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Investigating Okun Misery Index for Democratic States with Application in Albania

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"The Okun misery indexy accurately measures misery"
Steve H. Hanke

"The higher Okun misery index, the greater the economic and social discomfort. We are less pained by inflation if the job market is jumping and less sensitive to others' unemployment,if a placid price level is widely enjoyed".
Richard F. Janssen

Abstract

Okun misery index is a fundamental poverty assessment parameter. The objective of the present study is to develop a statistical analysis for Okun misery index in each democratic state during a specified period. The countries with the lowest misery index are: Switzerland 3.50, Japan 4.80, Norway 4.90, Mexico 8.37 and Australia 8.80. The countries with the highest misery index are: Greece 29.23, South Africa 28.90, Spain 24, etc.

This method applied in Republic of Albania over the period January 2005 –December 2014. The results of the present study include:

- The Central Limit Theorem is not valid for quarterly inflation rate in Albania during the specified period at 99.9% confidence level.
- The Central Limit Theorem is not valid for quarterly unemployment rate in Albania during the specified period at 99.9% confidence level.
- The Central Limit Theorem is not valid for quarterly Okun misery index in Albania during the specified period at 86.4% confidence level.
- The inflation process in Albania during the specified period is an unfair game at 98.8% confidence level.
- The unemployment process in Albania during the specified period is an unfair game at 99.9% confidence level.
- The miserably process in Albania during the specified period (related to the quarterly Okun misery index) is an unfair game at 98.3% confidence level.

Keywords: inflation rate, unemployment rate, Okun misery index, Central Limit Theorem, fair game.

1. Introduction

The scientific literature on macroeconomics policy has been using the concept of "social performance function over inflation and uneployment," especially in mathematical models of benevolent governments that want to maximise the utility function of the representative consumer. The welfare function over inflation and unemployment rate, known as "**loss function**" has become a standard tool in macroeconomic thinking, see Romer (2001), Mankiw (2010). The particular specifications for the loss function differ in terms of the relative weights attached to the two components, see Welsch (2007). From this point of view, the Okun misery index is a special case of the loss function.

The misery index is an economic and social indicator, initiated by late economist Arthur Melvin Okun, the Chairman of the Council of Economic Advisers under US President Lyndon B. Johnson in the 1960s. The misery index denotes the sum of a country's inflation and unemployment rates. It only captured the severity of the two vexing issues of the time, inflation and unemployment. The misery index is an important indicator of economic success or failure; the higher the total score, the worse the misery. The Okun misery index is often incorrectly attributed to Harvard University economist Professor Robert J. Barro in the 1970s. The Barro misery index additionally includes real Gross Domestic Product (GDP) and bank interest rates.

There is no doubt that the inflation and unemployment rates should be two important criteria in judging the success or failure of any economic policy. However, a full evaluation of economic performance must also include the measure of distributive justice. That is to say – how equitably are overall gains distributed amogst all society's members? If a strong economy does not improve the economic conditions of most people (especially the poorest households), or if economic gains are not fairly distributed, then any claims of overall prosperity or of a kinder society ring hollow. Arthur M. Okun strongly believed, as do we, that the political process in democracy must asign reasonable specific weights to equality, and that the misery index is a measure of miserably, see Hanke (2009).

The countries with the lowest misery index are: Switzerland 3.50, Japan 4.80, Norway 4.90, Mexico 8.37 and Australia 8.80. The countries with the higest misery index are: Grecee 29.23, South Africa 28.90, Spain 23.99, India 18.39 and Argentina 17.20. The USA has a rating of 13.10 and the UK 13.30. Back in June 1980, during Jimmy Carter's presidency, the USA reached an all time hing misery index rate of 21.98.

The impact of the misery index in business is significant. The misery index affects confidence. As it increases, consumers, businesses and investors become less confident about the future. They delay spending decisions and increasing savings. Different parts of the economy are afected in different ways by increases in the Okun misery index. As the unemployment rate increases, people who are unemployed find it more difficult to get a job and those in employment fear that they might lose their jobs. As the inflation rate increases, consumer incomes will buy fewer goods and services unless their incomes rise in proportion or faster than inflation. The misery index creates a feeling of helplessness. Consumers want and need more income to keep up with inflation, but unemployment keeps the wage pressures suppressed. In addition to this, there are fewer opportunities to suplement income with overtime or secondary part-time jobs. Individuals who can afford to safe are likely to buld up a 'worst case reserve,' but while this makes sense for the individual, it further weakens confidence in the economy as the reduced consumption causes businesses to cut back further on employment, see Simister (2011).

In this study we investigate the quarterly Okun misery index in Albania during the period January 2005 – December 2014. The data sources are Institute of Statistics (INSTAT) and the Bank of Albania (BoA).

Most frequently, the term "inflation" refers to a rise in the Consumer Price Index (CPI), which measures prices of a representative fixed basket of goods and services purchased by a typical consumer, see Mankiw (2010). The formula for

$$Inflation\ \ rate = \frac{P_0 - P_{-1}}{P_{-1}} 100\%$$

calculating the quarterly inflation rate is , where P_0 denotes the current average price level, and P_{-1} denotes the average price level a quarter ago. Today, most economists favor a low and stable rate of inflation, because low inflation may educe the severity of economic recession and the risk of destabilizing the economy, see Sargent, Williams and Zha (2006), Taylor (2011), and Giannellis (2011).

Unemployment, as defined by the International Labor Organization (Nov 26, 2007), is the state in which the people are without jobs, they have actively looked for work within the past four weeks, and ready to start work within two weeks. The unemployment rate is the percentage of total labor force unemployed: $unemployment\ \ rate = \frac{unemployed\ \ workers}{total\ \ labour\ \ force}$. Unemployment is the macroeconomic problem that disturbs the lives of many families. For most people, the loss of a job means a reduced living standard and psychological distress.

The Central Limit Theorem (CLT) explains why many probability distributions tend to be very close to the normal distribution. The amazing and counterintuitive thing about CLT is that no matter what the probability distribution of the percent population X, the probability distribution of the sample mean approaches a normal curve. A contemporary version of the CLT is given by Kolmogorov (2002).

The Central Limit Theorem

If all random samples ($x_1, x_2 ..., x_n$)of a reasonably large size n>30 are selected from any random variable X with finite expectation μand variance σ^2, then the probability distribution of the sample mean $\bar{x}$ is approximately normal with expectation μ and variance $\frac{\sigma^2}{n}$. This approximation improves with larger samples, as $n \to \infty$. The speed of the convergence to normal distribution is on the orded $n^{-0.5}$. The convergence is uniform for all x□(-∞; +∞) and monotonic in Shannon's entropy sense,see Kolmogorov (2002).

The Kolmogorov-Smirnov-Lilliefors test is a supreme distance statistical test designed only for normal distribution; see Field (2013), Hogg (2009). The Shapiro-Wilk test for normality (W test) compares a set of sample data $(x_1, x_2, ..., x_n)$ against the normal distribution. The W test is of regression type and assesses how well the observed cumulative frequency distribution curve fits the expected normal cumulative curve. The W test for normality is sensitive to both skewness and kurtosis. In general, W test is more accurate that Kolmogorov-Smirnov-Lilliefors test, Cramer-Von Mises test, Durbin test, Chisquared test, and b_1 test.

The rest of this paper is organised as follows: Section 2 presents the investigation of quarterly inflation rate dynamics; Section 3 presents the investigation of quarterly unemployment rate dynamics; Section 4 provides the statistical analysis of the quarterly misery index; and Section 5 presents the conclusion.

2. The Dynamics of Quarterly Inflation Rates

The data set is the quarterly inflation rate over the period January 2005- December 2014 in Albania, see Table 1. We calculate the statistical parameters for the data:

Sample size	n = 40
Sample mean	1.285
95% confidence interval for mean	.852 ; 1.718
Median	1.800
Variance	1.829
Standard deviation	1.3524
Coefficient of variation	1.052
Maximum	3.3
Minimum	-1.4
Range	4.7
Interquartile range	2.4
Skewness	-.742
Kurtosis	-.848

In this study, using Klomogorov - Smirnov- Lilliefors test as well as Shapiro-Wilk test for normality, we test the following hypothesis:

H_0: The quarterly inflation rates for Albanian over the period January 2005 –December2014 follow a normal distribution.

H_1: The quarterly inflation rates for Albania over this specified period follow a non-normal distribution.

Using SPSS (version 2013) we find the computed value of Kolmogorov-Smirnov-Lilliefors test=.213 and the corresponding significance level .000. Now we apply the Shapiro-Wilk test for normality. The computed value of the statistics is W = .870 and the associated significance is .000.

Decision Rule: Reject the null hypothesis H_0 at the confidence level .999 or 99.9%. In other words, the Central Limit Theorem is not valid for quarterly inflation rates over the specified period in Albania, at the confidence level 99.9%.

Definition 1:(according to J.L.Stein and N.N.Vorobiev, 1974) The inflation process is said to be a **fair game** if the successive differences of inflation rate follow a normal distribution.

This important definition has found several applications in economic sciences, see Stein (1974), Lucas (2000), Sargent, Williams and Zha (2006), Stock and Watson (2007).

The successive differences of quarterly inflation rate, over the period January 2005 – December 2014, in Albania are given in Table 1. We present the statistical parameters related to this data set.

Sample size	n = 40
Sample mean	-.050
95% confidence interval for mean	-.575 , .475
Median	.050
Variance	2.690
Standard deviation	1.6402
Coefficient of variation	-32.8
Maximum	3.3
Minimum	-4.3
Range	7.6
Interquartile range	1.1
Skewness	-.467
Kurtosis	1.17

We test the hypothesis:

H_0: The successive difference of the quarterly inflation rate for Albania, over the period January 2005 – December 2014, follow a normal distribution.

H_1: The successive difference of the quarterly inflation rate for Albania over this period follow a non-normal distribution.

We apply the Kolmogorov-Smirnov-Lilliefors test as well as the Shapiro-Wilk test for normality. The computed value of the KSL test is = .171, and the computed value of SW test is W = .929.

Decision Rule: Reject the null hypothesis H_0 at the confidence level 98.8%. In other words, at the confidence level 98.8%, the inflation process in Albania, over the period January 2005 – December 2014, related to the quarterly inflation rates, is an unfair game.

Remark . Since the inflation remains a central policy concern, there is a multiplicity of theoretical explanations for "unfair game inflation process in Albania". Therefore, all sources of possible evidence need carefully explored. Those who lose the most from the "unfair game process" are the poorest Albanian households, pensioners, and families who live below poverty level.

3. The Dynamics of the Quarterly Unemployment Rate

The data set is quarterly unemployment rates in Albania, over the period January 2005 – December 2014, see Table 1. We compute the statistical parameters for the data:

Sample size	n=40
Sample mean	14.20
95% confidence interval for mean	13.677 , 14.728
Median	13.80
Variance	2.70
Standard deviation	1.6431
Coefficient of variation	.1157
Maximum	18.60
Minimum	12.50
Range	6.10
Interquartile range	.97
Skewness	1.472
Kurtosis	1.113

Using Kolmogorov-Smirnov-Lilliefors test as well as Shapiro-Wilk test for normality, we test the following hypothesis:

H_0: The quarterly unemployment rate over the period January 2005 – December 2014 follows a normal distribution.

H_1: The quarterly unemployment rate over this specified period follows a non-normal distribution.

Using SPSS (version 2013) we find the computed value of KSL statistics .301 and the associated significance is .000. The computed value of SW test is W = .776 and the corresponding significance is .000.

Decision Rule: Reject the null hypothesis H_0 at the confidence level .999=99.9%. The Central Limit Theorem is not valid for quarterly unemployment rates, over the specified period January 2000 – December 2014, in Albania, at the confidence level 99.9%.

The successive differences of quarterly unemployment rate during January 2005 – December 2014 are given in Table 1. We present the statistical parameters related to the data set:

Sample size	n=40
Sample mean	.1256
95% confidence interval for mean	-0.509, .3022
Median	.000
Variance	.297
Standard deviation	.5447
Coefficient of variation	4.3368
Maximum	1.6
Minimum	-.9
Range	2.5
Interquartile range	.4
Skewness	1.410
Kurtosis	2.077

Test the hypothesis:

H_0: The successive differences of quarterly unemployment rate for Albania over the period January 2005 – December 2014 follow a normal distribution.

H_1: The successive differences of quarterly unemployment rate for Albania over this period follow a non-normal distribution.

We apply the Kolmogorov-Smirnov-Lilliefors test as the Shapiro-Wilk test for normality. Using SPSS (2013), we find for both statistical tests the significance .000. The computed value of SW test is W = .839

Decision Rule: Reject the null hypothesis H_0 at the confidence level 99.9%. In other words, at the confidence level 99.9%, the unemployment process, over the period January 2005 – December 2014, in Albania, related to the quarterly unemployment rates, is an unfair game.

4. The Dynamics of the Quarterly Okun Misery Index

The data set is quarterly Okun misery index in Albania during January 2005 – December 2014, see Table 1. We compute the statistical parameters for the data.

Sample size	n= 40
Sample mean	15.488
95% confidence interval for mean	14.717 , 16.258
Median	15.950
Variance	5.807
Standard deviation	2.4098
Coefficient of variation	.1556
Maximum	20.5
Minimum	11.2
Range	9.3
Interquartile range	3.7
Skewness	.045
Kurtosis	-.731

Using Kolmogorov-Smirnov-Lilliefors test as well as Shapiro-Wilk test for normality, we test the following hypothesis:

H_0: The quarterly misery index in Albania over the period January 2005 – December 2014 follows a normal distribution.

H_1: The quarterly misery index over this specified period follows a non-normal distribution.

Using SPSS (2013), we find the computed value of W statistics = .957 and the corresponding significance is .136. The computed value of KSL test is .118 and the corresponding significance level is .17.

Decision Rule: Reject the null hypothesis H_0 at the confidence level 86.4%. In other words, the CLT is not valid for quarterly misery index in Albania over the period January 2005 – December 2014, at the confidence level 86.4%.

The successive difference of the quarterly misery index, are given in Table 1. Please find below the statistical parameters related to this data set.

Sample size	n= 39
Sample mean	.074
95% confidence interval for mean	-.545, .694
Median	.1
Variance	3.649
Standard deviation	1.91
Coefficient of variation	25.81
Maximum	4.9
Minimum	-4.7
Range	9.6
Interquartile range	1.5
Skewness	-.207
Kurtosis	1.234

Using KSL test as well as SW test for normality we test the hypothesis:

H_0: The successive differences of the quarterly misery index in Albania over the specified period follow a normal distribution.

H_1: The successive differences of the quarterly misery index follow a non-normal distribution.

We apply the KSL test as well as the SW test for normality Using SPPS (2013) we find the computed value of KSL test= .157 and associated significance level= .017.The computed value of W statistics is .953, which corresponds to a significance level of .101.

Decision Rule: Reject the null hypothesis H_0 at the confidence level 97.6 %. In other words, the miserably process in Albania during the period January 2005 – December 2014 is an unfair game at the confidence level 98.3%.

5. Conclusion

The original Okun misery index is equal to the sum of inflation rate and unemployment rate in a given country during a specified period. The Okun misery index is a random process, in sense of Modern Probability Theory.

Okun misery index is not a perfect measure of poverty, but its dynamics reflect changes in society's economic performance. This index can be used as an approximation for unhappiness of individuals in a country during a specified period, in sense of economic and social welfare.

It seems reasonable and valuable to monitor Okun misery index dynamics over time in a given country (example: Albania), in order to evaluate that economy of the country is developing in the right direction.

The method developed in the present study for investigating of Okun misery index can be applied to any country where suitable official data exists.

We apply this method in Albania during the period January 2005 – December 2014. The sources of official data are Institute of Statistics of Albania and Bank of Albania.

This study investigates three types of macroeconomic models in Albania, over the period January 2005 – December 2014:

(1) Monetary models focused on quarterly inflation rate dynamics;

(2) Labour models focsed on quarterly unemployment rate dynamics;

(3) Miserably models using Okun misery index dynamics.

The Central Limit Theorem is not valid for the quarterly inflation rates at the specified time in Albania at the conficence level of 99.9%. The inflation process, related to the quarterly inflation rates, over the same period is an unfair game at the confidence level of 98.8%. Furthermore, the Central Limit Theorem is not valid for the quarterly unemployment rate, over the specified period, at the confidence level 99.9%. In addition to this, the unemployment process, related to the quarterly unemployment rates, is an unfair game at the 99.9% confidence level.

The Central Limit Theorem is not valid for the quarterly Okun misery index in Albania, over the perid of January 2005 – December 2014 at the confidence level 86.4%. The miserably process related to the quarterly misery index is an unfair game at the confidence level of 98.3%. An important question posed by this analysis is: How can the Albanian Government reduce the Okun misery index?

I. By fighting unfair game inflation process, as well as excessive speculation.
II. By fighting unfair game unemployment process.
III. By applying labor strategies that reduce unemployment rate and create a fair game employment process.

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Table 1. Quarterly inflation rate, unemployment rate, Okunmiseryindex and their successive differences .

Year	Quarter	Inflation Rates(%)	Succ. Diff. Infl. Rates(%)	Unemploy. Rates(%)	Succ. Diff. Une. Rates(%)	OkunMisery Index	Succ.Diff. Okun Miss. Index
2005	Q1	3.3		13.1		16.4	
	Q2	-1	-4.3	12.7	-0.4	11.7	-4.7
	Q3	-1.4	-0.4	12.6	-0.1	11.2	-0.5
	Q4	1.9	3.3	14.2	1.6	16.1	4.9
2006	Q1	2	0.1	14	-0.2	16	-0.1
	Q2	0.2	-1.8	13.9	-0.1	14.1	-1.9
	Q3	-1.2	-1.4	13.8	-0.1	12.6	-1.5
	Q4	1.8	3	13.7	-0.1	15.5	2.9
2007	Q1	2.2	0.4	13.7	0	15.9	0.4
	Q2	-0.8	-3	13.5	-0.2	12.7	-3.2
	Q3	0.4	1.2	13.2	-0.3	13.6	0.9
	Q4	1.7	1.3	13.4	0.2	15.1	1.5
2008	Q1	2.4	0.7	13.1	-0.3	15.5	0.4
	Q2	-0.3	-2.7	12.7	-0.4	12.4	-3.1
	Q3	-0.8	-0.5	12.6	-0.1	11.8	-0.6
	Q4	1.2	2	12.5	-0.1	13.7	1.9
2009	Q1	1.8	0.6	12.7	0.2	14.5	0.8
	Q2	-0.1	-1.9	12.7	0	12.6	-1.9
	Q3	-0.7	-0.6	12.8	0.1	12.1	-0.5
	Q4	2.2	2.9	13.7	0.9	15.9	3.8
2010	Q1	3	0.8	13.9	0.2	16.9	1
	Q2	-1	-4	13.8	-0.1	12.8	-4.1
	Q3	-0.6	0.4	13.5	-0.3	12.9	0.1
	Q4	1.8	2.4	13.5	0	15.3	2.4
2011	Q1	2	0.2	14	0.5	16	0.7
	Q2	2.5	0.5	13.8	-0.2	16.3	0.3
	Q3	2.3	-0.2	13.9	0.1	16.2	-0.1
	Q4	2.4	0.1	13.9	0	16.3	0.1
2012	Q1	2.4	0	14	0.1	16.4	0.1
	Q2	2.4	0	13.8	-0.2	16.2	-0.2
	Q3	2.7	0.3	14.1	0.3	16.8	0.6
	Q4	2.4	-0.3	14.1	0	16.5	-0.3
2013	Q1	2.5	0.1	14.8	0.7	17.3	0.8
	Q2	2.2	-0.3	16.4	1.6	18.6	1.3
	Q3	1.5	-0.7	17.2	0.8	18.7	0.1
	Q4	1.5	0	17.1	-0.1	18.6	-0.1
2014	Q1	1.9	0.4	18.6	1.5	20.5	1.9
	Q2	1.6	-0.3	17.7	-0.9	19.3	-1.2
	Q3	1.8	0.2	17.4	-0.3	19.2	-0.1
	Q4	1.3	-0.5	18	0.6	19.3	0.1

Short Bio

Fejzi Kolaneci has graduated from the Faculty of Natural Sciences, Department of Mathematics, University of Tirana, in 1962. He hold a PhD diploma in Mathematics from 1972 and a Doctor of Sciences diploma (second degree) from 1990. He was awarded the title Professor for distinguished contribution in Mathematical Sciences from 1994. During the period 2003 – 2011 he was the Head of Mathematics and Natural Sciences Departmen at the University of New York Tirana. From 1997 to 2002, Dean of the Teaching Faculty, University Fan Noli, Korca, Albania. During the period 1993 – 1997, the Scientific Secretary for Natural and Technical Sciences, Academy of Sciences, Tirana, Albania. His recent interests are in Stochastic Partial Differential Equations, Probability Theory, Mathematical Statistics and their applications in Physics, Biomedicine and Economics. Currently he is a full time Professor of Mathematics at the University of New York Tirana.