“Payments transition in India – consumer preferences and policy shifts”

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PAYMENTS TRANSITION IN INDIA – CONSUMER PREFERENCES AND POLICY SHIFTS

Abstract

Economic growth should be supplemented by an efficient payment and settlement system. Many attempts have been made to improve the efficiency of payment and settlement system in India. Especially the effort has been in terms of promoting digital economy. But the stickiness to payments through currency notes by the people has had a moderating effect on these efforts. The policy shift of Government of India towards demonetization of higher denomination currency notes has given thrust to digital payments. The study hypothesizes that post demonetization, the payment and settlement system indicators would show moderate to high deviation from the volume and value that can be forecasted using the historical data. Using Automatic ARIMA Forecasting in EViews, the forecasted values for the indicators for a period from November 2016 to March 2018 were estimated based on the historical data of the indicators from April 2011 to October 2016. The forecasted values of the indicators are then compared with the actual values of the indicators to see if they differ significantly by using paired t-test. The study finds evidence to suggest that the policy of demonetization and resultant reduced supply of currency notes has provided impetus to the Indian public to move towards digital platforms, and the increased supply of currency notes thereafter has not led to complete reversal of this shift in this change in consumer preference. This leads to the conclusion that through effective policy shifts, consumer preferences can be altered, and the Indian economy could become a less cash economy.

Keywords India, banking, demonetization, less cash economy, cashless economy, payment and settlement system

JEL Classification E41, E42, E44, E47

INTRODUCTION

The changes ushered through the policies of Globalization, Privatization and Liberalization in 1991–1992 have resulted in a sea change in the economic landscape of India and the Indian economy has grown exponentially following the economic reforms put in place in 1991–1992. The growth in the volume of economic activity needs the support of the Payment and Settlement Systems practiced in the country and its interaction with the world market. Reserve Bank of India (RBI), as the Central Bank of the country, has been developing the payment and settlement system for the country, that is robust, secure, and efficient in its functioning. Payment and Settlement Systems Act, 2007 (PSS Act, legislated in December 2007) and the Payment and Settlement System Regulations, 2008 (effective from August 12, 2008) framed thereunder regulate the Payment and Settlement Systems in India. Figure 1 depicts the payment systems and their components in India.

Reserve Bank of India has been putting efforts towards migrating to electronic payments and reduce the paper based transactions. 1,014 million transactions were paper based in 2002–2003 against 173 million electronic transactions. By the period 2005–2006, paper based transactions rose to 1,289.5 million, while electronic transactions rose to 1,130 million. In

Source: Compiled by authors based on the information available in Reserve Bank of India (2018b).

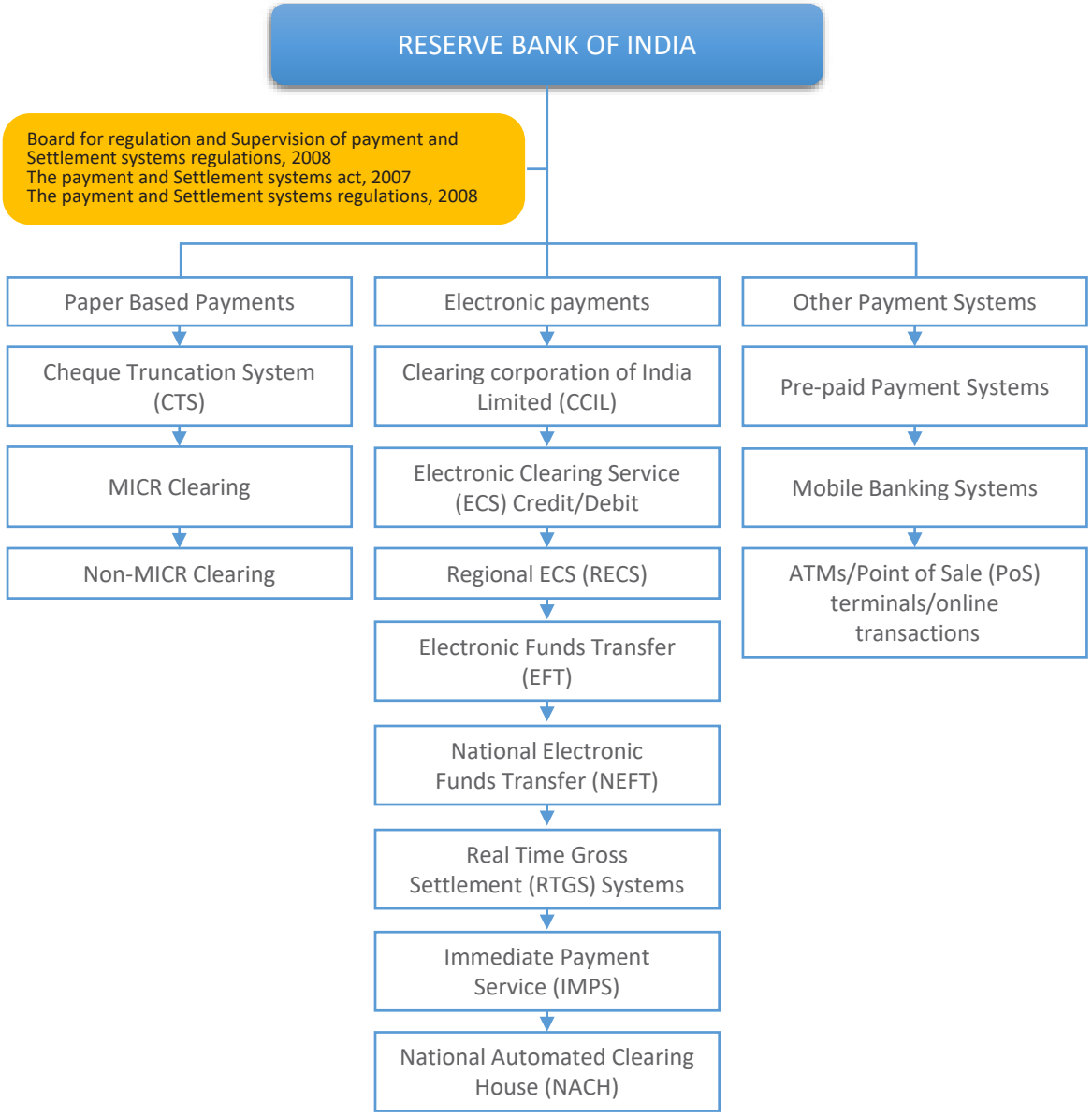

Figure 1. Payment system categories in India

2010–2011, 1,387.4 million retail transactions took place through paper based payments amounting to Rs. 101,341.3 billion. The volume and value of paper based retail transactions decreased to 1,096.4 million and Rs. 81,861 billion in the year 2015–2016, while total retail payments increased from 2,295.9 million transactions amounting to Rs. 114,428.2 billion to 6,945.2 million transactions amounting to Rs. 177,752 billion during the same period, clearly indicating the decline in the use of paper based payment system. The impetus for the use of electronic medium of transactions further enhanced due to demonetization of higher denomination currencies – Rs. 500 and Rs. 1,000 – by the Government of India, announced on November 8, 2016 (HuffPost, 2016; Reserve Bank of India, 2016). This also encouraged the discussion of converting Indian society into a less cash/cashless society – a society that relies less on the currency notes and coins for transactions. It needs to be understood that currency notes and coins are forms of money. Money, over the long history of its existence, has been taking different forms at different times. Electronic or digital payments is the latest form (digitized form) that money has taken, as a means of payment and settlement of dues, that can substitute and is substituting its older form (of currency notes and coins).

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Total currency in circulation in the Indian economy was Rs. 17,977 billion on November 4, 2016, which reduced to its half at Rs. 8,980.17 billion by January 6, 2017 following demonetization. Even though the monetary value was safe, in banks, the value needed to be transferred without using or by using the limited volume of currency notes. This obviously necessitated the use of banking channels for settlement of transactions in lieu of currency notes. This meant that the transactions that took place without the role of banking channels prior to demonetization had to be done through the banking channels. Over the period, the circulation of currency notes has increased in the economy with the introduction of new currency notes (denominations of Rs. 200, Rs. 500 and Rs. 2,000). Total currency in circulation has, approximately, reached the pre-demonetization level in March 2018 – on March 2, 2018, total currency in circulation was Rs. 17,900.67 billion (Dubbudu, 2017; Nayak, 2018; Reserve Bank of India, 2018c).

1. LITERATURE REVIEW

The studies related to payment and settlement systems have mainly concentrated on the technological aspects of the system, quality of service, factors influencing the adoption of the newer forms of payment systems and the risk perception of internet-based payment systems. There are a few studies that tried to analyze the impact of technology adoption and demonetization on the payment and settlement system in India.

Bhardwaj and Kaushik (2018) have discussed the basic model of Unified Payment Interface (UPI) and its usage in different scenarios. Abad Peiro, Asokan, Steiner, and Waidner (1998) have suggested a framework that allows applications to be developed independent of specific payment systems which are necessitated by the introduction of a variety of different and incompatible payment systems. Dhamija and Dhamija (2017) gave insights into the implementation and feasibility aspects of UPI and how it is better than the earlier systems that are prevailing (even) today.

Another aspect that has been studied is the dimensions of quality in mobile payment service in India (Singh, Grover, et al., 2017). The study has identified that usefulness and ease of use, perceived concern about trust and security have an impact on the perceived quality of mobile payment service in India by the consumers. Siu and Mou (2005), on the other hand, have identified that credibility, efficiency and problem handling play a dominant role in determining the service quality perceptions of customers on internet banking in Hong Kong, while they found that the future consumption is dependent on security and efficiency. N. Singh, Srivastava, and Sinha (2017) have studied the impact of customer's perception, satisfaction and preference on the usage rate of mobile wallets in North India. The study finds that there exists a strong correlation between consumers' perception, preferences and satisfaction. In a study of rural customers' satisfaction from e-banking in India, Sharma (2012) has identified that though rural customers satisfied with the services, they are apprehensive of the security measures and compensations provided in case of fraudulent transactions. The study also has identified that the lower level of education of rural population affects their usage of e-banking services due to language barriers and unawareness of the availability of multiple language interfaces.

In a study specific to the Allahabad City of India, Sahu and Singh (2017) have identified thirteen factors that will influence the successful transformation of the economy from cash based to cashless economy. The factors that were identified by the study are anonymity, bank involvement, drawer, infrastructure, mobility, parties, popularity, range of payment, risk, security, transfer limit, transfer mode, and transfer time. Similarly, Chandrasekhar and Ghosh (2017) observe that higher costs, the possibilities of loss of privacy, fraud, identity theft and surveillance are major concerns of digital transactions. The safety concerns in using technology platforms in banking transactions have been addressed, to some extent, by Singh et al. (2017) in their comparative study of India and other SAARC countries. The study has found that India has a better mechanism to counter credit risk, liquidity risk and operational risk in the payment system though Indian system is most permissive among the SAARC countries regarding the crime of computer hacking.

Roy and Sahoo (2016) considered the areas in which the payment and settlement system in India can

be improved with special reference to liquidity risk, operational risks, access criterion and transparency. The paper has also highlighted the opportunities and challenges in India in this context. In a related study, Dhananjay and Chandra (2015) have tried to test the difference in products related to the electronic medium of payment and settlement in India before and after the formation of National Payments Corporation of India (NPCI) and have found that there exists significant difference.

The influence of demonetization has been widely debated post the announcement in November 2016. While there were reports stating the increase in digital transactions (Maji, 2017; PTI, 2017) and growth in cashless transactions, the reports also suggest that the growth is only in small components of the larger ecosystem of digital transactions (Wilson, 2017). It has also been observed by reports (Waghmare, 2017) that the digital transactions are receding and re-monetization is taking place at a faster phase. Bhattacharya and Singh (2018) have observed that the sharp decline in the currency in circulation post-demonetization was followed by high weekly growth rate in currency in circulation when compared to normal periods during January and February 2017. Post June 2017, the growth and seasonal pattern of growth rates in currency in circulation were like the pre-demonetization period. Studying the adoption of digital payment system during the period of demonetization in India based on the unified theory of acceptance and use of technology (UTAUT2) and innovation resistance theory, Sivathanu (2018) found that the actual usage of digital payment systems is affected by the behavioral intention to use and innovation resistance. At the same time, Sivathanu (2018) has identified that stickiness to cash payments has a moderating effect on the behavioral intention to use and the actual usage of digital payment systems in India.

The above review of existing literature on the payment and settlement system, concentrating on Indian context, suggests that there have been many studies addressing specific aspects of the payment and settlement system, risk perceptions and challenges in the process. The studies on the usage trends in the important indicators of payment and settlement system and evolution of payment and settlement system in India towards transforming Indian economy towards a less cash society has not been studied with conclusive results and in the context of demonetization. The present study will try to bridge this gap, especially in the context of demonetization, keeping in mind the discussions in the preceding literature review.

2. METHODS

The present study looks at the reflection of demonetization of high denomination currency notes on November 8, 2016 in the Payment and Settlement System indicators as a result of non-availability of currency notes in circulation for the settlement of transactions. The study tries to find out if there is any significant shift from the use of currency notes to electronic medium for settlement of transactions following demonetization. This will essentially help us to understand if the policy shifts like demonetization can bring about transistion in the payment systems and convert the Indian economy into cashless/less cash economy. The results will also help in exploring the possibilities of similar action in countries that share similar economic set-up with India.

The study hypothesizes that post demonetization, the payment and settlement system indicators would show moderate to high deviation from the volume and value that can be forecasted using the historical data for the indicators. To test if the hypothesis can be accepted, data pertaining to the identified indicators have been collected from April 2011 to March 2018. Using Automatic ARIMA Forecasting in EViews, the forecasted values for the indicators for the period of seventeen months, from November 2016 to March 2018 [referred to as post-demonetization period], were estimated based on the historical data of the indicators from April 2011 to October 2016 [referred to as pre-demonetization period]. The forecasted values of the indicators are then compared with the actual values of the indicators to see if they differ significantly by using paired t-test.

3. INDICATORS AND TRENDS

Economic growth of a country will be accompanied by an upward trend in the volume and value of transactions taking place in the economy. India being an emerging economy, growing at 7.7

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percent year-on-year in the first three months of 2018, there is a definite upward trend in the payment and settlement system indicators. The present study has identified seven indicators of payment and settlement system in India, which are directly used by people for their transactions, for the analysis. The selected indicators are Real Time Gross Settlement (RTGS) Customer Transactions, Electronic Funds Transfer (EFT) and National Electronic Funds Transfer (NEFT) Transactions, Credit Card Usage at ATMs, Debit Card Usage at ATMs, Credit Card Usage at Point of Sale (PoS) Terminals, Debit Card Usage at PoS Terminals and M-Wallet Transactions. These payment and settlement systems help people to settle their economic transactions of different value. RTGS system is used to settle customer transactions of above Rs. 2 Lakh, NEFT system allows people to settle one-to-one fund transfer requirements, PoS Terminals allow people to pay for their purchases at various points of sale, and M-Wallet Transactions allow people to settle small denomination transactions using electronic medium without the use of currency notes. Automated Teller Machine (ATM) transactions, using either debit card or credit card, allow people to withdraw currency notes for their transaction requirements. The volume and value of transactions in these seven indicators have shown a continuous upward trend with the growth of the Indian economy (Figure 2 and Figure 3). The demonetization of high denomination currency notes in India on November 8, 2016 led to non-availability of currency notes resulting in the dependency of people on electronic medium for transactions. Since it was not possible to convert the value into currency notes, lower transactions were conducted through ATMs, and high level of transactions took place in other indicators cited above. This is evident in the data presented in Figure 2 and Figure 3.

Source: The data used for the study downloaded from the database on Indian economy available at https://dbie.rbi.org.in/DBIE/dbie.rbi?site=home.

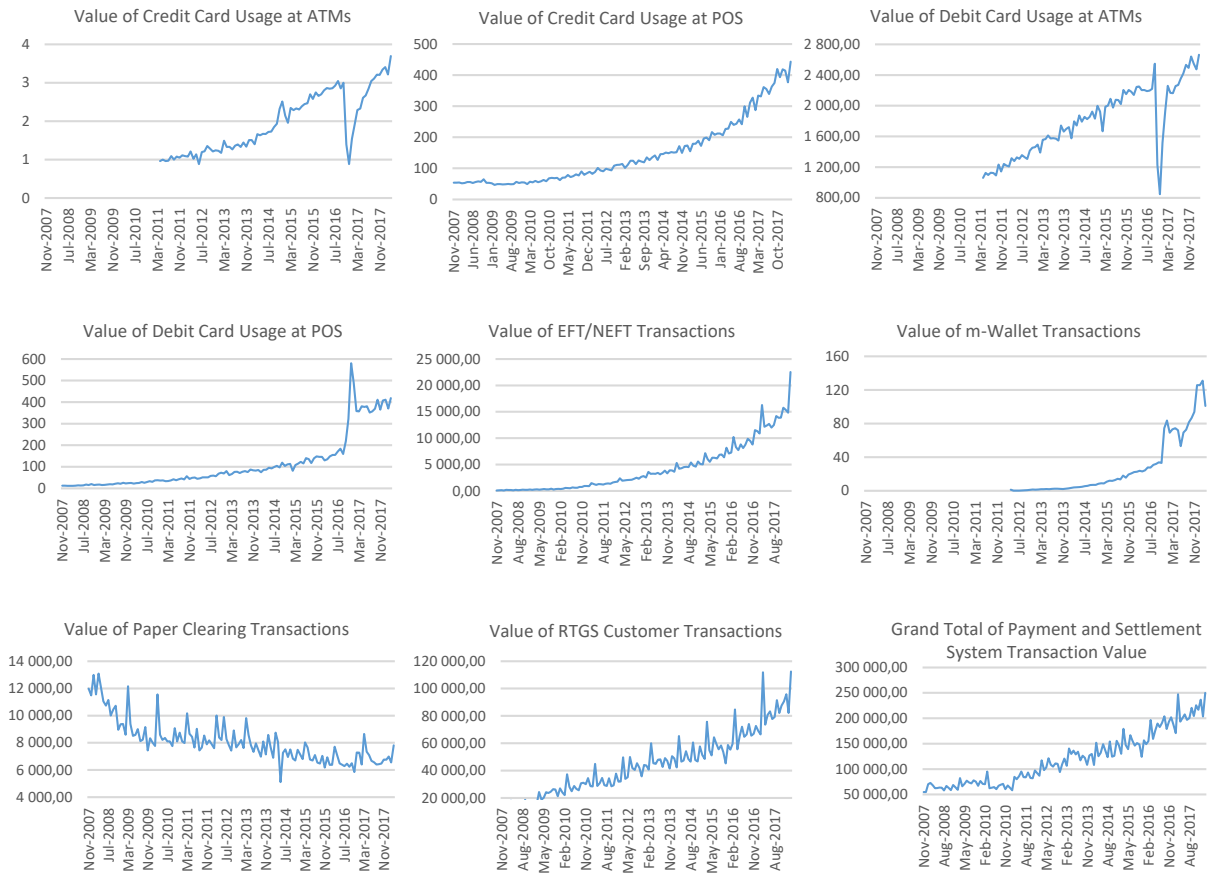

Figure 2. Trends in the value of transactions in the payment and settlement system indicators selected for the study

Source: The data used for the study downloaded from the database on Indian economy available at https://dbie.rbi.org.in/DBIE/dbie.rbi?site=home.

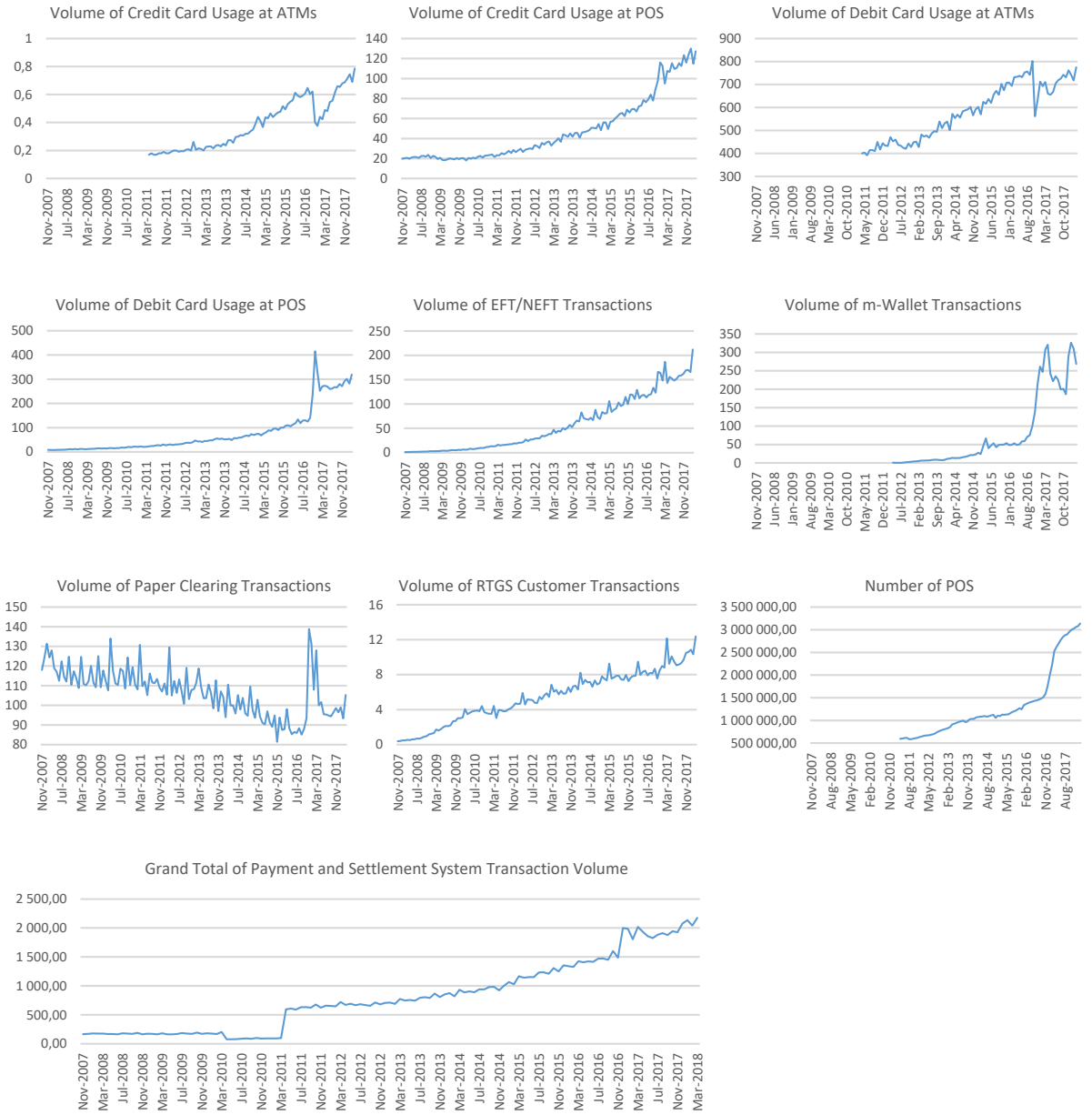

Figure 3. Trends in the volume of transactions in the payment and settlement system indicators selected for the study

In addition to the five indicators mentioned above, the study has also considered three additional indicators viz., paper based transactions (Paper Clearing), Number of PoS and Grand Total of all the transactions through various Payment and Settlement Systems prevailing in India. As mentioned in the initial discussion, there is a concerted effort to move away from paper based transactions to electronic transactions. But during the period following demonetization, there is an upward movement in paper based transactions in the country along with the various electronic medium of transactions. Similarly, there is a surge in the number of PoS terminals, while there is no visible change in the trend in the case of Grand Total of Payment and Settlement System Transactions.

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4. RESULTS AND DISCUSSION

The ARIMA (p, d, q) model was estimated for the selected indicators. The forecasted values and volumes of indicators, from November 2016 to March 2018, using the selected ARIMA (p, d, q) models for each selected indicator along with the corresponding actual values and volumes of the indicators are presented in Table 1 and Table 2 (Appendix). The results of paired t-test for actual and forecasted values and volumes of the indicators are presented in Table 3 and Table 4 (Appendix), respectively. It may be noted here that if a payment and settlement system indicator shows an upward trend in the value of transactions without accompanying upward trend in the volume of transactions, the trend in the value of transactions will be an outcome of limited number of higher value indicating a possible flow of money out of the banking system and concentrated economic activity. On the other hand, an upward trend in the volume of transactions without accompanying upward trend in the value of transactions will indicate lower economic activity as the volume of transactions is not translating into value. Similarly, if a payment and settlement system indicator shows a downward trend in the value of transactions without accompanying downward trend in the volume of transactions, the trend in the value of transactions will be an outcome of a larger number of lower value transactions taking place in the economy which could be due to weak economic activity. On the other hand, the downward trend in the volume of transactions without accompanying downward trend in the value of transactions will indicate a small number of higher value transactions indicating the concentration of economic activity and outflow of money from the banking system. Hence, to understand the trends in the payment and settlement system more clearly, the present study considers both the value and volume of transactions in the selected payment and settlement system indicators.

The results show that the actual value and volume of transactions in the case of RTGS, EFT/NEFT, M-Wallet, Credit and Debit card usage at PoS are found to be higher than the forecasted values and volumes for the period following demonetization indicating that customers have adopted these electronic payment and settlement systems. At the same time, the result for paper based transactions shows that during the period following demonetization, the value and volume of paper based transactions have also increased and are higher than the forecasted values. The results, thus, suggest that customers do adopt electronic system, which does not require the dependency on currency notes, in the scenario of less availability of currency notes though one can argue that the adoption was by compulsion during the post-demonetization period. At the same time, usage of cheques, demand drafts and similar paper based systems of payments also increase when customers have a shortage of currency notes. The use of the paper based system is less efficient compared to electronic mode of transactions due to the cost and time consumption in the process. In the present Indian scenario, in which a relatively large section of customers is not educated to use the electronic systems, the short supply of currency notes does come with the risk of adoption of traditional paper based systems of payment which will essentially pull down the efficiency of the banking system of the country at large.

As an obvious outcome of the restrictions on withdrawal of currency notes using ATMs and limited supply of currency notes to the ATMs (Reserve Bank of India, 2016) following the demonetization of higher denomination currency notes, the results presented for credit and debit card usage in ATMs show that the value and volume of transactions through ATMs are less than the forecasted values in the post-demonetization period. But, the more important point that needs to be observed is that the lower value and volume of transactions through ATMs has sustained even after the withdrawal of restrictions indicating that the customers who utilized digital platform for transactions have not immediately shifted back to the use of currency notes when the currency notes are made available without restrictions. This indicates that the practice of using currency notes is a matter of routine practice, which can be changed by means of different measures that can induce people to use digital platform for transactions and learn the conveniences and benefits attached to it. Demonetization of higher denomination currency notes, restrictions on withdrawal of currency notes using ATM and a limited supply of currency notes could be such measures that can make people adopt the digital platform for transactions.

Overall total (Grand Total) value and volume of transactions in the payment and settlement system of India did not show any obvious difference between actual value and volume of transactions and the forecasts in the post-demonetization period indicating that the transactions, in the period following demonetization, shifted from one mode of transactions to another – currency note based transactions to transactions in digital platforms – and there was no loss in the value and volume of transactions following demonetization. Alternatively, it is also possible that the loss in the value and volume of transactions due to lower economic activity during the period following demonetization was compensated by the value and volume of transactions that took place through banking channels that otherwise was taking place without using the banking channels, i.e., the transactions that took place in the unorganized sector prior to demonetization.

On applying paired t-test, it was found that the differences between the actual and forecasted value of transactions in all the indicators discussed above are statistically significant at 1 (one) per cent level of significance, except for the overall total value of transactions (Grand Total), which is significant only at 10 per cent level of significance. The paired t-test for the difference between the actual and forecasted volume of transactions yielded similar results except that in the case of total volume of transactions (Grand Total) the difference is found to be non-significant statistically. The result of the paired t-test, thus, statistically supports the discussions that are presented above.

CONCLUSION

The results discussed above indicate that demonetization of high denominations currency notes led to shifts in the usage of various payment and settlement systems practiced in India. The results clearly indicate the shift in usage from the currency notes to electronic medium of transactions and the shift has persisted even after the considerable increase in currency in circulation in the economy contradicting the results of Waghmare (2017) and Nithin, Jijin, and Baiju (2018). This clearly indicates that the preference of people towards currency note based transactions can be moderated towards the use of electronic platforms for transactions and demonetization did provide that moderating effect providing a solution to the issue of stickiness to cash payments highlighted by Sivathanu (2018). Moderated or controlled supply of currency notes – of higher denominations – can, therefore, result in the higher use of the electronic medium for transactions resulting in a less cash/cashless economy.

Though complete transformation of Indian economy to a digital economy, in which payment and settlement system consists only of digital platforms, is not possible in the present economic and social conditions of India, it can be suggested to:

a) withdraw higher denomination notes in a phased manner by restricting the printing and supply of high denomination currency notes;

b) rationalize and reduce operational costs of using digital platforms, such as the charges payable to the banks, to provide impetus to use digital platforms. In addition, the operational costs associated could be allowed to be deducted from the total income of individuals (customers) providing them tax benefits;

c) implement an extensive educational campaign (by the banking organizations, educational institutions and government bodies) to educate people how the transactions are to be carried out and the benefits of using digital platforms; and

d) have a full and effective implementation of Goods and Services Tax (GST) to provide scope for leading the Indian economy into a less cash/cashless economy.

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It should, however, be noted that to facilitate the growth of the economy and to finance the growing productive activities, the supply of money should grow with the growth in the economy. However, the study, as well as the earlier studies, has ignored the effect of economic growth and increase in the volume of production of goods and services on the volume of money required, as a means of payment for economic activities. Hence, further research can be carried out by incorporating the variables that measure economic growth and the growth in the productive activities in the economy and their effect on the payment and settlement system practiced in the country.

REFERENCES

1. Abad Peiro, J. L., Asokan, N., Steiner, M., & Waidner, M. (1998). Designing a generic payment service. *IBM Systems Journal, 37*(1), 72-88. https://doi.org/10.1147/sj.371.0072
2. Bhardwaj, S., & Kaushik, M. (2018). Unified Payment Interface – A Way Ahead for Demonetization in India. Smart Computing and Informatics. *Proceedings of the First International Conference on SCI, 2,* 273-280. https://doi.org/10.1007/978-981-10-5547-8_29
3. Bhattacharya, K., & Singh, S. K. (2018). The Story of Currency in Circulation – Are We Back to Square One after Demonetisation. *Economic & Political Weekly, 53*(13), 89-99. Retrieved from https://www.epw.in/journal/2018/13/money-banking-and-finance/story-currency-circulation.html
4. Chandrasekhar, C. P., & Ghosh, J. (2018). The Financialization of Finance? Demonetization and the Dubious Push to Cashlessness in India. *Development and Change, 49*(2), 420-436. https://doi.org/10.1111/dech.12369
5. Dhamija, A., & Dhamija, D. (2017). Technological Advancements in Payments: From Cash to Digital through Unified Payments Interface (UPI). *Strategic Human Capital Development and Management in Emerging Economies,* 250-258. https://doi.org/10.4018/978-1-5225-1974-4.ch011
6. Dhananjay, B., & Chandra, S. B. (2015). The Electronic Banking Revolution in India. *The Journal of Internet Banking and Commerce, 20*(2), 1-14. Retrieved from http://www.icommercecentral.com/open-access/the-electronic-banking-revolution-in-india.php?aid=59261
7. Dubbudu, R. (2017). *How much Currency is in circulation now?* Retrieved from https://factly.in/how-much-currency-is-in-circulation-now/ (accessed May 3, 12018).
8. HuffPost (2016). *Here's The Full Text Of Modi's Speech On The Discontinuation Of ₹500 And ₹1,000 Bank Notes.* Retrieved from https://www.huffingtonpost.in/2016/11/08/heres-the-full-text-of-modis-speech-on-the-discontinuation-of_a_21601525/ (accessed May 31, 2018).
9. Maji, P. (2017). Demonetisation keeps digital payments up; cashless transactions grow 13.5% in September. *Business Today Money Today*. Retrieved from http://www.businesstoday.in/money/banking/demonetisation-digital-payments-cashless-transactions-ewallets-credit-card-debit-card-paytm/story/263466.html (accessed February 3, 2018).
10. Ministry of Finance (2018). Government of India Economic Survey 2017–2018.
11. Nayak, G. (2018). Currency in circulation almost at pre-demonetisation levels. *The Economic Times*. Retrieved from https://economictimes.indiatimes.com/news/economy/finance/currency-in-circulation-almost-at-pre-demonetisation-levels/articleshow/63114589.cms (accessed 31 May 2018).
12. Nithin, M., Jijin, P., & Baiju, P. (2018). Has Demonetisation Pushed Digitalisation in India? Some Counter Evidences. *Journal of Business Thought, 9,* 58-69. https://doi.org/10.18311/jbt/2018/21170
13. PTI. (2017). Digital transactions shoot up post demonetization. *The Hndu Business Line*. Retrieved from http://www.thehindu-businessline.com/money-and-banking/digital-transactions-shoot-up-post-demonetisation/article9944062.ece (accessed February 3, 2018).
14. Reserve Bank of India. (2016). Reserve Bank of India Circular Dt. November 08, 2016: Withdrawal of Legal Tender Character of Existing Rs. 500/- and Rs. 1000/- Bank Notes.
15. Reserve Bank of India. (2018a). Certificates of Authorization issued by the Reserve Bank of India under the Payment and Settlement Systems Act, 2007 for Setting up and Operating Payment System in India. *Reserve Bank of India Occational Publications*. Retrieved from https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=12043 (accessed June 5, 2018).
16. Reserve Bank of India. (2018b). Reserve Bank of India – Payment and Settlement Systems. *Overview of Payment Systems in India*. Retrieved from https://www.rbi.org.in/scripts/paymentsystems_um.aspx (accessed February 3, 2018).
17. Reserve Bank of India. (2018c). DBIE-RBI: Database of Indian Economy. *Reserve Bank of India*. Retrieved from https://dbie.rbi.org.in/DBIE/dbie.rbi?site=publications (accessed May 31, 2018).
18. Roy, D., & Sahoo, A. (2016). Payment systems in India: Opportunities and challenges. *Journal of Internet Banking and Commerce, 21*(2), 1-48. Retrieved from http://

www.icommercecentral.com/open-access/payment-systems-in-india-opportunities-and-challenges.php?aid=76363

19. Sahu, G. P., & Singh, N. K. (2017). Paradigm Shift of Indian Cash-Based Economy to Cash-Less Economy: A Study on Allahabad City. In *Proceedings of the 16th IFIP WG 6.11 Conference on e-Business, e-Services, and e-Society, I3E 2017, Delhi, India, November 21-23, 2017* (pp. 453-461). Springer, Cham. https://doi.org/10.1007/978-3-319-68557-1_40

20. Sharma, N. (2012). An empirical study of rural customer's satisfaction from E-banking in India. *The Journal of Internet Banking and Commerce, 17*(3), 1-21. Retrieved from http://www.icommercecentral.com/open-access/an-empirical-study-of-rural-customers-satisfaction-from-ebanking-in-india.php?aid=38111

21. Singh, B. P., Grover, P., & Kar, A. K. (2017). Quality in Mobile Payment Service in India. In *Digital Nations – Smart Cities, Innovation, and Sustainability: Proceedings of the 16th IFIP WG 6.11 Conference on e-Business, e-Services, and e-Society, I3E 2017, Delhi, India, November 21-23, 2017* (pp. 183-193). Springer, Cham. https://doi.org/10.1007/978-3-319-68557-1_17

22. Singh, N., Srivastava, S., & Sinha, N. (2017). Consumer preference and satisfaction of M-wallets: a study on North Indian consumers. *International Journal of Bank Marketing, 35*(6), 944-965. https://doi.org/10.1108/IJBM-06-2016-0086

23. Siu, N. Y.-M., & Mou, J. C.-W. (2005). Measuring Service Quality in Internet Banking: The Case of Hong Kong. *Journal of International Consumer Marketing, 17*(4), 99-116. https://doi.org/10.1300/J046v17n04_06

24. Sivathanu, B. (2018). Adoption of digital payment systems in the era of demonetization in India: An empirical study. *Journal of Science and Technology Policy Management*. https://doi.org/10.1108/JSTPM-07-2017-0033

25. Waghmare, A. (2017). Threat to cashless economy? After demonetisation push, digital transactions recede. *Hindustan Times*. Retrieved from https://www.hindustantimes.com/india-news/digital-india-threatened-after-demonetisation-push-digital-transactions-recede/story-CpMaY0kcYoGLVreLhIYVHN.html (accessed February 3, 2018).

26. Wilson, J. (2017). Did Demonetisation Bring About a Digital Transaction Revolution? *The Wire*. Retrieved from https://thewire.in/152625/digital-transactions-demonetisation-detailed-analysis/ (accessed February 3, 2018).

http://dx.doi.org/10.21511/bbs.13(4).2018.02

APPENDIX

Table 1. ARIMA (p, d, q) estimations and actual value of transactions (November 2016 to March 2018)

Sources: [1] The data used for the study downloaded from the database on Indian economy available at https://dbie.rbi.org.in/DBIE/dbie.rbi?site=home. [2] Estimated by the authors.

Year and month	RTGS Customer Transactions		NEFT Transactions		m-Wallet Transactions		Credit Card Usage at ATMs		Credit Card Usage at PoS		Debit Card Usage at ATMs		Debit Card Usage at PoS		Grand Total of Payment and Settlement System Transaction Value		Paper Based Transactions	
	Actual Value[1]	ARIMA (3, 1, 3) Forecasted Value[2]	Actual Value[1]	ARIMA (4, 2, 4) Forecasted Value[2]	Actual Value[1]	ARIMA (3, 2, 3) Forecasted Value[2]	Actual Value[1]	ARIMA (0, 1, 1) Forecasted Value[2]	Actual Value[1]	ARIMA (4, 1, 3) Forecasted Value[2]	Actual Value[1]	ARIMA (2, 1, 3) Forecasted Value[2]	Actual Value[1]	ARIMA (4, 1, 3) Forecasted Value[2]	Actual Value[1]	ARIMA (4, 1, 3) Forecasted Value[2]	Actual Value[1]	ARIMA (2, 1, 3) Forecasted Value[2]
2016M11	66 880,17	63 280,29	8 807,88	9 094,90	33,06	35,35	1,39	3,09	265,59	280,36	1 234,52	2 336,56	321,74	186,96	193 240,74	174 074,85	5 845,13	5 949,07
2016M12	72 702,57	73 122,85	11 537,63	10 885,56	74,48	37,34	0,88	3,14	311,49	282,41	849,34	2 430,17	580,31	188,91	201 856,49	196 787,57	7 289,40	6 433,96
2017M01	68 863,65	64 486,57	11 355,08	9 669,10	83,53	38,15	1,54	3,20	327,08	295,45	1 516,44	2 455,24	490,04	192,31	187 740,65	189 176,99	7 281,23	6 385,43
2017M02	66 382,31	64 162,38	10 877,91	9 802,59	69,11	40,29	1,91	3,26	287,04	273,20	1 928,38	2 422,55	358,43	190,30	170 698,56	177 426,97	6 406,73	5 843,89
2017M03	111 825,01	74 392,51	16 294,50	11 400,22	73,12	42,06	2,29	3,31	333,90	303,33	2 259,46	2 563,55	356,99	192,34	247 275,65	203 406,30	8 654,94	6 314,66
2017M04	73 603,70	66 061,51	12 156,17	10 242,79	74,42	43,21	2,33	3,37	331,43	302,31	2 168,60	2 460,89	380,57	197,78	193 429,47	195 118,06	7 351,49	6 274,95
2017M05	80 716,62	65 635,09	12 410,81	10 377,88	71,94	45,31	2,61	3,43	361,41	313,66	2 163,92	2 607,33	377,78	206,01	200 254,02	183 100,99	7 100,00	5 740,62
2017M06	83 330,95	75 794,67	12 694,20	12 056,58	53,10	47,18	2,67	3,49	354,83	319,79	2 256,93	2 567,13	380,90	217,03	207 594,62	209 645,12	6 669,43	6 197,56
2017M07	77 675,80	67 664,04	12 011,60	10 766,70	69,34	48,51	2,85	3,56	339,30	306,29	2 270,76	2 600,02	351,31	229,55	196 919,86	201 827,32	6 572,52	6 166,33
2017M08	79 157,81	67 116,14	12 500,38	10 994,97	72,62	50,65	3,05	3,62	362,99	317,28	2 352,96	2 698,40	356,65	241,70	200 232,60	189 011,57	6 403,59	5 639,23
2017M09	91 521,65	77 198,69	14 182,14	12 686,73	81,54	52,60	3,11	3,68	374,65	319,95	2 419,54	2 609,85	369,32	251,66	220 442,57	216 297,97	6 429,99	6 082,63
2017M10	82 084,42	69 264,87	13 851,28	11 294,81	86,60	54,10	3,21	3,75	419,39	335,89	2 533,21	2 783,02	411,40	258,07	204 491,40	208 870,92	6 478,86	6 059,54
2017M11	87 550,13	68 598,92	13 884,00	11 604,16	93,88	56,29	3,20	3,81	392,96	347,20	2 492,72	2 689,47	365,19	260,70	225 570,44	195 229,62	6 774,71	5 539,68
2017M12	90 557,83	78 603,12	15 779,20	13 306,42	125,68	58,32	3,34	3,88	418,64	343,44	2 640,39	2 795,24	407,60	260,50	216 800,95	223 244,75	6 752,50	5 969,83
2018M01	95 866,37	70 863,69	15 374,07	11 808,69	125,63	59,99	3,41	3,95	414,37	344,31	2 550,22	2 826,35	411,03	259,29	236 656,45	216 230,96	6 994,65	5 954,55
2018M02	82 134,80	70 083,30	14 843,90	12 206,75	131,04	62,23	3,22	4,02	376,60	341,96	2 474,87	2 786,82	370,37	259,15	203 387,44	201 715,16	6 553,58	5 441,94
2018M03	112 498,68	80 007,96	22 540,77	13 905,14	100,97	64,35	3,69	4,09	443,08	353,48	2 663,50	2 950,12	418,57	261,91	249 685,40	230 460,69	7 811,97	5 859,12

Table 2. ARIMA (p, d, q) estimations and actual volume of transactions (November 2016 to March 2018)

Sources: [1] The data used for the study downloaded from the database on Indian economy available at https://dbie.rbi.org.in/DBIE/dbie.rbi?site=home. [2] Estimated by the authors.

Year and month	RTGS Customer Transactions		NEFT Transactions		m-Wallet Transactions		Grand Total of Payment and Settlement System Transaction Volume		Credit Card Usage at ATMs		Credit Card Usage at PoS		Debit Card Usage at ATMs		Debit Card Usage at PoS		Number of PoS Terminals		Paper Based Transactions	
	Actual Volume[1]	ARIMA (4, 2, 3) Forecasted Volume[2]	Actual Volume[1]	ARIMA (4, 1, 4) Forecasted Volume[2]	Actual Volume[1]	ARIMA (2, 1, 1) Forecasted Volume[2]	Actual Volume[1]	ARIMA (0, 1, 0) Forecasted Volume[2]	Actual Volume[1]	ARIMA (2, 1, 3) Forecasted Volume[2]	Actual Volume[1]	ARIMA (2, 1, 4) Forecasted Volume[2]	Actual Volume[1]	ARIMA (4, 1, 2) Forecasted Volume[2]	Actual Volume[1]	ARIMA (3, 2, 4) Forecasted Volume[2]	Actual Volume[1]	ARIMA (0, 1, 0) Forecasted Volume[2]	Actual Volume[1]	ARIMA (4, 1, 3) Forecasted Volume[2]
2016M11	7,56	8,02	123,05	121,79	138,09	101,57	1 488,55	1 637,02	0,40	0,62	97,91	84,18	561,36	767,00	236,47	134,53	1 590 714,00	1 533 549,94	93,50	80,91
2016M12	8,47	8,36	166,31	132,13	213,11	93,41	1 999,75	1 671,96	0,38	0,66	116,08	86,61	630,47	793,85	415,46	145,81	1 767 733,00	1 555 337,08	138,82	89,47
2017M01	8,98	8,47	164,19	134,50	261,67	103,68	1 985,22	1 707,64	0,44	0,67	112,80	89,71	712,35	803,85	328,62	144,95	2 015 847,00	1 577 433,74	131,17	82,84
2017M02	8,80	7,97	148,21	124,35	246,95	102,34	1 804,52	1 744,09	0,42	0,66	94,93	87,74	692,57	792,98	251,75	147,94	2 224 977,00	1 599 844,33	107,94	83,67
2017M03	12,14	8,58	186,70	139,37	307,45	103,12	2 018,57	1 781,32	0,49	0,71	107,61	92,53	710,11	833,00	271,17	156,10	2 529 141,00	1 622 573,31	127,98	86,86
2017M04	9,23	7,96	143,17	132,92	320,87	107,08	1 933,32	1 819,34	0,48	0,68	106,58	90,61	660,32	803,14	272,84	151,46	2 614 584,00	1 645 625,20	99,97	79,56
2017M05	10,09	8,34	155,82	132,62	241,72	107,36	1 858,98	1 858,17	0,55	0,73	115,33	93,85	655,47	845,79	269,85	164,24	2 692 986,00	1 669 004,58	101,63	87,82
2017M06	9,51	8,14	152,34	140,20	221,63	109,46	1 825,66	1 897,83	0,55	0,72	109,47	94,57	667,81	832,94	259,83	159,22	2 776 949,00	1 692 716,12	95,47	79,25
2017M07	9,07	7,95	148,14	136,35	235,46	111,57	1 884,02	1 938,34	0,61	0,74	110,76	94,93	703,91	842,61	261,26	168,33	2 840 113,00	1 716 764,53	95,35	84,53
2017M08	9,16	8,31	151,61	138,70	225,43	112,89	1 910,48	1 979,71	0,66	0,77	115,33	98,25	718,41	870,52	267,62	170,33	2 882 422,00	1 741 154,59	94,81	82,63
2017M09	9,32	7,69	157,67	140,02	199,48	114,89	1 878,35	2 021,97	0,65	0,76	112,63	97,00	726,42	844,33	266,36	170,97	2 900 038,00	1 765 891,17	94,37	79,28
2017M10	9,71	8,19	158,78	143,32	201,23	116,64	1 942,38	2 065,12	0,68	0,81	123,36	100,78	741,87	894,21	280,00	181,11	2 958 301,00	1 790 979,17	96,41	85,63
2017M11	10,51	7,72	161,97	140,14	186,67	118,31	1 924,90	2 109,20	0,69	0,79	115,90	100,32	731,33	866,48	270,96	176,05	2 998 733,00	1 816 423,60	98,60	76,60
2017M12	10,58	7,77	169,05	143,96	288,37	120,16	2 076,22	2 154,22	0,71	0,83	123,77	102,48	761,93	896,74	292,39	188,37	3 027 382,00	1 842 229,52	96,44	84,58
2018M01	10,85	7,86	170,21	147,93	326,30	121,89	2 134,71	2 200,20	0,75	0,84	129,98	104,15	741,56	905,15	301,37	185,34	3 061 817,00	1 868 402,06	98,99	78,39
2018M02	10,34	7,38	165,59	141,62	310,01	123,65	2 040,86	2 247,16	0,69	0,84	114,75	104,34	718,28	893,23	282,01	192,19	3 079 487,00	1 894 946,44	93,35	79,82
2018M03	12,36	7,82	212,01	149,92	268,79	125,43	2 173,68	2 295,13	0,79	0,89	127,29	107,52	774,94	939,79	318,90	196,96	3 137 204,00	1 921 867,93	105,29	82,17

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Table 3. Results of paired t-test for the difference between actual and forecasted value of transactions in the selected indicators

Source: Estimated by the authors.

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference				
					Lower	Upper			
Pair 1: RTGS customer transactions	Actual value Forecasted value	13 353,874	10 279,879	2 493,237	8 068,448	18 639,300	5,356	16,000	0,000
Pair 2: NEFT transactions	Actual value Forecasted value	2 293,972	2 020,865	490,132	1254,939	3 333,005	4,680	16,000	0,000
Pair 3: m-Wallet transactions	Actual value Forecasted value	34,361	19,414	4,709	24,379	44,343	7,297	16,000	0,000
Pair 4: credit card usage at ATMs	Actual value Forecasted value	–0,939	0,517	0,125	–1,205	–0,673	–7,487	16,000	0,000
Pair 5: credit card usage at PoS	Actual value Forecasted value	43,204	26,035	6,314	29,818	56,589	6,842	16,000	0,000
Pair 6: debit card usage at ATMs	Actual value Forecasted value	–459,233	384,819	93,332	–657,089	–261,378	–4,920	16,000	0,000
Pair 7: debit card usage at PoS	Actual value Forecasted value	167,885	72,410	17,562	130,655	205,115	9,560	16,000	0,000
Pair 8: grand total of PSS transaction value	Actual value Forecasted value	8 508,911	14 520,163	3 521,657	1 043,332	15 974,491	2,416	16,000	0,028
Pair 9: paper based transactions	Actual value Forecasted value	912,807	597,823	144,993	605,434	1 220,179	6,296	16,000	0,000

Table 4. Results of paired t-test for the difference between actual and forecasted volume of transactions in the selected indicators

Source: Estimated by the authors.

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference				
					Lower	Upper			
Pair 1: RTGS customer transactions	Actual volume Forecasted volume	1,773	1,320	0,320	1,094	2,451	5,537	16,000	0,000
Pair 2: NEFT transactions	Actual volume Forecasted volume	23,234	14,498	3,516	15,780	30,689	6,608	16,000	0,000
Pair 3: m-Wallet transactions	Actual volume Forecasted volume	135,281	50,539	12,257	109,297	161,266	11,037	16,000	0,000
Pair 4: credit card usage at ATMs	Actual volume Forecasted volume	–0,164	0,058	0,014	–0,194	–0,134	–11,676	16,000	0,000
Pair 5: credit card usage at PoS	Actual volume Forecasted volume	17,936	5,577	1,353	15,069	20,804	13,260	16,000	0,000
Pair 6: debit card usage at ATMs	Actual volume Forecasted volume	–148,030	29,977	7,271	–163,443	–132,617	–20,360	16,000	0,000
Pair 7: debit card usage at PoS	Actual volume Forecasted volume	118,410	44,524	10,799	95,518	141,302	10,965	16,000	0,000
Pair 8: grand total of PSS transaction volume	Actual volume Forecasted volume	–14,603	163,198	39,581	–98,512	69,306	–0,369	16,000	0,717
Pair 9: paper based transactions	Actual volume Forecasted volume	21,534	12,680	3,075	15,015	28,054	7,002	16,000	0,000
Pair 9: number of PoS terminals	Actual volume Forecasted volume	931 981,452	368 306,357	89 327,412	742 615,797	1 121 347,107	10,433	16,000	0,000

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