Evaluation of Consumer Confidence Index of Central Bank of Turkey Consumer Tendency Survey

Derya Karagöz and Serpil Aktaş

Department of Statistics, Hacettepe University, Beytepe. Ankara / Turkey

serpilaltunay@gmail.com

Abstract : Consumer confidence index is an indicator used to measure consumer confidence based on the degree of optimism on economy. Basically. it is a measure that reveals how optimistic or pessimistic consumers are with respect to the economy in the near future. The consumer confidence index calculated from the survey results can take value between 0-200. Consumer confidence index greater than 100 indicates an optimistic outlook for consumer confidence. Consumer confidence index is smaller than 100 represents the worst case. In this paper. consumer confidence index data are collected for the periods 2004-2012 from Central Bank of Turkey and analyzed using repeated measures analysis to investigate whether there is a trend throughout the years..

Key words: Consumer confidence index. Central Bank of Turkey. Repeated measures analysis.

Introduction

The repeated statement was added to the general linear model (GLM) procedure in 1984, since the methodology of univariate analysis of variance does not enough to resolve the covarince structure of repeated measures. The separate analyses at each time point, univariate analysis of variance, univariate and multivariate analyses of time contrast variables, and mixed model methodology are several statistical methods used for analyzing repeated measures data. The designs of repeated measures can be one-way repeated measures (one treatment factor) and two-way repeated measures (two treatment factors: one repeated factor (the trials factor) and one treatment factor (the groups factor)) which is a special type of repeated measures design that is frequently used by researchers is (Montgomery,2001).

The aim of this study is to analyze the Consumer confidence index (CCI) data using one-way repeated measures analysis and to investigate whether there is a trend throughout the years. The CCI data is collected for the periods 2004-2012 from Central Bank of Turkey and is calculated from the survey results. CCI can take value between 0-200. If it is greater than 100. it indicates an optimistic outlook for consumer confidence (CC) and if it is smaller than 100, it represents the worst case. CCI is a measure that reveals how optimistic or pessimistic consumers are with respect to the economy in the near future.

The remainder of our paper is organized as follows. In the next section, the definition of the consumer confidence index is given. In Methodology Section starts with a summary explaining the methodology of the repeated measures analysis experiments and then presents the theory of the repeated measures analysis of variances. Then we represent the analysis of CCI data for Central Bank of Turkey. Finally, the conclusions of this study is given in the last section.

Consumer Confidence Index

CC is one of the many indicators that is designed to measure the changes in economic activity and widely used in macroeconomic assessments and forecasts. CCI is a measure of consumer attitudes. Firstly. consumer attitudes might improve consumption forecast by reporting on consumers' views about their own and the economy's recent, current and expected economic conditions. Thus these data may be more informative about future consumer spending. Secondly, consumer attitudes may incorporate households' estimates of the impacts of rare shocks whose effects cannot be directly estimated from past experience or data (Brand., 2012).

A CCI measures how consumers feel about several economic factors. The measure is based on several questions by an interviewer to the consumer. The result which is represented by a numerical value speaks to consumer's evaluation of their own financial situation, employment chances, expenditure intentions and their opinion of general economic conditions. The index is based on a randomly selected sample of consumers that is representative of the country for which the index is constructed. The computation of a business confidence index essentially follows the same format except that it is the responses of business persons to business-focused

questions that are captured and measured. These indices may rise or fall from period to period or remain unchanged (Kelvin, 2011).

The analysis of CC derives from the distinct literature of psychological economics. It is widely accepted that the perceptions and expectations of households determine the type of responses given during the survey. Katona (1960 and 1968) studied much in this area. The author argues that as one of the main tendency measures, economic sentiment can be credited with having additional information on the future path of the economy. An increase in confidence should lead to a rise in consumption expenditure with a certain lag. Since income cannot reflect all changes in consumption. CC offers help as an indicator because it allows one to measure both the ability and willingness to buy that individuals possess alongside other significant economic and financial variables. One can separate the literature on CC into three distinct approaches. The first argues that there is a significant and strong relationship between consumer sentiment and consumption expenditures (Carroll et al. 1994). The second fails to find any supportive evidence of empirical significance, rejecting the validity of consumer confidence as a leading indicator (Garner, 1991). Finally. the third uses some form of unconventional methodology to bridge the gap between qualitative survey data and quantitative analysis, resulting in favorable (Jansen and Nahius, 2003) and non-favorable evidence (Dominitz and Manski, 2004). However. the common point of all these studies is to focus on the explanatory power of CC thus restricting it to the role of an exogenous variable. The approach used by each of these studies range from the use of time series models to estimate the predictive ability of consumer confidence on household spending; to the use of consumer expectations and changes in future consumer sales activity; to the use of unconventional methodology like analyzing forecast errors regarding the CCI, the possible relationship between the blue chip economic indicators and consumer sentiment, or micro-level expectations data in a Euler- equation framework (Kelvin. 2011).

Methodology

The Repeated Measures Analysis of Variances (rANOVA) is one of the most widely used experimental designs in the past two decades because of advancements in computing hardware and software. Specifically in educational, psychological, diet and population research, multiple measurements are made on the same experimental units over a period of time, such data are called repeated measures. The repeated measures experiments interest on how treatment means change over time; and how treatment differences change over time. i.e.. is there a treatment by time interaction? The repeated measures data analysis distinctive is the covariance structure of the observed data. The assumptions of using the *F* test to analyze an experimental design are :

- The response variable is continuous,
- The residuals follow the normal distribution,
- The subjects are independent,
- The within-subject covariance matrices are equal for all between-subject groups. This assumption is tested by Box's M test,
- All of the within-subject covariance matrices are circular. This assumption is tested by Mauchly's test and be studying the values of epsilon (defined below). The circularity assumption is not necessary when only two repeated measures are made. When the significance level of Mauchly's test is < 0.05 then sphericity cannot be assumed.

The one-way repeated measures analysis model is given;

$$y_{ij} = \mu + \alpha_j + d_{ij} + \varepsilon_{ij} \; . i = 1 \ldots n. \;\; j = 1 \ldots k$$

where n is the number of observation, k is the number of treatment

y_{ij} : the response variable

μ : is the overall mean effect

α_j : is a fixed effect of treatment j

d_{ij} : is a random effect of observation i in treatment j

ε_{ij} : is a random error observation i in treatment j

- $\varepsilon_{ij} \sim NID(0.\sigma_\varepsilon^2)$, approximately normally independently distributed with mean of 0 and variance of σ_ε^2.
- $d_{ij} \sim NID(0.\sigma_d^2)$, approximately normally independently distributed with mean of 0 and variance of σ_d^2.

Assuming d_{ij} and ε_{ijk} are independent

$$E(y_{ij}) = \mu + \alpha_j + \tau_i$$
$$Var(y_{ij}) = \sigma_d^2 + \sigma_\varepsilon^2$$

and the covariance between any two different observations on the same subject is

$$Cov(y_{ij} \,.\, y'_{ij}) = Var(d_{ij}) = \sigma_d^2 \,.\, j \neq j'.$$

Analysis of CCI data for Central Bank of Turkey

In this study the CCI data is collected for the periods 2004-2012 from Central Bank of Turkey from the Central Bank of Turkey database. In monthly, consumer tendency survey, consumers' assessments on current situation and their expectations for personal financial standing and general economic situation have been evaluating by the Central Bank of Turkey. Indices are compiled in accordance with the balance method of European Union. The balance is calculated as the difference between the percentages of positive and negative responses and 100 is added to this difference, thus forming a separate diffusion index for each question. Then, the general index is calculated by taking arithmetic means of diffusion indices of the questions included in consumer confidence index. The consumer confidence index calculated from the survey results is evaluated within the range of 0-200. It indicates an optimistic outlook when the index is above 100, but it indicates a pessimistic outlook when it is below 100. CCI data set and was downloaded for the Central Bank of Turkey web page (http://evds.tcmb.gov.tr/fame/webfactory/evdpw/yeni/cbt-uk.html) and is given in Table 1. For this data set the each CCI is observed monthly. This data is analyzed using repeated measures analysis to investigate whether there is a trend throughout the years. The response variable y_{ij} is CCI at month *i* in year *j*, the treatment factor α_j is a fixed effect of year j and d_{ij} is a random effect of month i in year *j*. Treatment factor is often referred to as the within-subjects factor. The repeated measures analysis model for this data set is given;

$$y_{ij} = \mu + \alpha_j + d_{ij} + \varepsilon_{ij} \,.i = 1 \ldots 12. \;\; j = 1 \ldots 9$$

Table 1: The CCI data collected for the periods 2004-2012 from Central Bank of Turkey

2004	2005	2006	2007	2008	2009	2010	2011	2012
111.40	105.40	101.70	91.80	92.10	71.60	79.20	91.30	92.20
111.90	105.20	101.10	92.70	87.60	74.00	81.80	93.60	93.20
111.00	102.10	101.70	92.40	82.00	74.80	84.70	93.40	93.90
111.00	100.40	102.30	93.70	76.20	80.80	85.80	93.50	91.10
107.30	100.30	100.10	95.00	75.40	83.30	86.60	92.80	92.10
106.60	99.10	92.20	94.20	75.00	85.30	88.00	96.40	91.80
105.40	99.20	88.60	95.50	77.00	82.40	87.50	94.80	92.80
105.40	97.50	91.40	98.20	79.80	81.30	87.40	91.70	91.10
101.20	95.50	91.40	97.10	80.70	81.90	90.40	93.70	88.80
102.80	98.10	91.60	96.20	74.20	80.50	89.00	89.70	85.70
103.70	99.50	93.30	92.50	68.90	78.40	91.30	91.00	89.20
105.20	99.50	92.00	93.90	69.90	78.80	91.00	92.00	89.00

The descriptive statistics for CCIs are displayed in Table 2. Figure 1 also shows the mean trend by years. As shown in Table 2 and Figure 1, the highest consumer confidence index mean is observed in 2004 due to the some economic precautions on the economy. It can be seen a decline until 2006. The mean index in 2006 is not different from the mean index in 2007. After 2007, there was a serious decline until 2008 which has the lowest CCI mean. Between 2009 and 2008 there was a stagnation. Since the last quarter of 2008, the global economic

crisis around the world was felt in our country. So an increase was observed again from 2009 to 2011. However, after 2011 the mean index again began to decrease.

Table 2: The descriptive statistics of CCI data for the periods 2004-2012

Year	Mean	Variance	Minimum	Maximum
2004	106.91	13.28	101.20	111.90
2005	100.15	8.42	95.50	105.40
2006	95.62	27.26	88.60	102.30
2007	94.433	4.052	91.80	98.20
2008	78.23	45.43	68.90	92.10
2009	79.42	16.78	71.60	85.30
2010	86.89	13.28	79.20	91.30
2011	92.825	3.291	89.70	96.40
2012	90.908	5.443	85.70	93.90

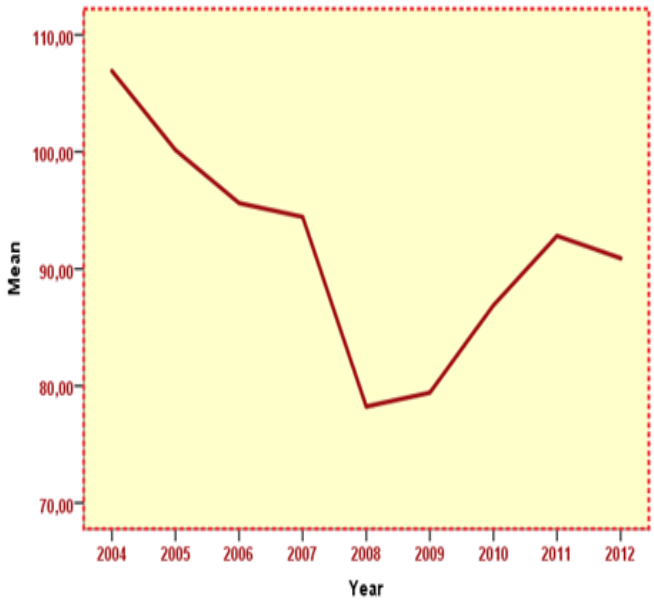

Figure 1 : The graph of the mean of the CCI for the periods 2004-2012

IBM SPSS 20 was used for the data analysis. For the CCI data collected for the periods 2004-2012 from Central Bank of Turkey, the normality assumption holds (P=0.127). The results of the Mauchly's Test of Sphericity is given in Table 3. From the results , we see that, the spherecity assumption does not hold (P=0.00).

Table 3: Mauchly's Test of Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
year	0.000	111.211	35	0.000	0.232	0.278	0.125

The null hypothesis for repeated measures analysis is "there is no trend for consumer confidence index" $H_0: \mu_1 = \mu_2 = \cdots = \mu_9$ can be tested against the alternative hypothesis, H_A: *At least one mean is different* . The results are given in Table 4. Since the spherecity assumption does not hold , Greenhouse-Geisser, Huyn-Feldt or Lower-bound test can be used. According to the Huynh-Feldt test, the hypothesis is rejected in the 5% significance level. So the mean of the CCI are different and has a trend for the periods 2004-2012. The multiple comparison test is performed to make the pairwise comparison, and the results of tests for the pairwise comparison are given in Table 5.

Table 4 : Repeated Measures ANOVA Results

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
year	Sphericity Assumed	8190.546	8	1023.818	67.029	0.000
	Greenhouse-Geisser	8190.546	1.858	4408.251	67.029	0.000
	Huynh-Feldt	8190.546	2.220	3689.288	67.029	0.000
	Lower-bound	8190.546	1.000	8190.546	67.029	0.000
Error(year)	Sphericity Assumed	1344.125	88	15.274		
	Greenhouse-Geisser	1344.125	20.438	65.766		
	Huynh-Feldt	1344.125	24.421	55.040		
	Lower-bound	1344.125	11.000	122.193		

Pairwise comparisons: The null hypothesis for pairwise comparisons is $H_0: \mu_i = \mu_j$, $i \neq j$ and alternative hypothesis is $H_A: \mu_i \neq \mu_j$, $i \neq j$. The results of pairwise comparisons with respect to Bonferroni test are given in Table 5. By considering Central bank of Turkey data, the consumer confidence index's means are not different for the years 2006 – 2007-2010- 2011, 2012, and 2008-2009-2010 and 2010-2012 and 2011-2012 , However the consumer confidence index's means for the others years are different. Especially the mean of the consumer confidence index's in 2004 is different from the other years.

Table 5: Bonferroni Pairwise comparisons

(i) year	**(j) year**	**Mean Dif. (i-j)**	**Std. Error**	Sig.[b]	**95%Con.Interval for Diff.**	
					Lower Bound	**Upper Bound**
2004	2005	6.758*	0.516	0.000*	4.570	8.947
	2006	11.292*	0.799	0.000*	7.905	14.678
	2007	12.475*	1.505	0.000	6.094	18.856
	2008	28.675*	1.560	0.000*	22.059	35.291
	2009	27.483*	1.995	0.000*	19.025	35.941
	2010	20.017*	2.028	0.000*	11.418	28.616
	2011	14.083*	1.075	0.000*	9.525	18.642
	2012	16.000*	0.712	0.000*	12.981	19.019
2005	2006	4.533*	1.025	0.037*	0.188	8.878
	2007	5.717	1.351	0.051*	-0.010	11.444
	2008	21.917*	1.562	0.000*	15.295	28.538
	2009	20.725*	1.914	0.000*	12.610	28.840
	2010	13.258*	1.823	0.001*	5.529	20.987
	2011	7.325*	0.999	0.001*	3.091	11.559
	2012	9.242*	0.699	0.000*	6.278	12.206
2006	2007	1.183	1.934	1.000	-7.019	9.386
	2008	17.383*	1.727	0.000*	10.062	24.705
	2009	16.192*	2.400	0.001*	6.016	26.367
	2010	8.725	2.394	0.139	-1.424	18.874
	2011	2.792	1.607	1.000	-4.022	9.605
	2012	4.708	1.297	0.143	-0.793	10.209
2007	2008	16.200*	2.151	0.000*	7.080	25.320
	2009	15.008*	0.907	0.000*	11.163	18.854
	2010	7.542*	0.925	0.000*	3.619	11.464
	2011	1.608	0.794	1.000	-1.757	4.974
	2012	3.525	1.052	.234	-0.938	7.988
2008	2009	-1.192	2.849	1.000	-13.273	10.889
	2010	-8.658	2.916	0.459	-21.022	3.706
	2011	-14.592*	1.977	0.001*	-22.976	-6.208
	2012	-12.675*	1.697	0.000*	-19.872	-5.478

2009	2010	-7.467*	0.928	0.000*	-11.403	-3.531
	2011	-13.400*	1.091	0.000*	-18.025	-8.775
	2012	-11.483*	1.509	0.000*	-17.883	-5.084
2010	2011	-5.933*	1.204	0.016*	-11.039	-0.827
	2012	-4.017	1.573	0.964	-10.684	2.651
2011	2012	-1.917	0.558	0.202	-4.284	0.451

* The mean difference is significant at the %1 level.

Conclusions

The CCI data for the periods 2004-2012 from Central Bank of Turkey was taken directly from the Central Bank of Turkey web page. We analyzed the CCI data using rANOVA and investigated that there is a trend through the years.

The evaluation of Turkish Economy's growth, inflation, labor and employment, public finance, foreign trade, balance of payments and tourism revenue figures for the period of 2001-2013 is very important in regards to the development and dynamics of the country's economics in the recent ten years.

In 2002, Turkey's economy took some precautions to overcome the economic crisis. It also started a growth period with the support of global help. These precautions ensure the trust and stability on the economy. During the period of 2002-2007, a high growth rates, substantial increase in exports and production and decrease on the inflation rates occurred. Since the last quarter of 2008, the global economic crisis around the world relatively affected the Turkey's economy. The year 2009 also was a difficult financial based crisis year for Turkey's economy.

Therefore, the dynamics on the CCI depend upon the structural movements in the economy.

References

Brand, Hamsici T. (2012). *On the Performance of Consumer Confidence Measurement* (pp. . 4474-4485). Section on Survey Research Methods – JSM 2012.

Carroll, C. D.. J. C. Fuhrer and D. W. Wilcox (1994). *Does Consumer Sentiment Forecast Household Spending? If So. Why?*. American Economic Review 84.

Central Bank of Turkey, (2014), http://evds.tcmb.gov.tr/fame/webfactory/evdpw/yeni/cbt-uk.html.

Dominitz. J. and C. Manski (2004). "How should we Measure Consumer Confidence?" Journal of Economic Perspectives. Vol.18. No.2. Spring. 51-66.

Garner, A. (1991). "Forecasting Consumer Spending: Should Economists Pay Attention to Consumer Confidence Surveys?". Federal Reserve Bank of Kansas City Economic Review. May/June.

IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.

Jansen. W. and N. Nahius. (2003). *The Stock Market and Consumer Confidence: European Evidence*. In: Economics Letters 79. 89–98

Katona G. (1960) *The Powerful Consumer*. McGraw-Hill. New York

Katona G. (1968)). *Consumer behavior: Theory and findings on expectations and aspirations*. The American Economic Review. 58. (2).

Kelvin A. S. (2011). *Consumer confidence and economic growth – a case study of trinidad and Tobago*. Paper presented at the 4th biennial international conference on business. banking and finance.

Montgomery. D.C. (2001). *Design and Analysis of Experiments* . John Wiley&Sons.