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THESIS WORK

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ABSTRACT

Household debt level is rising despite of crises and big interest rates in a lot of countries, it can lead to bigger problems starting from recession in global level to defaults of present economic system. The household debt to GDP ratio has increased to 15.14, to 2.49 percentage point bigger from last year even if the average interest rate was 15-20%. However, the economic growth is also increasing in similarly same temp, showing that growth of debts will bring to a growth of some sectors in economics.

The article aims to show the link between household debt and economic growth in Kazakhstan between 1996-2022. To achieve this goal article provides the relation of household debt on economic growth by using several economic models like Vector Autoregressive, Autoregression integrated moving average (ARIMA), regression with Newey-West standard errors, Pearson's correlation model and etc. In article there are two group of data, from 1996 to 2022 annually and from 2007 to 2022 quarterly. Result has shown that there is strong positive relation between household debt and economic growth. Also, by analyzing the result of all model estimations author concluded that household debt affects to economic growth positively.

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INTRODUCTION

World’s economic system in modern sense has limited number of variables or components that make our better or vice versa worse than present time. Household debt is from long period of time being and standing in one row with these variables and that’s why administration of government and financial organizations should also try to regulate in some cases or try to create a policy and reforms by adding a big role to debt, and specially to the debt of households, because households are playing the main role in the economics of country.

Household debt refers to the amount of money that individuals owe to financial institutions, such as banks and credit card companies. Economic growth, on the other hand, refers to the increase in a country's gross domestic product (GDP) over time. The relationship between household debt and economic growth is complex and multifaceted, with different factors influencing the direction and magnitude of this relationship.

On one hand, household debt can stimulate economic growth by increasing consumption and investment. When households borrow money, they have more disposable income to spend on goods and services, which can boost economic activity and create jobs. Additionally, when households use debt to finance investments, such as buying a home or starting a business, this can lead to long-term economic growth and productivity.

However, excessive household debt can also have negative effects on economic growth. When households take on too much debt, they may become overleveraged and unable to repay their loans, which can lead to default and bankruptcy. This can cause financial instability and reduce confidence in the economy, leading to decreased investment and consumption. Additionally, high levels of household debt can divert resources away from more productive uses, such as investment in education and infrastructure.

In the modern period of unprecedented and unusual economic fluctuations and global financial crises, the dynamics between household debt and economic growth

have been risen as a subject of unique and significant topic in research. As nations and states starting to navigate the policy of cheating in fiscal stability and sustainable development, the question about the highness in levels of household debt and its relation and effect on economic growth has become a central concern for policymakers, economists, and researchers.

The world was witness of the catastrophic consequences of extremely high level of household debt during the 2008 financial crisis, which exposed the vulnerability of economics which is highly affecting on consumer spending and underscored the weakness of household balance sheets. This crucial event in 2008 prompted a deep revaluation of the traditional and conservative assumption that expanding household debt is a specific and clear driver of economic well-being.

Therefore, the relationship between household debt and economic growth is complex and depends on a variety of factors, including the level of debt, the purpose of borrowing, and the stability of the financial system.

The purpose of this dissertation is to find the relation between household debt and economic growth in Kazakhstan, by mixing it other key factors affecting to them. By examining the theoretical framework, this research trying to add its piece of findings to existing knowledge collection.

To achieve this goal author has put next objectives: to find the relation between household debt and economic growth; to estimate the effect of household debt on output by economic model; to analyze the result came from estimation.

Research work contains 11 tables, 5 figures, 8 formula (plus 2 in literature review part) and 34 literatures.

Data

The data for this research was taken from primary and secondary sources. Here are some sources in following:

Primary sources:

1. National Bank of Kazakhstan. The website www.nationalbank.kz contains different information about debt and reserves of Kazakhstan's central bank and there have a lot of statistical materials with separate time periods such as monthly, quarterly and year.

2. Bureau of National Statistics in Kazakhstan. Bureau has a lot of statistical data and figures about the Kazakhstan from economics to gender statistics, from environmental statistics to labor force and trade balance.
3. World Bank. This website consists international statistical data frame of about 190 countries and a lot of materials related to economics and finance of countries.
4. International Monetary Fund. It is the biggest financial organization located in Washington and aims to regulate the financial condition of countries around the world.
5. Organization for Economic Co-Operation and Development (OECD). The international organization that aims to improve and make better the wellbeing of people entering to this group. Also, they have a lot of important and crucial materials and data about world countries.

LITERATURE REVIEW

Household debts were existing from ancient periods where first civilizations and communes have formed, and it was one of the ways of close and satisfy their needs and by debt they were able to do a lot of things as an alternative of ones who didn't borrow, however from other sides they have owed from themselves in future, so there are not only positive, but also negative sides.

The reforms and consumer behaviors has led household debts to experience a significant increases and changes since the start of 21st century. For instance, in some countries like United States, the ratio of household debt to GDP rose from 75% in 2000 to 104% in 2007, primarily due to the expansion of mortgage borrowings. Similarly, an analysis conducted by the International Monetary Fund (IMF) revealed that household debt in 12 Asian countries, including Korea, Japan, and China, grew at an average rate of 15% per year between 2002 and 2006, with mortgage debt contributing to about two-thirds of this growth (Lee, 2009).

Analyze of the panel of 30 countries between 1960-2012 showed that household debt has a negative effect on economic growth (Mian, 2017). In a previous study conducted by Sufi and Mian in 2014, similar findings were observed for countries like the United States and other advanced economies. This aligns with the results obtained by Alter et al. in 2018, who conducted research covering a broader range of countries and a longer sample period from 1950 to 2016. Both studies highlighted the significance of "debt-driven" consumption during periods of household credit expansion and examined the impact on household consumption behavior. Additionally, Jordà et al. (2016) explored the role of mortgages in the macro economy. Through an analysis of 17 advanced countries spanning from 1870 to contemporary times, they demonstrated the central role of housing finance in the modern macroeconomy. Further research by Brunnermeier et al. (2019) delved into the interconnections between household credit, financial markets, and macroeconomic factors. Their findings suggested a predominantly positive association between credit growth and output

growth, indicating the influence of credit on overall economic performance. In the conclusion, they highlighted the importance of household debt to economic growth.

Abd Samad, Daud&Dali (2020) are used panel data to find the effect and relation between them and by using the sample of 43 countries from different parts of world from period of 1980 to 2018, they have made panel method research. The findings relayed on a bias-corrected least squares dummy variables (LSDVC). The researchers have found that it has not only negative, although harmful and detrimental effect on economic growth.

According to Tina Tu (2008), the level of household debt can have various effects on the economy. Firstly, households are present on the balance sheets of financial institutions, and changes in their indebtedness can impact the financial market and the overall economy. Secondly, excessive household debt can lead to a reduction in household consumption. Since household consumption constitutes a significant portion of the gross domestic product (GDP), a decrease in consumption can have a substantial negative impact on the economy, as noted by Hull (2003).

At the microeconomic level, when households accumulate excessive debt, they may be forced to borrow more to cover the costs of servicing their existing debt. In such a scenario, households might face difficulties in saving and become more vulnerable to economic downturns. Tina (2008) employed a model to examine the relationship between household debt and the economy. The model can be represented as follows:

$Yt = \alpha + \beta1Xt + \beta2Xt-1 + \beta3Xt-2 + \beta4Xt-3 + \beta5Xt-4 + \delta1rt + \delta2rt-1 + \delta3rt-2 + \delta4rt-3 + \delta5rt-4 + e$, where: Yt represents the household debt-to-disposable income ratio in the current time period. βk (where $k = 1, 2, 3, 4, 5$) indicates the effect of house prices on the debt ratio. $\beta1$ represents the contemporaneous effect of house prices on the household debt-to-disposable income ratio, while $\beta2$, $\beta3$, and so on represent the lagged effects of house prices. Xt represents the house price index, with Xt-1 indicating the house price index lagged by one period, and so on. δk (where $k = 1, 2, 3, 4, 5$) denotes the effect of interest rates on the debt ratio. $\delta1$ represents the short-run effect

of interest rates on the debt ratio, while δ2, δ3, and so forth represent the lagged effects of interest rates. rt represents the interest rates, with rt-1 indicating the interest rate lagged by one period, and so forth. t represents the time period, where each period corresponds to a quarter of a year.

In Roslim's work conducted in 2018, it was found that there is a positive correlation between household debt (specifically, household debt to GDP ratio) and GDP. The study revealed that household debt, along with labor force and gross capital formation, significantly influence the GDP. Specifically, the results indicated a positive and significant relationship between household debt and gross capital formation, while a negative and significant relationship was observed between the labor force and GDP. On the other hand, variables such as consumption, unemployment rate, and household saving were found to have an insignificant relationship with GDP. The findings of this study contribute to a deeper understanding of the relationship between household debt and economic growth. The results have implications for policymakers, investors, households, and future researchers, providing valuable insights into the dynamics between household debt and GDP (Roslim, 2018).

In Zain's study conducted in 2019, the relationship between household debt and various macroeconomic variables was examined using the OLS (Ordinary Least Squares) method. The dependent variable in this study was logged household debt (LHD), while the independent variables included GDP (gross domestic product), BLR (base lending rate), HPI (house price index), and UN (unemployment).

The multiple linear regression model after taking logarithms was as follows:

$$LHD = \alpha + \beta_1 GDP + \beta_2 BLR + \beta_3 HPI - \beta_4 UN + \varepsilon$$

The results indicated that all the explanatory variables, except GDP, showed a significant relationship with household debt. Among the variables, housing price (HPI) was found to be the most significant factor positively associated with household debt. This suggests that as housing prices increase, household debt tends to rise as well. This finding aligns with previous research by Nizar (2015) that also demonstrated a positive relationship between GDP and household debt. Nizar's study suggested that substantial

GDP growth leads to higher household earnings, encouraging households to take on more loans.

Interestingly, the relationship between the base lending rate (BLR) of commercial banks and household debt was contrary to previous studies. While previous research suggested a negative relationship between the base lending rate and household debt, the findings of this study showed the opposite. Debelle (2004) conducted a study supporting these findings, indicating that an increase in the lending rate affects new borrowers due to the aggregate level of household debt. Similarly, Zimunya & Daboloko (2015) found that an increase in interest rates leads to an increase in household debt as households, facing decreased income, resort to loans despite rising interest rates.

When considering the unemployment variable, the negative sign suggests a negative relationship between unemployment and household debt. This aligns with previous studies, such as Debelle (2004), which emphasized that the unemployment rate is a substantial negative shock to household income. During periods of unemployment, borrowers may struggle to meet mortgage payments, leading to default. The study also highlighted the positive relationship between housing prices and household debt. As housing prices rise, households accumulate more debt to purchase properties. This finding is supported by Nizar's (2015) study, which found a positive relationship between housing prices and household indebtedness. Nomatye & Phiri (2017) also indicated a significant positive correlation between the house price index (HPI) and household debt in South Africa. Based on the results and findings of this study, it is evident that housing prices play a crucial role in determining household debt in Malaysia. The government should closely examine the increasing trend in house prices, as it burdens potential homebuyers. Measures such as government projects and planned housing schemes, like "My First Home Schemes" and "Rumah Selangorku," can be implemented to assist middle-income households in purchasing their first homes. Additionally, it is advisable for households to seek financial advice from organizations like the Credit Counselling and Debt Management Agency (AKPK)

before taking on loans. AKPK provides valuable guidance to borrowers to prevent insolvency.

Household can be correlated not only with housing price and GDP, although there is a clear correlation between the household debt and health, it is not clear whether there is a causal relationship between the two (Grafova, 2007). Grafova has found that debt and health could be related in multiple ways, and they may also be influenced by common factors like impulsiveness and risk aversion. While studies have found that individuals with more debt tend to have poorer health outcomes, experiments that manipulate debt levels have not consistently shown a causal effect on health. Thus, it is important to consider alternative explanations and potential confounding factors when examining the relationship between debt and health. She has concluded that there is directly negative correlation between healthy lifestyle and debt holding (Grafova, 2007). The ones who have less healthy lifestyle are more tend to hold debts.

Household debts can be analyzed by several ways, and one of the interesting types of research that was made by Wajiha in 2008 (Wajiha et al, 2018), they have made research by dividing them into age groups, there is some conclusions below. The average value of household debt among respondents were 100160 Pakistani rupee and standard deviation circled in 259538 rupees. 65.6% of respondents are between 25-49 years and it can be proved because they contain main bone of economic active resource in Pakistan by the research data of International Monetary Fund. Next part of age group is from 50 to 59, they contain 18.5% of respondents and third group is people above 60, and they are 11.3% of respondents. In the observation have been attached even teenagers and little respondents below 14 ages. They are only 1% of all respondents and placed in the last place by frequency. The average years of their education at school and in other educational places and bodies are not cheerful, it's only 7.8 years with 3.65 years of standard deviation, the maximum rank is entire 23 years, while some respondents didn't go to educational schools never in their life. About half of them are paid employees, third of them are working in agricultural structures and 20 percent of them self-employers. Household's number of respondents also verifying and deviating

high, the minimum number of members is only 1 man and maximum number of members in household is 47 people. The average number of households are 7.2 people. 95 percent of respondents were man by gender. The research concluded for an interesting finding in its process. Children have no issue with developing family obligation; In most cases, business visionaries apply for expanded get to money related administrations within the nation. Family studies taken note that people's horribleness obligation was not altogether lower than that of youthful individuals. It can be accepted that the sum owed may reflect the debtor's choice to require out an advance at the age, but if this were genuine, at that point they would need to reimburse most of theirs. Youthful individuals are more often than not driven by realism and are ordinarily disappointed with their position. Individuals borrow to induce something presently that they will as it was purchase within the future. But older people are tend to satisfy with what they have, even if they are much poor, which is how the aging paradox or the paradox of aging is working. The comes about of this consider too appeared that individuals matured 50-59 were essentially more obliged than youthful experts. More seasoned individuals borrow concurring to their needs, not at will, in case they utilize it. In this way, the interaction frameworks work as a back framework for the destitute, something else they may have issues with the installment.

METHODOLOGY

Author wrote some list of models that will be used in this research. There are two types of models here, first group of models are linear models like Pearson's correlation, OLS linear regression method, ANOVA and et cetera. Second group of models are time series models like model of ARIMA (Auto Regression Integrated Moving Average), Vector Autoregression and Regression with Newey-West standard errors.

Linear models

The Pearson correlation criterion is a parameter of methodological statistics, the determination or absence of a linear relationship between significant magnitude indicators, as well as an assessment of its closeness and statistical evaluation. In other words, the Pearson correlation test allows you to determine whether to decrease (increase or decrease) one indicator in response to a change in another? In statistical calculations and inferences, the correlation coefficient is usually referred to as rxy or Rxy.

The Pearson correlation coefficient, also known as Pearson's r or simply "r," is a statistical measure used to quantify the strength and direction of the linear relationship between two continuous variables. It was developed by Karl Pearson and is one of the most commonly used measures of correlation in statistics.

The Pearson correlation test was actually developed by Karl Pearson (1857-1936), a British scientist, in the late 19th century, rather than the 1990s. Pearson collaborated with other researchers, including Francis Edgeworth and Raphael Weldon, to refine and advance the analysis of covariance between two random variables. Together, they contributed to the development and application of the Pearson correlation test, which has since become a widely used statistical method for measuring the linear relationship between variables.

The Pearson correlation coefficient is a statistical measure that quantifies the strength and direction of the linear relationship between two variables measured on a quantitative scale. It provides a numerical value between -1 and +1, where a value of -

1 indicates a perfect negative correlation, +1 indicates a perfect positive correlation, and 0 indicates no correlation.

To assess the statistical significance of the identified relationship, additional calculations such as hypothesis testing can be performed. This helps determine whether the observed correlation is likely due to chance or if it represents a true relationship between the variables.

It is important to note that the variables being compared should be measured on a quantitative scale. This means that they should be numerical in nature and capable of being measured with precision. Examples of such variables include heart rate, body temperature, leukocyte count per 1 ml of blood, and systolic blood pressure. The Pearson correlation coefficient is not suitable for assessing the relationship between categorical variables or variables measured on an ordinal scale. The Pearson correlation coefficient assesses the presence and strength of a linear relationship between two variables. It measures the degree to which the variables change together in a linear fashion. However, it does not provide information about the direction of the relationship (positive or negative) or the nature of the changes (linear or nonlinear).

To analyze the direction, nature, and dependency of one variable on another, regression analysis is commonly used. Regression analysis allows for a more detailed examination of the relationship between variables by estimating the equation of a line (simple linear regression) or a curve (nonlinear regression) that best fits the data. This analysis helps determine how changes in one variable relate to changes in the other and can provide insights into the predictive ability of the variables. It's important to note that the Pearson correlation coefficient is applicable only when comparing two variables. Factor analysis helps identify underlying factors or dimensions that explain the patterns of interrelationships among multiple variables.

The application of the Pearson correlation test relies on the assumption of normal distribution for each variable being compared, making it a parametric test. However, when analyzing indicators with non-normal distributions or those measured on an

ordinal scale, such as ranks, it is recommended to utilize Spearman's rank correlation coefficient.

It is crucial to differentiate between the concepts of dependence and correlation. While dependence indicates the presence of a relationship between values, it does not imply correlation as defined by statistical measures. In other words, dependence determines the basis for correlation, but not the other way around.

Pearson's correlation coefficient can be calculated in next way by using the following formula:

$$r_{xy} = \frac{\sum(d_x \times d_y)}{\sqrt{(\sum d_x^2 \times \sum d_y^2)}}$$

There are some principles and rules of Pearson correlation's coefficient:

1. Positive correlation: If the correlation coefficient (r) is close to 1, it indicates a strong positive linear relationship between the variables. This means that as one variable increases, the other tends to increase as well. For example, there might be a positive correlation between the hours spent studying and exam scores.
2. Negative correlation: If the correlation coefficient (r) is close to -1, it indicates a strong negative linear relationship between the variables. This means that as one variable increases, the other tends to decrease. An example of negative correlation could be the relationship between temperature and heating costs. As temperature increases, heating costs tend to decrease.
3. No correlation: If the correlation coefficient (r) is close to 0, it suggests no significant linear relationship between the existing variables. However, it is important to note that even if the correlation coefficient is close to 0, there could still be other types of relationships (nonlinear) between the variables that are not captured by the Pearson correlation coefficient. For example, variables may be related in a curvilinear or non-linear manner.
4. The strength of correlation is determined by the magnitude of the correlation coefficient (r), which measures the extent of the linear relationship between variables. A value closer to 1 or -1 signifies a stronger relationship, while values closer to 0 indicate a weaker relationship. For example, a correlation coefficient of 0.9 denotes a stronger relationship compared to a correlation coefficient of 0.3.
5. Assumptions: The coefficient of Pearson's correlation assumes that the relationship between the variables is linear and that the variables follow a

bivariate normal distribution. It is also sensitive to outliers, as extreme values can influence the correlation coefficient.

To determine the statistical significance of the correlation coefficient (rxy), its assessment is conducted using a t-test. The t-test is calculated using the given formula

$$t_r = \frac{r_{xy}\sqrt{n} - 2}{\sqrt{1 - r_{xy}^2}}$$

To determine the statistical significance of the correlation, the resulting value tr is compared to the critical value tcrit at a specific significance level, considering the degrees of freedom n-2. If the calculated value tr is greater than the critical value tcrit, it indicates a statistically significant correlation.

Linear regression is a statistical method employed to examine and model the association between a dependent variable and one or more independent variables. Its purpose is to identify the optimal line of best fit that represents the linear relationship between these variables.

In linear regression, the dependent variable represents the variable of interest that we aim to predict or explain, while the independent variables are the factors used to make predictions or provide explanations for the dependent variable. The relationship between the dependent variable (often denoted as "Y") and the independent variable(s) (often denoted as "X") is represented by a straight-line equation. The line equation takes the form of:

$$Y = \beta_0 + \beta_1 \times X_1 + \beta_2 \times X_2 + \cdots + \beta_n \times X_n + \varepsilon$$

Where:

- Y represents the dependent variable.
- X_1, X_2, ..., X_n are representing independent variables of model.
- β_0, β_1, β_2, ..., β_n are representing coefficients or parameters of the model, indicating the effect of each independent variable on the dependent variable.
- ε represents the error term, accounting for the discrepancy between the actual observed values and the predicted values by the model.

The objective of linear regression is to determine the values of coefficients β0, β1, β2, ..., βn that minimize the sum of squared differences between the observed values and the predicted values. This is referred to as the residual sum of squares (RSS). The method commonly used to achieve this is known as the method of least squares. By employing this method, the linear regression model identifies the line that minimizes the overall distance between the observed data points and the predicted values along the line. This optimal line represents the best-fit line that captures the relationship between the dependent variable and the independent variables.

Once the coefficients are estimated, they can be used to make predictions on new data or to understand the relationship between the variables. The coefficient β0 represents the intercept or the value of Y when all the independent variables are zero. The coefficients β1, β2, ..., βn represent the change in Y associated with a one-unit change in the respective independent variables, assuming all other variables are held constant.

Linear regression can be used for various purposes, including:

1. Prediction: Once the model is fitted, it can be used to predict the values of the dependent variable for new or unseen values of the independent variables.
2. Relationship analysis: Linear regression helps assess the strength, direction, and significance of the relationship between the dependent and independent variables. The coefficients provide insights into the impact of each independent variable on the dependent variable.
3. Variable selection: Linear regression can assist in identifying the most significant independent variables that have the strongest impact on the dependent variable. Variables with non-significant coefficients may be excluded from the model to simplify it and improve interpretability.
4. Assumptions and diagnostics: Linear regression relies on several assumptions, such as linearity, independence of errors, constant variance, and normal distribution of errors. Diagnostic tests can be performed to assess these

assumptions and identify potential issues like multicollinearity or heteroscedasticity.

5. Model evaluation: Various statistical measures, such as the coefficient of determination (R-squared), adjusted R-squared, and significance tests, can be used to evaluate the goodness-of-fit and overall performance of the linear regression model.

Shortly, it shows the linear relationship between dependent and independent variables and make some piece of understanding to the range of numbers.

Time Series models

The ARIMA model is a statistical model that can be used to capture the trend, seasonality, and random noise components of a time series. The model is a combination of three different types of models:

Autoregressive (AR) models: AR models use the past values of the time series to predict the current value.

$$AR(p): y_t = \mu + \varphi_1 y_{(t-1)} + \varphi_2 y_{(t-2)} + \cdots + \varphi_p y_{(t-p)} + \varepsilon_t$$

Moving average (MA) models: MA models use the errors from previous predictions to predict the current value.

$$MA(q): y_t = \mu + \varepsilon_t + \theta_1 \varepsilon_{(t-1)} + \theta_2 \varepsilon_{(t-2)} + \cdots + \theta_q \varepsilon_{(t-q)}$$

Integrated (I) models: I models difference the time series to remove trends. The ARIMA model is a powerful tool for forecasting time series data. However, it is important to note that the model is not perfect. The model can be sensitive to outliers and it may not be able to capture all of the dynamics of a time series. Here the model of ARIMA in formula:

$$ARIMA(p,d,q): \left(1 - \varphi_1 L - \cdots - \varphi_p L^p\right) \times ((1-L)^d y_t - \mu) = (1 + \theta_1 L + \cdots + \theta_q L^q)\varepsilon_t$$

where:

— yt is the value of the time series at time t.

— μ is the mean of the time series.

— ϕ1, …, ϕp are the AR coefficients.

— θ1, …, θq are the MA coefficients.

— et is the error term.

The Vector Autoregressive (VAR) model is a statistical framework employed to understand the interdependencies among multiple variables as they evolve over time. VAR models are a type of stochastic process model that extends the concept of autoregressive models to encompass multivariate time series data. These models find applications in various fields, including economics and the natural sciences. Similar to the autoregressive model, each variable in a VAR model is represented by an equation that describes its temporal evolution. These equations incorporate lagged values of the variable itself, lagged values of other variables in the model, and an error term. The VAR model can be utilized for both forecasting future values and conducting causal analysis. However, it is essential to emphasize that the VAR model does not establish causality but rather uncovers statistical relationships among the variables.

$$\begin{pmatrix} y_{1t} \\ y_{2t} \end{pmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{pmatrix} y_{1t-1} \\ y_{2t-1} \end{pmatrix} + \begin{pmatrix} \in_{1t} \\ \in_{2t} \end{pmatrix}$$

or we can make it more compact:

$$y_t = A_1 y_{t-1} + \in_t$$

If shortly, this model can be used to analyze, to forecast and for other tasks, that’s why it is one of the important and crucial tools for time series analysis.

RESULTS

The volume of household debt

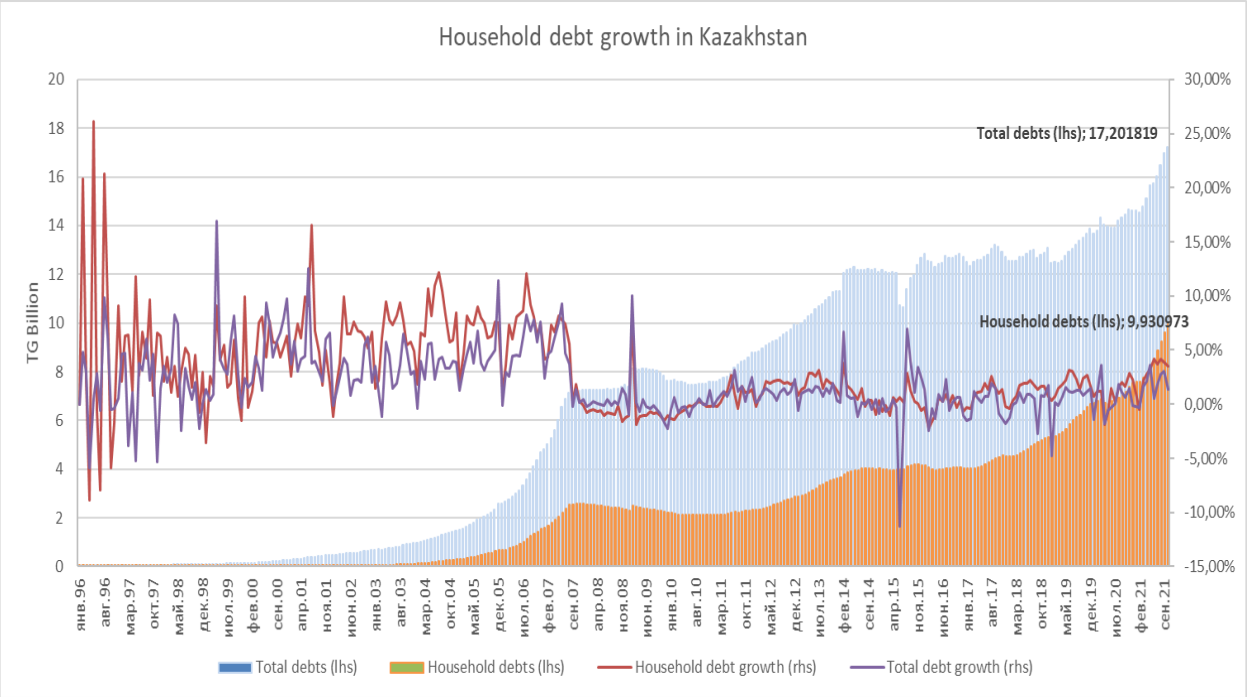
The volume of lending worldwide is growing year by year. Kazakhstan's amount of lending was also grown incredibly in each type of lending, like in external debt, or the debt taken from households or businesses, if in December 2019 the total amount of lending amounted to 13864.89 million tenge, then a year later it increased to 14623.065 billion tenge, and in October 2021 the total amount of lending amounted to 17201.82 billion tenge. Over 3 years, the total volume of bank lending has increased by about 24%. And about 57.7% of loans were taken by individuals. This is 9930.97 billion tenge. And the amount of credit to households for 2021 is 282 times more than in 1996. (see figure 1).

The development of Kazakhstan's economy and the reform of the banking system in 1995 had a positive impact on consumers, the household lending market, especially consumer loans, grew sharply. If by the end of 2003 household debts amounted to 100 billion tenge, then only in 3 years the number of household debts reached more than 1 trillion tenge.

The ratio of household debt to GDP has shown positive dynamics over the past 3 years. The coefficient increased from 8.6 points in 2017 to 10.65 points in 2020. The highest ratio was 20.05 in 2007 December before the Great Recession in 2008. After the ratio fell 5 years in a row and at the end of 2011, it was 8.3 points (see figure 2).

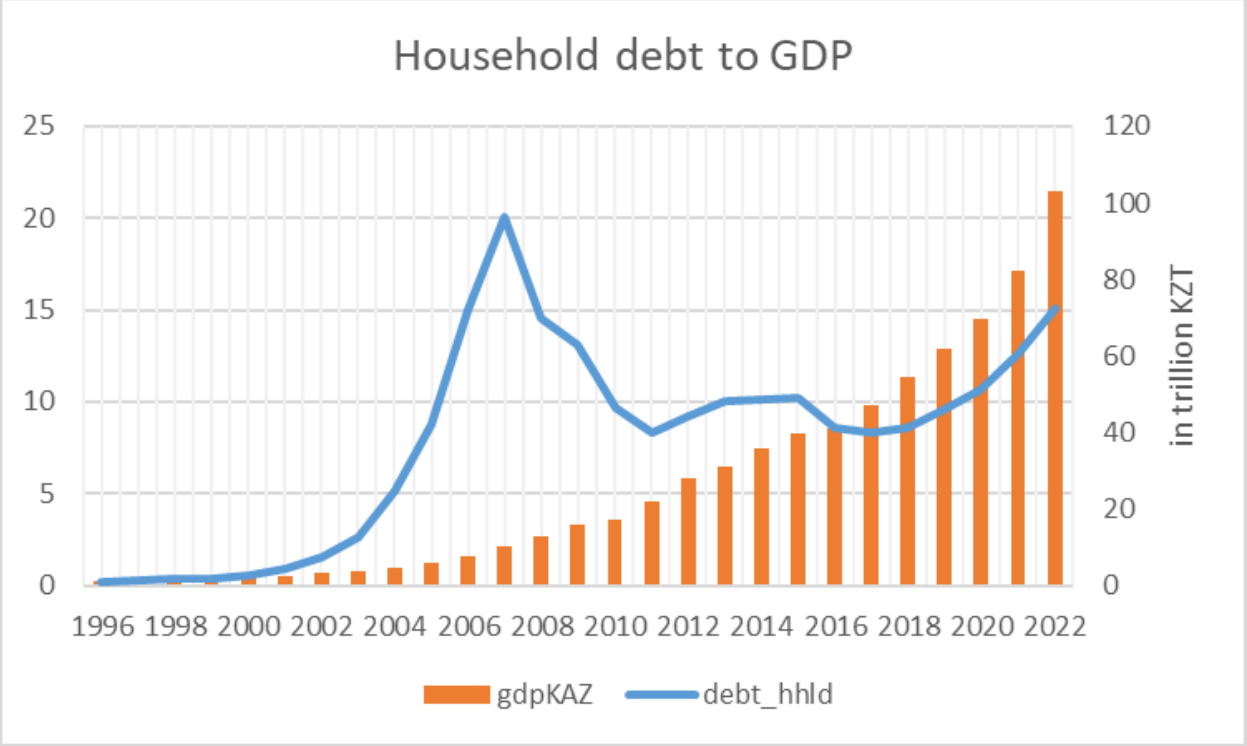
Credit has four main types, they are mortgage loans, auto loans, student loans, and other consumer loans. Consumer loans are the most commonly used, and they probably account for half of the household debt. But mortgage and auto loans have their consumers, and they are also growing steadily. The main creditors for consumption in Kazakhstan are second-tier banks, and the most demanded creditors are the "House Construction Savings Bank", "Halyk Bank", "Sberbank" and "Kaspi Bank". Households mostly take out a debt to buy a house or a car.

Figure 1. Debt growth in Kazakhstan



Note: compiled by author from the analysis of materials from the National Bank of Kazakhstan and Bureau of National statistics

Figure 2. Household debt to GDP in Kazakhstan from 1996 to 2022



Note: compiled by author from the analysis of materials from the National Bank of Kazakhstan and Bureau of National statistics

Figure 2 shows the trend of household debt to GDP move from 1996 to 2022 and there can be seen not so beautiful, but specific economic cycle. Author giving an accent and attention to the growth of GDP, even if the share of household debt is making some volatility in specific periods because of macro and micro level situations, GDP in Kazakhstan has been increased by one temp in long term.

Table 1. Components of debt in Kazakhstan and its percentage to GDP from 1996 to 2022

Debt to GDP **Year**	debt_total (%)	debt_gov (%)	debt_priv (%)	debt_corp (%)	debt_hhld (%)
1996	24,33	20,02	4,31	4,15	0,16
1997	25,04	20,75	4,29	4,04	0,25
1998	40,99	35,60	5,39	5,06	0,33
1999	54,16	46,78	7,38	6,97	0,41
2000	53,72	43,10	10,62	10,06	0,56
2001	50,67	35,60	15,07	14,12	0,95
2002	35,41	17,60	17,81	16,25	1,55
2003	36,11	14,90	21,21	18,57	2,64
2004	36,68	11,40	25,28	20,10	5,18
2005	42,25	8,10	34,15	25,34	8,81
2006	52,63	6,70	45,93	30,91	15,02
2007	62,39	5,90	56,49	36,43	20,06
2008	53,17	6,70	46,47	31,91	14,56
2009	55,14	10,20	44,94	31,86	13,09
2010	45,50	10,70	34,80	25,10	9,70
2011	41,29	10,20	31,09	22,78	8,31
2012	44,21	12,10	32,11	22,90	9,21
2013	43,97	12,60	31,37	21,29	10,07
2014	45,01	14,50	30,51	20,39	10,12
2015	52,90	21,90	31,00	20,82	10,18
2016	46,76	19,70	27,06	18,46	8,60
2017	43,26	19,90	23,36	15,01	8,35
2018	41,48	20,30	21,18	12,60	8,58
2019	39,84	19,90	19,94	10,36	9,58
2020	48,10	27,40	20,70	10,05	10,65
2021	46,2	24,4	21,8	9,15	12,65
2022	51,8	27,4	24,4	9,25	15,14

Note: completed by author based on the data from World Bank and National Bank of Kazakhstan

There we can see the description of total debt structure in Kazakhstan and its decomposition to GDP in every year. Author doesn't take it quarterly because there are some limitations with materials and to avoid some errors in research. If we will look to the Table 1 above, there are 5 phases of economic cycles. From 1996 to 2007, the share of household debt to economic growth was accelerate increased. In 2008 the Great Recession make a lot of countries, additionally Kazakhstan in hard situation and it, the Recession, has constantly decreased the share of debt until 2011. In 2012 the share of household debt has started to increase again, but only 3 years, until 2015, when the Prime Minister of Kazakhstan decided to accept the floating currency regime, and it made look our tenge relatively weak against other currencies, mostly to US dollars, and in 19 of August in 2015, 1 US dollar was equals to 255 tenge, 1 day earlier 1 dollar was cheaper for 72 tenge. 2016-2017 years was observed decreasing of household debt's share until in 2018 the share has started to increase rapidly. Today, despite of big growth rate of economic growth in Kazakhstan after some accidents like COVID in 2020s and Russian-Ukrainian conflict in 2022s, the share of GDP is increasing rapidly with high motivation.

Time Series Analysis

The second part of findings will be about time series analysis models and here author has made an estimation on 3 different time series models: VAR model, ARIMA model and regression model with Newey-West standard errors.

To estimate with time series analysis, next group of variables were used: real GDP, national government savings, population size, school education, openness to trade, total dependency ratio, total fertility rate, government debt to GDP, corporate debt to GDP and household debt to GDP ratios. In table 2, given the summarize output of these variables.

Table 2. Summary statistics 1.0

Variable	Obs	Mean	Std. Dev.	Min	Max
rgdpp	25	6489.496	4304.81	1130.1	13890.8
ngs	25	20.85904	2.546293	17.1613	27.64648

pop	25	16151.36	1283.258	14851.06	18631.78
school	25	11.224	0.6905795	9.5	11.8
openc	25	77.1556	15.49949	50.54	105.7
cpi	25	109.084	5.544342	101.9	128.7
dep	25	50.5764	4.419133	44.64	58.84
llgdp	25	24.69345	9.493471	9.23716	40.552
debt_corp	25	18.22114	9.100661	4.040086	36.42995
debt_hhld	25	7.476713	5.428062	0.1568074	20.05631
TFR	25	2.3968	0.3708742	1.8	2.9
debt_gov	25	18.902	11.16619	5.9	46.78

Note: completed by author relying on the results from estimation

The first dataset, real GDP per capita, contains 25 observations where the mean number is 6489.496, and the standard deviation for these variables was 4304.81, also minimum value with 1130.1, and a maximum value of 13890.8. The second variable represents the net government savings. It has 25 observations with a mean of 20.85904, in addition, the standard deviation for this variable was 2.546293, with a minimum range with 17.1613, and a maximum value of 27.64648. The third variable in a table represents the population. It has 25 observations with an average of 16151.36, and with standard deviation number which is equal to 1283.258, a minimum value of 14851.06, and a maximum value of 18631.78. Next variable represents the average number of years of schooling. It has 25 observations with an average number of 11.224, and the standard deviation range which is equals to 0.6905795, and the minimum value – 9.5, and a maximum value – 11.8. After comes variable that represents the openness to trade. It has 25 observations with a mean number 77.1556, and the standard deviation of 15.49949, a minimal range of 50.54, and a maximum value of 105.7. The next variable represents the consumer price index. It has 25 observations with an average number – 109.084, and standard deviation value of 5.544342, a minimal rank of 101.9, and a maximum value of 128.7. The variable with abbreviation dep represents the dependency ratio. It has 25 observations with an average number of 50.5764, with next indicator of standard deviation – 4.419133, a minimal value of 44.64, and a maximal number of 58.84. llgdp represents total liquid liabilities to the gross domestic product. It has 25 observations with a mean of 24.69345, a standard deviation of 9.493471, a

minimum value of 9.23716, and a maximum value of 40.552. Next variable represents corporate debt of Kazakhstan. It has 25 observations with an average 18.22114, a standard deviation of 9.100661, a minimal percentage of 4.040086, and a maximum percentage of economic growth which is equals to 36.42995. debt_hhld mean the variable that represents household debt to GDP ratio. It has 25 observations with a mean of 7.476713, a standard deviation of 5.428062, a minimal percentage of 0.1568074, and a maximum percentage to economic growth – 20.05631. Next variable with abbreviation TFR represents the total fertility rate in Kazakhstan. It has 25 observations with a mean of 2.3968, a SD of 0.3708742, a minimum value of 1.8, and a maximum value of 2.9. And the last. debt_gov, represents government debt to GDP ratio in Kazakhstan. It has 25 observations with a mean of 18.902, a standard deviation of 11.16619, a minimum value of 5.9, and a maximum value of 46.78.

Table 3. Description of results from VAR model testing

Vector autoregression						
Sample	=	1999-2020		Number of observations	=	22
Log likelihood	=	-162.588		AIC	=	16.14445
FPE	=	812556		HQIC	=	16.31968
Det (Sigma_ml)	=	153726.8		SBIC	=	16.88834
Equation	Parms	RMSE	R-sq	F	P > F	
rgdpp	15	695.084	0.9905	52.30701	0.0000	
	coef.	standard error	t	P > | t |	[95% Confidence Level]	
rgdpp						
L1.	0.422	0.197	2.142	0.069	-0.044	0.888
L2.	-0.152	0.214	-0.71	0.501	-0.659	0.355
L3.	0.019	0.196	0.095	0.927	-0.446	0.483
ngs	187.388	133.128	1.408	0.202	-127.41	502,185
pop	3.657	1.673	2.186	0.065	-0.298	7,612
school	-2973.8	1906.448	-1.56	0.163	-7481.795	1534.272
openc	-32.664	42.815	-0.763	0.47	-133.904	68.577
cpi	-119.49	86.839	-1.376	0.211	-324.834	85.85
dep	-1288.7	259.624	-4.964	0.002	-1902.568	-674.742
llgdp	-373.3	128.993	-2.894	0.023	-678.316	-68.275

debt_total	-65.226	77.063	-0.846	0.425	-247.451	117
debt_hhld	630.603	238.033	2.649	0.033	67.744	1193.461
debt_corp	-282.97	184.427	-1.534	0.169	-719.071	153.128
TFR	1189.76	3273.586	0.363	0.727	-6551.041	8930.561
_cons	65893.7	32360.843	2.036	0.081	-1.06E+04	1.42E+05

Note: results were estimated by author with help of economic tool

There are the results from estimation by the model VAR. Number of periods were from 1999 to 2022 with 3 lags in addition. Number of observations is 22 and there are 15 parameters. Root mean squared error is equals 695.08 while the value of R squared is 99.05%. F criterion for these variables is 52.3 which is good and the critical F is very tiny, so it is statistically significance. There are only 1 dependent variable and 11 independent variables, and following variables has different results.

Akaike's information criterion, a measure of model fit that penalizes for the number of parameters in the model, is 16.144 and Hannan-Quinn information criterion that measure the model fit that penalizes for the number of parameters in the model and the sample size is equals to 16.319, Schwarz information criterion is equals to 16.888.

In this model, the coefficients of lag 1, lag 2 and lag 3 are 0.422, -0.152, and 0.019. This means that the current value of the dependent variable is 42.2% dependent on its value one period ago, -15.2% dependent on its value two periods ago, and 1.9% dependent on its value three periods ago.

From this table, author has taken following model by estimating the economic growth model:

$$real\ GDP = 0.422 \times x_{t-1} - 0.152 \times x_{t-2} + 0.019 \times x_{t-3}$$

The first model was made from 3 lags extracted from estimation. The second formula extracted from this estimation can be written in next way:

$$\begin{aligned} real\ GDP = {} & 65893.7 + 187.388 \times ngs + 3.657 \times pop - 2973.8 \times school \\ & - 32.664 \times openc - 119.49 \times cpi - 1288.7 \times dep - 373.3 \times llgdp \\ & - 65.226 \times debt_{total} + 630.603 \times debt\_hhld\ - 282.97 \\ & \times debt\_corp\ + 1189.76 \times tfr + \varepsilon \end{aligned}$$

and we can know the impact of these variables to the economic growth, the F criterion is statistically significant.

The main attention for author was the effect of household debt to economic growth, because it is directly related with the topic of research. 1% growth of household debt will bring to a growth of real GDP per person to 6.3%. The p-value is also less than 0.05, so it is statistically significant.

Table 4. ARIMA regression

ARIMA Regression						
Sample		1996-2020		Number of observations		25
				Wald chi2 (13)		136603,43
Log likelihood		-182,8514		Prob > chi2		0,0000
			OPG			
rgdpp	Coef.	Std. Error	z	P > |z|	[95% Conf. Interval]	
ngs	-88.11645	105.4428	-0.84	0.403	-294.7805	118.5476
pop	5.094526	1.299134	3,92	0.000	2.54827	7.640782
school	-1158,197	1115,59	-1,04	0,299	-3344,713	1028,32
openc	-7.986477	29.42885	-0.27	0.786	-65.66597	49.69301
cpi	-44.03327	62.30169	-0.71	0.480	-166.1423	78.0758
dep	-1605.827	140.3707	-11.44	0.000	-1880.949	-1330.706
llgdp	-430.2009	83.88539	-5.13	0.000	-594.6133	-265.7886
debt_corp	-313.2326	151.6507	-2.07	0.039	-610.4626	-16.00268
debt_hhld	536.4979	96.08552	5,58	0.000	348.1738	724.8221
debt_gov	-27.67158	35.52016	-0.78	0.436	-97.28982	41.94666
TFR	-148.6954	2137.85	-0.07	0.945	-4338.804	4041.413
_cons	38843.89	10112.95	3,84	0.000	19022.86	58664.91
ARMA						
ma						
L1.	-0,672894	0,5178883	-1.30	0.194	-1.687937	0,342148
L2.	-0.3271046	0.5670784	-0.58	0.564	-1.438558	0.7843487
/ Sigma	290,3223					

Note: completed by author relying on the results from estimation

Based on the information you provided, it appears that the Wald chi-square statistic for a specific parameter in your ARIMA model is 136603.43, and the corresponding p-value is 0.0000.

The Wald chi-square statistic of 136603.43 suggests that the estimated coefficient for the parameter is significantly different from zero. This means that there is strong evidence to reject the null hypothesis that the parameter has no effect in the model.

The p-value of 0.0000 indicates the probability of observing a Wald chi-square value as extreme as 136603.43 (or even more extreme) under the assumption that the null hypothesis is true. Since the p-value is very close to zero, it suggests strong evidence against the null hypothesis. In practical terms, this means that the parameter is highly likely to have a significant effect in the model.

The Wald chi-square test provides evidence that the estimated coefficient for the parameter is statistically significant, and it suggests that the parameter has a meaningful impact on the ARIMA model based on the given p-value.

The model from estimation can be expressed in next way:

$$real\ GDP = 38843.89 - 88.116 \times ngs + 5.094 \times pop - 1158.197 \times school - 7.986 \times openc - 44.033 \times cpi - 1605.827 \times dep - 430.2 \times llgdp - 313.232 \times debt\_corp + 536.5 \times debt\_hhld - 27.7 \times debt\_gov - 148.7 \times tfr + \varepsilon$$

From this model, author highlighted the moment with household debt coefficient, the growth of household debt for 1% will lead to a growth of real economic growth to 5.36% and the p value is 0.000, so it is statistically significant at 0.05 level.

The model of moving average (MA) expressed by an estimation can be written in next way:

$$real\ GDP = -0.672 \times x_{t-1} - 0.327 \times x_{t-2}$$

This means that the current value of the dependent variable is -67.2% dependent on its value one period ago, -32.7% dependent on its value two periods ago. The model shows that the volume of economic growth will be in negative value.

Table 5. Regression method with Newey-West standard errors

Regression with Newey-West standard errors			Number of obs	=	25	
maximum lag: 0			F (9, 15)	=	117.02	
			Prob > F	=	0.0000	
rgdpp	Coef.	Newey-West Std. Err.	t	P>t	[95% Confidence Interval]	
debt_hhld	472.3178	153.329	3,08	0.008	145.5048	799.1308
debt_corp	-217.0283	197.9886	-1,10	0.290	-639.031	204.9744
ngs	12,5168	75.77707	0,17	0.871	148.9982	174.0318
pop	5.680892	1.03403	5,49	0.000	3.47691	7.884874
school	-1838.098	1016.86	-1,81	0.091	4005.483	329.2876
cpi	-41.96818	34.63664	-1,21	0.244	115.7944	31.85808
openc	3.074426	20.53297	0,15	0.883	40.69056	46.83941
dep	-1566.535	157.6338	-9,94	0.000	1902.524	-1230.547
llgdp	-432.758	127.4175	-3,40	0.004	704.3419	-161.174
_cons	29785.07	10881.05	2,74	0.015	6592.655	52977.48

Note: completed by author relying on the results from estimation

The model of regression with Newey-West standard errors made some adjustments to the potential autocorrection and heteroscedasticity in data, and also it is more modified version of standard errors relatively to traditional OLS method.

The model has shown a different result relatively to VAR model and ARIMA model, there are no any lags (in VAR model used 3 lags, ARIMA model used 2 lags respectively).

The p value associated with F-statistics is very small (0.000) and F-statistics is equals to 117.02 value. It was calculated based on two degrees of freedom: 9 for the numerator and 15 for the denominator degrees of freedom.

The model of regression can be written in next ways:

$$real\ GDP = 29785.07 + 472.31 \times debt\ hhld - 217.1 \times debt\ corp + 12.516 \times ngs + 5.68 \times pop - 1838.1 \times school - 41.96 \times cpi + 3.07 \times openc - 1566.535 \times dep - 432.758 \times llgdp + \varepsilon$$

Author makes another conclusion relying on this model: 1% growth of household debt will lead to a 4.72% of growth real GDP and 1% growth of corporate debts will lead to a decrease of real GDP for 2.17%.

Analysis with other regression models

The next group of materials (material from 2007 to 2022 in quarter maturity) used in this research was estimated by other type of regression model. The 16 years with 4 quarters in each give 64 of periods. By saying other type, author means the linear regression models, ANOVA model and etc. Firstly, author wants to show the summary output of the next 7 variables that will be used in estimation in this part.

Table 6. Summary statistics

Variable	Obs	Mean	Std. Dev	Min	Max
Real GDP	64	24654.44	20013.3	2587.402	91363.22
Corporate debt	64	6945.351	1324.741	3481.763	8779.306
Household debt	64	4593.983	2868.334	1790.636	14158.38
Population	64	17381	1213.828	15370.02	19765
Unemployment rate	64	5.3457	0.65818	4.8	7.26
Inflation	64	8.130313	4.487583	1.7	20.3
Life expectancy	64	70.20141	2.680734	65.78	73.7

Note: completed by author relying on the results from estimation

There are 7 main variables here, starting from real GDP to corporate debt, unemployment rate, population size, inflation rate, life expectancy and household debt respectively. All the variables have taken from statistics about Kazakhstan. There are

some description analyses for the table 5: real GDP: The variable "Real GDP" has 64 observations. The mean value is 24654.44, with a standard deviation of 20013.3. The minimum and maximum values are 2587.402 and 91363.22, respectively. Corporate debt: There are 64 observations for the "Corporate debt" variable. The mean value is 6945.351, and the standard deviation is 1324.741. The minimum and maximum values are 3481.763 and 8779.306, respectively. Household debt: The "Household debt" variable also has 64 observations. The mean value is 4593.983, with a standard deviation of 2868.334. The minimum and maximum values are 1790.636 and 14158.38, respectively. Population: The "Population" variable has 64 observations. The mean population is 17381, with a standard deviation of 1213.828. The minimum and maximum values are 15370.02 and 19765, respectively. Unemployment rate: There are 64 observations for the "Unemployment rate" variable. The mean rate is 5.3457%, with a standard deviation of 0.65818. The minimum and maximum values are 4.8% and 7.26%, respectively. Inflation: The "Inflation" variable has 64 observations. The mean inflation rate is 8.130313%, with a standard deviation of 4.487583. The minimum and maximum values are 1.7% and 20.3%, respectively. Life expectancy: The "Life expectancy" variable has 64 observations. The mean life expectancy is 70.20141 years, with a standard deviation of 2.680734. The minimum and maximum values are 65.78 years and 73.7 years, respectively.

Table 7. Correlation between GDP, debt and other variables

	nominal debt	*Household debt*	*unemployment rate*	*pop*	*inflation*	*life expectancy*
nominal gdp	1					
household debt	0,889	1				
unemployment rate	-0,857	-0,671	1			
population	0,950	0,945	-0,852	1		
inflation	-0,197	-0,091	0,382	-0,230	1	
life expectancy	0,877	0,806	-0,867	0,918	-0,368	1

Note: completed by author relying on the results from estimation

The Pearson's correlation showed the interesting picture of relation between these 6 variables. The relation between debt of households and nominal GDP is 0.889. It is strong positive linear relationship. The correlation between unemployment rate and nominal GDP is strong negative, if concretely -0.857 and it has moderate negative linear relationship of -0.671. We have taken population size, because we wanted to get more strong results, it has strong linear relation between nominal GDP of 0.95 and strong positive relation of 0.945 between household debt and -0.85 of negative relation between unemployment rate. However, inflation rate has no relation with these variables, maybe the main reason is that it can be affected by other variables like interest rate of central bank, consumer price index, government policies and political conditions among border countries. Life expectancy has strong positive linear relation with nominal GDP which is 0.877 and strong positive relation of 0.806 and strong negative relation of -0.867 which means that increase of life expectancy leads to decrease in unemployment rate. Also, there are strong positive relation between population size which is equals to 0.918, however it has no relation with inflation rate.

Figure 3. Correlation matrix between real GDP and other variables

	rgdpp	*ngs*	*pop*	*school*	*openc*	*cpi*	*dep*	*llgdp*	*crisis*	*TFR*	*debt_priv*	*debt_corp*	*debt_hhld*	*rgdp*
rgdpp	1,0000													
ngs	-0,4866	1,0000												
pop	0,7695	-0,5585	1,0000											
school	0,7250	-0,0673	0,5847	1,0000										
openc	-0,5752	0,6364	-0,8126	-0,1746	1,0000									
cpi	-0,2872	-0,1379	-0,2122	-0,4622	0,0689	1,0000								
dep	-0,2781	-0,2280	0,3253	-0,3978	-0,4319	0,1750	1,0000							
llgdp	0,8102	-0,1593	0,5195	0,8343	-0,2691	-0,2742	-0,6022	1,0000						
crisis	-0,2300	0,1594	-0,3272	-0,3106	0,2143	-0,0259	-0,1799	-0,0412	1,0000					
TFR	0,8967	-0,4059	0,8705	0,7869	-0,6043	-0,1930	-0,1046	0,8206	-0,2992	1,0000				
debt_priv	0,9024	-0,4745	0,9416	0,7618	-0,7003	-0,2578	0,0175	0,7481	-0,2826	0,9580	1,0000			
debt_corp	0,9384	-0,4740	0,8833	0,7723	-0,6625	-0,2596	-0,1299	0,8142	-0,2582	0,9537	0,9806	1,0000		
debt_hhld	0,7838	-0,4409	0,9604	0,6914	-0,7060	-0,2366	0,2351	0,5959	-0,2984	0,8954	0,9567	0,8811	1,0000	
rgdp	0,9958	-0,5174	0,8219	0,7214	-0,6246	-0,2932	-0,1954	0,7800	-0,2550	0,9097	0,9294	0,9525	0,8280	1,0000

Note: completed by author relying on the results from estimation

In figure 3, author used the real value of GDP instead of nominal and has added some other variables to make it more informative. There are 2 different form of GDP, rgdpp is the real GDP per capita and rgdp is real GDP volume, the result was different to both variable, in first case, the correlation coefficient between household debt and

real GDP per capita is 0.783 while the second coefficient has showed 0.828 correlation coefficient.

Figure 4. Regression Statistics

Regression Statistics	
Multiple R	0,845
R Square	0,848
Adjusted R Square	0,832
Standard Error	0,080
Observations	64

Note: completed by author relying on the results from estimation

The regression statistics of variables have showed strong R values, adjusted R square is equals to 0.832 while R square is equals to 0.848. It means that about 83.2% of dependent variables can be explained by these statistical variables that author has.

Table 8. ANOVA model

ANOVA					
	Df	*SS*	*MS*	*F*	*Significance F*
Regression	6	2.363e+15	3.93e+14	53.62	4,0898E-31
Residual	57	4.186e+14	7.34e+12		
Total	63	2.782e+15	4.41e+13		

Note: completed by author relying on the results from estimation

ANOVA model has showed an interesting result for these 6 variables, where total degree of freedom was equals to 63 and total sum of squares is 2.782e+15, because the value of variables is very big; The Fisher's equation equals to 53.62 and it is bigger than significance F of 0.000 value.

Table 9. Summary output for linear regression model

Real GDP growth	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
intercept	1.86e+07	3.52e+07	0.529	0.599	-5.18e+07	8.91e+07
households	2.76427	0.81379	3.39	0,00102	1.134	4.393
corporate	-0.56437	0.60288	-0.93	0.353	-1.7716	0.6428
unemployment rate	-4940018	2176452	-2.26	0.027	-9298289	-581.75

population	-5.7206	3.63107	-1.57	0.121	-12.991	1.5505
inflation	37980.4	98562	0.385	0.701	-159.38	235.347
life expectancy	1.86e+07	3.52e+07	0.529	0.599	-5.18e07	8.91e07

Note: completed by author relying on the results from estimation

The table 9 has shown the summary output for linear regression model where the dependent variable real GDP, and with 6 independent variables: household debt, corporate debt, unemployment rate, population and inflation rate. Author wants to highlight the importance of 2 main variables: household and corporate debts. From the model, we can conclude that household debt affect positively and corporate debt affect negatively to economic growth. 1% growth of household debt affect to growth of economic growth to 2.76% and 1% growth of corporate debt will lead to decrease in economic growth to 0.56% respectively. Household hold debt variable's p value equals to 0.0012 at 0.005 confidence level and t stat is 3.39 while the t critical is equals to 1.671, it statistically significant in p and t values.

After this general estimation, author extracted 3 main variables and make another experiment with them, author has got 2 different models with 2 different results, first was made to the relation and effect of household and corporate debt to nominal economic growth, in second model there was real GDP instead of nominal as dependent variable.

Figure 5. The linear regression model between nominal GDP and debts

Source	SS	df	MS	Number of obs	=	64
				F(2, 61)	=	145.10
Model	2.7275e+15	2	1.3638e+15	Prob > F	=	0.0000
Residual	5.7333e+14	61	9.3988e+12	R-squared	=	0.8263
				Adj R-squared	=	0.8206
Total	3.3008e+15	63	5.2394e+13	Root MSE	=	3.1e+06

nomgdpsep	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
corporate	1.212692	.3397882	3.57	0.001	.5332439	1.892141
households	1.955429	.1569313	12.46	0.000	1.641625	2.269232
_cons	-5941129	2118630	-2.80	0.007	-1.02e+07	-1704667

Note: completed by author relying on the results from estimation

Regression output shows that both variables, corporate and household debts have a positive and significant impact on real GDP growth. A one-unit increase in corporate spending is associated with a 1.212692 unit increase in nominal GDP growth, holding all else constant. The 100 tenge growth of corporate debt can increase the volume of real GDP to 121.26 tenge. Similarly, a one-unit increase in household spending is associated with a 1.95 unit increase in nominal GDP growth. The intercept term, which represents the value of nominal GDP growth when all other variables are equal to zero, is -5941129. This means that, in the absence of any corporate or household debt volumes, nominal GDP growth would be negative.

Figure 6. The linear regression model between real GDP and debts

Source	SS	df	MS	Number of obs	=	64
				F(2, 61)	=	124.44
Model	2.2344e+15	2	1.1172e+15	Prob > F	=	0.0000
Residual	5.4762e+14	61	8.9773e+12	R-squared	=	0.8032
				Adj R-squared	=	0.7967
Total	2.7820e+15	63	4.4158e+13	Root MSE	=	3.0e+06

realgdpgro~h	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
corporate	1.169315	.3320814	3.52	0.001	.5052772	1.833353
households	1.746538	.1533718	11.39	0.000	1.439852	2.053224
_cons	-5252607	2070577	-2.54	0.014	-9392981	-1112234

Note: completed by author relying on the results from estimation

The linear regression model between real GDP as dependent variable and household and corporate debt as independent variables respectively. The F stat for model is equals to 124.44 and the p value corresponding to F-stat is 0.000 which means that the model is statistically significant. From the model, next conclusion can be made: 100 million tenge growth of corporate debt will bring a growth of real GDP to 116 million tenge, 100 million tenge growth of household debt will led to growth of 174 million tenge of real GDP.

Table 10. Correlation between GDP, household debt and corporate debt

	nominal GDP	*corporate*	*households*	*real GDP*
nominal GDP	1			
corporate	0,619850906	1		
households	0,888841729	0,513516602	1	
real GDP	0,993157	0,62023601	0,8735823	1

Note: completed by author relying on the results from estimation

In this figure author has taken only 4 variables, real GDP, nominal GDP, corporate debt and household debt in Kazakhstan, and came to one interesting conclusion, household debt and corporate debt has moderate linear relation and the change in one doesn't so strongly affect to another's value, however corporate has also moderate linear relation with nominal GDP which is equals to 0.619 and it shows that household debt more preferably to affect to economics. But because of limitation in period and because of novelty of Kazakhstan's history, author cannot describe the effect and relation of household debt to economy, but in Kazakhstan's case it has strong relation. Real GDP has also big correlation with household debt – 0.873 and by this model author can surely say that household debt and real GDP has relation. Also, author wants to add that these variables have been taken in discrete quarter periods.

CONCLUSION

The study has analyzed the relationship between household debt and economic growth, with estimating the effect of debts to economic growth by using different type of regression models, linear and time series respectively. Data was taken in interval of 1996-2022 annually and 2007-2022 quarterly. Exogenous variables have been taken in macro level, like unemployment rate, inflation rate and consumer price index.

The correlation model has showed that there is strong positive relationship between household debt and economic growth (0.873 with real GDP and 0.888 with nominal GDP). A strong positive relationship between household debt and economic growth, as indicated by correlation coefficients of 0.873 with real GDP and 0.888 with nominal GDP, suggests that as household debt increases, so does economic growth. The next variable is the relation of corporate debt on economic growth, there is no strong relation, because corporate debt has 0.62 coefficient with real GDP and 0.619 coefficient with nominal GDP.

To achieve next goal, author used a several type of regression model and first group was time series models. To these models' author has used annual maturity data between 1997-2022. It was estimated in 3 different time series model: VAR, ARIMA and regression model with Newey-West standard errors. By estimating these models, author find out 3 different results because of lag differences (in VAR was 3 lag, in ARIMA 2 lag and in 3rd one no lags) and because of some changes in structure of variables. However, household debt has affected positively in all models: in VAR model, 1% growth of household debt will bring to 6.3% growth of economic growth; in ARIMA model, 1% growth of household debt will bring to 5.36% growth of economic growth and at last in regression model with Newey-West standard errors, 1% growth of household debt will bring to 4.72% growth of economic growth.

The next group of materials (material from 2007 to 2022 in quarter maturity) used in this research was estimated by other type of regression model. The 16 years with 4 quarters in each give 64 of periods and the estimation was statistically significant by p values and t stat (p value is equals to 0.001 and t stat is equals to 3.39 at 0.05

confidence level). Model estimated that the 1 unit of growth in household debt will bring to 2.76-unit growth of real GDP.

Also, author wanted to highlight only 3 variables and estimated with 2 different dependent variables, real and nominal GDP. Model showed that 1 unit growth of household debt will bring to 1.95 unit of growth of nominal GDP and corporate growth bring to 1.21 unit of growth of nominal GDP. Second model has similar results: 1 unit growth in household debt will bring to 1.74 unit of growth of real GDP and 1 unit growth of corporate debt will bring to 1.17 unit of growth of real GDP respectively.

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APPENDIX A

Table 11. Description of existing variables, abbreviations to time series models with sources

	Description	variable names	Units	Source
Data	Real GDP volume	real gdp	levels	Statistical Bureau of Kazakhstan
Data	Real GDP per capita growth	growth	percent	Statistical Bureau of Kazakhstan
Data	Gross national savings	ngs	percent of GDP	Statistical Bureau of Kazakhstan
Data	Population	pop	thousands	OECD, national sources
Data	Average years of school of population more than 15	school	nb of years	OECD, national sources
Data	Trade openness (in current prices)	openc	percent of GDP	OECD, national sources
Data	Annual changes in consumer prices	cpi	percent	OECD, national sources
Data	Total dependency ratio	dep	percent	OECD, national sources
Data	Liquid liabilities	llgdp	percent of GDP	OECD, national sources
Data	Banking crisis	crisis	1 for crisis, 0 otherwise	Statistical Bureau of Kazakhstan
Data	Total non-financial debt	debt_total	percent of GDP	IMF, OECD, national sources
Data	General government, all liabilities	debt_gov	percent of GDP	IMF, OECD, national sources
Data	Private non-financial debt	debt_priv	percent of GDP	OECD, national sources
Data	Non-financial corporate, all liabilities less shares and other equity	debt_corp	percent of GDP	OECD, national sources
Data	Household debt	debt_hhld	percent of GDP	OECD, national sources

Note: completed by author relying materials from external sources