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Role and prospects for development of the credit card market in Poland

Rola i perspektywy rozwoju rynku kart kredytowych w Polsce

Abstract

The purpose of the article is to analyse and evaluate the functioning of the credit card market in the Polish banking services market, from 2009 to 2023, as well as to identify the trends of changes that may occur in the credit card market at the end of 2024 and in 2025. For the study, development trend models were used to forecast the changes that will occur in the credit card market in Poland. The analysis was carried out with the use of Statistica 13.3. The analysis was based on the results of a study conducted by the National Bank of Poland on the use of payment cards, including credit cards, in retail payments. The article hypothesizes that with the increasing fees associated with the use of credit cards, the number of credit cards issued, as well as the number of transactions carried out using them, is decreasing. The research conducted in the article made it possible to make a prediction, according to which the number of credit cards can be expected to fall to 3.51 million cards by the end of 2024, and to fall to 2.17 million by the end of 2025. On the other hand, the value of credit card transactions conducted, according to the forecast, will increase to PLN 61,807.11 million by the end of 2024, and to 64,249.09 million by the end of 2025. Further technological advances will have an increasing impact on increasing competition among credit card issuers. Banks are looking to modern technological solutions to achieve a competitive advantage in the market.

Keywords

payment cards, credit cards, non-cash payments, electronic banking

Streszczenie

Celem artykułu jest analiza i ocena funkcjonowania rynku kart kredytowych na polskim rynku usług bankowych w latach 2009–2023, jak również identyfikacja tendencji do zmian, jakie mogą nastąpić na rynku kart kredytowych pod koniec 2024 r. oraz w roku 2025. Do badań wykorzystano modele tendencji rozwojowej (trendu), które wykorzystano do prognozowania zmian, jakie będą zachodziły na rynku kart kredytowych w Polsce. Analizę przeprowadzono z użyciem programu Statistica 13.3. Podstawą analizy były wyniki badań przeprowadzonych przez Narodowy Bank Polski w zakresie wykorzystania kart płatniczych, w tym kart kredytowych, w płatnościach detalicznych. W artykule postawiono hipotezę, że wraz z wzrastającymi opłatami związanymi z korzystaniem z kart kredytowych spada liczba wyemitowanych kart kredytowych, jak również liczba transakcji zrealizowanych przy ich użyciu. Przeprowadzone w artykule badania umożliwiły dokonanie prognozy, zgodnie z którą można oczekiwać, że liczba kart kredytowych pod koniec 2024 r. spadnie do 3,51 mln kart, a pod koniec 2025 r. – do 2,17 mln. Natomiast wartość przeprowadzonych transakcji przy użyciu kart kredytowych, zgodnie z prognozą, wzrośnie pod koniec 2024 r. do 61 807,11 mln zł, a pod koniec 2025 r. do 64 249,09 mln zł. Dalszy postęp technologiczny będzie mieć coraz większy wpływ na wzrost konkurencji wśród emitentów kart kredytowych. Banki upatrują w nowoczesnych rozwiązaniach technologicznych źródła przewagi konkurencyjnej na rynku.

Słowa kluczowe

karty płatnicze, karty kredytowe, płatności bezgotówkowe, bankowość elektroniczna

JEL: G21

Introduction

Modern information technology has helped to make retail payments more efficient and secure, and to optimize their costs. Payment cards have

become the most common form of non-cash monetary settlements used in retail payments, and technological advances have enabled banks to serve customers outside of branches 24 hours a day, 7 days a week (Golnik, 2019; Bahar & Hobi-

koglu, 2015; Runnemark et al., 2016; Mansour, 2021, Thaker et al., 2021; Garcia-Swartz et al., 2006; Bolt & Humphrey 2007).

Credit cards are the second largest category of cards in the payment card market in Poland and are a separate product offered by banks, granted after verification of the holder's creditworthiness range. At the moment, after a temporary slump in the credit card market as a result of the COVID-19 pandemic, there is renewed interest in credit cards. According to BIK data, consumers are reaching for credit cards far more readily than a year ago, treating them as a financial reserve for current and future needs (Otto-Duszczak, 2020).

With the development of technology, competition is also increasing among credit card issuers, who offer a wide range of products enabling individuals to obtain credit cards more easily. Credit card issuers, through various promotional offers and discounts, are trying to increase the attractiveness of using this payment instrument. As a result, the use of credit cards is increasing, and the area of their use is expanding more and more (Borowski-Beszta & Kiermas, 2019; Golnik, 2019; Önder, 2018). The issue raised in the article is very important, as the credit card market plays an increasingly important role in the operation of the payment card market in Poland. The public is becoming more and more eager to get into debt, which is supported, among other things, by the increase in the granted limit in credit cards in November 2023 (an increase of 15.2% compared to a year earlier).

The purpose of this article is to analyse and evaluate the development of the credit card market in Poland from 2009 to 2023, and to present the main directions of changes that may occur at the end of 2024 and 2025 in the credit card market. It was hypothesized that as the fees associated with the use of credit cards increase, the number of credit cards issued decreases, and so does the number of transactions made using them.

A trend analysis method was adopted as the research method, which was used to forecast the changes that will take place in the credit card market in Poland at the end of 2024 and 2025. The analysis was based on the results of research published by the National Bank of Poland.

Literature review

A credit card can be defined as an accepted and authorized payment card with which payments can be made up to a credit limit that the card issuer sets. They function on a pay later basis and it is not necessary to have an account at a particular bank to have this type of card issued.

In order to issue a credit card, it is enough to submit an application and attach the documents required by the bank (e.g. a certificate of earnings and length of service issued by the employer). The application usually includes a number of different types of questions about an applicant's financial situation. Based on the submitted application, the bank evaluates creditworthiness and sets the amount of the credit limit. The rules for examining creditworthiness and setting the limit vary widely. Even for the same person, the amounts of the limits granted differ from one bank to another. New customers usually receive basic limit, which can be increased by the bank after some time of good cooperation. The credit card holder can make transactions up to the credit limit granted. The bank totals all transactions once a month, and then sends the cardholder a summary statement of these transactions together with an information on the amount of credit taken with the card. The rules for repaying the credit are set by each bank on its own. Typically, the bank will give the cardholder a certain minimum amount that the cardholder is required to repay once a month (this can be, for example, 10% of the credit taken out). The bank may also charge no interest on the loan if it is repaid in full by a certain date (e.g., two weeks after receiving the monthly statement). The credit card granted by the bank is a revolving credit. This means that each repayment of debt increases the available limit for further card transactions. The credit granted to the cardholder usually carries a higher interest rate than regular credit. This is due to the cost of servicing the card and the associated credit, which is higher than the cost of regular credit. In practice, each payment made with a credit card reduces the credit limit granted by the bank. You can also use a credit card to withdraw cash from an automatic teller machine, but this incurs an additional fee and an immediate liability on which interest is charged. Many banks also offer a grace period, which allows interest-free repayment of the loan within 51 days of the date of the transaction. A credit card is an example of an embossed card, it has embossing and can be handled both at electronic points and at manual imprints (Deb & Lodh, 2016; Szajna, 2021; Ferús, 2022).

The differences in credit cards from one bank to another can be considerable, and comparisons are best made on a selection of the most important parameters. In credit cards, the most important factors are the threshold, the interest-free period and the associated interest rate, as well as fees, which are usually higher than the interest rate. The selected factors should form the basis, while the others should supplement the comparisons. The bank leaves an appropriate limit on the credit float at the consumer's disposal, and this is the

amount up to which the user can borrow. These funds, depending on the institution and the card, range from PLN 500 upwards and depend on the creditworthiness of the holder. The threshold amount should not significantly exceed the amount the customer is able to repay. Card holders can determine for themselves how often and where they will pay for it, setting the amount of monthly spending they will be able to repay. Having already set the amount usually doubles it, since the repayment is made in the following month, so that the customer has the ability to use the card. The threshold calculated this way should be raised by a set amount allocated, for example, for occasional expenses or unplanned trips and other similar situations. Such a limit configuration should help to settle the entire debt. The current situation is very favourable for banks, as each customer must take the need to pay interest into account. The balance on credit cards also sets the maximum level on a monthly, daily and weekly basis. Depending on the bank, the definition of limits and their detail often varies. In a situation where the customer only uses the interest-free term, the interest rate is not important. The interest rate on the loan is relevant when the customer does not have the ability to pay the entire charge in the allotted time. A customer who wants to avoid the interest calculated on a credit card should not withdraw money from an ATM, and should repay the entire amount used within the specified time. Every credit card holder should be disciplined and remember that the credit card is to be used only for non-cash payments. The day on which the debt is repaid is of great importance for timely payment of the card debt (Szajna, 2021; Hinc, 2008).

Since the beginning of the 1990s, very intensive growth of the payment card market has been observed in Poland. The fact is that these cards have become not only an essential element of the retail policy of most commercial banks, but also the most common form of non-cash monetary settlements used in retail payments.

Research methodology

The empirical study covered the credit card market in Poland from 2009 to 2023. The basis of the analysis is data made available by the National Bank of Poland. The subject of consideration in the article is the models of development trend (trend) and an attempt to use the same to forecast changes that will occur in the credit card market in Poland at the end of 2024 and in 2025. Linear regression was used to analyse the trend.

The essence of regression is to determine the analytical function that will best describe the

relationship between the average values of the explanatory (dependent) variable Y and the specific values of the explanatory (independent) variables X_i (Matuszyk, 2004). An accurate picture of the assignment of average values is obtained through the so-called regression function of the first kind, which refers to the general population (Janc & Kraska, 2001):

$$\hat{Y}_i = \alpha_0 + \alpha_1 X_i + \xi_i$$

where:

- α_0, α_1 ($i = 0, 1, 2, \dots, k$) – values of true regression coefficients,
- ξ_i – random component,
- $\hat{Y}_i$ – theoretical value of the explained (dependent) variable of the i -th observation,
- X_i ($i = 0, 1, 2, \dots, k$) – the explanatory (independent) variable of the i -th observation.

A function of the first kind refers to the theoretical values of the function for the entire population, respectively. However, basic calculations describing the correlation relationship of variables are carried out on the basis of the corresponding sample, rather than the entire population. The expression of this correlation is the regression function of the second kind, which is an approximation of the regression function of the first kind (Janc & Kraska 2001):

$$\hat{Y}_i = \alpha_0 + \alpha_1 X_i + u_i$$

where:

- $\hat{Y}_i$ – theoretical value of the explained (dependent) variable of the i -th observation,
- u_i – residual component calculated according to the formula $u_i = X_i - \hat{Y}_i$.

The parameters of the regression equation from the sample are estimated using the classical least squares method. The method of least squares (MNK) consists in estimating the parameters of the function in such a way that, for the sample data, the condition is met (Ostasiewicz et al., 1997):

$$\sum_{i=1}^n (Y_i - \hat{Y}_i)^2 = \sum_{i=1}^n (Y_i - (\alpha_0 + \alpha_1 X_i + u_i))^2 \Rightarrow \min$$

where:

- Y_i – empirical value of the explained (dependent) variable of the i -th observation,
- $\hat{Y}_i$ – theoretical value of the explained (dependent) variable of the i -th observation.

The linear regression function can also have a multivariate form. Then the function n -element for the i -th number of observations and with k variables will be presented as follows (Janc & Kraska 2001):

$$\hat{Y}_i = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \dots + \alpha_k X_{ki} + \xi_i.$$

On the other hand, the multiple regression model of the second type takes the following form:

$$\hat{Y}_i = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \dots + \alpha_k X_{ki} + u_i.$$

In order to assess the fit of a simple regression to empirical points, the so-called analysis of residuals is used, which represent the difference between the empirical and theoretical values of the regression function (Ostasiewicz et al., 1997). The analysis of residuals is aimed at checking the assumptions of the classical method of least squares, the correctness of the model as to its shape and the explanatory variables included in it. With regard to the regression of Y against X , the residuals are represented by the following formula:

$$z_i = Y_i - \hat{Y}_i \text{ for } i = 1, 2, 3, \dots, n$$

where:

Y_i – empirical value of the explained (dependent) variable of the i -th observation,

$\hat{Y}_i$ – theoretical value of the explained (dependent) variable of the i -th observation.

A regression function is correctly estimated if the values of the residuals have a normal distribution.

Statistical methods for assessing the detailed properties of the distribution of residuals include testing the normality of the residual component. It is important because the basic assumption about the stochastic structure of the model is that the random component has a normal distribution. One popular test is the Durbin-Watson consistency test, which allows checking first-order autocorrelation. This should verify the hypothesis that the autocorrelation coefficient is zero. A check of the Durbin-Watson test is the following statistic (Welfe, 2003):

$$d = \frac{\sum_{i=2}^n (e_i - e_{i-1})^2}{\sum_{i=1}^n e_{i-1}^2}$$

where:

e_i – the rest of the model,

n – sample size.

A parametric F -Snedecor test can be used to assess the significance of the choice of total explanatory variables. The F -Snedecor test for k and $n - k - 1$ degrees of freedom (where: k – the number of variables, and n – the number of observations) verifies the null hypothesis H_0 : $\alpha_1 = \alpha_2 = \dots = \alpha_i = 0$ about the absence of multiple correlation between the studied characteristics Y (the explanatory variable) and X_i (explanatory variables). Rejection of the null hypothesis H_0 is equivalent to the fact that at least one of the coefficients α_i is different from zero.

The empirical value of the F parameter is calculated according to the given formula (Józwiak & Podgórski, 1997; Sobczyk, 2024):

$$F = \frac{\left[\sum_{i=1}^n (\hat{Y}_i - \bar{Y})^2 \right] / k}{\left[\sum_{i=1}^n (Y_i - \bar{Y})^2 \right] / (n - k - 1)}$$

where:

Y_i – empirical value of the dependent (explained) variable of the i -th observation,

$\bar{Y}$ – average value of the dependent (explained) variable,

$\hat{Y}_i$ – theoretical value of the dependent (explained) variable of the i -th observation.

The calculated F value should then be compared with the critical value of F^* for a certain level of significance ($\alpha = 0,05$) and for k and $n - k - 1$ degrees of freedom. Hypothesis H_0 is rejected when the calculated F value is greater than or equal to the critical value of F^* .

The Shapiro-Wilk test is considered the best test for checking the normality of the distribution of a random variable. The test statistic for the Shapiro-Wilk test is shown by the formula (Razali & Wah, 2011):

$$W = \frac{(\sum_{i=1}^{\lfloor \frac{n}{2} \rfloor} a_{n-i+1} (e_{n-i+1} - e_i))^2}{\sum_{i=1}^n (e_i - \bar{e})^2}$$

$$W = \frac{(\sum_{t=1}^{\lfloor \frac{n}{2} \rfloor} a_1(n) (\overline{X_{n-t+1}} - \bar{X}_t))^2}{\sum_{t=1}^n (X_t - \bar{X})^2}$$

where:

a_i – Shapiro-Wilk coefficient, a constant, being dependent on n and on k ,

e_i – residuals of the model ordered in ascending order.

The critical value for a fixed α is read from the $W(\alpha, n)$ quantile tables for the Shapiro-Wilk test.

The critical area in this test is a left-handed area, so the null hypothesis is rejected if the calculated value of the test statistic is less than or equal to the critical value, i.e. $W \leq W(\alpha, n)$.

In regression analysis, the measure most commonly used to assess the fit of a linear regression function model to the data used is the coefficient of determination. The coefficient of determination is calculated using the following formula (Janc & Kraska, 2001; Welfe, 2009):

$$R^2 = \frac{\sum_{i=1}^n (\hat{Y}_i - \bar{Y})^2}{\sum_{i=1}^n (Y_i - \bar{Y})^2}$$

where:

Y_i – empirical value of the explained (dependent) variable of the i -th observation,

$\bar{Y}$ – average value of the explained (dependent) variable of the i -th observation,

$\hat{Y}_i$ – the theoretical value of the explained (dependent) variable of the i -th observation.

The R^2 value is between 0 and 1 and is a measure of the extent to which the model explains the formation of the Y variable. The closer the R^2 value is to unity, the better the fit of the model. When R^2 is equal to unity, it means that all observations lie exactly on the regression line and there is a close relationship between the explanatory variable Y and the explanatory

variables X_i . In the case of $R^2 = 0$, there is no linear relationship between the variables.

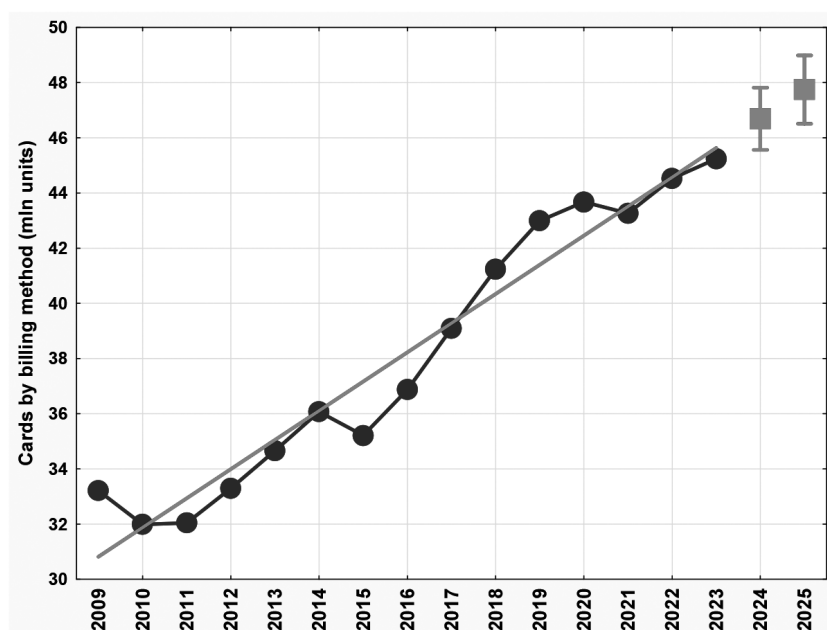
In general, a model that not only has a good fit to the empirical data, but in which all included explanatory variables X_i have a significant effect on the explanatory variable Y , is considered satisfactory.

Analysis of the credit card market in Poland

Data provided by the National Bank of Poland was used to analyse the credit card market in Poland from 2009 to 2023. Trend analysis using linear regression was carried out with Statistica 13.3. To verify the validity of the models, we used, among others, the parametric F -Snedecor test, the coefficient of determination R^2 , the Shapiro–Wilk normality test, and assessed the autocorrelation of the residuals using the Durbin–Watson statistic.

The payment card market in Poland is growing steadily. It functions within the national payment system as part of the retail payment system. According to the National Bank of Poland, at the end of 2023, there were 45.24 million payment cards in circulation in the Polish market, which is 720 thousand more than in 2022 and represents an increase of 1.62% (Figure 1). Based on Figure 1, it can be seen that one of the components of this time series is an increasing trend. The values of the phenomenon observed are increasing from

Figure 1. Number of payment cards issued from 2009 to 2023 (million units)



Source: own compilation based on: *Number of payment cards issued in 1998–2023*.

<https://nbp.pl/system-platniczy/dane-i-analizy/karty-platnicze/>

year to year. The trend graph can be described by the linear function shown in Table 1. Making a projection into the future of the linear trend observed in 2009–2023, it would be expected that, at the end of 2024, the number of payment cards issued would be 46.69 million cards, and at the end of 2024 it would increase to 47.75 million cards (an increase of 1.06 million cards – 2.3%). To assess the quality of the estimated model, the coefficient of determination R^2 was used, based on which it can be seen that the model fits the real data in 94.6%. In turn, a parametric F -Snedecor test, the Shapiro–Wilk normality test were used to test the significance of the choice of explanatory variables, and the autocorrelation of the residuals was evaluated using the Durbin–Watson statistic. The residuals of the model have a normal distribution

and there is no basis for their autocorrelation, so the model has the desired properties (Table 1).

In 2023, payment cards were used to carry out transactions amounting to PLN 1,193.16 billion (Figure 2), an increase of PLN 96.42 billion compared to the end of 2022 (an increase of 8.79%).

From an analysis of Figure 2 and Table 2 it can be concluded that the linear trend passed the best verification from the classical models of development trend and thus the model's fit to real data was 93.5%. The rest of the model had a normal distribution and showed no autocorrelation. Using the trend from Table 2 to extrapolate into the future, it can be expected that at the end of 2024 the value of payment card transactions carried out will increase to 1,118.84 billion, and at the end of 2025

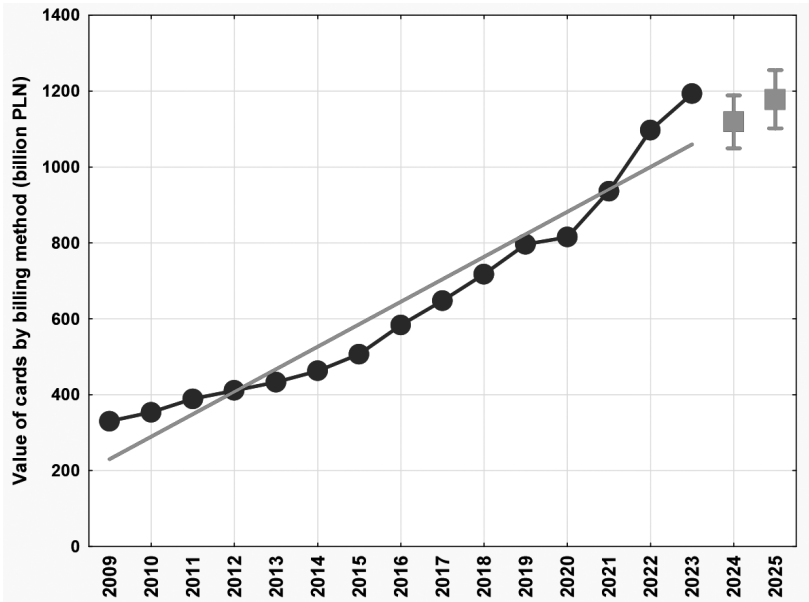
Table 1. Forecast for 2024–2025 for number of the cards by billing method (million units)

Cards by billing method (mln units)		
Linear model: $Y = 1.05809 \cdot x + 29.75971$		
$(R^2 = 94.6; F(1, 13) = 227.52; p_F < 0.0000, d_W = 0.8931144; p_{S-W} = 0.8954; p_w = 0.081)$		
Year	Forecast	Confidence interval (90%)
2024	46.69	45.56–47.82
2025	47.75	46.51–48.99

Note: R^2 – coefficient of determination; F – F -Snedecor test; p_F – significance of whole model (based on test F); p_{S-W} – Shapiro–Wilk normality test; p_w – significance of whole model (based on Shapiro–Wilk test); d_W – Durbin–Watson statistic.

Source: own study.

Figure 2. Value of payment card transactions completed from 2009 to 2023 (billion PLN)



Source: as in Figure 1.

Table 2. Forecast for 2024–2025 for value of the cards by billing method (billion PLN)

Cards by billing method (PLN mln)		
Linear model: $Y = 59.2429 \cdot x + 170.9687$		
$(R^2 = 93.5; F(1, 13) = 186.28; p_F < 0.0000, d_W = 0.3456; p_{S-W} = 0.9136; p_w = 0.1537)$		
Year	Forecast	Confidence interval (90%)
2024	1118.84	1048.95–1188.73
2025	1178.08	1101.34–1254.82

Note: R^2 – coefficient of determination; F – *F-Snedecor* test; p_F – significance of whole model (based on test F); p_{S-W} – Shapiro–Wilk normality test; p_w – significance of whole model (based on Shapiro–Wilk test); d_W – Durbin–Watson statistic.

Source: own study.

to 1 178.08 billion (an increase of PLN 59.24 billion – 5.29%).

Adopting the distribution of payment cards proposed by the NBP, debit cards have by far the largest market share. Credit cards are the second largest group of payment cards (about 4.91 million units – Figure 3). At the end of 2023, credit cards accounted for about 10.97% of total payment cards in Poland. The number of credit cards over fifteen years has decreased by 5.95 million units (54.79% decrease).

Based on an analysis of the results presented in Figure 3 and Table 3, it can be concluded that the number of credit cards will decline markedly from year to year during the study period. The trend graph is decreasing in nature and can be described by the cubic polynomial function presented in Table 3. Extrapolating, that is extending the decreasing trend observed in 2009–2023 into the future, it would be expected that at the end of 2024 the number of issued credit cards will be 3.51 million cards, and at the end of 2025 it will fall to 2.17 million cards (a decrease of 1.34 million, accounting for 38.18 %). The model has a 96.3% fit to the actual data. Based on significance tests: *F-Snedecor*, Shapiro–Wilk and coefficient of determination R^2 , it should be concluded that the selection of explanatory variables for the model is correct. The rest of the model has a normal distribution and there is no basis for their autocorrelation, so the model has the desired properties.

According to data from the National Bank of Poland, in 2023 credit card transactions amounted to PLN 64,983.46 million. Compared to 2022, the value decreased by PLN 5,879.76 million (down 9.95%) (Figure 4).

Analysing Figure 4, it can be seen that there is a continuing upward trend in the value of credit card transactions completed. Based on Figure 4 and Table 4, it can be observed that the best verification from the classical models of development trend passed the linear trend, and thus the

model's fit to real data was 93.7% The rest of the model had a normal distribution and showed no autocorrelation. Using the linear trend from Table 4 to project into the future, it can be expected that at the end of 2024 the value of card transactions will be 61,807.11 million, and at the end of 2025 it will rise to 64,249.09 million (an increase of 2,441.98 million, i.e. 3.95%).

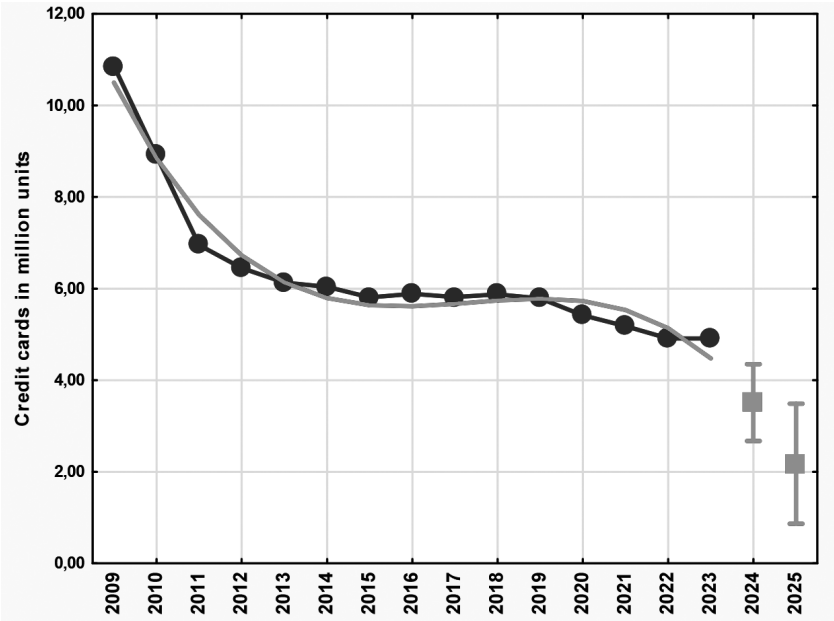
At the end of 2023, the growth rate of credit card sales compared to 2022 was positive in terms of the value of credit cards (+9.95%) and negative looking at the number of cards sold (–0.11%) (Figure 5).

In the previous decade, the number of accounts opened was much higher. In 2009, more than 10.86 million credit card accounts were opened. However, year after year, the number of credit cards issued showed negative growth, and in 2023 the number of issued credit cards was already only 4.91 million units. In fifteen years, there was a decline of 5.95 million cards (–45.21%). This may suggest an interruption of the credit card market's prosperity, although the dynamics in value terms in 2022 compared to 2021 is still good (+9.19%).

As of 2019, the number of credit cards is steadily declining, which may mean that fewer and fewer of the public choose to have credit cards.

Each customer paying with a credit check enjoys an interest-free credit for a specified period, and can settle his or her obligation after the so-called interest-free period. Usually it is about 51–59 days, depending on a bank chosen. Then, after this period, the customer can choose whether to pay off the entire debt and not pay interest, or to pay off only a part of it and pay the rest later, together with the interest charged by the bank. A credit card is not linked to the customer's account. To service this type of card, the bank opens a special account into which funds are deposited to reduce the debt balance.

Figure 3. Number of credit cards issued from 2009 to 2023 (million units)



Source: as in Figure 1.

Table 3. Forecast for 2024–2025 for number of the credit cards (millions units)

Credit cards (mln units)		
Trend in the form of a 3rd degree polynomial		
$Y = -2.36638 \cdot x + 0.26056 \cdot x^2 - 0.00926 \cdot x^3 + 12.61235$		
$(R^2 = 96.3; F(3, 11) = 94.92; p_F < 0.0000, d_W = 1.1356; p_{S-W} = 0.7385; p_w = 0.0006)$		
Year	Forecast	Confidence interval (90%)
2024	3.51	2.67–4.35
2025	2.17	0.86–3.49

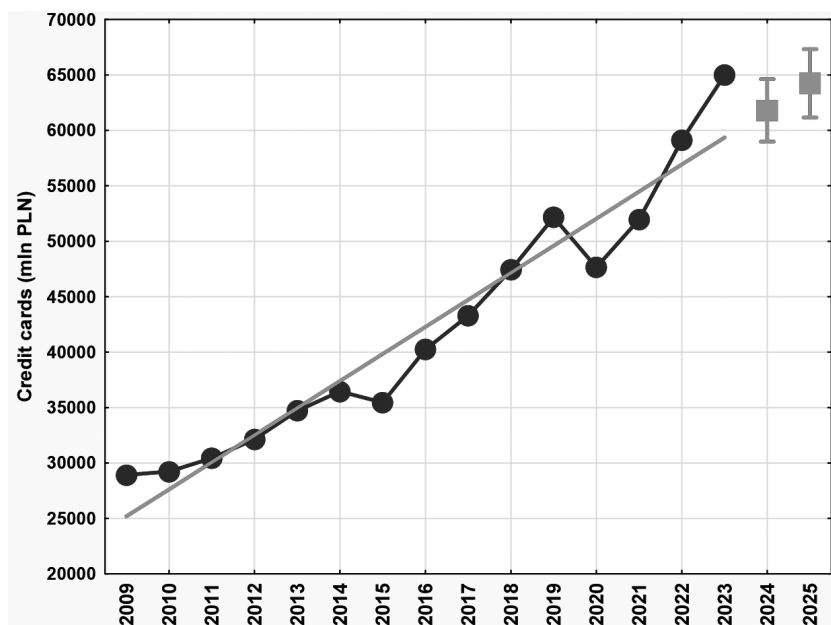
Note: R^2 – coefficient of determination; F – *F*-Snedecor test; p_F – significance of whole model (based on test F); p_{S-W} – Shapiro–Wilk normality test; p_w – significance of whole model (based on Shapiro–Wilk test); d_W – Durbin–Watson statistic.

Source: own study.

Significant declines in the number of credit cards granted, with a concurrent increase in the average amount of limits granted, ultimately translate into an increase of the total amount of limits put at customers' disposal. This relationship is due to a change in the strategy of card issuers. At the moment, most issuers are offering products especially to long-established, loyal customers. The increase in limits is also influenced by the withdrawal of some banks from installment sales within low-amount card accounts. The maximum limit can be up to PLN 100 thousand. However, it is worth bearing in mind that we are using the bank's funds, which must be returned according to

the agreement. At the end of 2023, individual customers of the largest Polish banks had 4.91 million active credit cards, with PKO BP issuing the most credit cards, followed by BNP Paribas and Santander.

Data collected by banks show that, in 2023, about 9.45 trillion non-cash transactions were carried out using payment cards, which represented an increase of 0.89 trillion transactions (a 10.4% increase) compared to 2022 (Figure 6). There is also an upward trend comparing 2023 to 2009, where the number of transactions carried out was 1,250% higher. This indicates an increase in the propensity of

Figure 4. Value of completed credit card transactions from 2009 to 2023 (million PLN)

Source: as in Figure 1.

Table 4. Forecast for 2024–2025 for value of the credit cards (million PLN)

Credit cards (mln PLN)		
Linear model: $Y = 2441.98 \cdot x + 227535.46$		
$(R^2 = 93.7; F(1, 13) = 194.12; p_F < 0.0000, d_W = 1.0636; p_{S-W} = 0.9303; p_w = 0.2758)$		
Year	Forecast	Confidence interval (90%)
2024	61807.11	58985.01–64629.22
2025	64249.09	61150.37–67347.81

Note: R^2 – coefficient of determination; F – F -Snedecor test; p_F – significance of whole model (based on test F); p_{S-W} – Shapiro-Wilk normality test; p_w – significance of whole model (based on Shapiro-Wilk test); d_W – Durbin-Watson statistic.

Source: own study.

customers in retail payments to use payment cards in non-cash transactions.

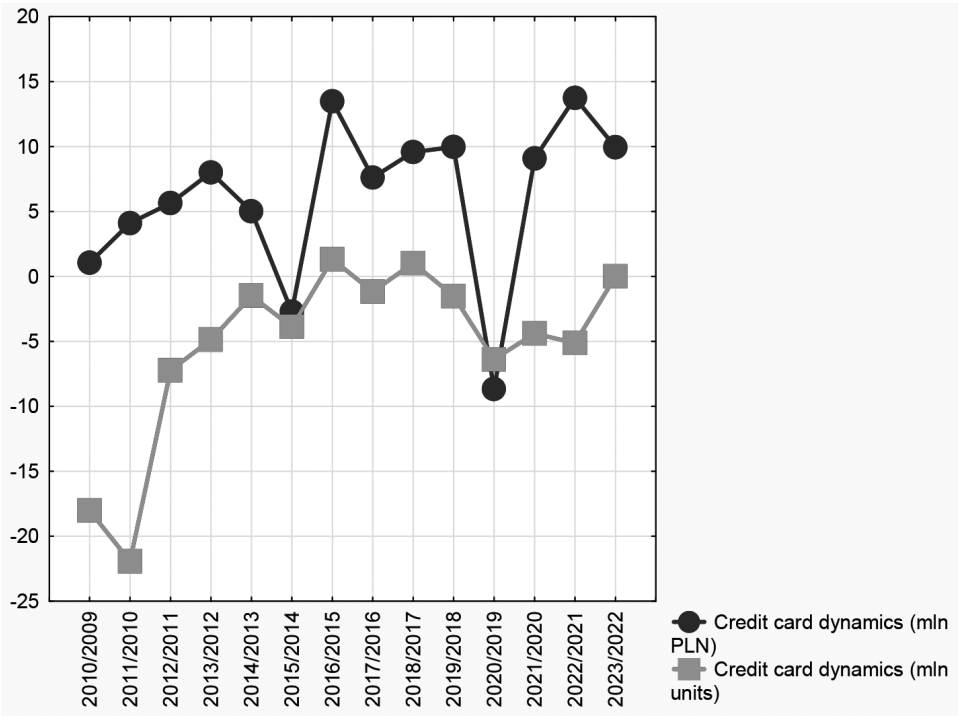
Interpreting the results shown in Figure 6 and in Table 5, it should be noted that the number of non-cash transactions is clearly increasing from year to year during the study period. The trend graph is of an increasing nature and can be described by a linear regression function. By extrapolating the increasing trend observed in 2009–2023, it can be expected that, at the end of 2024, the number of cashless transactions will increase to 8.98 billion transactions, and at the end of 2025 to 9.62 billion transactions (an increase of 0.64 billion transactions – 7.13%). The linear trend model fits the actual data: 94.3% in

this case. Based on the significance tests performed, it should be concluded that the selection of explanatory variables for the model is correct (Table 5).

Conclusion

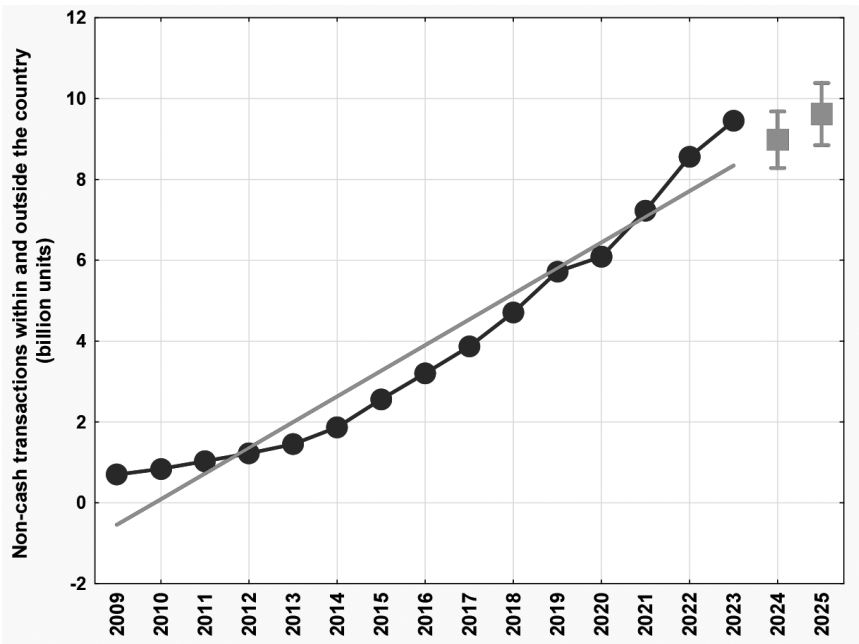
Non-cash card payments play a very important role in both the Polish and global markets for banking services. The use of modern technologies, both IT and telecommunications, is constantly increasing from year to year. It is to be expected that banks will further develop and improve the most popular distribution channels

Figure 5. Dynamics of change in the number of issued credit cards from 2009 to 2023 (million units)



Source: as in Figure 1.

Figure 6. Number of non-cash transactions carried out in 2009–2023 (billion units)



Source: as in Figure 1.

for their services, which payment cards undoubtedly are.

Based on an analysis of the credit card market in Poland it can be concluded that the number of credit cards by volume is decreasing while the

average debt on individual cards is increasing. Such a situation may be due both to the changing policies of banks in issuing cards, as well as to the public's awareness that any credit card not actively used for payments and not settled on time

Table 5. Forecast for 2024–2025 for non-cash transactions within and outside the country (billion units)

Non-cash transactions within and outside the country (billion units)		
Linear model: $Y = 0.63518x - 1.18143$		
$(R^2 = 94.3; F(1, 13) = 214.77; p_F < 0.0000, d_W = 0.27956; p_{S-W} = 0.903693; pw = 0.108389)$		
Year	Forecast	Confidence interval (90%)
2024	8.98	8.28–9.68
2025	9.62	8.85–10.38

Note: R^2 – coefficient of determination; F – *F-Snedecor* test; p_F – significance of whole model (based on test F); p_{S-W} – Shapiro–Wilk normality test; pw – significance of whole model (based on Shapiro–Wilk test); d_W – Durbin–Watson statistic.

Source: own study.

incurs corresponding costs. Banks are now more willing to issue cards to regular, loyal customers with established credit histories for correspondingly higher limits depending on creditworthiness. In addition, it is no longer the practice for banks or card-issuing institutions to ship inactive cards for future customer use.

A significant influence on changes in the dynamics of credit card numbers is consumer behaviour, which is changing based on advancing trends such as security, changing share of sales channels and time savings. Uncertain times caused by the loss of income during the COVID-19 pandemic and the more frugal lifestyle of the public are among the examples of reasons for which credit cards operating on the basis of an open credit account have begun to lose popularity among consumers. At the end of 2023, the number of credit cards stood at 4.91 million. According to the forecast carried out, it can be expected that the number of credit cards at the end of 2024 will decrease to 3.51 million, and by the end of 2025 will decrease to 2.17 million. In turn, the value of conducted credit card transactions will increase to 61,807.11 million by the end of 2024, and to 64,249.09 million by the end of 2025.

When analysing banks' offers, customers should pay special attention to how they intend to use the credit card, as well as to any additional costs resulting from failure to meet certain conditions. It is impossible to determine unequivocally which bank's credit card will be the best product. An important aspect that has a great influence on the choice of a particular credit card is other added values. The cardholder, by using the card, receives various types of discounts or additional points. One of the main advantages of owning credit cards is the technical convenience of combining with its ownership, as well as its constant use in paying for products and services.

Customers with a credit card do not need to perform unnecessary activities to specifically store money, as well as to protect it from loss or adverse actions of others. Using a credit card also affects the consumer's credit history. With regular debt repayments for each month, the customer can count on positive verification, and consequently on obtaining a new cash loan. On the other hand, a credit card has the effect of lowering creditworthiness. In such a situation, it does not matter whether the entire limit has been used or whether there is no debt on it. The bank always calculates the amount of the limit level on the card as the total debt. Thus, the credit potential is reduced. From the point of view of a credit card holder, it can be observed that, in addition to their advantages, they have some disadvantages too. The latter ones include the payment of any fees is associated with the ability to use the credit card. In some cases, there is also a risk of losing the card and its potential use by third parties (Sokołowska, 2015; Stecki, 1998). Then, there may be temptation to get into too much debt with credit cards and spend the money on non-essential things. As a result, you can easily fall into a debt trap, and especially so when you have more such cards.

Using a credit card allows bank customers to take out an unsecured loan up to a certain limit. The funds thus obtained are usually used for consumption purposes. In addition, the card can be used to settle all payments and even bring additional benefits such as additional products offered by the card issuer's partners.

Credit cards are a great convenience. However, it should be borne in mind that if used incompetently, they can contribute to an increase in debt. That, in consequence, may have the effect of bad credit history in the business information bureau. In the case of credit cards, one should be

wary of changing interest rates due to the interest rate, but also the accumulation of interest after bypassing the free billing period. According to data provided by the Central Economic Information Center, as many as 1,943 personal

bankruptcies were published in the National Debt Register in April 2024. During the 15-year history of consumer bankruptcy in Poland, this is the highest result (a 29% increase compared to a year earlier).

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