

## FISHER HYPOTHESIS–THE ALBANIA CASE

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### Abstract

The Fisher's hypothesis is regarded as one of the most important hypothesis in macroeconomics. Fisher (1930) argued that the nominal interest rate consists of an expected 'real' rate plus an expected inflation rate and there exist a one-to-one positive relationship between inflation and nominal interest rates in the long run.

The objective of this paper is to investigate the relationship between the interest rate and inflation in the long run in the Albanian context. Understanding the relationship between the interest rate and other variables like inflation is important to the study of the financial markets and for the policy making of every country, especially for a developing country as Albania, where no published study to my knowledge exists that has examined this relationship for this country.

This paper raises and tries to give answer to two basic questions. First, is the Fisher hypothesis, which postulates a positive relationship between inflation and interest rate valid in the Albanian case? Secondly, if it is, does it hold in its weak or strong form?

In order to see if the hypothesis holds for the Albanian case, as in many other countries or not and what is the extent of this relationship, it is used the regression model.

**Keywords:** Albania, Fisher Hypothesis, Inflation, Interest Rate.

### INTRODUCTION

The interest rate and inflation are important variables in the macroeconomic subjects, so there are many papers that examined the relationship between these variable especially in the recent decade. It should be note that the Fisher effect states that nominal interest rate move one for one with expected inflation, leaving the real rate of interest unaffected. This simple hypothesis has enjoyed widespread empirical research and remains one of the most important of monetary economics.

However, there has been little empirical research conducted to verify Fisher's hypothesis for the developing countries and especially for Albania where no research has been conducted to investigate this hypothesis. Thus this is the objective of this paper ,to see if this holds in the

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Albanian case. Below will be given a brief view of the studies done for this topic in different countries and then it will be tested if the relationship between inflation and interest rate holds for the Economy of Albania by using regression analysis.

## LITERATURE REVIEW

There are a number of reasons, according to Hawtrey (1997, p.337), to the question why the Fisher hypothesis has maintained such a key position in economic literature.

Firstly, the real rate of interest plays a vital role in any economy's economic growth, savings and investments, while also it affects trade and capital flows through its influence on the exchange rate. Secondly, there is a large amount of evidence, as proposed by Fama (1975), to suggest that nominal interest rates can be used to determine future inflation expectations. Thirdly, the Fisher hypothesis is an important factor of consideration for central banks. Should a long-run Fisherian link be established between interest rates and expected inflation, this would suggest that the real interest rate is not affected by monetary policy, but instead determined by real economic factors alone (Payne and Ewing 1997:683)

Fisher in his book *Theory of Interest* (1930) employed a distributed lag structure by using annual consumer price index (CPI) data between the years 1890 and 1927 in the US market and 1820 and 1924 in the UK market. He reached the following conclusion: (1930, p 451)

``When the effects of price changes upon interest rates are distributed over several years, we have found remarkably high coefficients of correlation, thus indicating that interest rates follow price changes closely in degree, though distantly in time``.

Fisher's study provides strong evidence about the one-to-one positive relationship between nominal interest rates and expected inflation which leaves the real interest rates constant over time. And this conclusion is known as the Fisher hypothesis/effect.

The Fisher equation can be understood in two very different ways. It can either represent an ex ante relationship, referring to expected inflation, or it can represent an ex post relationship, referring to actual inflation which is dependent on the available information on inflation rate

The ex ante Fisher equation, which means that people adjust the cost of borrowing, or nominal rate to the expected inflation  $\pi^e$

While in the ex post Fisher equation, which decomposes the nominal interest rate,  $i$  into real interest rate,  $r$  and actual inflation rate,  $\pi$ .

Shown mathematically the formulas would be:

$$i \approx r^a + \pi^e \leftrightarrow r^a \approx i - \pi^e \text{ (ex ante)}$$

and

$$i \approx r + \pi \leftrightarrow r \approx i - \pi \text{ (ex post)}$$

Where:

$i$  is the nominal interest rate.

$r$  is the real interest rate.

$r^a$  is the actual interest rate.

$\pi^e$  is the expected inflation.

The general Fisher Equation is:

$$i = r + \pi + (r \pi) \text{ but } r \pi \text{ is neglecting in most cases as it is small and so } i \approx r + \pi \leftrightarrow r \approx i - \pi$$

On this study when discussing about the Fisher effect for the Albanian case it is understood the ext post Fisher effect as there is no information about the expectations

Since Fisher's work, there has been a significant amount of empirical research done in different countries and methods to confirm the hypothesis, .So below will be review the empirical literature with studies done in developed countries and developing countries.

Most of the empirical studies for the fisher effect are done in the developed countries and mostly in USA.

Fama (1975:269) concludes that, during the period 1953-1971, nominal interest rates correctly incorporated "all information about future inflation rates, that is, in time series of past inflation rates". He also finds evidence to support the hypothesis that the expected real returns on one- to six- months' bills are constant for the period under study.

Levi and Makin (1979:36) argue that the level of anticipated inflation is a function of various factors including changes in employment, output and the amount of uncertainty about future inflation movements.

Mishkin (1992) explains why there is a high correlation between the level of interest rates and inflation in certain periods and not in others. BY Using monthly

data from 1953 to 1990, he finds no support for a short-run Fisher effect, but did find evidence in support of a long-run Fisher effect. The study makes a distinction between a short-run Fisher effect, where a change in expected inflation is associated with an immediate change in short term interest rate, and a long-run Fisher effect, where inflation and interest rates trend together in the long-run. According to his study the Fisher relationship would only hold in periods when inflation and interest rates display stochastic trends.

Empirical studies for developing countries is sparse. Payne and Ewing (1997) evaluated the Fisher effect for nine developing countries. Unit root tests revealed that interest rates and inflation were integrated of order one for all countries. Using the Johansen and Juselius cointegration approach it indicated the presence of a long-run relationship between nominal interest rates and inflation for Sri Lanka, Malaysia, Singapore and Pakistan. A unit proportional relationship was found for Malaysia, Sri Lanka and Pakistan, while there was no evidence of a Fisher effect for Argentina, Fiji, India, Niger and Thailand

## ALBANIAN APPLICATION

In this section it will be studied whether the Fisher hypothesis holds true in the Albanian economy. The period used in this application will be post 1990, when Albania passed from a communist regime, a centralized and controlled economy to a free market economy, such that the hypothesis will be tested with data that hold the theories of a free market economies.

The range of data used is 18 years, from 1995 to 2012, as the data are more reliable in these years and do not cover the first transition phase from the centralized to the free market economy.

But also in the late 1996 and in the year 1997 are some abnormal data for both inflation and interest rate due to some political and social disorders (civil war and pyramid schemes) that happened in that time in Albania. Such in 1996 and 1997 it is seen an abnormal increase in inflation and also in the lending rate and those years reflect in a decrease in overall in the strength of relationship between inflation and lending rate in Albania. But as the disorders finished after 1997 the economic activity took a normal path and the data generally supports the Fisher hypothesis like in most other countries.

For the inflation it is used the real inflation, as there are no data available or missing information about the expected inflation in Albania during the period that is used for the study. So consequently it is understood that it is studied the ex-post Fisher equation for Albania. While for the interest rate it is used the lending interest rate of banks for short and middle term loans in Albania.

In the Table 1 it is presented the database that is used for the regression analyses, the results and interpretation of which will be discussed later.

**Table 1: Regression database**

Year	CPI Yearly % changes (Base year 2007)	Lending interest rate	Estimated real interest rate
1995	7.98	19.65	11.67

<b>1996</b>	12.76	23.96	11.20
<b>1997</b>	32.93	33.74	0.81
<b>1998</b>	21.63	27.32	5.69
<b>1999</b>	0.40	21.62	21.22
<b>2000</b>	0.06	22.10	22.04
<b>2001</b>	3.12	19.65	16.53
<b>2002</b>	5.22	15.30	10.08
<b>2003</b>	2.36	14.27	11.91
<b>2004</b>	2.88	11.76	8.88
<b>2005</b>	2.37	13.08	10.71
<b>2006</b>	2.37	12.94	10.57
<b>2007</b>	2.94	14.10	11.16
<b>2008</b>	3.36	13.02	9.66
<b>2009</b>	2.24	12.66	10.42
<b>2010</b>	3.58	12.82	9.24
<b>2011</b>	3.43	12.43	9.00
<b>2012</b>	2.03	10.88	8.85

Source: [www.instat.gov.al](http://www.instat.gov.al)

[www.worldbank.org](http://www.worldbank.org)

INSTAT (Albanian Statistical Institute) publications, the annual change of Consumer Price Index (CPI) with 2007 as the base year.

WORLDBANK Database, Lending interest rate (%)

By the data taken from INSTAT (Albanian Statistical Institute) for the annual change of Consumer Price Index (CPI) % with 2007 as the base year and the lending interest rate (%) taken from the WorldBank database, it is calculated by the author the estimated real inflation rate ( $r = I - \pi$ ) or the ex post real interest rate, as it was mentioned before that it is tested if the ex post Fisher equation holds for the Albanian case.

In the Figure 1 and also at the Table 1 can be seen that generally an increase in inflation rate is followed by an increase in the consumer price index rate and vice versa which confirms the ex post Fisher theory which states an increase in inflation leads to a proportional increase in the nominal interest rate. But in order to see the extent of this relationship it is conducted the regression analysis using excel program.

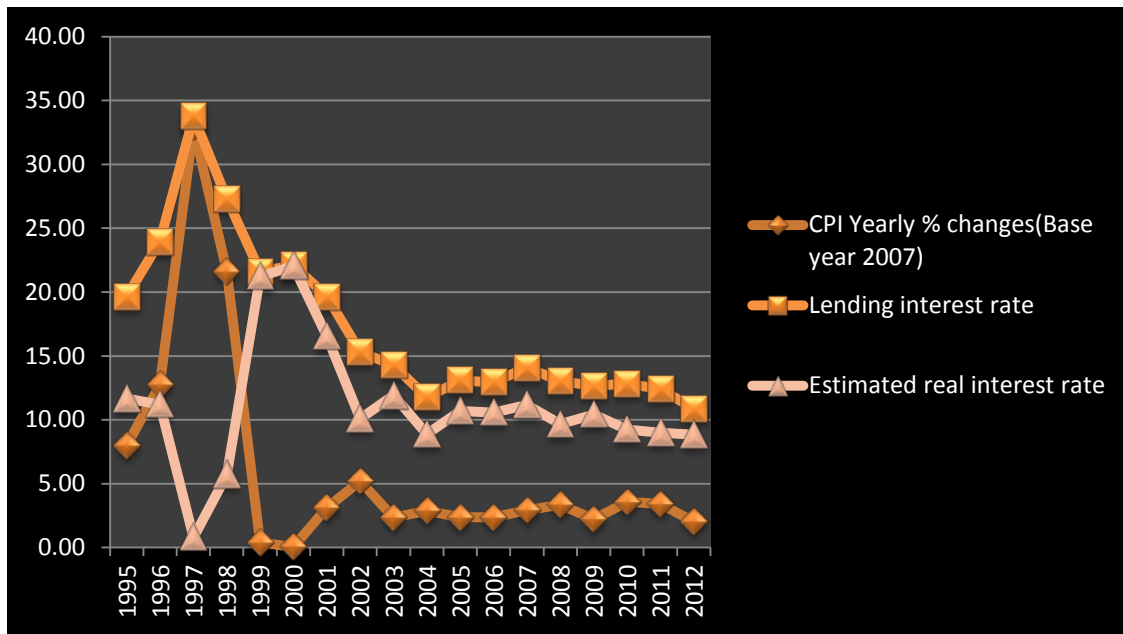


Figure 1: The line graph of inflation and interest rate

Source: Generated from INSTAT and WORLDBANK by author

In order to analyze if the ex post Fisher equation holds for the Albanian economy it is used the regression model for the inflation and interest rate from 1995 to 2012.

The regression model of this study is

$$Y = \alpha + \beta X + e$$

Where

$\alpha$  - is a constant

Y - is the dependent variable which is being explained-the lending interest rate

$\beta$  - is the slope that shows how much Y changes for 1 unit change in X

X - is the independent variable –the yearly CPI change

e - is the error term which shows the error in predicting the value of Y by the given value of X.

According to the theory of Fisher there exists an almost equal change in interest rates whenever the expected inflation rate changes (a one to one relationship).

At Figure 2 is shown a scatter plot graph in order to see visually the relationship between interest rate and inflation in Albania during the period 1995-2012.

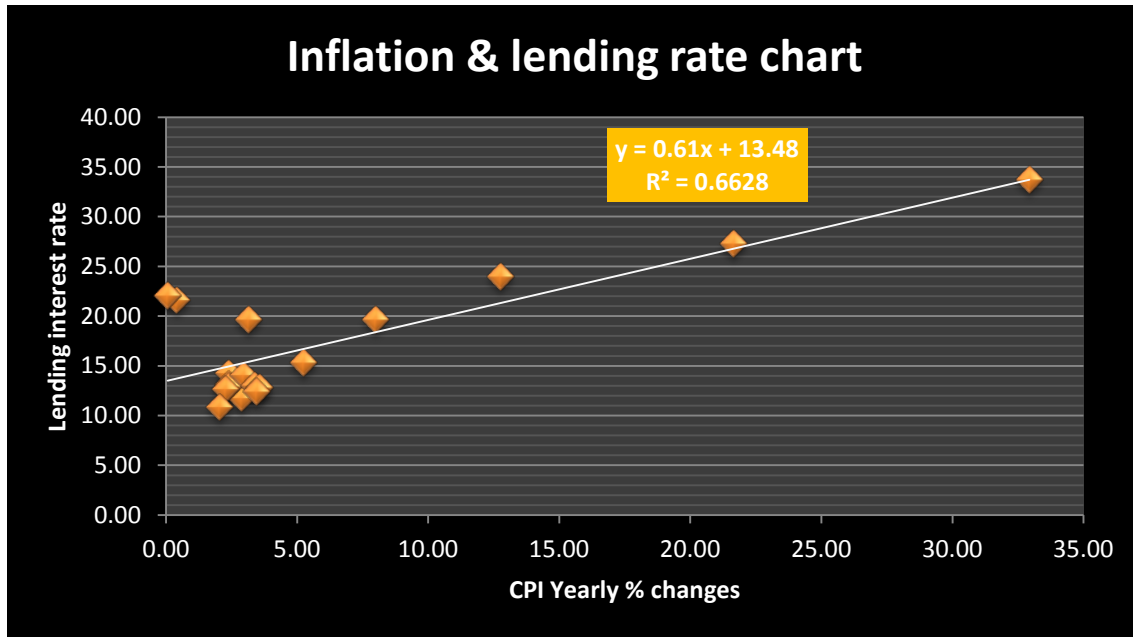


Figure 2: The graph of inflation and interest rate relationship

Source: Generated from INSTAT and WORLDBANK by author

The regression equation derived in the Albanian case is :

$$i = 13.4863 + 0.61395 \pi$$

Where  $i$  is the interest rate that is tried to be explained by  $\pi$  that represents the inflation rate.

The intercept represents the value of interest if there is no inflation or deflation or inflation is 0, thus according to the equation if in Albania there would be no inflation or deflation the interest rate would be almost 13 percent. While the slope is 0.61 which shows the extent that the inflation rate explains the interest rate which can be explained by the abnormal values of the years 1996 -1997 caused by the political and social disorders happened at those years. It means that 1 unit increase in inflation is followed by 0.61 increase in interest rate.

The results of the relationship between the CPI change and lending interest rate from 1995 to 2012 in the Albanian case are shown in the ANOVA table, Table 2, which is derived by the regression analysis using excel.

**Table 2:Regression analyses Results****SUMMARY  
OUTPUT**

<i>Regression Statistics</i>	
Multiple R	0.81416
R Square	0.66286
Adjusted R Square	0.64179
Standard Error	3.79498
Observations	18

<b>ANOVA</b>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	453.06208	453.0621	31.45854	3.92E-05
Residual	16	230.43008	14.40188		
Total	17	683.49215			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	13.4863	1.123024	12.0089	2.04E-09	11.10557	15.86698	11.10557	15.86698
CPI Yearly changes	0.61395	0.1094617	5.608791	3.92E-05	0.381899	0.845996	0.381899	0.845996

Source :INSTAT [www.instat.gov.al](http://www.instat.gov.al) and WOLDBANK [www.worldbank.org](http://www.worldbank.org)  
(Regression analysis for the Albanian data between CPI and lending interest rate in years 1995-2012).

The coefficient of determination ,R Square shows how much the dependent variable can be explained by the independent variable.In this case R Square is 0.66286 >0.5 which means that the lending interest rate explains only 66% the inflation rate in Albania during the period 1995-2012.For every one unit increase in inflation rate the interest rate would increase by 0.66 unit.Although the inflation and interest move in the same direction ,the increase in interest rate would be smaller compared to the increase in the inflation rate,not a one to one relationship as stated by Irving Fisher.



The t-stat is needed in order to see the statistical significance of the this model. T-stat is 12.0089 > 5 that means that the coefficient is significant and the independent variable ,inflation is statistically significant to explain the dependent variable ,interest rate.

The F-statistics is an important indicator generated by Anova table in order to test if

$H_1 = 0$  - null hypothesis that all regression coefficients are equal to zero

$H_2 \neq 0$  - alternative hypothesis that regression coefficients are not equal to zero

The F statistics is used to test the hypothesis that the variation in the independent variable (the inflation rate) explains a significant proportion of the variation in the dependent variable (the interest rate).

So differently expressed the null hypothesis states that there is no relationship between the independent and dependent variable and the alternative hypothesis states that there is a statistically significant relationship between them.

The null hypothesis is accepted if  $F_{table} > F_{statistics}$ . In this model the confidence level is 95% so  $\alpha=0.05$ . The range of data is from 1995 -2012 so there are 18 observations, also shown in the table, so  $n=18$ . The F distribution is defined in terms of two degree of freedom(df). So for the numerator the df is  $k-1$  and for denominator is  $n-k$ , concretely for this case  $k-1= 2-1 =1$  and  $n-k=18-2=16$ . So when finding the F-table value it is seen F Table for  $\alpha=.05$ .  $F_{(.05, 1, 16)}$ . The critical value of F from the table is 4.4940.

While F value from our model is 31.45 ,as shown in the Anova table ,which is greater than F-table value. So the null hypothesis is reject ted as  $F_{table} < F_{statistics}$  ,  $4.4940 < 31.45$ . The alternative hypothesis is accepted at a 5 % level of significance that not all the coefficients are equal to zero and that there exist a statistically significant relationship between the lending interest rate and CPI rate in Albania.

## CONCLUSION

In many studies that are made in different countries generally The fisher effect is proved to be true but in some countries controversies exists. Albanian case also supports the Fisher effect theory. In this paper has been studied the relationship of inflation and interest for a eighteen year period (199-2012) .Results of the regression analysis show that although the inflation and interest move in the same direction ,the increase in interest rate would be smaller compared to the increase in the inflation rate,not a one to one relationship as stated by Irving Fisher. The lending interest rate explains only 66% the inflation rate in Albanian economy during the studied range.

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