Estimating Barro misery index in democratic states with application in Albania: 2005 – 2014

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"The Barro misery index accurately measures misery"
Steve H. Hanke

"The higher Barro misery index, the greater the economic and social discomfort"

Richard F. Janssen

Abstract

In the present study we develop a statistical analysis of the Barro misery index and its components in contemporary democratic states with application in Republic of Albania during the period January 2005- December 2014. BMI is calculated by the formula:
BMI = π + u – GPD + i, where

BMI denotes quarterly Barro misery index,

π denotes quarterly inflation rate,

u denotes quarterly unemployment rate,

GDP denotes quarterly real GDP growth rate,

i denotes nominal long-term interest rate.

Kolmogorov's Central Limit Theorem is a fundamental theorem of Modern Probability Theory "Fair game" and "Effective market in week sense" are important concepts of Macroeconomics.

Some results of the study include :

Kolmogorov's Central Limit Theorem is not valid for quarterly inflation rates in Albania during the period January 2005-December 2014 at the confidence 99. 9%.

The inflation process in Albania during the specified period, related to the quarterly inflation rate, is an unfair game at the confidence 98. 8%.

The inflation process in Albania during the specified period, related to the quarterly inflation rate, is not effective at the confidence 97. 5%

Kolmogorov's Central Limit Theorem is not valid for quarterly unemployment rates in Albania during the specified period at the confidence 99. 9%.

The unemployment process in Albania during the specified period, related to the quarterly unemployment rate, is an unfair game at the confidence 99. 9%.

The unemployment process in Albania during the specified period, related to the quarterly unemployment rate, is not effective at the confidence 99. 9%

The official data of the quarterly GDP growth rate for Albania during the specified period contradict Kolmogorov's Central Limit Theorem at the confidence 77. 1%.

The GDP growth rate process for Albania during the specified period is a fair game at the confidence 86. 4%.

The GDP growth rate process for Albania during the specified period is not effective at the confidence 99. 9%.

The official data of the quarterly Barro misery index for Albania during the specified period contradict Kolmogorov's Central Limit Theorem at the confidence 96. 1%.

The Barro misery index for Albania during the specified period is a fair game at the confidence 84. 8%.

The Barro misery index process for Albania during the specified period is not effective at the confidence 63. 7%.

Keywords: Barro misery index, Okun misery index, inflation, unemployment, GDP growth rate, Albania.

Abbreviations:

CLT- Central Limit Theorem

GDP- Gross Domestic Product

KLS test- Kolmogorov-Smirnov-Lilliefors test

SW test- Shapiro-Wilk test

BMI- Barro misery index

OMI- Okun misery index

Introduction

The concept "misery index" is an economic and social indicator, created by late distinguished economics Arthur Melvin Okun, the Chairman of Council of Economic Advisers under US President Lyndon B. Johnson in the 1960's. The Okun misery index denotes the sum of the annual (or quarterly) inflation rate and unemployment rate for a given country. Harvard University Professor Robert J. Barro improved OMI by adding two random variables: annual (or quarterly) real GDP growth rate and nominal long-term interest rate, see Barro (1999).

In the present study, BMI calculated by the formula:
BMI = π + u – GPD + i, where

BMI denotes quarterly Barro misery index,

π denotes quarterly inflation rate,

u denotes quarterly unemployment rate,

GDP denotes quarterly real GDP growth rate,

i denotes nominal long-term interest rate.

In other words,

BMI = OMI – GDP + i, where

OMI denotes the quarterly Okun misery index.

The BMI is an important indicator of economic and social performance: the higher BMI, the worse misery.

Professor Robert J. Barro used BMI to measure the dynamics of misery during each President's term of USA.

The impact of BMI in business is significant, because this 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 affected in different ways by increases in the BMI. As the quarterly 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. The BMI creates a feeling of helplessness. Consumers want and need more income to keep up wage pressures suppressed. In addition to this, there are fever opportunities to supplement income with overtime or secondary part- time jobs.

Individuals who can afford to save are likely to build up a "worst case reserve", but this strategy makes sense for individuals, it further weakens confidence in the economy, as the reduced consumption causes business to cut back further on employment, see Simister (2011), Lechman (2012).

BMI contains four metrics: π, u, quarterly GPD growth rate and i. From Modern Probability Theory point of view, BMI is a random field: it changes over time and in different countries reflects changes in society's economic performance.

BMI is not a perfect measure of poverty for a given country during a specified period of time. But definitely, BMI can be used as a proxy (approximation) of the economic and social welfare, see Welsch (2007). The life of individual is strongly determined and affected by BMI.

In the present study we develop a statistical analysis of BMI in Republic of Albania during the period January 2005 – December 2014. The official data in the BMI for Albania during this period speak loudly. The main purpose is to learn about the miserably process of Albania citizens, while their lives are strongly affected by dynamics in BMI.

The sources of official data are Institute of Statistics of Albania (INSTAT) and Bank of Albania (BoA).

Definitions

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 reduce 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.

GDP is the market value of all officially recognized final goods and services produced within a country in a given period of time (quarterly GDP versus annual GDP), see Blanchard (2011), Mankiw (2011), Taylor (2008).

GDP per capita is often considered as an indicator of a country's standard of living.

Official GDP estimates not take into account the underground economy, in which transactions contributing to production (such as illegal trade and tax-avoiding activities) are unreported, causing GDP to be underestimated.

GDP can be determined in three ways, all of which should, in principle, give the same result:

Production Approach

Expenditure Approach

Income Approach

The most direct of three ways is the Production Approach which calculates the sum of outputs of every class of enterprise to arrive at the total.

In Albania, GDP was calculated by INSTAT only through Production Approach and Expenditure Approach. Among these two methods, is being considered that Production Approach better evaluates GDP for Albania's conditions.

According to the Production Approach, GDP is calculated by the formula:

GDP = VAT + TP + CT + SB, where

GDP denotes the Gross Domestic Product at market prices,

VAT denotes Value Added Tax at basic prices,

TP denotes taxes on products including VAT,

CT denotes customs tax,

SB denotes subsidies on products and imports.

The Production Approach is the basic method to calculate GDP in Albania.

The market is **weakly efficient** regarding to a specific economic process, if the relative successive differences of the process follow a normal distribution. This definition is given by E. Fama (Nobel Award winner).

The Central Limit Theorem (CLT) explains why many probability distributions tend to be very close to the normal distribution. The CLT is also known as the second fundamental theorem of Probability Theory.

A contemporary version of the CLT is given by A. N. Kolmogorov.

Theorem 1 (CLT)

If all random samples $(x_1, x_2, \dots, x_n)$ of a reasonably large size n > 30 are selected from any random variable (population) X with finite expectation μ and 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 $n \to \infty$, see Kolmogorov (2002).

Theorem 2 (Berry – Esséen)

If the third central moment $E(X- \mu)^3$ exists and is finite, then the above convergence is uniform for all $x \in (-\infty, +\infty)$ and the speed of convergence is at least on the order $\frac{1}{\sqrt{n}}$, see Shiryaev (2006).

Theorem 3 (Arstein – Ball – Barthe – Naor)

The convergence to normal distribution is monotonic in the sense that the entropy of the random variable

$$Z_n = \frac{n(\bar{x} - \mu)}{\sigma\sqrt{n}}$$

increases monotonically to that of the standard normal distribution (Arstein, Ball, Barthe, and Naor, 2004).

The amazing and counterintuitive thing about CLT is that no matter what the probability distribution of the parent population X, the probability distribution of the sample mean $\bar{x}$ approaches a normal curve.

The remainder of the paper is organized as follows:

Section 2 presents the statistical analysis of quarterly inflation rate. Section 3 provides the investigation of quarterly unemployment rate. Section 4 presents the dynamics of Okun misery index. Section 5 presents the statistical analysis of quarterly GDP growth rate. Section 6 investigates quarterly Barro misery index. Section 7 concludes the paper.

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 –December 2014 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 observed value of Kolmogorov-Smirnov-Lilliefors test=. 213 and the corresponding significance level. 000. Now we apply the Shapiro-Wilk test for normality. The observed 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 2. 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 observed value of the KSL test is =. 171, and the observed value of SW test is W =. 929.

The associated significance level is 1. 2%.

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.

The relative successive differences of quarterly inflation rate, over the period January 2005 – December 2014, in Albania are given in Table 3. We present the statistical parameters related to this data set.

Sample size	*n = 39*
Sample mean	*-. 4799*
95% confidence interval for mean	*-1. 1297,. 1699*
Median	*. 0800*
Variance	*4. 018*
Standard deviation	*2. 00456*
Minimum	*-7. 00*
Maximum	*6. 00*
Range	*13. 00*
Interquartile range	*1. 53*
Skewness	*-. 196*
Kurtosis	*4. 711*

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 =. 236, and the computed value of SW test is W =. 844.

Decision Rule: Reject the null hypothesis H_0 at the confidence level 97. 5%. In other words, at the confidence level 97. 5%, the inflation process in Albania, over the period January 2005 – December 2014, related to the quarterly inflation rates, is not effective.

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 4. 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 5. We present the statistical parameters related to the data set:

Sample size	*n=39*
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 relative successive differences of quarterly unemployment rate for Albania over the period January 2005 – December 2014 follow a normal distribution.

H_1 : The relative 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 observed 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.

The relative successive differences of quarterly unemployment rate, over the period January 2005 – December 2014, in Albania are given in Table 6. We present the statistical parameters related to this data set.

Sample size	*n = 39*
Sample mean	*. 00884*
95% confidence interval for mean	*-. 00331,. 02098*
Median	*. 00000*
Variance	*. 001*
Standard deviation	*. 037472*
Maximum	*. 127*
Minimum	*-. 048*
Range	*. 175*
Interquartile range	*. 030*
Skewness	*1. 593*
Kurtosis	*2. 561*

We test the hypothesis:

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

H_1 : The relative successive difference of the quarterly unemployment 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 observed value of the KSL test is =. 209, and the observed value of SW test is W =. 842.

The significance level for both tests is. 000.

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 in Albania, over the period January 2005 – December 2014, related to the quarterly unemployment rates, is not effective game.

The Dynamics of the Quarterly Okun Misery Index

The data set is quarterly Okun misery index in Albania during the period January 2005 – December 2014, see Table 7. 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 Okun misery index in Albania over the period January 2005 – December 2014 follows a normal distribution.

H_1: The quarterly Okun 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 Okun misery index in Albania over the period January 2005 – December 2014, at the confidence level 86. 4%.

The successive difference of the quarterly Okun misery index, are given in Table 8. 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 Okun misery index in Albania over the specified period follow a normal distribution.

H_1 : The successive differences of the quarterly Okun 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 98. 3 %. 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%.

The relative successive differences of quarterly Okun misery index rate, over the period January 2005 – December 2014, in Albania are given in Table 9. We present the statistical parameters related to this data set.

Sample size	*n = 39*
Sample mean	*. 01315*
95% confidence interval for mean	*-. 03145,. 05774*
Median	*. 00613*
Variance	*. 019*
Standard deviation	*. 137556*
Maximum	*. 438*
Minimum	*-. 287*
Range	*. 724*
Interquartile range	*. 106*
Skewness	*. 570*
Kurtosis	*2. 079*

Test the hypothesis:

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

H_1 : The relative successive difference of the quarterly Okun misery index 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 observed value of the KSL test is =. 147, and the observed value of SW test is W =. 935.

The corresponding significance levels are. 034 and. 026, respectively.

Decision Rule: Reject the null hypothesis H_0 at the confidence level 97. 4%. In other words, at the confidence level 97. 4%, the misery process in Albania, over the period January 2005 – December 2014, related to the quarterly Okun misery index, is not effective.

The Dynamics of the Quarterly GDP growth rate

The data set is quarterly GDP growth rate for Albania during the period January 2005- December 2014, see Table 10. The source of the official data is INSTAT.

Using SPSS, compute statistical parameters for the data.

Sample size	*40*
Sample mean	*. 8897*
95% confidence interval for mean	*. 2157, 1. 5638*
Median	*1. 035*
Variance	*4. 441*
Standard deviation	*2. 10747*
Coefficient of variation	*2. 368 = 236. 8%*
Maximum	*6. 38*
Minimum	*-2. 61*
Range	*8. 99*
Interquartile range	*2. 53*
Skewness	*. 455*
Kurtosis	*. 291*

Test the hypothesis
H_0 : The quarterly GDP growth rate for Albania during the period January 2005- December 2014 follows a normal distribution.
H_1: The quarterly GDP growth rate for Albania during the period January 2005- December 2014 follows a non-normal distribution.
We apply KSL test as well as SW test for normality. Using SPSS, we find the observed value of SW test =. 964 and corresponding significance =. 229. From the KLS test we find that the observed value is. 067 and corresponding significance =. 200.
Decision Rule: Reject the null hypothesis H_0 at the confidence level 77. 1%. In other words, the official data of the quarterly GDP growth rate for Albania during the period Jan 2005 – Dec 2014 contradict Kolmogorov's CLT at the confidence level 77. 1%.
The data set consists of the successive differences of quarterly GDP growth rate for Albania during the period Jan 2005 – Dec 2014, see Table 11. Using SPSS, we compute statistical parameters for this data set.

Sample size	*39*
Sample mean	*. 1123*
95% confidence interval for mean	*-. 8991, 1. 1237*
Median	*. 53*
Variance	*9. 735*
Standard deviation	*3. 12016*
Coefficient of variation	*27. 78= 2778 %*
Maximum	*7. 88*
Minimum	*-6. 38*
Range	*14. 26*
Interquartile range	*3. 45*
Skewness	*. 031*
Kurtosis	*. 113*

Test the hypothesis

H_0 : The successive differences of the quarterly GDP growth rate for Albania during the period Jan 2005 – Dec 2014 follow a normal distribution.

H_1: The successive differences of the quarterly GDP growth rate for Albania during the period January 2005- December 2014 follow a non-normal distribution.

Using SPSS, we find the observed value of SW test =. 985 and corresponding significance =. 864. From the KLS test we find that the observed value is. 084 and the corresponding significance =. 200.

Decision Rule: The GDP growth rate process for Albania during the period Jan 2005 – Dec 2014 is a fair game at the confidence level 86. 4%.

Test the hypothesis

H_0 : The relative successive differences of the quarterly GDP growth rate for Albania during the period Jan 2005 – Dec 2014 follow a normal distribution.

H_1: The relative successive differences of the quarterly GDP growth rate for Albania during the period January 2005- December 2014 follow a non-normal distribution.

Using SPSS, we find the observed value of SW test =. 850 and corresponding significance =. 000. The observed value of KSL test is. 182 and corresponding significance. 002.

Decision Rule: The GDP growth rate process for Albania during the period Jan 2005 – Dec 2014 is not effective at the confidence level 99. 9%.

The dynamics of quarterly Barro misery index

The data set is quarterly Barro misery index for Albania during the period January 2005- December 2014, see Table 12. The source of the official data is INSTAT.

Using SPSS, we compute the statistical parameters for the data.

Sample size	40
Sample mean	26. 398
95% confidence interval for mean	20. 328, 22. 468
Median	26. 380
Variance	11. 196
Standard deviation	3. 3460
Maximum	32. 5
Minimum	17. 6
Range	14. 9
Interquartile range	5. 1
Skewness	-. 267
Kurtosis	-. 113

Test the hypothesis
H_0 : The quarterly Barro misery index for Albania during the period January 2005- December 2014 follows a normal distribution.

H_1: The quarterly Barro misery index for Albania during the period January 2005- December 2014 follows a non-normal distribution.

We apply KSL test as well as SW test for normality. Using SPSS, we find the observed value of SW test =. 984 and corresponding significance =. 848. The observed value of KSL test is. 066 and corresponding significance. 200.

Decision Rule: The CLT is valid for quarterly Barro misery index in Albania during the period Jan 2005- Dec 2014 at the confidence level 84. 8%.

The data set consists of the successive differences of Barro misery index for Albania during the period Jan 2005 – Dec 2014, see Table 13. Using SPSS, we compute statistical parameters for this data set.

Sample size	*40*
Sample mean	*-. 037*
95% confidence interval for mean	*-1. 169, 1. 096*
Median	*-. 210*
Variance	*12. 549*
Standard deviation	*3. 5424*
Maximum	*6. 1*
Minimum	*-12. 6*
Range	*18. 7*
Interquartile range	*4. 4*
Skewness	*-. 878*
Kurtosis	*2. 688*

Test the hypothesis

H_0 : The successive differences of the quarterly Barro misery index for Albania during the period January 2005 – December 2014 follow a normal distribution.

H_1: The successive differences of the quarterly Barro misery index for Albania during the period January 2005- December 2014 follow a non-normal distribution.

Using SPSS, we find the observed value of SW test =. 941 and corresponding significance =. 039. The KSL test is not applicable for this data set.

Decision Rule: Reject the null hypothesis H_0 at the confidence level 96. 1%. In other words, the official data of the quarterly Barro misery index for Albania during the period Jan 2005 – Dec 2014 represents an unfair game at the confidence level 96. 1%.

Test the hypothesis

H_0 : The relative successive differences of the quarterly Barro misery index for Albania during the period Jan 2005 – Dec 2014 follow a normal distribution.

H_1: The relative successive differences of the quarterly Barro misery index for Albania during the period January 2005- December 2014 follow a non-normal distribution.

Using SPSS, we find the observed value of SW test =. 970 and corresponding significance =. 363. The observed value of KSL test is. 095 and corresponding significance. 200.

Decision Rule: The Barro misery index for Albania during the period Jan 2005 – Dec 2014 is not effective at the confidence level 63. 7%.

Conclusion

The present study was motivated by some indicators for miserably process in Albania during the period January 2005- December 2014. The sources of official data are INSTAT and Bank of Albania.

It seems reasonable and valuable to monitor " Barro misery index dynamics over time in Republic of Albania", in order to make sure that Albanian economy is developing in right direction. Combination of high quarterly inflation rates, high quarterly unemployment rates and low GDP growth rates constitute significant obstacles for Albanian citizens to benefit from wide range of opportunities that free market is offering to its participants.

These issues are of particular importance to Albanian Government, Albanian Parliament and especially to Albanian people. The mean value of the quarterly BMI for Albania during the period the period Jan. 2005- Dec. 2014 equals 21. 898, and 95% confidence interval for the mean is (20. 328, 22. 468). The standard deviation of the quarterly BMI equals to 3. 3460.

Using Kolmogorov's CLT, KSL test, SW test, "fair game" concept in sense of Stein- Vorobiev and "weakly efficient market" concept in sense of E. Fama, we obtain the following results:
CLT is not valid for quarterly inflation rates in Albania during the period Jan. 2005- Dec. 2014 at the confidence level 99. 9%.
The inflation process in Albania during the specified period is an unfair game at the confidence level 98. 8%.
The inflation process in Albania during the specified period is not effective at the confidence level 97. 5%.
CLT is not valid for quarterly unemployment rates in Albania during the period Jan. 2005- Dec. 2014 at the confidence level 99. 9%.
The unemployment process in Albania during the specified period is an unfair game at the confidence level 99. 9%.
The Okun miserably process in Albania during the specified period is an unfair game at the confidence level 98. 3%.
The Okun miserably process in Albania during the specified period is not effective at the confidence level 97. 4%.
The quarterly GDP growth rate process in Albania during the period Jan. 2005- Dec. 2014 is not effective at the confidence level 99. 9%.
The Barro miserably process in Albania during the period Jan. 2005- Dec. 2014 is an unfair game at the confidence level 96. 1%.
We found a strong evidence for the divergence of several macroeconomic data in Albania during the specified period from CLT, fair game process and weakly effective market.
An obvious feature of our study is the severity of rejecting Kolmogorov's CLT or fair game hypothesis or weakly effective market hypothesis. Therefore, there is a strong suspect for the presence of excessive speculation and associated excessive speculators in Albania's market during the period January 2005- December 2014. 1

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Appendix

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

Year	*Quarter*	*Inflation Rates(%)*	*Succ. Diff. Infl. Rates(%)*	*Unemploy. Rates(%)*	*Succ. Diff. Unemploy. Rates(%)*	*GDP growth rates (%)*	*Successive differences of*

							GDP growth rates (%)
2005	Q1	3. 3		13. 1		-1. 96	
	Q2	-1	-4. 3	12. 7	-0. 4	5. 92	7. 88
	Q3	-1. 4	-0. 4	12. 6	-0. 1	-0. 46	-6. 38
	Q4	1. 9	3. 3	14. 2	1. 6	0. 07	0. 53
2006	Q1	2	0. 1	14	-0. 2	0. 98	0. 91
	Q2	0. 2	-1. 8	13. 9	-0. 1	1. 09	0. 11
	Q3	-1. 2	-1. 4	13. 8	-0. 1	1. 96	0. 87
	Q4	1. 8	3	13. 7	-0. 1	3. 6	1. 64
2007	Q1	2. 2	0. 4	13. 7	0	-0. 86	-4. 46
	Q2	-0. 8	-3	13. 5	-0. 2	-0. 29	0. 57
	Q3	0. 4	1. 2	13. 2	-0. 3	1. 78	2. 07
	Q4	1. 7	1. 3	13. 4	0. 2	6. 38	4. 6
2008	Q1	2. 4	0. 7	13. 1	-0. 3	2. 08	-4. 3
	Q2	-0. 3	-2. 7	12. 7	-0. 4	-1. 68	-3. 76
	Q3	-0. 8	-0. 5	12. 6	-0. 1	1. 76	3. 44
	Q4	1. 2	2	12. 5	-0. 1	1. 37	-0. 39
2009	Q1	1. 8	0. 6	12. 7	0. 2	2. 59	1. 22
	Q2	-0. 1	-1. 9	12. 7	0	1. 92	-0. 67
	Q3	-0. 7	-0. 6	12. 8	0. 1	-2. 24	-4. 16
	Q4	2. 2	2. 9	13. 7	0. 9	-2. 34	-0. 1
2010	Q1	3	0. 8	13. 9	0. 2	3. 24	5. 58
	Q2	-1	-4	13. 8	-0. 1	2. 2	-1. 04
	Q3	-0. 6	0. 4	13. 5	-0. 3	-0. 15	-2. 35
	Q4	1. 8	2. 4	13. 5	0	0. 65	0. 8
2011	Q1	2	0. 2	14	0. 5	3. 19	2. 54
	Q2	2. 5	0. 5	13. 8	-0. 2	-2. 61	-5. 8
	Q3	2. 3	-0. 2	13. 9	0. 1	1. 69	4. 3
	Q4	2. 4	0. 1	13. 9	0	-0. 12	-1. 81
2012	Q1	2. 4	0	14	0. 1	-0. 42	-0. 3
	Q2	2. 4	0	13. 8	-0. 2	0. 95	1. 37
	Q3	2. 7	0. 3	14. 1	0. 3	2. 06	1. 11
	Q4	2. 4	-0. 3	14. 1	0	-1. 25	-3. 31
2013	Q1	2. 5	0. 1	14. 8	0. 7	0. 15	1. 4
	Q2	2. 2	-0. 3	16. 4	1. 6	1. 13	0. 98
	Q3	1. 5	-0. 7	17. 2	0. 8	-1. 95	-3. 08
	Q4	1. 5	0	17. 1	-0. 1	-1. 61	0. 34
2014	Q1	1. 9	0. 4	18. 6	1. 5	1. 42	1. 42
	Q2	1. 6	-0. 3	17. 7	-0. 9	-0. 37	-1. 79
	Q3	1. 8	0. 2	17. 4	-0. 3	3. 3	3. 67
	Q4	1. 3	-0. 5	18	0. 6	2. 42	-0. 88

Table 2. Okun misery index, Barro misery index, their successive differences and their relative successive differences.

Okun Misery Index	*Succ. Diff. Okun Miss. Index*	*Barro Misery Index*	*Succ. Diff. Barro Miss. Index*
16. 4		*30. 2*	*. 0*
11. 7	*-4. 7*	*17. 6*	*-12. 6*
11. 2	*-0. 5*	*23. 5*	*5. 9*
16. 1	*4. 9*	*27. 8*	*4. 4*
16	*-0. 1*	*26. 8*	*-1. 0*
14. 1	*-1. 9*	*24. 8*	*-2. 0*
12. 6	*-1. 5*	*22. 4*	*-2. 4*
15. 5	*2. 9*	*23. 7*	*1. 3*
15. 9	*0. 4*	*28. 6*	*4. 9*
12. 7	*-3. 2*	*24. 8*	*-3. 8*
13. 6	*0. 9*	*23. 6*	*-1. 2*
15. 1	*1. 5*	*20. 5*	*-3. 1*
15. 5	*0. 4*	*25. 2*	*4. 7*
12. 4	*-3. 1*	*25. 9*	*. 7*
11. 8	*-0. 6*	*21. 8*	*-4. 0*
13. 7	*1. 9*	*24. 1*	*2. 3*
14. 5	*0. 8*	*23. 7*	*-. 4*
12. 6	*-1. 9*	*22. 5*	*-1. 2*
12. 1	*-0. 5*	*26. 1*	*3. 7*
15. 9	*3. 8*	*30. 0*	*3. 9*
16. 9	*1*	*25. 5*	*-4. 6*
12. 8	*-4. 1*	*22. 4*	*-3. 1*
12. 9	*0. 1*	*24. 9*	*2. 5*
15. 3	*2. 4*	*26. 5*	*1. 6*
16	*0. 7*	*24. 6*	*-1. 8*
16. 3	*0. 3*	*30. 7*	*6. 1*
16. 2	*-0. 1*	*26. 3*	*-4. 4*

16. 3	0. 1	28. 2	1. 9
16. 4	0. 1	28. 6	. 4
16. 2	-0. 2	27. 1	-1. 6
16. 8	0. 6	26. 5	-. 5
16. 5	-0. 3	29. 6	3. 0
17. 3	0. 8	29. 0	-. 6
18. 6	1. 3	29. 3	. 3
18. 7	0. 1	32. 5	3. 2
18. 6	-0. 1	32. 0	-. 4
20. 5	1. 9	30. 9	-1. 1
19. 3	-1. 2	31. 5	. 6
19. 2	-0. 1	27. 7	-3. 8
19. 3	0. 1	28. 7	1. 0