

## Developing A Mathematical Equation to Predict Khums and Zakat in the Iranian Economy

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### ABSTRACT

*Khums and Zakat in Islam, especially among Shiite communities, are the most important religious aspects for establishing the Islamic economy, so the accurate prediction of their amount is significant to ensure the provision, planning and financial targeting in the Islamic economy. The purpose of this descriptive-exploratory study is to fit the calculations made of Khums and potential Zakat in the country during the years 2008 to 2014 and design a mathematical equation to predict the amount of Khums and potential Zakat in the Islamic economy of Iran, using the second-degree equation of Fourier Series in MATLAB software. While calculating the types of Khums and Zakat, the research results determine the coefficient of determination  $R^2$  equal to 1 for total Khums, 0.9982 for income Khums, 0.9838 for total Zakat, 0.991 for Zakat without livestock and 0.9203 for total Khums and total Zakat. The results are obtained from the mean base square of RMS are 0, 0, 1.2504, 1.503 and 1.4982, and the adjusted coefficient of adjusted  $R^2$  are 0, 0, 0.9029, 0.2947 and 0.5215, respectively. It is a sign of the goodness of accurate fitting of research calculations. In this article, for each of the five types of Khums and Zakat, the formula for calculating the output of specific coefficients are recorded and presented by MATLAB software, which is an efficient method in predicting results in other sciences and can predict the types of Khums and Zakat in the Islamic economy of Iran accurately.*

*Keywords: Zakat, Khums, Fourier Series, Islamic economics*

### INTRODUCTION

Confirmation and fitting of performed calculations significantly increase the variability, reliability, and reliance on it and make management decisions and goal-setting more accessible and accurate. In this research, to achieve the nature of inquiry and research creativity and to understand the research environment, and to increase the power of discernment, judgment, and decision-

making, the hypotheses and equations proved by other sciences are used to discover relationships aim of scientific analysis. It should be done in the shortest distances, and the vacuum of sciences should be filled. For this purpose, this study goes to the current and validation of mathematical equations of engineering "Fourier Series" to prove the rational relationship of the studied variables and the goodness of fitting the calculations

performed the potential capacity of Khums and Zakat in the Fourier Series in MATLAB engineering software. To prepare the input of information to the software, there is a need for a series of information that the research has not used the information of other researchers and has calculated the latest information of the time series of Khums and Zakat for the years 2008 to 2014. These years are also due to the latest possible data that has been obtained to the latest and most recent economic and social database of the country.

We use the Fourier Series equation in MATLAB engineering software, and the performed series data about Khums and Zakat are given to the software. In the first step, the data series diagram is provided by the software. In the second step, MATLAB software in the form of Fourier Series, by determining the points close to the calculations performed, determines the formula of the subject and declares the fit or non-fit of the data numerically. Provides a close fit to the data points with the coefficients of the sine-cosine function expressions with the feature of reproducibility to the exact formula and a suitable fit for Khums and Zakat of the sine-cosine function. And a nonlinear regression diagram is found.

Therefore, this article tries to calculate and present series data of Khums and Zakat during the years 2008 to 2014, then gives equations for five kinds of Khums and Zakat by using a theory of Fourier mathematical equation that is widely used in mathematics, mechanics, electronics and electricity.

## LITERATURE REVIEW

*Literature of Using the Fourier Mathematical Equation and MATLAB Software*

There is very limited literature on the use of the Fourier's mathematical equation and MATLAB software in fitting calculations and extracting the equation from it to predict variables. Therefore, this research is creative and innovative in its kind to confirm and improve the fit of time series calculations in economics and to determine the prediction equation of economic variables.

### *Internal Literature*

Mehrpour and Pourbakhshian (2015), using 48-year data available from the monthly discharge of 5 stations of Sirvan River and also 51-year data from the daily release of Ivazu River in Fourier Series MATLAB software, calculate the goodness of fit (R), mean square error (MSE) squared mean square error (RMSE). Their model is suitable for predicting river discharge to deal with the risks of floods and erosion. They can plan to make optimal use of it to manage and supply agricultural water downstream and check the water supply capacity for the reservoirs of some dams.

Gilani Nia (2011) provides a practical and straightforward news system for predicting random data and short-term fluctuation. He introduces the Fourier Series, Markov's chain and comparison of the forecasting model (Gray) with the combined forecasting model (Gray-Fourier-Markov); by combining these methods, the artificial intelligence detection algorithm is created to make an expert system for predicting short-term and unstable random data with high accuracy and precision; for case study the effectiveness of the proposed algorithm from the data of Taiwan studies (Chen Tsai Lin, 2008) and data related to tourism demand forecast in Iran are

tested, the results show that the output of the model for the two countries has in high accuracy.

Moghaddam (2009) has used the regression method and artificial neural network to predict and estimate oil field production. He has obtained the prediction results of his research by modifying and constructing the existing algorithm neural networks of MATLAB software. By comparing the estimates of the two methods, he has shown an unusual downward trend at the end of the production period of an oil field or well.

#### *Out of Iran Research Literature*

Prahitama et al. (2018) discuss variable time series data. They then achieve regression modelling to predict inflation in the food sector as well as transportation. They introduce the predictor variable as a logarithm and the response variable as a  $t$ -th ( $y_t$ ) function in the time series. According to their research, the non-parametric regression model of Fourier Series is an accurate and advanced approach and overcoming data with trigonometric distribution is one of its advantages. They obtain 99%  $R^2$  for 120 parameters in their research in inflation modelling for the transport, communications and financial services sector using the Fourier K Series, which is 90% in the multi-linear regression model. The Fourier Series regression model was determined to predict food inflation in the  $Y_{t-1}$  and  $Y_{t-2}$  algorithms.

American biologists Fidino and Magle (2017) present a technique using the Fourier Series to estimate periodic signals in dynamic occupation models. These models are based on data from a long-term study of long-term camera traps in medium to large mammals in Chicago, Illinois, USA. They use the Fourier Series in dynamic occupancy

models to divide the variability between periodic signals and their deviations and conclude that the Fourier Series are highly generalizable and can be adapted to any periodic pattern. The results demonstrate the potential of using the Fourier Series in dynamic occupation models to estimate periodic resources and the ease of using prior knowledge of life-history strategies of different animal species.

Dhar et al. (1993) use the Fourier Series for modelling electricity consumption in commercial buildings. They get accurate and periodic consumption forecasting. In all cases, the studied accuracy of the Fourier Series model is very close to the individual and cumulative hourly approaches. They conclude that the new system to modelling hourly energy use, adapted from the Fourier Series, is appropriate for analyzing optimal savings and identifying disadvantages.

#### *Computation of Research Literature in Khums and Zakat*

##### 1. The Background of Khums Calculating

The basis and amount of income Khums in the Iranian economy have been estimated in various studies, including Gilak Hakimebadi (2000) and Kia Al-Hosseini and Bagheri (2001). In these two studies, researchers have calculated the amount of Khums through national accounts. They have calculated the disposable income of the private sector. By deducting the consumption expenses of the private sector, they have obtained the basis of Khums and have estimated the amount of Khums. They did not consider the total government revenue to be Khums. Kia al-Husseini has reached the base of Khums according to the following relations:

*Private sector Khums income = gross national product - government revenues*

*Khums base = income subject to private sector Khums - private sector consumption costs - private sector fixed capital depreciation*

*Amount of Khums = 0.2% x Base of Khums*

Therefore, the tax base of Khums in this research will be examined as follows:

*Khums base = Gross National Product - Government Revenues - Private Sector Consumption Expenditures - Private Sector Fixed Capital Depreciation + Public Sector Salary*

Askari et al. (2010) calculate the basis of Khums for each year by having and calculating the significant variables, i.e. gross national product, depreciation of private sector fixed capital, government revenues, public sector wages and private sector consumption expenditure. By calculating the base of Khums and multiplying it by the final rate of Khums (0.2), the amount of Khums of the country is obtained each year. The mathematical symbol of the above relations is as follows:

$$Y_d = GNP - (IPK + IRE + GR) + GW$$

In the above relation, respectively,  $Y_d$  is the disposable income of the private sector (households), GNP is the gross national product at the market price, IPK is the accrued profit, IRE is the acquired rent, GR is the total government revenue, and GW is the public sector salary.

To obtain the basis of Khums, we also use the following equation:

$$BK = Y_d - C$$

In this regard, BK is the basis of Khums,  $Y_d$  is the disposable income of the private sector, and C is the amnesty costs of Khums for the private sector.

Now to calculate Khums, we will have:

$$K = 0/2 (BK)$$

That K indicates the obligatory Khums in each year.

## 2. The Background of Zakat Calculating

Hasas Yeganeh and Pifeh (2013) have also considered the basis for calculating the appropriate amount of Zakat to be quite complex. They write that for all the money that is not used during a lunar year, 2.5% of Zakat is allocated. Zakat on investment income is 10%, and salary Zakat is 2.5%. Zakat is calculated at 2.5% of the value or net profit depending on the type of trade. In calculations related to Zakat, the current market value is determined as the basis of evaluation. Aqeli (2012) quotes Qamidi (2002), mentioning that the most common Zakat is Zakat on wealth, which is 2.5% of cumulative wealth after deducting personal expenses. Production (agriculture, industry, land rent, etc.) is limited to Zakat of 10% (tithe) or 5% so that if both labour and capital are used in the production process (such as irrigated crops), the rate is 5%. And if one of these two factors is used for production (such as rain-fed crops), the rate is 10%. For any income that does not require work or capital, such as finding treasures (underground treasures), this rate is 20%. The rules for Zakat on animals are determined by the type of group of

animals (cattle, sheep and camels). Kia Al-Hosseini (2005) has considered the rate of Zakat on cash as 2.5% and Zakat on crops on net production. Also, the rate of Zakat on cattle is constantly considered to be 1 to 2%.

## CONCEPTUAL DEFINITIONS of RESEARCH

### *Sharia Funds or Religious Funds*

Funds mean money. It is mentioned in the dictionary of Farhang Dehkhoda<sup>1</sup>. It is one of the ordinary meanings of funds; Khums, Zakat and rejection of oppression are paid to some mujtahids. Some funds are considered to be funds raised, money paid to others for goodness and charity. The jurists have used the term "religious funds" in various jurisprudential issues. Some say that the definition of "Sharia funds" has not been defined in jurisprudence, so they do not consider it as a jurisprudential term but consider it as a standard term (a term that is common among the people) and consider its customary meaning as all currencies that due to the rules of Sharia by the obligors are paid.

### *Zakat*

Zakat is defined as the growth of development and purity and as a noun for the obligatory right and the particular amount that must be separated in the property with special conditions.

### *Cases of belonging and consumption of Zakat*

According to Imami<sup>2</sup> jurisprudence and the consensus of its jurists, but also according to the agreement of jurists of different Islamic religions and in other words, due to the necessity of religion,

Zakat is undoubtedly the basis of the minimum range of four grains (wheat, barley, dates and raisins), (camels, cows and sheep) and cash (standard gold and silver coins). Zakat is not specific to Islamic law but has existed in past religions, and in terms of nations, it has a very high range.

Amini et al. (2019) write that according to the view of all jurists in all Islamic sects, the consumption of Zakat of al-Fitr and Zakat on a property is the same and the same for all classes as stated in the Holy Qur'an: "*Indeed, Alms (Zakat) are for the poor and the needy, and those employed to administer the (funds); for those whose hearts have been (recently) reconciled (to Truth); for those in bondage and debt; in the cause of Allah; and for the wayfarer: (thus is it) ordained by Allah, and Allah is full of knowledge and wisdom* " Sure Toubeh 60. However, although the use of Zakat is specified in the Qur'an, the ruling hand is open to spend Islamic taxes. One of the uses of Zakat is stated in the cause of God, which is all-pleasing in the grounds of God, and includes the propagation and spread of the religion of Islam and welfare and social services and solving the problems of Muslims.

### *Khums*

Khums in the word means "one-fifth", and in jurisprudential terms, it is one-fifth of the man's property that must pay from income and surplus on its expenses with special conditions. Of course, Imami jurists have considered it a financial obligation that God Almighty has made obligatory for the Messenger of God (PBUH) and his descendants instead of Zakat and honouring them. Of course, all the definitions of the jurists are used: First, Khums is one of the indisputable

obligations and necessities of religion, such as prayer and fasting; Secondly, Khums is a financial right for Bani Hashem<sup>3</sup> and is paid in their honour instead of Zakat; Thirdly, Khums is given only to the children of Bani Hashem; Fourthly, Khums is obligatory which is fixed from the Qur'an, Sunnah and consensus. Therefore, although in verse 41 of Surah Anfal, it is stated, "*And know that anything you obtain of war booty – then indeed, for Allah is one-fifth of it and for the Messenger and for [his] near relatives and the orphans, the needy, and the [stranded] traveller, if you had believed in Allah and in that which We sent down to Our Servant on the day of criterion – the day when the two armies met. And Allah, over all things, is competent... 4*", but the war booty in this verse is not limited to the spoils of war.

#### *Items of belonging and consumption of Khums*

According to the Imami jurists, the items of Khums are 1- spoils, 2- mines, 3- treasure, 4- what is obtained from diving in the sea, 5- income after deducting annual expenses, 6- land that an infidel buys from a Muslim and 7- Halal property mixed with Haram. As can be seen, in the present era, the essential basis of Khums is the fifth item (income after deducting annual expenses).

The important point is that according to all Imami jurists, Monah (all kind of annual expenses) is not subject to Khums, or it is one of the cases in which the holy shari'ah has forgiven the obligation to pay Khums. Monah is the cost of living commensurate with dignity, some examples of which are: a) what are the daily necessities of life, luxuries and charities; b) financial and tax duties

collected by the government; c) atonement, blood money and unspent expenses; d) the needs of human beings in daily life, such as a house, a garden for comfort and leisure time, cars or any other means of transportation; e) expenses for children's marriage, education and the like, even if those children are wealthy; f) expenses for obligatory or recommended Hajj travel or pilgrimage, travel and entertainment.

Amini et al. (2015) write that Khums is one of the Islamic taxes, the principle of which has been proven by the Holy Qur'an, Revaiat<sup>5</sup>, noble narrations and Consensus, and only in those cases there are differences between different religions.

#### *Fourier Series*

The Fourier Series is a method in mathematics by which an alternating function can be written as a set of sine and cosine functions. The case is named after the French mathematician Joseph Fourier. The basic concept behind the Fourier Series is that different parts can be rewritten using sine and cosine functions. Fourier Series theory shows that if  $f(x)$  holds in conditions such as (Dirikele Condition), it can be expressed as a coordinate Series.

## RESEARCH METHODOLOGY

### *Based on the Purpose of the Research*

According to the objectives and subjects, descriptive and exploratory research methods have been used. This research results from an accurate and regular objective description of the characteristics of a phenomenon or a topic.

In this descriptive study, It is tried to study the purpose of the research, which is to describe the

conditions or phenomenon of the legal aspects of Khums and Zakat for the research, and calculate the calculation of Khums and Zakat and present the prediction equation of Khums and Zakat in a particular time. The implementation of this descriptive research is to understand the existing conditions better or help the decision-making process of financial reliance on Khums and Zakat and justify it. In this research, the variables have been studied and compared as they are.

An exploratory study is used when there is little information about the current state of a phenomenon or how to solve problems that have arisen in the past and are similar to the current situation. The correct information is not available, as this research targets his goal.

*Methods and Tools of Data Collection and Tools for Doing Work*

The method and tools of data collection in this research are library and field methods and tools for doing MATLAB software.

*Type of Research in Terms of Results*

In terms of research results, it is an applied type that economic researchers can use, especially Islamic economics,

politicians, economists, and religious institutions and men. This research aims to achieve principles and rules that are applied in real and practical situations and help improve the product and efficiency of executive methods in the field of Islamic economics.

RESEARCH FINDINGS

*Findings and Potential Calculations of Khums and Zakat during the Years 2008 to 2014*

1. Findings of Research in the Field of Khums

For feasibility, the macroeconomic method is used to evaluate the potential calculation of Khums numerically. Given the conditions of the present age, the revenues from the spoils of war were abandoned. The amount of Khums of the treasure, the property obtained from diving and the mixed property is minimal and accurate, or even approximate statistics are not available. Khums belonging to dhimmi<sup>6</sup> land is not relevant because it does not even have legal and executive support. The only available option for research is Khums on income and Khums on mines.

**Table 1.** Calculation related to Khums of income during the years 2008 to 2014<sup>7</sup> billion Rials

K Annual Khums amount	BK Khums base	C Is Deducted		Y <sub>d</sub>	Is collected	Is collected			GNP (GDP at current prices)	Year
		Capital depreciation of private sector	Private-sector consumption costs	Private sector disposable income	GW Government salaries and wages	Government spending	IRE Computation Profit <sup>8</sup>	IPK Accrual rent <sup>9</sup>		
219521	1097603	288848	1679316	306567	270651	436680	-	-	3231796	2008
197025	985125	294316	1918896	3198337	329729	514761	-	-	3383369	2009

K Annual Khums amount	BK Khums base	C Is Deducted		Y <sub>d</sub>	Is collected	Is collected			GNP (GDP at current prices)	Year
		Capital depreciation of private sector	Private-sector consumption costs	Private sector disposable income	GW Government salaries and wages	Government spending	IRE Computation Profit <sup>8</sup>	IPK Accrual rent <sup>9</sup>		
281399	1406993	318812	2266489	3992294	415031	614503	-	-	4191766	2010
389227	1946133	416956	2885045	5248134	464622	704329	-	-	5487841	2011
287537	1437683	657977	3688329	5783989	510170	792548	-	-	6066367	2012
531985	2659927	905530	4811248	7561705	681294	1070684	-	-	7951095	2013
350945	1754727	1005628	5792939	8553294	858253	1352861	-	-	9047902	2014

Source: Research calculations

Note: Calculation of income Khums is explained before  $Y_d = \text{GNP} - (\text{IPK} + \text{IRE} + \text{GR}) + \text{GW}$ ,  $\text{BK} = Y_d - \text{C}$ ,  $\text{K} = 0/2$ .

Khums of mines, if its added value reaches the quorum, Khums is required to be paid after deducting expenses, which is 20% of the added value of the mine. The quorum mine is 105 ordinary shekels of silver or 10

ordinary shekels of gold after deducting expenses. By importing the added value of mining the relevant Khums has been calculated during the years 2008 to 2014:

**Table 2.** Calculation related to mining Khums in Iran's economy during the years 2009 to 2015 billion Rials

Total Khums of mine, oil and gas	Khums of oil and gas	Khums of mines	Added value of oil and gas	Added value of mine	Year
171653	166162,4	5490,6	830812	27453	2008
141144	135882,8	5261,8	679414	26309	2009
196050	188404	7646,6	942020	38233	2010
320393	310905,4	9488,4	1554527	47442	2011
270431	254701,4	15730,2	1273507	78651	2012
399033	380477,8	18555,2	1902389	92776	2013
369233	349827	19406,8	1749135	97034	2014

Source: Research calculations

Note: The value of mine and oil and gas are extracted from the Iranian Central Bank annual economic report. Mining Khums is obtained by multiplying it by 20% for each year.

**Table 3.** Potential Khums in Iran during the years 2008 to 2014 billion Rials

Khums of mine, Oil and Gas	Khums income	Total Khums income (income, mining, oil and gas)	Year
171653	219521	391174	2008
141144	197025	338169	2009
196050	281399	477449	2010
320393	389227	709620	2011



Khums of mine, Oil and Gas	Khums income	Total Khums income (income, mining, oil and gas)	Year
270431	387537	557968	2012
399033	531985	931018	2013
369233	350945	720178	2014

Source: Research calculations

Note: Table 3 is extracted from table 1 and 2.

## 2. Findings of research in the field of Zakat

Using the computational experiences of researchers and aggregating their opinions, and taking into account the average estimate of Zakat during the years 2008 to 2014, the following

values are calculated. In calculating the price of wheat to estimate Zakat al-Fitr, the average daily price in the market has been obtained and applied during these years. Economic statistics is from a series of financial data of the Central Iranian Bank.

**Table 4.** Estimation of cash Zakat during the years 2008 to 2014 billion Rials

Cash Zakat (2.5% of) billion Rials	The sum of the total amount subject to Zakat million Rials	Net savings of individuals and institutions million Rials	Net investment of individuals and institutions in millions of Rials	Year
13463	538512733	538512733	0	2008
18619	744773151	677654772	67118379	2009
4008	160349291	78619341	81729950	2010
21378	855124929	855124929	0	2011
20659	826352521	826352521	0	2012
28037	1121476585	1095431402	26045183	2013
59084	2363365680	1716514186	646851494	2014

Source: Research calculations

Note: To calculate cash zakat each year, individuals' net capital and savings have been cumulated and then multiplied by 2.5%.

**Table 5.** Estimation of Zakat on Crops during the years 2008 to 2014 on billion Rials

Zakat on crops	Output value of products	Year
16516	220218	2008
20183	269108	2009
21785	290468	2010
24753	230047	2011
36830	491073	2012
62930	839065	2013
76478	1019714	2014

Source: Research calculations

Note: To calculate the zakat on agricultural products subjected to zakat, the value of products has been multiplied by an average of 5 for irrigation with water of wells and 10 for irrigation with rain, 7/5.

**Table 6.** Estimation of Zakat al-Fitr during the years 2008 to 2014 on billion Rials

The amount of al-Fitr Zakat	The average price of 3 kg of wheat	The population subjected to Zakat payment	Average percentage of absolute urban and rural poverty	Total population	Year
494	8352	59216389	18%	72215108	2008
438	7311	59939930	18%	73097476	2009
523	8613	60723057	18%	74052508	2010
789	12813	61622729	18%	75149669	2011
991	15882	62440067	18%	76146423	2012
1553	24609	63134717	18%	76993557	2013
1994	31149	64016373	18%	78068747	2014

Source: Research calculations

Note: The population subjected to Zakat comes from (population \* Average percentage of absolute urban and rural poverty), and the amount of al-Fitr Zakat comes from ( The average price of 3 kg of wheat\* the population subjected to Zakat)

**Table 7 .** Summary of potential Zakat calculations during the years 2008 to 2014, except for livestock Zakat, on billion Rials

Total of Zakat	Cash Zakat	Zakat on crops	al-Fitr Zakat	Year
30473	13463	16516	494	2008
39240	18619	20183	438	2009
26316	4008	21785	523	2010
46920	21378	24753	789	2011
58480	20659	36830	991	2012
92520	28037	62930	1553	2013
137556	59084	76478	1994	2014

Source: Research calculations

### *Summarizing and Concluding Potential Calculations of Khums and Zakat*

As shown in the Table 8, during the years 2008 to 2014, the potential number of religious funds of Khums and Zakat is more than the amount of tax and public revenues; even in 2013,

the sharia funds of Khums and Zakat have been nearly double the taxes collected.

This comparison aims to show the importance of Khums and Zakat as an Islamic tax against the current tax in the country.

**Table 8.** Comparison of Zakat and Potential Khums with Actual Tax Revenues and National Income of the Country during the Years of 2008 to 2014 on Billion Rials

Equality of potential Sharia funds with public revenues	Equality of potential Sharia funds with tax revenues	Total Khums and Zakat	Tax revenues	General government revenues	Year
1/1	1/76	421647	239741	379338	2008
.8	1/26	377409	300035	466546	2009
1/31	1/77	503765	284527	384288	2010
1/39	2/1	756640	359451	544470	2011

Equality of potential Sharia funds with public revenues	Equality of potential Sharia funds with tax revenues	Total Khums and Zakat	Tax revenues	General government revenues	Year
1/08	1/55	616448	359166	568203	2012
1/3	1/88	931018	494249	717384	2013
.87	1/2	857734	709651	977593	2014
1/13	1/64	4557089	2782820	4037822	Total

Source: Research calculations

*Extraction results of findings and potential calculations of Khums and Zakat during the years 2008 to 2014 in MATLAB software and data fitting*

1. Work method

From a Series of data consisting of two variables, x and y, the same numerical calculations performed from the potential capacity of Khums and Zakat (y) and the corresponding years (x), we want to provide a functional model to describe these two variables mathematically. To do this, we use the MATLAB software curve fitting toolbox.

Using MATLAB code, we enter the central data Series diagram by entering the information Series. This data is made up of a Series of two-sentence Fourier collected with noise.

2. Definitions

R<sup>2</sup>

R<sup>2</sup> is a statistical measurement of data close to the fitted regression line. R<sup>2</sup> is also called the coefficient of determination or coefficient of detection.

The definition of the coefficient of determination R<sup>2</sup> is relatively simple: "The coefficient of determination R<sup>2</sup> indicates what percentage of changes in the dependent variable is explained by the independent variable" or in other words, the coefficient of determination indicates "how many changes in the

dependent variable are affected by the relevant independent variable "The rest of the changes in the dependent variable are related to other factors."

R-squared = Explained variation / Total variation

The coefficient of determination is always between 0 and 1, indicating that the model does not explain any variability of the response data around its mean.

1 shows that the model has all the variability of the response data around its mean.

Theoretically, if R<sup>2</sup> = 1, all observed values would be the same as the fitted values, and all data points would be on the fitted line.

An essential difference between the coefficient of determination (R<sup>2</sup>) and the adjusted coefficient (R<sup>2</sup> adjusted) of determination is that the coefficient of determination assumes that each independent variable observed in the model explains the changes in the dependent variable. Therefore, the percentage shown by the coefficient of determination takes the effect of all independent variables on the dependent variable. But the rate shown by the adjusted coefficient of determination is only the result of the actual impact of the model's independent variables. Not all variables are independent. Another difference is that the coefficient of determination does not determine the

suitability of the variables for the model, even with a high value. Still, the estimated value of the adjusted coefficient can be trusted.

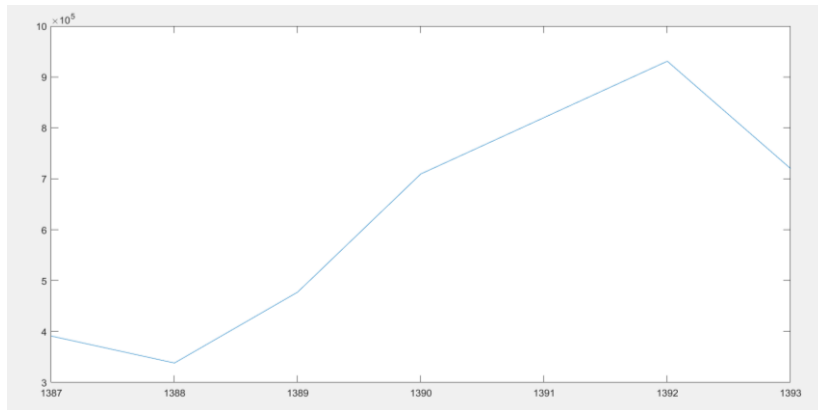
**Root Mean Square (RMS)**

The main task of the regression algorithm is to find a line that has the best position relative to the points. The best position has different definitions, but we assume that the best position is

the line with the shortest distance to all points. In other words, the best position is the lowest RMS.

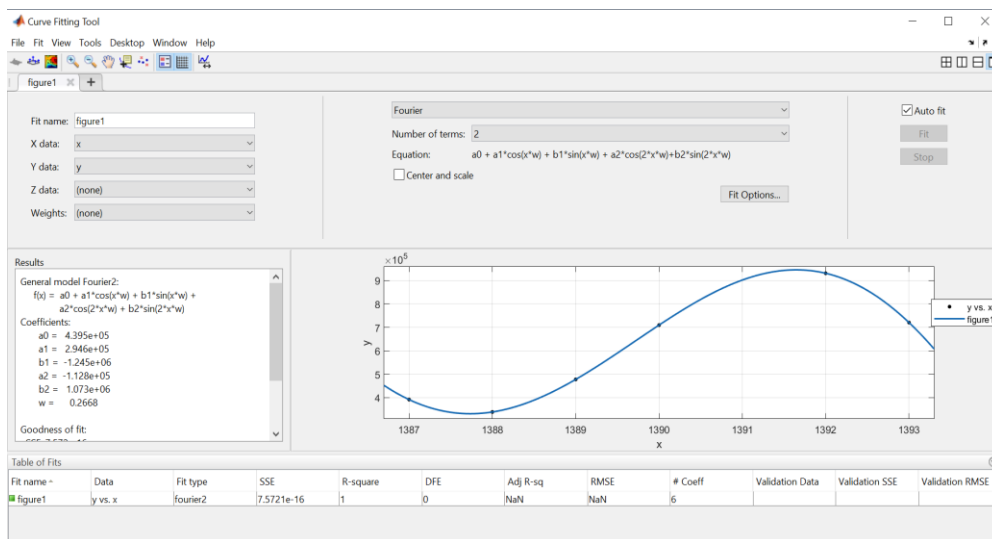
*Fitting Model and Equation of Total Khums*

The model obtained through the LOWESS algorithm fits the curve in MATLAB software as shown in Figure 1 and the proposed relation as Fourier Series.



**Chart 1.** The main chart for the total Khums data Series

Note: It is noted about charts that all of them are created by the first step entering the series date of Khoms and Zakat from tables which are calculated in 5 kinds of Khums and Zakat in MATLAB Software, then software present the points and cure close to point in the chart as possible and provide formula and coefficients. The year of the charts and figure is recorded in Persian Language, so 1387 is 2008 till 1393 is 2014.



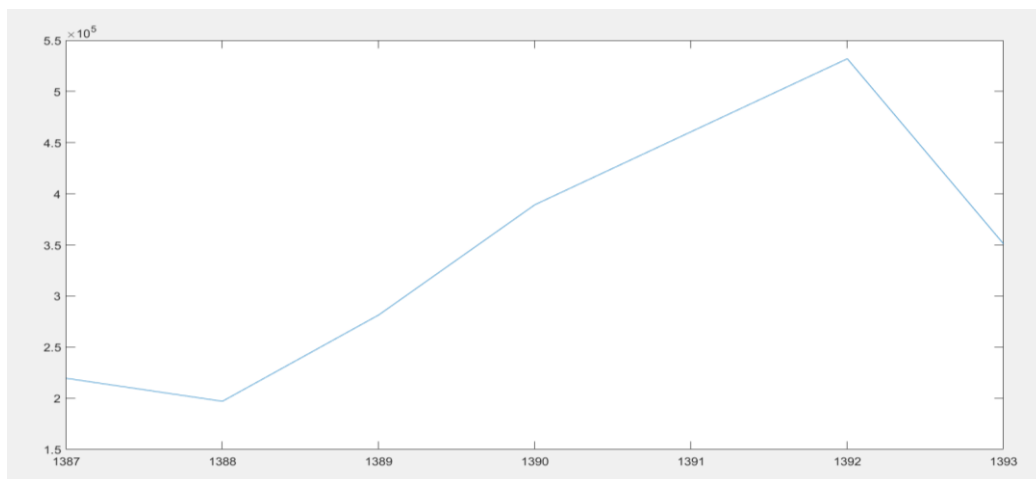
**Figure 1.** Curve diagram and total Khums fit

Mathematical model, the nonlinear regression model is obtained from the function fits of total Khums by using the Fourier Series of degree 2 will be as follows:

$$f(x) = a_0 + a_1 \cdot \cos(x \cdot w) + b_1 \cdot \sin(x \cdot w) + a_2 \cdot \cos(2 \cdot x \cdot w) + b_2 \cdot \sin(2 \cdot x \cdot w)$$

$a_0 = 4.395e+05$   
 $a_1 = 2.946e+05$   
 $b_1 = -1.245e+06$   
 $a_2 = -1.128e+05$   
 $b_2 = 1.073e+06$   
 $w = 0.2668$

The diagram of the LOWESS algorithm is very close to the original



**Chart 2.** Came for the Income Khums data Series

*Fitting Model and Equation of Income Khums*

The model is obtained through the LOWESS algorithm fits the curve in MATLAB software as shown in Figure 2 and the proposed relation as Fourier Series

Mathematical model, the nonlinear regression model is obtained from the function fits the income

diagram and has been able to model the behaviour of the data well. The square mean of the base RMS has no number with the lowest possible NaN number. The adjusted coefficient of adjustment  $R^2$  has no adjusted with the lowest possible NaN number, and the coefficient of determination  $R^2$  is equal to 1. The statistical measurement fits precisely on the regression line.

Therefore, the above equation with its coefficients is presented and introduced according to the unique features of reproducibility and accuracy of the Fourier Series to predict the total Khums of the entire Iranian economy.

Khums by using the Fourier Series of degree 2, will be as follows:

$$f(x) = a_0 + a_1 \cdot \cos(x \cdot w) + b_1 \cdot \sin(x \cdot w) + a_2 \cdot \cos(2 \cdot x \cdot w) + b_2 \cdot \sin(2 \cdot x \cdot w)$$

$a_0 = -1.196e+14$   
 $a_1 = -1.353e+14$   
 $b_1 = -8.438e+13$   
 $a_2 = -1.754e+13$   
 $b_2 = -3.58e+13$   
 $w = 0.002667$

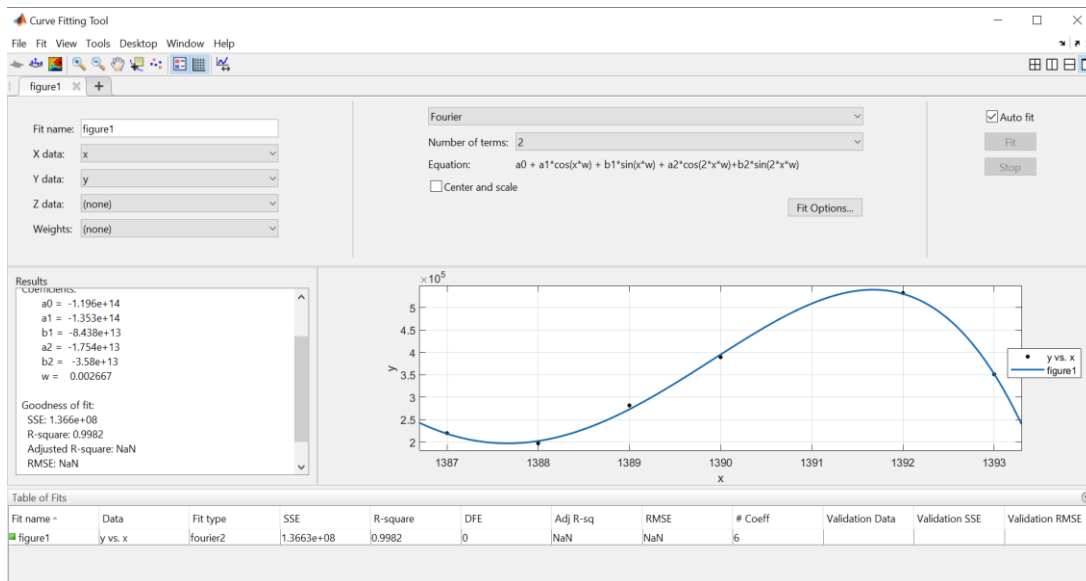


Figure 2. Diagram of the Income Khums fitting curve

The diagram of the LOWESS algorithm is very close to the original diagram and has been able to model the behaviour of the data well. The square mean of the base RMS has no number with the lowest possible NaN number. The adjusted coefficient of adjustment  $R^2$  has no adjusted with the lowest possible NaN number. The coefficient of determination  $R^2$  is equal to 0.9982, i.e. the statistical measurement is fitted on the regression line.

Therefore, the above equation with its coefficients is presented and

introduced according to the unique characteristics of reproducibility and accuracy of the Fourier Series to predict the income Khums of Iran's economy.

*Fitting Model and Equation of Total Zakat*

The model is obtained through the LOWESS algorithm fits the curve in MATLAB software as shown in Figure 3 and the proposed relation as Fourier Series.

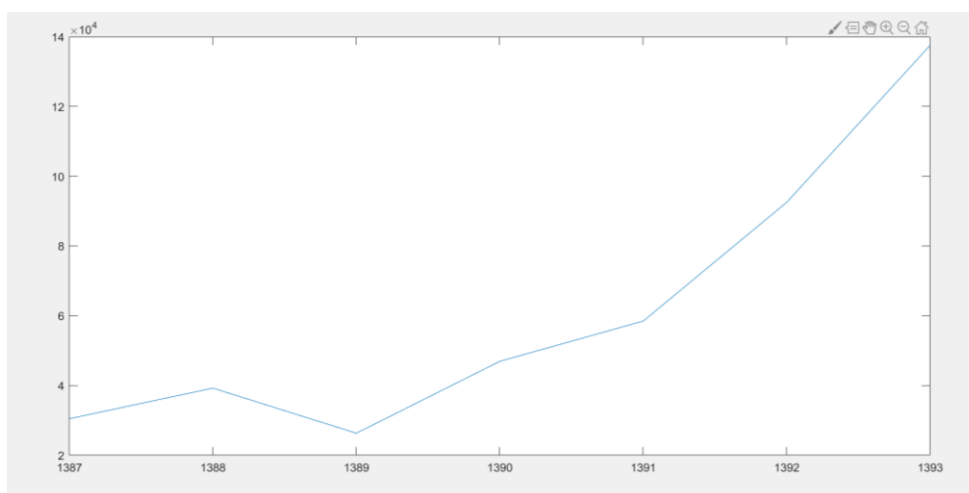


Chart 3. Main for the Total Zakat data Series

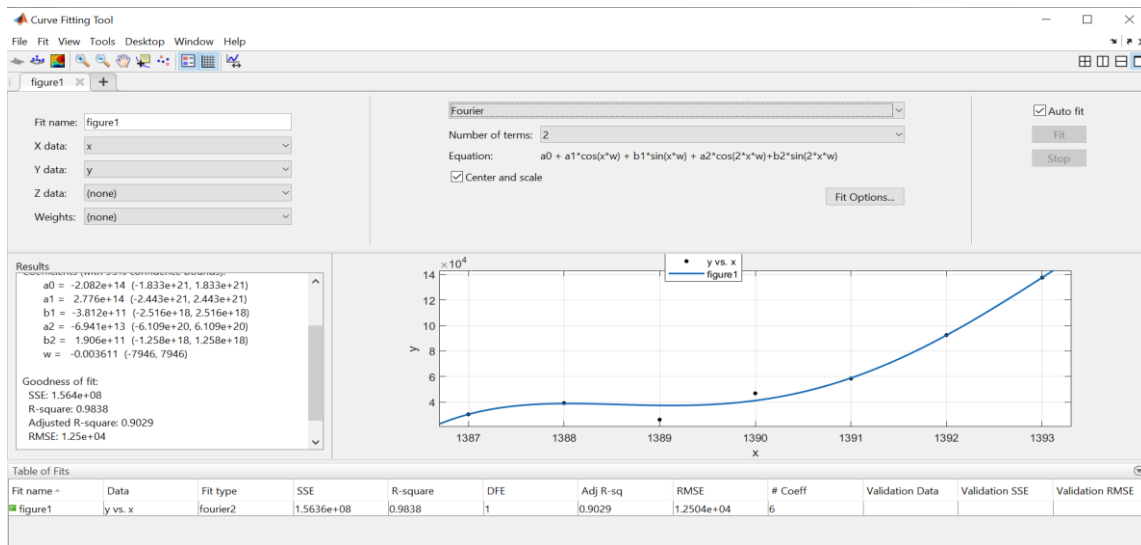


Figure 3. Diagram of the Total Zakat fitting curve

Mathematical model, the nonlinear regression model obtained from the function fits the total Zakat by using the Fourier Series of degree 2, will be as follows:

$$f(x) = a_0 + a_1 \cdot \cos(x \cdot w) + b_1 \cdot \sin(x \cdot w) + a_2 \cdot \cos(2 \cdot x \cdot w) + b_2 \cdot \sin(2 \cdot x \cdot w)$$

$a_0 = -2.082e+14 (-1.833e+21, 1.833e+21)$   
 $a_1 = 2.776e+14 (-2.443e+21, 2.443e+21)$   
 $b_1 = -3.812e+11 (-2.516e+18, 2.516e+18)$   
 $a_2 = -6.941e+13 (-6.109e+20, 6.109e+20)$   
 $b_2 = 1.906e+11 (-1.258e+18, 1.258e+18)$   
 $w = -0.003611 (-7946, 7946)$

The diagram of the LOWESS algorithm is very close to the original chart and has been able to model the behaviour of the data well.

The mean base square of RMS with the lowest possible number is 1.2504, and the adjusted coefficient of determination is  $R^2$  adjusted with the lowest possible number of 0.9029. The

coefficient of determination of  $R^2$  is equal to 0.9838, which is a very close statistical measurement is.

Therefore, the above equation with its coefficients is presented and introduced to the Iranian economy according to the unique characteristics of reproducibility and accuracy of the Fourier Series to predict the total Zakat.

#### Fitting Model and Equation of Zakat without Cattle

The model is obtained through the LOWESS algorithm that fits the curve in MATLAB software as shown in Figure 4 and the proposed relation as Fourier Series.

Mathematical model, the nonlinear regression model is obtained from the fits Zakat without cattle by using the Fourier Series of degree 2 will be as follows:

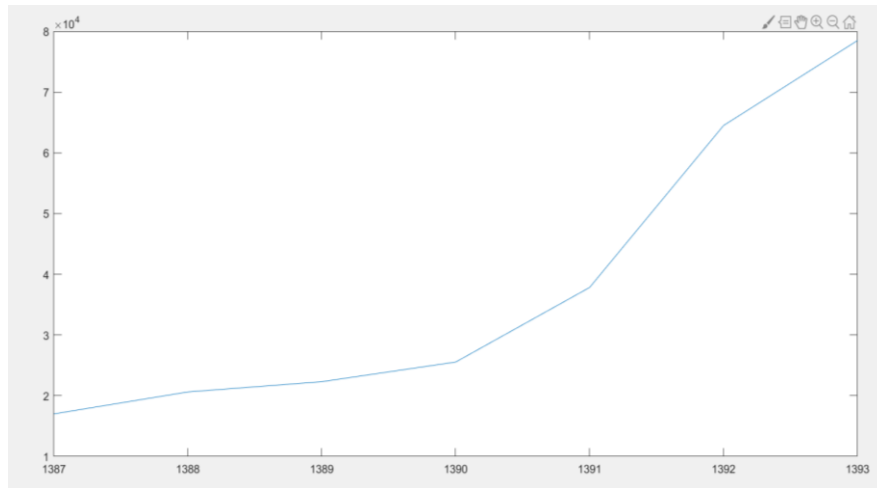
$$f(x) = a_0 + a_1 \cdot \cos(x \cdot w) + b_1 \cdot \sin(x \cdot w) + a_2 \cdot \cos(2 \cdot x \cdot w) + b_2 \cdot \sin(2 \cdot x \cdot w)$$

$a_0 = 4.018e+04 (2.584e+04, 5.453e+04)$   
 $a_1 = -4589 (-2.836e+07, 2.835e+07)$

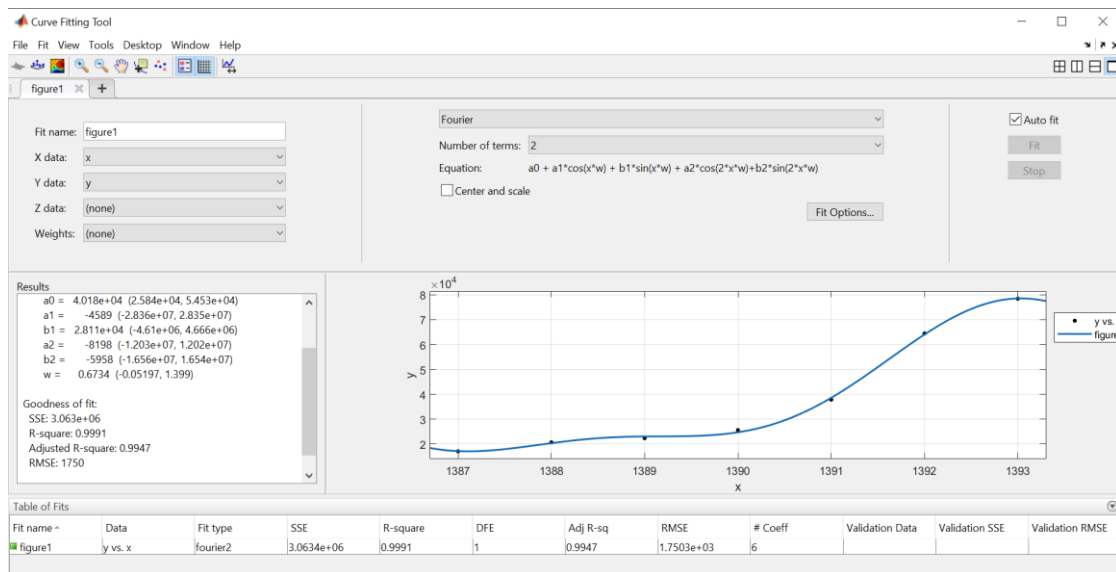
$b_1 = 2.811e+04 (-4.61e+06, 4.666e+06)$   
 $a_2 = -8198 (-1.203e+07, 1.202e+07)$   
 $b_2 = -5958 (-1.656e+07, 1.654e+07)$

$w = 0.6734 (-0.05197, 1.399)$

The diagram of the LOWESS algorithm is very close to the original diagram and has been able to model the behaviour of the data well.



**Chart 4.** Came for Zakat without cattle

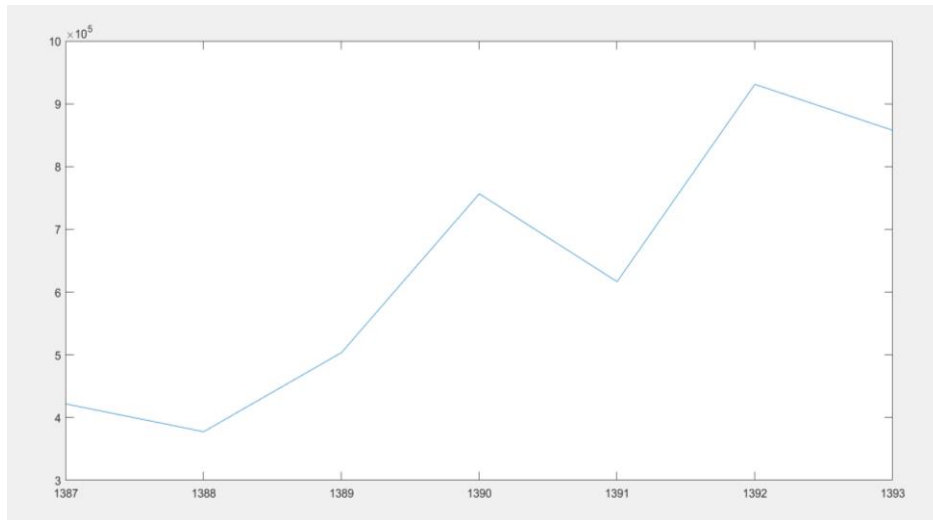


**Figure 4.** Curve and fit of Zakat without cattle

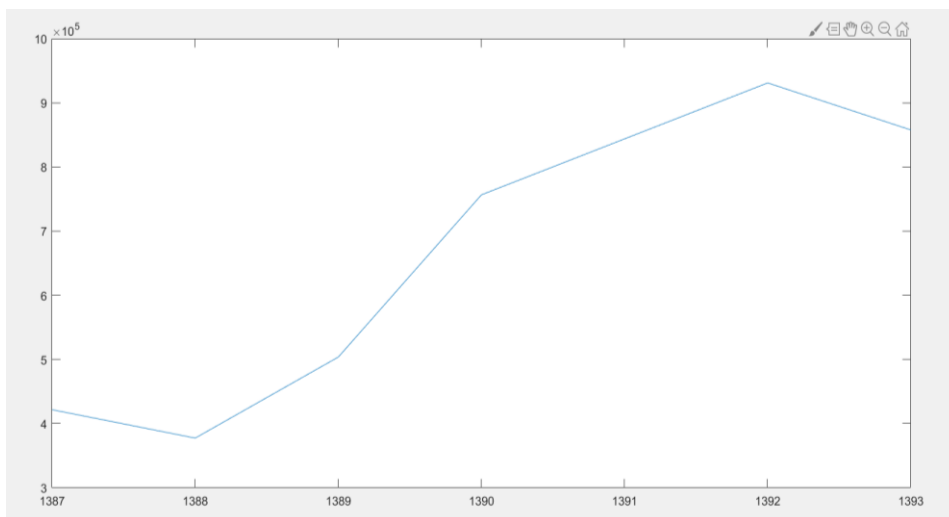
The mean base square of the RMS with the lowest possible number is 1.7503, and the adjusted coefficient of adjustment is  $R^2$  adjusted with the lowest possible number of 0.9947. The coefficient of determination of  $R^2$  is equal to 0.9991, statistical measurement very close to the regression line.

Therefore, the above equation with its coefficients is presented to the Iranian economy concerning the unique characteristics of reproducibility and accuracy of the Fourier Series for predicting Zakat without cattle.





**Chart 5.** The primary data of total Khums and Zakat



**Chart 6.** The main chart of total Khums and Zakat data softened by the software of failure in 2012.

*Fitting Model and Equation of Total Khums and Zakat*

The model obtained through the LOWESS algorithm fits the curve in MATLAB software as shown in Figure 5 and the proposed relation as Fourier Series.

Mathematical model, the nonlinear regression model is obtained from the function, fit total Khums and Zakat by using the 2nd degree Fourier Series will be as follows:

$$f(x) = a_0 + a_1 \cdot \cos(x \cdot w) + b_1 \cdot \sin(x \cdot w) + a_2 \cdot \cos(2 \cdot x \cdot w) + b_2 \cdot \sin(2 \cdot x \cdot w)$$

$a_0 = 6.382e+05$  (-8.472e+04, 1.361e+06)  
 $a_1 = -1.87e+05$  (-2.858e+08, 2.855e+08)  
 $b_1 = 1.405e+05$  (-3.802e+08, 3.805e+08)  
 $a_2 = 1.129e+05$  (-2.924e+08, 2.926e+08)  
 $b_2 = 7.207e+04$  (-4.595e+08, 4.597e+08)  
 $w = 0.8866$  (-0.5771, 2.35)

The diagram of the LOWESS algorithm is very close to the original diagram and has been able to model the behaviour of the data well.

The mean base square of the RMS with the lowest possible number is 1.4982, and the adjusted coefficient of

determination is  $R^2$  adjusted with the lowest possible number is 0.5215. The coefficient of determination of  $R^2$  is equal to 0.9203. The statistical measurement is very close to the regression line.

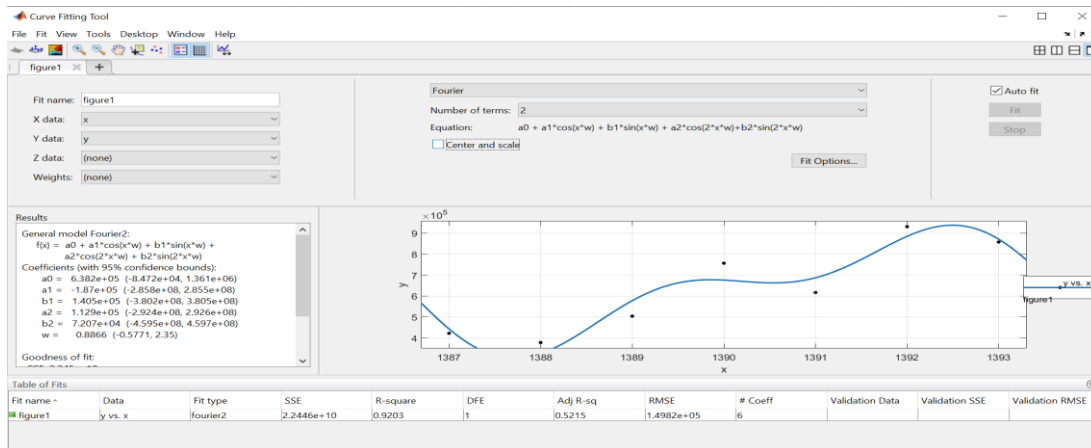


Figure 5. Fitting the curve to the total Khums and Zakat

Therefore, the above equation with its coefficients is presented to the Iranian economy according to the unique characteristics of reproducibility and accuracy of the Fourier Series to predict total Khums and Zakat.

## CONCLUSION

This article provides an accurate forecast formula for Total Khums, Total Zakat, Income Khums, Zakat without cattle and Total of Khums and Zakat, and fits the accuracy of the calculations and confirms their goodness with very high accuracy. The research determines the goodness of fitting Khums and Zakat data and the accuracy of estimates performed by Khums and Zakat from 2008 to 2014. By using the accuracy and repeatability feature of the Fourier Series in MATLAB engineering software, We extract the calculation formula for predicting types of Khums

and Zakat, especially total Khums and Zakat, for the first time in the field of Islamic economics in Iran that provides economists to build an Islamic economy based on Khums and Zakat concerning consider the equality of total Khums and Zakat numbers to the taxes collected in the study years.

By having the formula for predicting Khums and Zakat, it is possible to get the number of Khums and Zakat in the financial years easily, accurately and quickly, then implement the targeting and necessary action to achieve and receive these forecasts, and enforce budget and plan to make economic development and the fights against poverty.

It is hoped that the technique presented in this study will be a new design and idea for researchers who need econometrics and economic forecasting.

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<sup>1</sup> - The Persian dictionary

<sup>2</sup> - School of Shiite Twelve Imams

<sup>3</sup> - To the family of the Prophet

<sup>4</sup> - *وَاعْلَمُوا أَنَّمَا غَنِمْتُمْ مِنْ شَيْءٍ فَإِنَّ لِلَّهِ خُمُسَهُ وَلِلرَّسُولِ وَلِذِي الْقُرْبَىٰ وَالْيَتَامَىٰ وَالْمَسَاكِينِ وَابْنِ السَّبِيلِ إِنْ كُنْتُمْ آمَنْتُمْ بِاللَّهِ وَمَا أُنزِلْنَا*  
*عَلَىٰ عَبْدِنَا يَوْمَ الْفُرْقَانِ يَوْمَ التَّقَىٰ الْجَمْعَانَ وَاللَّهُ عَلَىٰ كُلِّ شَيْءٍ قَدِيرٌ*

<sup>5</sup> - noble narrations of Prophet Muhammad and Imams

<sup>6</sup> - Non-Muslim People of the Book (Jews, Christians, Zoroastrians, and Sabeans) say they have made a covenant with Muslims to be safe in an Islamic country under the protection of the Islamic State.

<sup>7</sup> - The necessary information for the following years was not available by the Iranian Central Bank and the Iranian Statistics Organization.

<sup>8</sup> - Its statistics do not exist in government accounts.

<sup>9</sup> - Its statistics are in the cost of consumption.