were analyzed to check how changes in number of MFS agents impact the number of registered MFS users.

In addition to the impulse response function, forecast error variance decomposition was used to investigate how the change in number of MFS agents explains variation in number of registered MFS users.

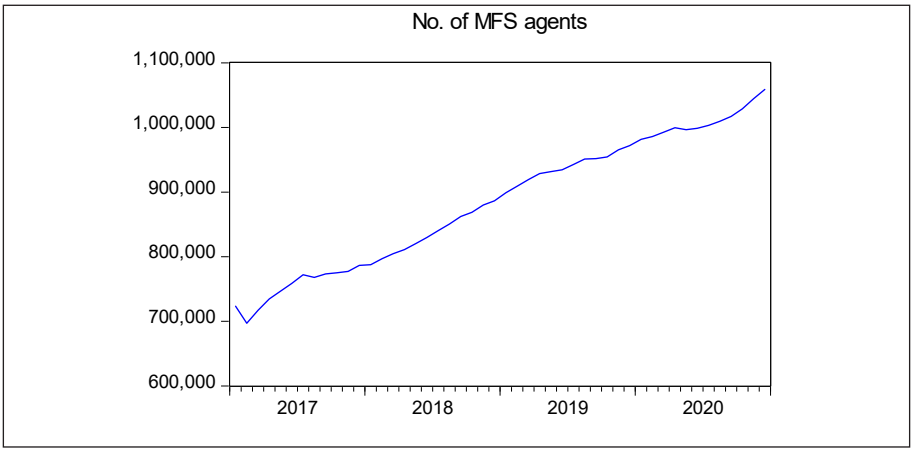
Granger Causality Test

Additionally, Granger causality test was used to check whether any of the variable Granger caused the other variable. Granger causality test is a statistical hypothesis test that examines if one time series can predict the variability in another time series (Granger, 1969). The parameters for this test were based on the optimal VAR model estimated during the previous step.

Results & Discussion

During the time period of 2017 to 2020, both number of MFS agents and number of registered MFS users were increasing steadily. In January 2017, the number of MFS agents was merely 723,112; which increased by more than 46% to 1,058,897 by December of 2020. This increasing trend is clearly visible in chart 1. During the same time period, number of registered MFS users per 100,000 individuals increased to 993 from 419, an increase of more than 136% (chart 2).

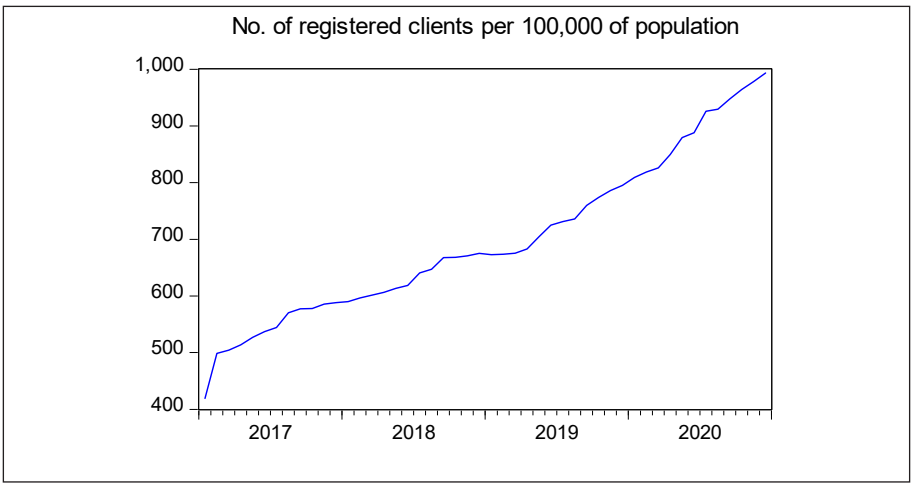
Chart 1. Number of MFS agents



S o u r c e : own study based on Bangladesh Bank MFS dataset (Bangladesh Bank, 2021).

From the charts, it is also visible that both time series shows an increasing trend, but no apparent seasonality was revealed, nor was there any indication of cyclic behavior. From visual inspection of the charts, it can also be stated that both time series were non stationary.

Chart 2. Number of registered MFS users per 100,000 of population



S o u r c e : own study based on Bangladesh Bank MFS dataset (Bangladesh Bank, 2021).

Impact of COVID-19

Like all other countries in the world, Bangladesh also faced the consequence of the COVID-19 pandemic. On March 8, 2020, the first case of COVID-19 was detected in Bangladesh, and the government initiated a countrywide shutdown on 26 March, 2020. As movement of individuals was restricted, commercial activities were suspended and formal financial service organizations like banks remained inactive, it was assumed that MFS activities will see a substantial rise (Islam, Talukder, Siddiqui & Islam, 2020). Although there were changes in the trends of these variables after the month of March, according to data 6 month prior and after March 2020, the evidence was inconclusive to attribute such changes to the pandemic. During the 48 months analyzed in the study, number of agents had an average growth rate of 0.82% with a standard deviation of 0.92%, while number of registered users had an average growth rate of 1.89% with a standard deviation of 2.78%. In fact, the monthly average growth rate of the number of agents was 0.60% during the six months prior to the first case detection, whereas this average growth rate dropped down to 0.40% during the six months afterwards. In case of number of registered users, during the six months prior to pandemic, the growth in registered users were 1.79%, and 2.33% percent during the six months after march. When compared to the standard deviations, it can be stated that there were no abnormal changes in the growth rate after March 2020.

Stationarity

As discussed earlier, visual inspection of both time series revealed that both exhibit increasing trend and are non-stationary. This finding was also supported by the ADF test of stationarity, results of which are presented in table 1. Both variables had a unit root and thus were non-stationary at level. The ADF test also showed that at 95% confidence level, both variables became stationary at first difference.

Table 1. Unit Root Test Results Table (ADF)

Null Hypothesis: the variable has a unit root			
	At Level		
		NO__OF_REGISTERED_CLIENTS_PER_100000	**NO__OF_MFS_AGENTS**
With Constant	t-Statistic	0.0144	-1.2596
	Prob.	***0.9550***	***0.6403***
		no	no
With Constant & Trend	t-Statistic	-1.2911	-2.6531
	Prob.	***0.8781***	***0.2601***
		no	no
Without Constant & Trend	t-Statistic	6.1373	6.9115
	Prob.	***1.0000***	***1.0000***
		no	no
	At First Difference		
		d(NO__OF_REGISTERED_CLIENTS_PER_100000)	**d(NO__OF_MFS_AGENTS)**
With Constant	t-Statistic	-4.4037	-9.4196
	Prob.	*0.0010*	*0.0000*
		***	***
With Constant & Trend	t-Statistic	-10.8314	-9.3775
	Prob.	***0.0000***	***0.0000***
		***	***
Without Constant & Trend	t-Statistic	-2.3026	-1.5496
	Prob.	***0.0221***	***0.1127***
		**	no

Notes:
a: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1% and (no) Not Significant
b: Based on SIC
c: Probability based on MacKinnon (1996) one-sided p-values.

S o u r c e : own study based on Bangladesh Bank MFS dataset (Bangladesh Bank, 2021).

Co- integration

To check for cointegration between the two time series variables, Johansen Cointegration test was used in this study. The results of the test (table 2) indicated that at the selected lag length of 2 specified by AIC and FPE, there was no cointegration. Both Trace and Maximum Eigenvalue tests showed similar results indicating the absence of any cointegration among the two time series variables under investigation.

Table 2. Summary of Cointegration test

Date: 03/17/21 Time: 13:59
Sample: 2017M01 2020M12
Included observations: 45
Series: NO__OF_MFS_AGENTS NO__OF_REGISTERED_CLIENTS_PER_100000
Lags interval: 1 to 2

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept, No Trend	Intercept, No Trend	Intercept, No Trend	Intercept, Trend	Intercept, Trend
Trace	1	0	0	0	0
Max-Eig	1	0	0	0	0

* Critical values based on MacKinnon-Haug-Michelis (1999).

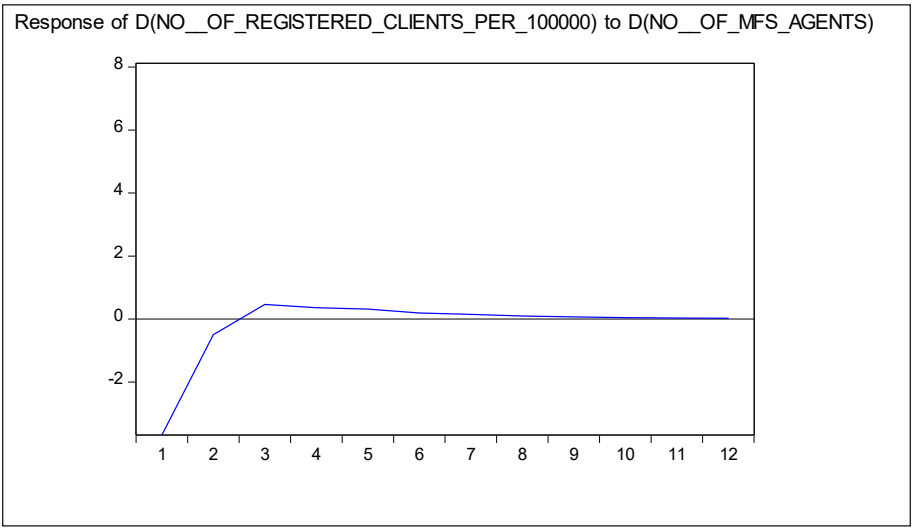
S o u r c e : own study based on Bangladesh Bank MFS dataset (Bangladesh Bank, 2021).

Vector Autoregressive Model

Impulse Response Analysis of VAR model

Impulse response analysis investigates how a time series variable responds to a shock in another time series variable. Based on the VAR model developed in the previous step, four impulse response graphs were produced. Since the objective of the study was to check how a change in number of MFS agents changes the number of registered MFS users, among the four graphs, only the one that depicts the response of number of registered users to a shock in number of agents is highlighted here (chart 3).

Chart 3. Impulse response: response of number of registered MFS users to a change in number of MFS agents



S o u r c e : own study based on Bangladesh Bank MFS dataset (Bangladesh Bank, 2021).

From the graph, it is evident that initially there is a negative impact on the number of registered MFS users, as indicated by the line starting below 0, when there is a shock in the number of MFS agents. Eventually, this negative impact fades away as the line moves from below 0 to above 0 and then merges into 0. One way to interpret this finding is that, when the number of MFS agents goes up by 1 unit, during the next two months, the number of registered MFS users per 100,000 of population goes down by more than 2 units. During the next 6 months, number of registered MFS users is marginally positively affected – after which, this effect starts to decay, eventually becoming zero, for 1 unit of positive change in number of MFS agents.

Forecast Error Variance Decomposition of VAR Model

In a similar manner to Impulse Response analysis, forecast error variance decomposition (FEVD) shows how much of the variability of one time series is caused by shocks in another time series. By looking at the variance decomposition of number of registered clients in table 3, it can be stated that regardless of

short or long term, number of MFS agents does not significantly affect the number of registered MFS users. For instance, during the 6th period, only about 16% of the forecast error variance in number of registered users was due to number of MFS agents, which was deemed insignificant.

Table 3. Forecast Error Variance Decomposition

Variance Decomposition of D(NO__OF_MFS_AGENTS):			
Period	**S.E.**	**D(NO__OF_MFS_AGENTS)**	**D(NO__OF_REGISTERED_CLIENTS_PER_100000)**
1	4342.483	100.0000	0.000000
2	4589.611	99.45571	0.544294
3	4715.778	96.00657	3.993425
4	4732.140	95.80261	4.197390
5	4755.958	95.08286	4.917138
6	4760.689	94.99087	5.009126
7	4765.463	94.85346	5.146536
8	4766.764	94.82494	5.175063
9	4767.772	94.79699	5.203013
10	4768.110	94.78912	5.210883
11	4768.331	94.78316	5.216845
12	4768.415	94.78112	5.218883
Variance Decomposition of D(NO__OF_REGISTERED_CLIENTS_PER_100000):			
Period	**S.E.**	**D(NO__OF_MFS_AGENTS)**	**D(NO__OF_REGISTERED_CLIENTS_PER_100000)**
1	8.894830	16.98720	83.01280
2	8.938255	17.12442	82.87558
3	9.131167	16.67070	83.32930
4	9.140166	16.79548	83.20452
5	9.169914	16.80620	83.19380
6	9.173320	16.83979	83.16021
7	9.178825	16.84695	83.15305
8	9.179872	16.85441	83.14559
9	9.180970	16.85662	83.14338

Table 3. Forecast...

Variance Decomposition of D(NO__OF_REGISTERED_CLIENTS_PER_100000):			
Period	**S.E.**	**D(NO__OF_MFS_AGENTS)**	**D(NO__OF_REGISTERED_CLIENTS_PER_100000)**
10	9.181261	16.85828	83.14172
11	9.181492	16.85886	83.14114
12	9.181568	16.85924	83.14076
Cholesky Ordering: D(NO__OF_MFS_AGENTS)			
D(NO__OF_REGISTERED_CLIENTS_PER_100000)			

S o u r c e : own study based on Bangladesh Bank MFS dataset (Bangladesh Bank, 2021).

Granger Causality Test

Granger causality test between the two variables was conducted with the same parameters of the VAR model discussed in the previous section. From the results of the test (table 4), it was concluded there was no Granger causality among the variables, as indicated by a p value of higher than 0.05. It may also be mentioned here that none of the variable Granger caused the other variable.

Table 4. VAR Granger Causality/Block Exogeneity Wald Tests

Date: 03/18/21 Time: 20:13 Sample: 2017M01 2020M12 Included observations: 45			
Dependent variable: D(NO__OF_MFS_AGENTS)			
Excluded	Chi-sq	df	Prob.
D(NO__OF_REGISTERED_CLIENTS_PER_100000)	3.127916	2	0.2093
All	3.127916	2	0.2093
Dependent variable: D(NO__OF_REGISTERED_CLIENTS_PER_100000)			
Excluded	Chi-sq	df	Prob.
D(NO__OF_MFS_AGENTS)	1.243859	2	0.5369
All	1.243859	2	0.5369

S o u r c e : own study based on Bangladesh Bank MFS dataset (Bangladesh Bank, 2021).

Conclusion

During the period of 2017 to 2020, Bangladesh realized a positive growth in the number of MFS agents and in the number of registered MFS users, and the COVID-19 pandemic that started in March of 2020 did not cause any significant change in the increasing trend of these two variables.

Although both the number of agents and number of users were steadily increasing simultaneously, however, in this particular case correlation did not lead to causation. The study was unable to find and long-term cointegrating relationship between these two variables, nor was it able to find Granger causality. Moreover, Impulse response and variance error decomposition methods in the VAR context revealed that increasing the number of MFS agents initially had a negative impact on the number of MFS users, followed by a marginal positive impact for a couple of months. Ultimately, any effect of increasing the number of MFS agents decayed out rather rapidly.

Hence, it was concluded that increasing access to mobile financial services may not necessarily lead to more people being financially inclusive. The policy makers should refrain from solely relying on increasing the number of MFS access points or agents.

What could be a better option to improve financial inclusion in Bangladesh? The answer to this question requires additional investigation. One potential option based on earlier research is that, rather than increasing the number of MFS access points at this point, it would be relatively more beneficial to focus on increasing customer satisfaction by improving the services offered by MFS providers.

References

Alampay, E.A., Moshi, G.C., Ghosh, I., Peralta, M.L., & Harshanti, J. (2017). *The impact of mobile financial services in low- and lower middle-income countries.* Ontario: International Development Research Centre.

Bangens, L., & Soderberg, B. (2008). *Mobile banking: financial services for the unbanked?* Stockholm: The Swedish Programme for ICT in Developing Regions.

Bangladesh Bank (2012). Mobile financial services in Bangladesh: an overview of Market Development, https://www.bb.org.bd/pub/research/policypaper/pp072012.pdf (accessed: 11.01.2021).

Bangladesh Bank (2021). Mobile Financial Services (MFS) comparative summary statement, https://www.bb.org.bd/fnansys/paymentsys/mfsdata.php (accessed: 07.01.2021).

Business Finance for the Poor in Bangladesh (2021). A study on Mobile Financial Services for MSEs in Bangladesh: Prospects and Challenges, https://static1.squarespace.com/static/5a84894df14aa1f379d18290/t/5aa3f91371c10b34ddbdd701/1520695608351/BFP-B+policy+study+mobile+financial+services.pdf (accessed: 1.11.2021).

Chaia, A., Dalal, A., Goland, T., Gonzalez, M.J., Morduch, J., & Schif, R. (2009). *Half the World is Unbanked.* New York: Financial Access Initiative.

Corr, C. (2006). *Financial Exclusion in Ireland*: *An exploratory study and policy review.* Dublin: Combat Poverty Agency.

Damodaran, A. (2013). Financial Inclusion: Issues and Challenges. *AKGEC International Journal of Technology,* 4(2), 54-59.

Demirguc-Kunt, A., & Klapper, L. (2012). Measuring financial inclusion: The global findex database. *World Bank Policy Research Working Paper*, 6025, 1-58.

Dev, S.M. (2006). Financial Inclusion: Issues and Challenges. *Economic and Political Weekly*, 41(41), 4310-4313. http://dx.doi.org/10.2307/4418799.

Devlin, J.F. (2005). A Detailed Study of Financial Exclusion in the UK. *Journal of Consumer Policy*, 28(1), 75-108. http://dx.doi.org/10.1007/s10603-004-7313-y.

Duncombe, R., & Boateng, R. (2009). Mobile Phones and Financial Services in Developing Countries: a review of concepts, methods, issues, evidence and future research directions. *Third World Quarterly,* 30(7), 1237-1258. http://dx.doi.org/10.1080/01436590903134882.

Frame, W.S., & White, L.J. (2004). Empirical Studies of Financial Innovation: Lots of Talk, Little Action? *Journal of economic literature*, 42(1), 116-144. http://dx.doi.org/10.1257/002205104773558065.

Granger, C. (1969). Investigating Causal Relations by Econometric Models and Cross-spectral Methods. *Econometrica,* 37(3), 424-438. http://dx.doi.org/10.2307/1912791.

Horne, J.C. (1985). Of financial innovations and excesses. *The Journal of Finance,* 40(3), 620-631. http://dx.doi.org/10.1111/j.1540-6261.1985.tb04984.x.

Iqbal, B.A., & Sami, S. (2017). Role of banks in financial inclusion in India. *Contaduría y Administración,* 62(2), 644-656. http://dx.doi.org/10.1016/j.cya.2017.01.007.

Islam, M.T., Talukder, A.K., Siddiqui, M.N., & Islam, T. (2020). Tackling the COVID-19 pandemic: The Bangladesh perspective. *Journal of Public Health Research*, 9(4), 389-397. http://dx.doi.org/10.4081/jphr.2020.1794.

Johansen, S. (1988). Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control,* 12(2-3), 231-254. http://dx.doi.org/10.1016/0165-1889(88)90041-3.

Kabir, M.H., Sadrul Huda, S., & Faruq, O. (2020). Mobile Financial Services in the context of Bangladesh. *Copernican Journal of Finance* & *Accounting*, 9(3), 83-98. http://dx.doi.org/10.12775/CJFA.2020.013.

Kanobe, F., Alexander, P.M., & Bwalya, K.J. (2017). Policies, regulations and procedures and their effects on mobile money systems in Uganda. *The Elec-tronic Jour-*

nal of Information Systems in Developing Countries, 83(1), 1-15. http://dx.doi.org/10.1002/j.1681-4835.2017.tb00615.x.

Kim, D.-W., Yu, J.-S., & Hasan, M.K. (2018). Financial inclusion and economic growth in OIC countries. *Research in International Business and Finance,* 43, 1-14. http://dx.doi.org/10.1016/j.ribaf.2017.07.178.

Kim, M., Zoo, H., Lee, H., & Kang, J. (2018). Mobile financial services, financial inclusion, and development:A systematic review of academic literature. *The Electronic Journal of Information Systems in Developing Countries,* 84(5), 1-17. http://dx.doi.org/10.1002/isd2.12044.

Mbogo, M. (2010). The impact of mobile payments on the success and growth of micro-business: The case of M-Pesa in Kenya. *Journal of Language, Technology & Entrepreneurship in Africa*, 2(1), 182-203. http://dx.doi.org/10.1057/9781137574633_6.

Ozili, P.K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review,* 18(4), 329-340. http://dx.doi.org/10.2478/fiqf-2020-0023.

Pearce, D., & Ortega, C.R. (2012). Financial Inclusion Strategies Reference Framework: World Bank, https://documents1.worldbank.org/curated/en/801151468152092070/pdf/787610WP0P144500use0only0900A9RD899.pdf (accessed: 02.11.2020).

Porteous, D. (2006). *The enabling environment for mobile banking in Africa.* London: Department for International Development.

Sarma, M. (2008). Index of Financial Inclusion. *ICRIER Working Paper*, 215, 1-26.

Sarma, M., & Pais, J. (2011). Financial Inclusion and Development. *Journal of International Development,* 23(5), 613-628. http://dx.doi.org/10.1002/jid.1698.

Sharma, D. (2016). Nexus between financial inclusion and economic growth. *Journal of Financial Economic Policy,* 8(1), 13-36. http://dx.doi.org/10.1108/JFEP-01-2015-0004.

Siddik, M.N., Sun, G., Yanjuan, C., & Kabiraj, S. (2014). Financial Inclusion through Mobile Banking: A Case of Bangladesh. *Journal of Applied Finance & Banking*, 4(6), 109-136.

Vodafone (2007). The transformational potential of m-Transactions. *The Vodafone Policy Paper Series*, 6, 1-52.

World Bank (2012). *Information and Communications for Development 2012*: *Maximizing mobile.* Washington: World Bank Group Publications.

World Bank (2012). *The little data book on financial inclusion.* Washington: World Bank Group Publications.

World Bank (2015). *How to Measure Financial Inclusion.* Washington: World Bank Group Publications.

World Bank (2018). *The Little Data Book on Financial Inclusion 2018.* Washington: World Bank Group Publications.