

IRSTI 06.73.02

Transformation of Fintech: Impact of POS and ATM on Non-Cash Payments

Anna Kredina

University of International Business, Kazakhstan

Abstract

The banking system of Kazakhstan has undergone many changes in recent years: traditional bank branches are no longer in such demand as 20 years ago. Now banks are intentionally closing branches and transferring their clients to the online format. These steps were especially justified in the context of the COVID-19 pandemic. At the same time, technology has grown: since the beginning of the emergence of point-of-sale (POS) terminals, Automated teller machines (ATM) have developed. To ensure the security of transactions, transfers are tied to an individual, and the transfers themselves have multi-factor identification. The necessity to have payment cards linked to the account is still relevant, even if the user uses applications on his mobile phone to make non-cash transfers. The purpose of this study is to identify the existence of a relationship between non-cash payments and proxy servers for non-cash banking in Kazakhstan. In this scientific study, two hypotheses (zero and alternative) were put forward and tested, of which one was later confirmed. Statistical monthly data cover the period 2004-2020, were obtained from the electronic repository of the Statistical Bulletin of the National Bank of Kazakhstan. To test the relationship of selected determinants have been used program SPSS and Microsoft Excel. Kolmogorov-Smirnov test was used for checking the normality of data distribution (revealed the normal distribution of the

collected quantitative data). This made it possible to find the Pearson correlation coefficient. Further, in the course of the study, a correlation matrix was compiled. It was found the presence of a significant relationship between the amount of non-cash transfers, POS & ATM. This confirms the correct orientation of public policies towards the development of technical systems and the digitization of the economy. The results of this study are important for the banking system and policy dissemination of non-cash payments.

Keywords: FinTech, Innovation, Automated teller machines (ATM), point-of-sale (POS) terminals, non-cash payments

Introduction

Innovation is interconnected with development - this is a truth that can be confirmed by the practical results achieved by a business that has actively invested in new technologies. Moreover, entire economies are introducing an information and technical component into processes, i.e. digitalization is transforming the financial sector. As a result, financial technologies emerge, which are the result of the integration between innovations in the technical and financial fields (Puschmann, 2017). A consequence of the development of IT technologies is the emergence of startups and FinTech applications that are being introduced by the government and business into widespread use (Kang et al., 2016). According to Leong & Sung (2018), FinTech applications can be roughly divided into four main categories: payments; consulting services; financing and compliance.

This article will cover payments. There are several ways to make online payments. First: you can go directly to the branches of banks and operators will be able to transfer cash or electronic money to the account. This method is good for those who are just getting acquainted with banks or, on the contrary, do not want to delve into the banking system. However, during a pandemic, this method is not convenient. Many bank branches are closed or work in reduced mode. To reduce contacts, you can use terminals or mobile applications. Bank terminals for

withdrawing or depositing cash minimize contact, face recognition systems increase the security of transactions. You can use mobile banking, which every bank in Kazakhstan has, from a personal computer. Mobile applications are installed on smartphones and allow you to transfer money online in a 24/7 format. The user must have an account with a linked card (credit or debit), then the application will work, since payments are not impersonal.

Large businesses and representatives of new businesses (startups) are actively using financial technologies to conduct non-cash payments. The shift of interests in this case occurs towards customer focus (Alt et al., 2019; Kumar & O'Brien, 2019; Zavolokina, Dolata & Schwabe, 2016). The financial literacy of people of all ages is increasing every year, leading to a more intelligent use of their assets and the widespread adoption of mobile applications (Sági, Vasa & Lentner, 2020; Puschmann, 2017). Moreover, the state is actively interested in increasing digitalization and financial literacy of the population (Yermekbaeva & Rakhmatullina; 2020). For example, in Kazakhstan in 2018, the state program “Digital Kazakhstan” began to be implemented, divided into five steps (“Digital Kazakhstan ...”).

Literature Review

Scientists have long noticed that financial stability and economic growth are intertwined. In many countries, moving away from the shadow economy is associated with increased transparency and the number of wire transfers. The security of transactions is ensured by the implementation of the International standard for the exchange of electronic messages between organizations in the financial industry (ISO 20022). For example, in Kazakhstan, the introduction of ISO 20022 into the practice of banks of the second first began in 2019, in Albania in 2017, and in the EU countries since 2016 (Bouille & Haase, 2019; Lindsay, 2015). Usually the implementation of this standard is supported by the government and carried out by the central bank of the country.

Scientists' studies of user satisfaction, point-of-sale terminals and automated teller machines have revealed customer attitudes towards digital innovation in banks (Chocholáková et al., 2015; Adeoti & Osotimehin, 2012). Banks began to apply research findings to improve their ATM programs, and now ATMs are not just for cash withdrawals. Internet banking practically built into the terminal, a multi-factor personal identification system made it possible to make many non-cash transactions more accessible and secure. Payment for using ATMs for transactions in excess of large amounts falls on the user in the form of a commission, which brings additional income to the bank (Alao & Sorinola, 2015; Alagh & Emeka, 2014).

The researchers Aliha, Sarmidi & Said (2020) identified the relationship between the cash supply and the amount of POS and ATM. Moreover, the elasticity of demand for money in relation to POS has been proven, as well as not significant for ATM. In order to use the terminals, you must have payment cards (debit and credit). Scientists are studying indicators that influence the distribution of POS and ATM, the main indicators of which are: economic, banking, energy, technological and demographic (Gjika et al., 2020; Valverde & Rodriguez Fernandez, 2012).

Methodology

The purpose of this study is to check the existence of a relationship between non-cash payments and proxy servers for non-cash banking in the Republic of Kazakhstan.

To achieve the goal, we will perform the following steps:

Step 1: collect and analyze data on the number of transactions for 2004-2020.

Step 2: analysis of the number of technical means intended for non-cash payments in Kazakhstan over 17 years.

Step 3: check the data for normal distribution (the Kolmogorov-Smirnov test will be used).

Step 4: finding the Pearson correlation coefficients.

In this study, we will formulate two hypotheses: a null hypothesis and an alternative one.

Hypothesis Ho - no connection between the number of transactions carried out, ATMs and Pos terminals;

Hypothesis H₁ - there is a connection between the number of transactions carried out, ATMs and Pos terminals.

Dependent variable - number of transactions (thousand); the independent variables are the number of ATMs and the number of Pos terminals.

To check the relationship of selected determinants (finding the correlation coefficient) are used SPSS software and Microsoft Excel.

Correlation analysis is a statistical method for studying the relationship between random variables. In this study, the dependent variable is the number of transactions (thousands). There are several independent variables, namely: the number of ATMs (ATM) the number of Pos terminals as the main proxy servers for cashless banking.

The essence of correlation analysis is to calculate the coefficients of the relationship between variables. These coefficients can be calculated using the statistical programs R, STATA in which various software packages are used to calculate the correlation (Oliveira et al., 2020; Shkolnyk et al., 2019; Nettleton, 2014;). This study will use SPSS.

In general, in various scientific studies it is customary to use the formula for calculating the Pearson correlation coefficient, which is calculated using the formula below (1):

$$r_{xy} = \frac{\Sigma(x_i - \bar{x}) * (y_i - \bar{y})}{\sqrt{\Sigma(x_i - \bar{x})^2 * \Sigma(y_i - \bar{y})^2}}, \quad (1)$$

where x_i – are the values of the X variable;

y_i – the values of the variable Y;

\bar{x} – arithmetic mean for variable X;

\bar{y} – arithmetic mean for variable Y.

The Pearson correlation method is the most common method for numeric variables; it is assigned a value from -1 to 1, where 0 is no correlation, 1 is complete positive correlation, and -1 is complete negative correlation. This is interpreted as follows: a correlation value of 0.7 between two variables will indicate that there is a significant and positive relationship between them.

This research study will test the hypotheses put forward on the basis of data that cover 17 years (2004-2020), taken from the Statistical Bulletin of the National Bank of the Republic of Kazakhstan. In the following parts of the article, analysis, calculations and results will be presented.

Analysis Determinants

National payment systems play an important role in shaping monetary policy. There are two such systems in Kazakhstan: the International Bank Transfer System (ISMT) and the Interbank Clearing System (ICS). In this article, monthly indicators from 2004 to 2020 were taken from the Statistical Bulletin of the National Bank of Kazakhstan. This made it possible to identify the cyclical nature of the development of economic and financial processes. For example, you can pay attention to 2008, 2009 and 2010. Let us remind you that at the end of August 2008 the Financial Crisis began in Kazakhstan. 2009 - stocks of economic entities were spent. In 2010, there is a sharp increase in the number of payments. Figure 1 shows that the situation repeats itself in 2019-2020 (this time we take 2 years, since the crisis due to the COVID-19 pandemic began in late 2019 - early 2020).

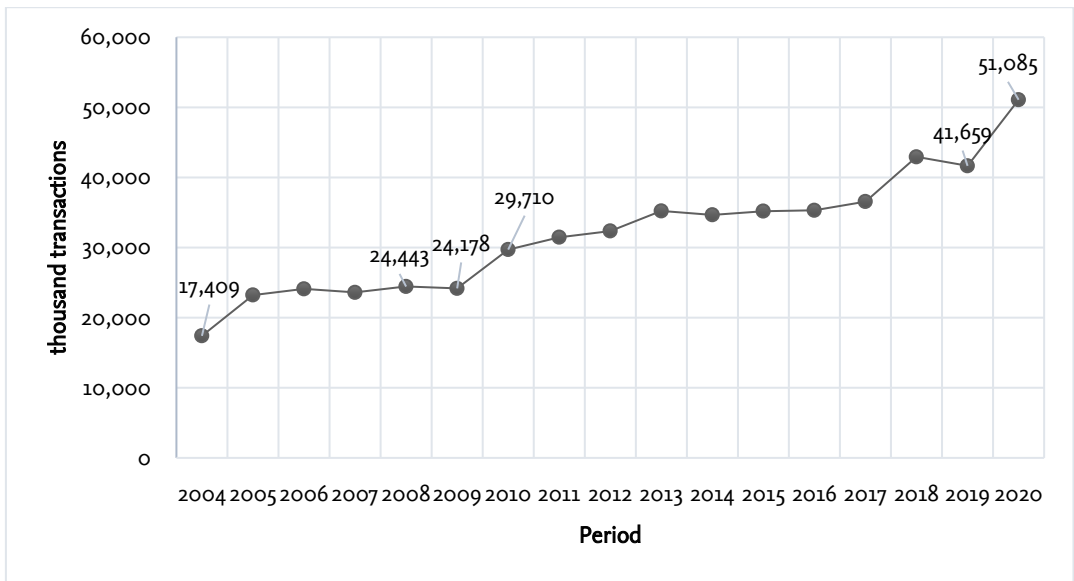


Figure 1. Number of payments 2004-2020.

The record year for the number of transactions was 2020. This year, for the first time in Kazakhstan, the number of transactions on non-cash money transfers exceeded the number of cash withdrawals. In general, the increase in remittances is steady. Figure 2 shows a sharp decline in the number of remittances in 2010 and 2020. It turns out that the number of transfers is growing, and less money is transferred through payment systems.

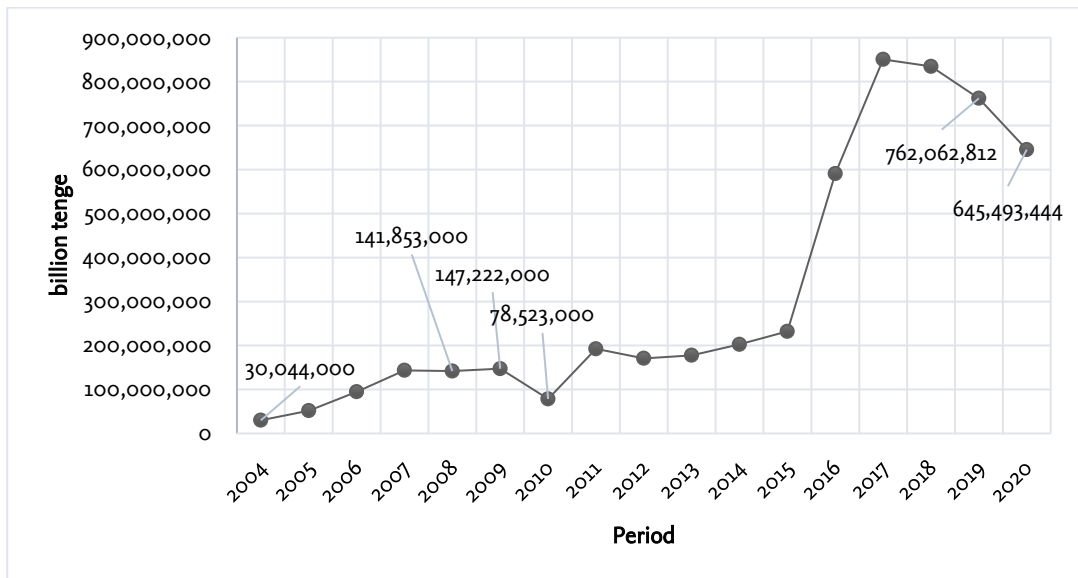


Figure 2. Volume of payments 2004-2020.

The largest volume of transferred tenge was in 2017 and so far Kazakhstan has not reached this mark. Maybe there is less cash? No, cash in circulation is shown in Figure 3. The smooth growth of cash was in 2008 and in 2009, in 2010 there is a sharp upward leap. The cash money supply behaves similarly in 2019-2020. In the following Figure 3, it can be seen that the cash money supply has been growing in similar periods. This shows that in post-crisis periods a lot of money is diverted to the shadow economy.

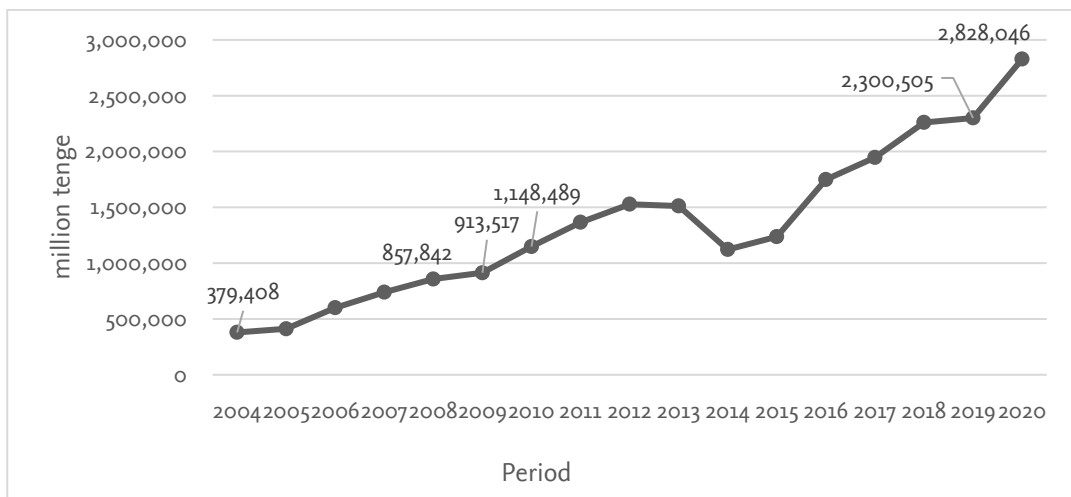


Figure 3. Cash in circulation in 2004-2020.

Several conclusions can be drawn from the data collected. First: the economy develops cyclically, in a spiral. Taylor & Bacha, (1976) expressed the opinion that the economy develops cyclically and this is now being confirmed. Stiglitz (2010) examined the 2008 financial crisis and concluded that the financial crisis is affecting other sectors of the economy, including the tech industry. Park, Ali & Chevalier, (2011) argued in support of the fact that tech companies also experience certain difficulties during the crisis, but some companies learn and even make money during difficult times. Sabden (2018) viewed the tech giant as Samsung. And he also cited as an example that this company learns quickly and brings innovation to the business model. It can be added that this company entered the Kazakhstan market with its Samsung Pay application in 2019, in parallel with the Apple Pay application. During the COVID-19 pandemic, these two companies made it possible to pay on the spot using cell phones. In any case, for such payments to take place, you need

a bank card tied to the application and to the phone (Ceipidor, 2012). Table 1 shows the change in the number of selected indicators for the last 2019-2020 years.

Table 1. Dynamics of the number and volume of remittances in 2019-2020.

Indicator	2019	2020	Dynamics %
Number of payments, thousand transactions	41615	51085	23
The volume of payments, billion tenge	762062812	645493444	-15
Cash in circulation, million tenge, at the end of the period	26632221	31785976	19

Also, on the presented graphs it is noticeable that the number of transactions increased by 23%, the volume of money transferred decreased by 15%, the volume of cash in circulation increased by 19%. It turns out that in the post-crisis period money goes into the shadow economy.

In the United States, the population prefers to withdraw cash only to pay a certain small amount. If the amounts are close to \$ 100, people prefer to carry payment cards (Shy, 2020).

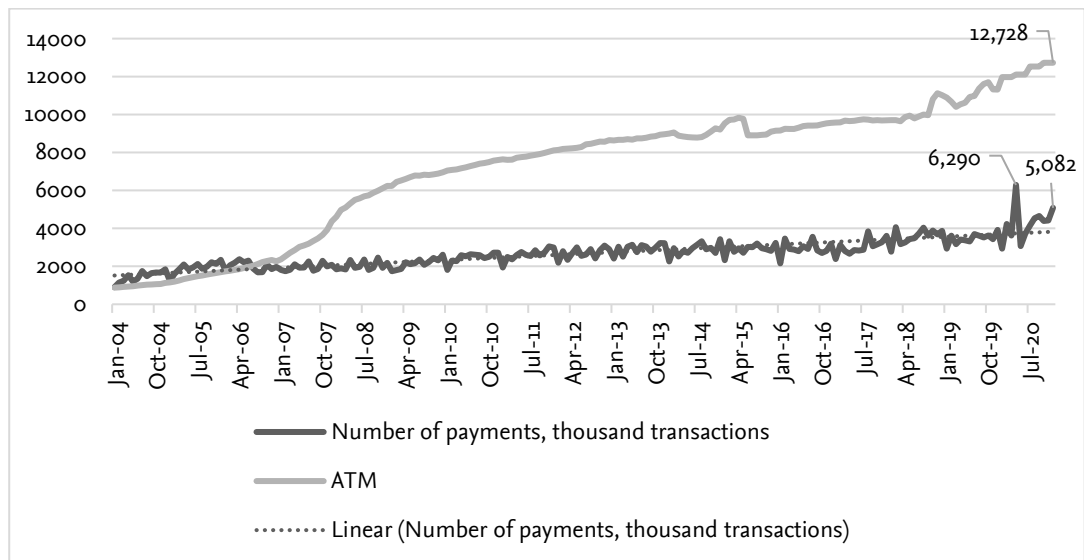


Figure 4. Number of transactions and ATMs 2004-2020.

Figure 4 shows that the peak of non-cash transfers is April 2020 (6,290 thousand transactions). It was in this month for the first time in Kazakhstan that the number of cashless money transfer operations exceeded the number of cash withdrawals. The trend line of transactions is upward. The number of POSs exceeds ATM by 16.6 times, so the POSs are presented separately in Figure 5.

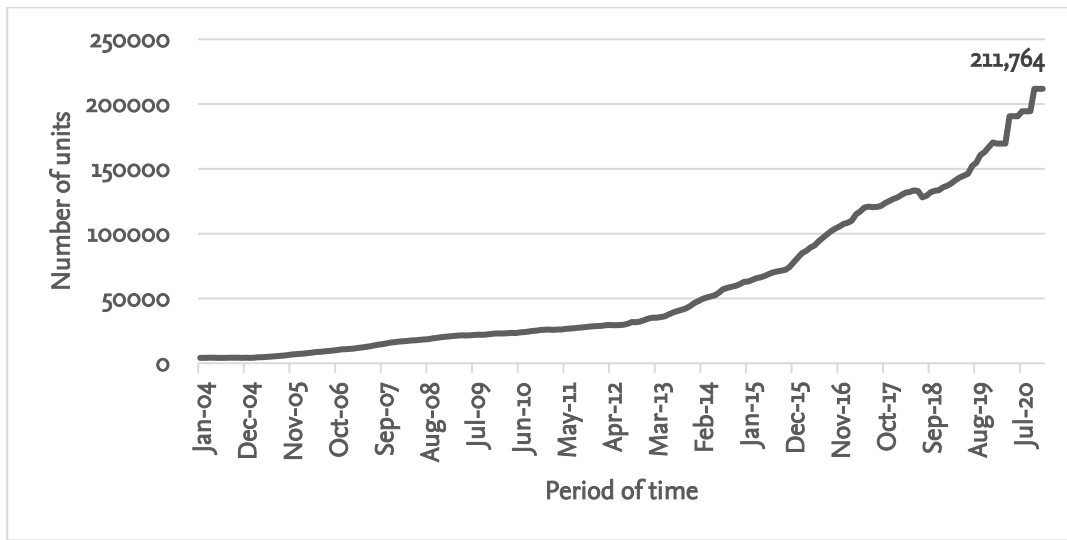


Figure 5. Number of Pos-terminals.

Both figures show upward trends in both the number of transactions and the number of vehicles. ATM and POS were divided into 2 charts, since when all indicators are presented in different figures, April 2020 stands out noticeably (the most acute period of the pandemic and lockdown in Kazakhstan for 2020). Further, in Table 2, three periods were considered with a step of 5-6 years: 2004-2009, 2010-2014, 2015-2020.

Table 2. Dynamics of the number of technical means for non-cash banking in 2004-2020.

Equipment for cashless payments	2004	2009	Growth, %	2010	2014	Growth, %	2015	2020	Growth, %	Growth for the whole period
	4	9								

Pos terminals	4211	2291	444	2591	6275	142	77	211	171	49
		3		4	2		857	764		
ATM machines	1124	6956	519	7605	9206	21	9 146	12 728	39	10

The largest jump in the number of equipment was observed in the first period: 2004-2009. The increase in the number of Pos terminals and ATMs at that time was by 444% and 519%, respectively. An increase in the number of equipment in 2020 compared to the base year 2004 of Pos terminals by almost 50 times, ATMs by 10 times.

Findings and Discussion

Moving on to descriptive statistics. Data for each indicator was taken monthly from 2004 to 2020 (total number of observations 204). The source was the website of the National Bank of Kazakhstan, Statistical Bulletins for 17 years. For convenience of presentation, the data were encoded, shown in Table 3.

Table 3. Coding determinants.

Designation	Decoding	Source
V1	Number of payments, thousand transactions	National Bank of the Republic of Kazakhstan
V2	Pos terminals, pcs.	
V3	ATMs, pcs.	

Using the SPSS program in our study allowed us to apply descriptive statistics and calculate the correlation between the selected indicators (Valente et al., 2020). To check the normality of the data, the Kolmogorov-Smirnov test was used, the results of which are shown in Table 4.

Table 4. Test data for normal distribution.

One-Sample Kolmogorov-Smirnov Test					
		V2	V4	V5	
N		204	204	204	
Normal Parameters ^{a,b}	Mean	2670,44	59216,45	7233,66	
	Std. Deviation	770,612	56456,984	3359,255	
Most Extreme Differences	Absolute	,053	,212	,139	
	Positive	,053	,212	,108	
	Negative	-,048	-,165	-,139	
Test Statistic		,053	,212	,139	
Asymp. Sig. (2-tailed) ^c		,200 ^d	,000	,000	
Monte Carlo Sig. (2-tailed) ^e	Sig.	,167	,000	,000	
	99% Confidence Interval	Lower Bound	,157	,000	,000
		Upper Bound	,177	,000	,000
a. Test distribution is Normal.					
b. Calculated from data.					
c. Lilliefors Significance Correction.					
d. This is a lower bound of the true significance.					
e. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.					

According to the test results, the mean, standard deviation, extreme differences and the significance of the error were shown, which is not more than 0.5. It turns out that the data taken are quantitative, have a normal distribution, so Pearson's

correlation coefficients were calculated. Further, such a correlation matrix was compiled, the result is in table 5.

Table 5. The obtained correlation coefficients.

Correlations				
		V1	V2	V3
V1	Pearson Correlation	1	,836**	,834**
	Sig. (2-tailed)		,000	,000
	N	204	204	204
V2	Pearson Correlation	,836**	1	,806**
	Sig. (2-tailed)	,000		,000
	N	204	204	204
V3	Pearson Correlation	,834**	,806**	1
	Sig. (2-tailed)	,000	,000	
	N	204	204	204
**. Correlation is significant at the 0.01 level (2-tailed).				

The correlation coefficient between technical means and the number of non-cash transfers is high. POS and non-cash transactions have the highest correlation (0.836), ATM and transactions also have the highest correlation coefficient (0.834). The statistical significance of the coefficients is high. This indicates a significant relationship between the indicators. Moreover, both technologies have overlapping linear relationships and complement each other (0.806), which by the way excluded the conduct of regression analysis in this study.

Conclusion

Hypothesis Ho - lack of connection between the number of transactions performed and ATMs - is rejected.

Hypothesis H₁ - the presence of a connection between the number of transactions performed and ATMs - is accepted and has evidence.

To move cash registers and other customer service out of bank branches, banks are deploying ATMs. During quarantine, these measures are especially relevant. Our results show that banks are focusing on servicing POS terminals (in 2020, POS exceeds ATM by 17 times) more than on ATMs. At the same time, both technologies help to increase non-cash transfers in the country.

The adult population (aged 16+) makes non-cash transfers using ATMs and POS terminals. It turns out that in Kazakhstan, to increase the number of non-cash payments, it is necessary to increase the number of equipment for payment, involving all known methods. The spread of mobile applications, the use of NFS systems, QR codes also has a positive effect on the increase in the number of online transfers.

Limitations in the study: this article does not take into account the points of payment with QR codes as the determinant of non-cash payments. The idea was to preserve the time series from 2004 to 2020, and in Kazakhstan, the beginning of the implementation of QR codes for payment began in 2017. Therefore, in the future, scientists will be able to study the relationship between QR codes payment and non-cash transfers.

References

1. Adeoti, O., & Osotimehin, K. (2012). Adoption of point of sale terminals in Nigeria: Assessment of consumers' level of satisfaction. *Research Journal of Finance and Accounting*, 3(1), 1-6.

2. Aliha, P. M., Sarmidi, T., & Said, F. F. (2020). Investigating The Impact Of Atm And Pos Terminals On Money Demand In Nine European Countries In The Context Of A Random Effect Model As The Appropriate Panel Data Model. *Regional Science Inquiry*, 12(2), 31-41.
3. Alagh J. I., Emeka E. E, (2014). Impact of Cashless Banking on Banks' Profitability (Evidence from Nigeria). *Asian Journal of Finance & Accounting*. 6(2).
4. Alao, A. A., Sorinola, O. O., (2015). Cashless Policy and Customers' Satisfaction: A Study of Commercial Banks in Ogun State, Nigeria. *Research Journal of Finance and Accounting*. 6(2), 37-48.
5. Alt, R., Ehmke, J. F., Haux, R., Henke, T., Mattfeld, D. C., Oberweis, A., ... & Winter, A. (2019). Towards customer-induced service orchestration-requirements for the next step of customer orientation. *Electronic Markets*, 29(1), 79-91.
6. Bouille, I., & Haase, T. (2019). Adoption of global market practice for payments will pave the road to a successful global migration to ISO 20022. *Journal of Payments Strategy & Systems*, 13(2), 104-112.
7. Carbo Valverde, S., & Rodríguez Fernández, F. (2012). Competing Technologies for Payments: Automated Teller Machines (ATMs), Point of Sale (POS) Terminals and the Demand for Currency (No. 2012113). *Fundacion BBVA/BBVA Foundation*.
8. Ceipidor, U. B., Medaglia, C. M., Marino, A., Sposato, S., & Moroni, A. (2012). KerNeeS: A protocol for mutual authentication between NFC phones and POS terminals for secure payment transactions. In 2012 9th International ISC Conference on Information Security and Cryptology, 115-120.
9. Chochořáková, A., Gabčová, L., Belás, J., Sipko, J. (2015), Bank Customers' Satisfaction, Customers' Loyalty and Additional Purchases of Banking Products and Services. A Case Study from the Czech Republic, *Economics and Sociology*, 8(3), 82-94. DOI: 10.14254/2071-789X.2015/8-3/6
10. Gjika, E., Basha, L., Puka, L., & Shahini, I. (2019, March). ATMs and POS Diffusion: An Econometric Model Albania case study. In *Proceedings of the*

- 2019 2nd International Conference on Computers in Management and Business, pp. 59-63.
11. Kumar, R., & O'Brien, S. (2019). 2019 findings from the diary of consumer payment choice. Federal Reserve Bank of San Francisco, 10, 1-16.
 12. Leong, K., & Sung, A. (2018). FinTech (Financial Technology): what is it and how to use technologies to create business value in fintech way? *International Journal of Innovation, Management and Technology*, 9(2), 74-78.
 13. Lindsay, S. (2015). ISO 20022 and real-time domestic payments. *Journal of Payments Strategy & Systems*, 9(1), 22-29.
 14. Nettleton, D. (2014). Selection of Variables and Factor Derivation. *Commercial Data Mining*, 79–104. doi:10.1016/b978-0-12-416602-8.00006-6
 15. Oliveira, T. P., Moral, R. A., Zocchi, S. S., Demetrio, C. G., & Hinde, J. (2020). lcc: an R package to estimate the concordance correlation, Pearson correlation and accuracy over time. *PeerJ*, 8, e9850.
 16. Park, K., Ali, M., & Chevalier, F. (2011). A spiral process model of technological innovation in a developing country: The case of Samsung. *African Journal of Business Management*, 5(13), 5162-5178.
 17. Puschmann, T. (2017). Fintech. *Business & Information Systems Engineering*, 59(1), 69–76. doi:10.1007/s12599-017-0464-6
 18. Sabden, O. (2018). The concept of the future and the new paradigm of the fifth spiral: State, business, science, society and informatization. *The Journal of Asian Finance, Economics, and Business*, 5(4), 173-185.
 19. Sági, J., Vasa, L., & Lentner, C. (2020). Innovative Solutions in The Development Of Households' financial Awareness: A Hungarian Example. *Economics & Sociology*, 13(3), 27-45.
 20. Shkolnyk, I., Kozmenko, S., Kozmenko, O., & Mershchii, O. (2019). The impact of the economy financialization on the level of economic development of the associate EU member states. *Economics and Sociology*, 12(4), 43-58. doi:10.14254/2071-789X.2019/12-4/2.
 21. Shy, O. (2020). How currency denomination and the ATM affect the way we pay. *Journal of Economics and Business*, 111, 105908.

22. Stiglitz, S. F. J. E. (2010). Time for a visible hand: lessons from the 2008 world financial crisis. Oxford University Press.
23. State program “Digital Kazakhstan”. (2017). <https://digitalkz.kz/o-programme/>.
24. Taylor, L., & Bacha, E. L. (1976). The unequalizing spiral: A first growth model for Belindia. *The Quarterly Journal of Economics*, 197-218.
25. Yermekbaeva, D., & Rakhmatullina, A. (2020). The Importance of Implementing Digitalization in Kazakhstan. *Eurasian Journal of Economic and Business Studies*. 3(57), 40-55. DOI –10.47703/ejeb.v3i57.19
26. Valente, M.J., Rijnhart, J., Smyth, H.L., Muniz, F.B., & MacKinnon, D. (2020). Causal Mediation Programs in R, Mplus, SAS, SPSS, and Stata. *Structural Equation Modeling: A Multidisciplinary Journal*, 27(6), 975 - 984.
27. Zavolokina, L., Dolata, M., & Schwabe, G. (2016). FinTech transformation: How IT-enabled innovations shape the financial sector. In *FinanceCom*, 75-88.