MULTIVARIATE TIME SERIES MODELING OF THE NUMBER OF APPLICANTS FOR CONDITIONAL CASH TRANSFER PROGRAM IN TURKEY

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Abstract

Conditional Cash Transfer (CCT) is a social assistance program which aims for investing in human capital by enabling families under risk of poverty to send their children to school and to benefit from health services regularly. CCT program in Turkey was spread among poor families, and demands for the program were increased. The need for examining these demands scientifically made this study necessary. In this study, the change of CCT applications over time was modeled by using multivariate time series modeling namely vector autoregressive models with exogenous variables (VARX) according to geographical regions.

Keywords: *Conditional Cash Transfer (CCT), Systems of Dynamic Simultaneous Equations (SEM), Multivariate Time Series Analysis, VARX models.*

TÜRKIYE'DEKİ ŞARTLI NAKIT TRANSFERI PROGRAMI BAŞVURULARININ

ÇOK BOYUTLU ZAMAN SERİLERİ İLE MODELLENMESİ

Özet

Şartlı Nakit Transferi (ŞNT), yoksulluk riski altında bulunan ailelerin çocuklarının düzenli olarak eğitim ve sağlık hizmetlerine erişiminin sağlanması ile bu ailelerin beşeri sermayelerini desteklemeyi amaçlayan bir sosyal yardım programıdır. Türkiye'deki ŞNT programı yoksul haneler arasında hızlı bir şekilde yayılmış ve bahse konu yardım programı için talep artmıştır. Yardım programı için bu talebin bilimsel olarak incelenmesi ihtiyacı bu çalışmayı gerekli kılmıştır. Bu çalışma ile Şartlı Nakit Transferi Programı için yapılan yardım başvuruları bağımlı değişkenli vektör otoregresif zaman serileri isimli çok boyutlu zaman serileri analizi ile coğrafi bölgeler temelinde modellenmiştir.

Anahtar Kelimeler: *Şartlı Nakit Transferi (ŞNT), Dinamik Eşzamanlı Denklem Sistemleri, Çok Boyutlu Zaman Serileri Analizi, VARX modeller.*

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1. INTRODUCTION

Being a social assistance program CCT, aims for decreasing poverty by means of cash transfers in the short run and aims for investing in poor' human capital by providing basic preventative health care, regular school attendance and nutrition in the long run. Under the state of these aims, starting from 1990s more than 20 countries in the world has implemented their own CCT program by the mediation or leadership of World Bank. The program in Turkey has started in order to eliminate the negative effects of economic crisis on poor in 2001 within the Social Risk Mitigation Project.

CCT program is implemented in many countries all over the world. It was started as a pilot social assistance program in the countries facing global crises such as Kenya and Pakistan. On the other hand, in countries such as, Colombia, Argentina, Brazil and Mexico, it is implemented as a large-scale social assistance program. Early experience of CCT program took place in Latin American Countries (LAC) where the risk of poverty is quite high. With the experience gathered from the implication of CCT in those countries, more sophisticated programs were introduced in Africa and Asia as well. As the main goals of the programs are achieved, impact assessments are done to evaluate the certain effects of the programs by the mediation or leadership of International Food Policy Research Institute (IFPRI). Although, these impact assessments provide information about the effects of the CCT on beneficiary people or households covered in the program, they still do not reveal information about when to reach the desired number of people to benefit from the program.

In our knowledge, almost in all CCT programs in the world, number of people or households to be covered in the program is determined (or guessed) before the program starts. However, during the implementation step of the CCT, this number is mostly exceeded and the number of people (or households) to be covered in the program even in the following weeks or months is mainly unknown. Besides, total number of people (or households) to apply for the CCT program, in the following weeks or months in any country where it is implemented, is unknown, as well.

An innovative study for determining the total number of applications and beneficiary households for the CCT program in Turkey was done as an expertise thesis (Ortakaya, 2010a). In thesis study, Autoregressive Conditional Heteroscedastic (ARCH) and Generalized Autoregressive Conditional Heteroscedastic Models (GARCH) were used to predict and to forecast the total number of applicants and beneficiary households for CCT program all over Turkey. This was a univariate case study and time varying applications and beneficiary households according to geographical differences was not taken into account. Besides, the geographical relations for the applicants (whether the application in one region has an increasing or decreasing effect on the applications of other regions) were not of interest (Ortakaya, 2010a). Hence, in this updated study, it is aimed to examine the unpredictable demands for the CCT

program in Turkey according to geographical regions. It is also aimed to show that the number of applicants for the CCT program in Turkey can be modeled by using multivariate time series analysis. (Further discussion in multivariate time series modeling can be found in literature see Bollerslev et al., 1988; Engle and Kroner, 1995; Engle, 2002; Brooks et al., 2003; Comte and Lieberman, 2003). By using this study, resources to be allocated for the CCT program in Turkey according to geographical regions and the number of people who are responsible for the implementation of the CCT can be re-planned. By using the required data, this study can also be extended for the CCT programs in other countries as well.

In order to obtain the demand for the CCT applications, the multivariate time series analysis considering all geographic regions in Turkey is used. The change in CCT applications are modeled by vector autoregressive model with exogenous variable (VARX) given as the household size. In almost all poverty studies, as the household size increases the risk of poverty increases. Due to this importance, the change of household size can provide information for determining the time varying behavior of applications for the CCT program in Turkey. Hence, household size is included as an exogenous variable model.

The remainder of this paper is organized as follows: In Section 2, CCT program in Turkey is described in detail. In Section 3, proposed model is defined. In Section 4, proposed model is applied to the CCT applications and obtained results are given. In the final section general evaluations and conclusions were drawn with the help of data analysis obtained by using the fitted model.

2. CONDITIONAL CASH TRANSFER PROGRAM IN TURKEY

CCT program has been started within the context of Social Risk Mitigation Project (SRMP) in Turkey. Under the CCT component of the investment portion, a social assistance program has been applied in order to invest in human capital of poor people and break intergenerational poverty chain by providing education and health supports (SYDGM, 2007). By the termination of SRMP on 31th of March 2007, applications under CCT were delivered to General Directorate of Social Assistances (GDSA).

2.1. The Aim of CCT Program in Turkey

Declared among the recent social assistances programs, CCT is aimed for transferring cash directly to poor who cannot access to education and health services provided by the state sufficiently. In a more explicit way, CCT is a social assistance program to provide cash support for poor families who are under the scope of Social Assistance and Solidarity Foundation Law and who cannot send their children to school or who have flunk their children from schools, and who cannot get or afford regular

health checks for their pre-school children or who cannot give a birth in a health institution.

The aim of CCT program is to make children of poor to let them continue to their education and to make poor families have their children aged between 0 - 6 health checked regularly. In addition, it is aimed for pregnant in poor families to give a birth in a health centers. The main aim of the CCT program is to create a positive attitude for poor families towards accessing education and health services by providing direct cash transfer so that the intergenerational poverty among them will be prevented.

2.2. Target Group, Goals and Components of The Program

Target group of the program is constituted by the families who cannot send their children to school or who cannot have their children's health-checked regularly, who do not belong to any social security institution, who do not have a regular income and who belong to the poorest community. The goals of the program are as follows:

* *To enable children of poor to continue their education by meeting education the costs like text books, school clothing, school fees that prevent children from going to schools,*

* *To enable poor families to benefit from health and nutrition services such as immunization, growth monitoring and troubleshooting in malnutrition disorder after the birth,*

* *To prevent from the birth risks during pregnancy by regular follow-ups before giving the birth, to have a fully scheduled vaccination after the birth, to avoid possible risk of anemia during pregnancy and to give a birth in hospitals or in health institutions (SYDTF, 2005).*

In order to achieve the goals of the CCT program by meeting the specific conditions for each sub-program, education, health and pregnancy supports are provided. Under the scope of education component, families who belong to the poorest proportion should register their children to schools and should make them continue their education at 80% attendance rate. Under the scope of health component, families who belong to the poorest proportion should visit the clinics or health centers regularly to have their children aged between 0-6 checked and have them vaccinated in schedule. They should also attend the health seminars in those clinics and health centers regularly. Under the scope of pregnancy support, pregnant women in families having the same socio-economic status as stated above should have regular health checks during their pregnancy period, and give birth in a health center.

2.3. Targeting Mechanism of CCT Program

Generally, different targeting mechanisms are employed in the social assistance programs. By using these mechanisms, poor households or individuals in poor households are targeted. There are other methods used for targeting the poor geographically. Sometimes combinations of these methods are applied. Three different approaches are used for targeting the poor households or individuals in poor households. These approaches are: Verified Means Testing (VMT), Unverified Means Testing (UMT) and Proxy Means Testing (PMT) (Castañeda and Lindert, 2005).

VMT is used in OECD countries where the households or the individual's income and expenditure can be measured, can be held in sophisticated databases and can be verified by using cross-checks from other national databases. VMT is accepted to be the most effective targeting mechanism in identifying the poor due to countries' low level of informal economy rate, existence of integrated database of assets, social insurance, banking and taxing systems (Castañeda and Lindert, 2005). However, this method cannot be widely used in developing countries. The main reasons are that administration, infrastructure and implementation costs are high. And the systems used in VMT are not commonly applicable in developing countries.

In the assessment of VMT method, conditions to benefit from the social assistance programs are determined. After that households apply for the desired social assistance program and the information they provide during application is verified and checked both by field visits and from the databases. The ones meeting the necessary requirements are considered to be eligible for the program. On the other hand, in the assessment of UMT method, the applicant household's or individuals' income is received according to their statements and these statements are not verified or only a limited number of them are verified by field visits. To measure the socio-economic level of households in local level, surveys are conducted and the gathered data are registered to central databases whenever possible. Different kinds of analysis are made using this unverified information, and the applicants are determined as beneficiary if they meet the conditions to benefit from a given social assistance program. Compared to the VMT method, UMT method is more economical and easy to apply. However, this method has disadvantages such as being inaccurate in measuring income and socio-economic level, becoming far from transparency and accountability, and letting some households or individuals to benefit from social assistance programs longer than they can (Adato 2000; Adato et al., 2000).

Due to the difficulty in measuring the income in an efficiently, in some LAC countries and in Turkey, PMT method is used for identifying the poor. In this method, poverty is considered as a multidimensional phenomenon. To apply this method, a statistical approach is used. First, households are selected by using various sampling techniques all over the country. After the sampling is done, questions are asked

to determine the socio-economic status of these households. Using the data gathered, regression models are fitted by using explanatory variables obtained from the questionnaires. When there are correlated variables, principle component analysis is mostly applied and smaller numbers of independent and uncorrelated variables are obtained.

Variables like; the development status of the residence area where the applicant's house is settled, the number of people living in the house, education level of each household, the number of children continuing in education in the house, working status and income of the total family members, the quality and quantity of goods in the house, etc. are included in the regression models so as to create a scoring formula for determining the household's socio-economic level. According to the result of analysis made, households or individuals who have a smaller score than the desired threshold point become eligible for the social assistance program (Ortakaya, 2010b).

PMT is considered as an effective targeting method for detection of extreme poor households and enabling them benefit from social assistance programs in the long-term. (Castañeda and Lindert, 2005). In order to use PMT for determining the poor households in CCT Program in Turkey, different indicators implying the socio-economic status of the family had to be determined. To obtain these indicators, "Beneficiary Assessment Research" was conducted (Özcan and Ayata, 2001).

The formula used in the beneficiary selection system of CCT is being updated. A new study on developing a scoring formula was started by GDSA. This study is carried out with the cooperation of The Scientific and Technological Research Council of Turkey (STRCT), Turkish Statistical Institute (TSI) and State Planning Organization (SPO). The aim of the study is to determine the poor households that apply for any of the social assistance programs as well as CCT. The differences in Nomenclature of Units for Territorial (NUTS) Statistics in Turkey, consumption and income per capita households and the applicants' socio-economic status are taken into account in within the developing steps of the new formula (Ortakaya, 2010b).

2.4. The Process of Application and Becoming Beneficiary in CCT

In order to benefit from CCT program, one should apply the SAS foundation in his/her district. First investigation is done by using the Integrated Information System for Social Assistance Services. Within this first investigation information like; addresses, copies of civil-family registration, employment status, unemployment insurance, short-time working allowance and job loss compensation, social assistance received including (CCT and Project Supports), home care allowance received, existence of social security, benefiting from health services and receiving allowance (assistance) according to the law no.2022, benefiting from green card services, owning property or planted area and owning a motor vehicle, being registered to tax system and run-

ning a business, getting a scholarship obtained by just providing a Turkish Identity Number for the applicants in few seconds (Ortakaya, 2010b).

Second investigation consists of home visits of applicant households by the social workers in SAS Foundations. They check whether the information that temporary beneficiaries has provided during the application is correct or not (SYDTF, 2005). The applicants' information is verified by the social workers by social investigation report. All these information and social investigation reports are presented to board of trustees of the desired SAS Foundation and final decision whether the applicant become beneficiary or not is given by them.

2.5. Monitoring System of CCT

In order to check whether the aims of the CCT program are satisfied, there should be a strong co-ordination and co-operation between the state institution that runs the CCT program, and health and education services that the state provides. The conditions that the beneficiaries should satisfy during the program are monitored by the help of Integrated Information System for Social Assistance Services.

Payments in CCT program are maintained depending on the beneficiaries' permanence in the program. In order households to continue benefiting from the CCT program, they should bring their children aged between 0-6 to clinics for their health checks and vaccinations where it was scheduled by the ministry of health. They should also make their children continue their education. Tracking of these both processes are held by feedbacks from e-school for education tracks and from Family Medicine Information System for health tracks.

Under the scope of education support sub-program of CCT, the children of beneficiary household should attend the school with 80% of attendance rate and s/he should not repeat the same term more than once.

Under the scope of health support sub-program of CCT, the beneficiary household should bring their children aged between 0-6 to clinics for health checks regularly. The schedule of the health visits are;

* *Children between 0-6 months old should be brought to clinics monthly for health checks,*

* *Children between 7-18 months old should be brought to clinics within every two months for health checks,*

* *Children between 19-72 months old should be brought to clinics within every six months for health checks.*

To benefit from pregnancy support of CCT program, the pregnant mother within the program should keep visiting the health clinics for health check on schedule where the visiting times are determined by the ministry of health. In order to benefit from this program pregnant mother should visit the health centers or clinics every month till birth and 2 months after the birth.

3. METHODOLOGY AND ANALYTICAL FRAMEWORK

In this study, the change in CCT applications in Turkey according to seven geographical regions is of interest. In time series modeling of applicants, household size is thought to provide additional information about the past and future observations. Hence, numbers of applications are modeled by VARX given as the household size. Moreover, a dynamic relationship between applicants according to geographical regions is of interest. Therefore, Systems of Dynamic Simultaneous Equations (SEM) model is used in this study.

3.1. Systems of Dynamic Simultaneous Equations

In practice, the generation processes are not affected only by the variables in the system. In fact, they are affected by the variables both within the system and as well as outside of the system. The variables within the system are called as endogenous and the ones outside the system are called as exogenous or unmodelled (Lütkepohl, 2005). A model with exogenous variables can have the structural form:

$$Ay_t = A^*_1 y_{t1} + ... + A^*_p y_{tp} + B^*_0 x_t + B^*_1 x_{t1} + ... + B^*_s x_{ts} + w_t \qquad 3.1.1$$

where $y_t = (y_{1t},...,y_{Kt})'$ is a K-dimensional vector of endogenous variables and $x_t = (x_{1t},...,x_{Mt})'$ is an M-dimensional vector of exogenous variables. A is a (KxK) matrix and shows the relations between the endogenous variables, B^*_i's are (KxK) and B^*_i's are (KxM) coefficient matrices, respectively and w_t is a K-dimensional error vector. When the error term is white noise, the model described in (3.1.1) is named as Vector Autoregressive Model with Exogenous Variables VARX(p,s), where p is the order of Autoregressive (AR) term and s is the order of exogenous variable. Generally, these models are called as dynamic simultaneous equations (SEM). (For more details in SEM see Doornik and Hansen, 1997).

3.2. Unconditional and Conditional Forecasts

To predict future values of the endogenous variables in dynamic SEM, corresponding values of exogenous variables should be known. In practice, however, those unmodelled variables are generally unknown. If the endogenous variables are generated by the reduced form then the optimal -step forecast can be obtained as given below:

$$y_t(h)=A_1y_t(h1)+...+A_py^t(hp)+B_0x_t(h)+...+B_sx_t(hs), \qquad 3.2.1$$

where $y_t(j):=y_{t+j}$ and $x_t(j):=x_{t+j}$ for $j \leq 0$, and the for $=1,2,...$ can be obtained in that manner since the forecasts are based on the forecasts of the exogenous variables for the forecast period. In this type of forecast, future values of exogenous variable should be estimated and they should be included in the forecasts of endogenous variable. Hence, the forecast error caused by the exogenous variable effects the forecasts of endogenous variable. (i.e. forecast errors of exogenous variable increases the forecast errors of endogenous variable.)

In some cases the future values of exogenous variables are known or can be controlled and the forecast of y_t is of interest. This type of forecast is called as .

3.3. Wald Test for Granger Causality

A former definition of causality can be expressed shortly as a cause cannot come after the effect (Granger, 1969). In other words, if a variable affects a variable , then should contribute improving the predictions of . Let Ω be the information set containing all relevant information up to and including period . Let $z_t(h|\Omega_t)$ be the optimal -step predictor of the process z_t at origin on the basis of the information in Ω_t. The forecast MSE can be denoted by $\sum_u(h|\Omega_t)$. The process x_t is set to cause z_t in Granger's sense if

$$\sum_u(h|\Omega_t) < \sum_z(h|\Omega_t/\{x_s|s \leq t\}) \text{ for at least one} =1,2,..., \qquad 3.3.1$$

If (3.3.1) holds, then x_t is Granger-causes or simply causes z_t. Moreover z_t can be predicted more efficiently if the information in x_t process taken into account in addition to all other information in the universe, then x_t is causal for z_t (Lütkepohl, 2005).

4. DATA COLLECTION AND DATA ANALYSIS

Data for modeling the total number of applicants (demands) changing over time were taken from CCT Program's database. By using this data, time-varying demands were examined and modeled with respect to geographical regions. For modeling the number of the applicants, data from May 2003 to June 2009 were used. Total number of CCT program applicants and the total household size of those applicants were grouped weekly according to geographical regions. Here the endogenous variable is the total number of applicants and the exogenous variable is the total number of people living in the house. For modeling the number of applicants, a total of 317 weekly data obtained between May 24, 2003 and June 20, 2009 was used and the possible number of applicants for the future observations was forecasted.
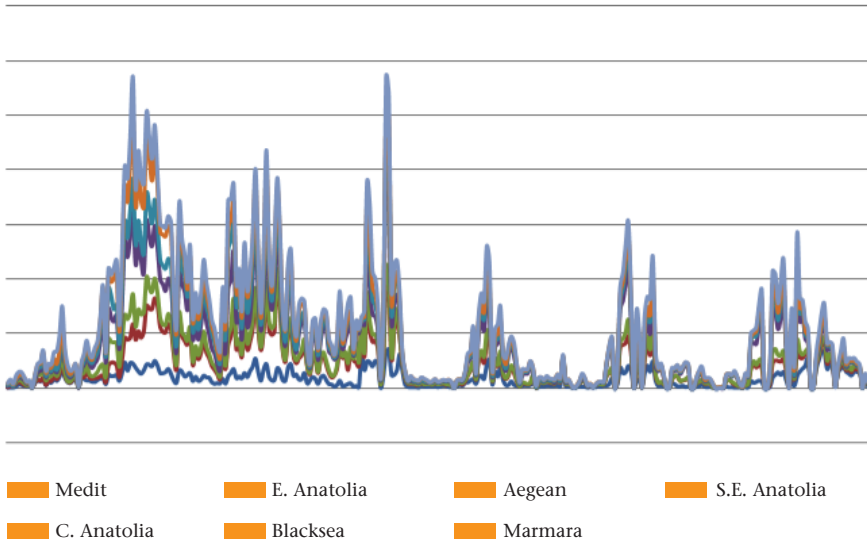
Medit   E. Anatolia   Aegean   S.E. Anatolia
C. Anatolia   Blacksea   Marmara

**Figure 1: Time Series Plot of Weekly Total CCT Program Applicants According to
Geographical Regions**

As it can be seen in Figure 1, during the pilot stage of the program in 2003, average
number of applicants all over Turkey was around 2,000. After 2004, by spreading out
the program all over the country, the total number of applicants rose up quickly. Es-
pecially in May of 2004 in Southeastern Anatolia Region, the corresponding number
increased through 30,000. Due to increase in the awareness of CCT program all over
Turkey, the number of applicants during the time period March 2003 through Janu-
ary 2006 were higher in number than the other time periods. It can also be inferred
from the Figure 1 that, after the July 2006, the volatility of the number applicants
with respect to geographical regions has decreased.

In this part of the study our concern is to investigate the relationship between total
the number of applicants in each regions. In other words, our aim is to learn if the
increase or decrease in demand for the CCT program in one region affects the de-
mand for the program in other regions. Due to socio-economic levels, geographical
distance and migration within the neighborhood regions, we may expect to discover
certain relations on the demands for the CCT program in a couple of regions. Espe-
cially, because of high ratio of migration rate in Mediterranean Region, demands in
there can be affected from demands in the other regions such as, Eastern and South-
eastern Anatolia.

Before starting to model the number of applicants for CCT program with respect
to geographical regions, checking the linear association between the endogenous

variable (total number of weekly applicants) and exogenous variable (weekly total household size) would be necessary. Hence, to detect this relation, a scatter plot of endogenous variable versus exogenous variables according to seven regions is used and strong positive linear association found between them.

In order to stabilize the variation in the endogenous variable Box-Cox transformation method is used. After trying several lambda values for each regions, 0.35 for Mediterranean, Central Anatolia and Blacksea Regions, 0.32 for Aegean and Marmara Regions, 0.42 for Eastern Anatolia Region and 0.39 for Southeastern Anatolia Region found to be applicable (For the lambda values of those series, the smallest AIC and SBC values are obtained). In order to keep the linear association between endogenous and exogenous variables the same transformation is applied to exogenous variable as well.

After the transformation is completed Augmented Dickey-Fuller (ADF) test is applied for both endogenous and exogenous variables for applicants in each region. According to test result there are no regular unit roots but there exist seasonal unit root. In order to get rid of seasonal unit root, seasonal differences for both endogenous and exogenous variables are taken and a VARX(p,s) model was fitted to the data. Since the data is differenced at lag seven (i.e. seasonally differenced), values including seven for p and s was tried. The smallest finite-population corrected Akaike Information Criteria (AICC) obtained when $p=(1,7)$ and $s=2$ without the constant term. Here, p shows the *Ylag* values and s shows the *Xlag* values. A more explicit form of the fitted VARX(7,2) model is given below:

$$y_t = A_1 y_{t1} + A_2 y_{t7} + B_0 x_t + B_1 x_{t1} + B_2 x_{t2} + w_t, \quad 4.1$$

where $y_t = (y_{1t}, ..., y_{7t})'$ is a seven-dimensional vector of endogenous variables (number of applicants for CCT program with respect to geographical regions) and $x_t = (x_{1t}, ..., x_{7t})'$ is a seven-dimensional vector of exogenous variables (household size of the applicants with respect to geographical regions). A_1 and A_2 are (77) and B_0, B_1, B_2 are (77) coefficient matrices, respectively, and w_t is a seven-dimensional error vector. According to significant model parameters by LSE of VARX(7,2), this model seems to fit reasonably good. DW statistics are closer to two for each individual variable. Besides, normality of the residuals for Aegean, Central Anatolia and Marmara Regions seem to be satisfied. The residuals from Eastern Anatolia and Blacksea Regions do not seem normal according to Normality Chi-square values obtained by SAS. However, p-values in Anderson Darling (AD) test statistics for checking the normality of residuals from Eastern Anatolia Region was found to be 0.103 and those for Blacksea Region was found to be 0.02 in MINITAB.
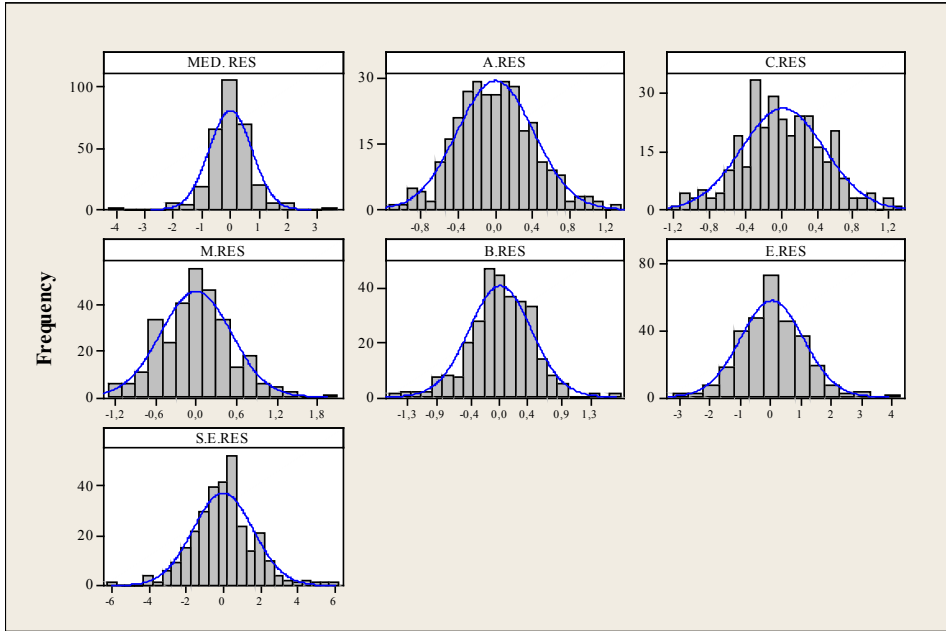
Figure 2: Histogram of the Residuals from Applicant Series According to Geographical Regions (Checked Distribution: Normal)

Now each of the fitted series and 10 forecasted values from the models above are plotted against the observed values for each geographical region. In order to obtain the forecasts, 10 last observations of the exogenous variables are used. (Since the exogenous variables are the total household size, it is not meaningful to have rapid changes in them). Besides, using unconditional forecasts results in higher forecast errors, so conditional forecast is used.

Table 1: Granger-Causality Wald Test for the Applicant Series

VARIABLES		TEST	DF	CHI-SQUARE	PR> CHI-SQUARE
GROUP 1	GROUP 2				
abast	dbast	1	2	4.9	0.0863
abast	gbast	2	2	8.74	0.0127
mbast	dbast	3	2	0.84	0.6581
mbast	gbast	4	2	7.29	0.0262

According to Wald Test presented in Table 1, the p-values for test two and test four are significant. Also p-value for the first test is closer to 0.05. This means that the to-

tal number of weekly CCT program applicants from Eastern Anatolia Region affects positively the total number of weekly CCT program applicants from Mediterranean Region (using the 10% significance level). Also, applicant series from Southeastern Anatolia Region affects positively the Marmara and Mediterranean Regions as well. In fact, Southeastern Anatolia Region, which has the highest number of applicants and beneficiary households in CCT program, has crucial importance on the behavior of applicants all over Turkey. It was also checked if the applicant series in Marmara and Mediterranean Regions have an effect on the applicant series Southeastern Anatolia Region and Eastern Anatolia Region. The applicant series in other regions was also checked if they have relation with any other applicant series of each region, and they were found to be insignificant by Wald Test at 10% of significance level.

5. CONCLUSION

CCT is a social assistance program which aims for increasing the accessibility to health and education services of poor families by enabling them to send their children to schools and making those families to visit health services regularly. In this program, the poorest people is targeted and their basic needs like education, health and nutrition are met so that, they tend to create a positive behavior on accessing health and education services. Thus, intergenerational poverty transfer among them is to be prevented.

There are two fundamental aims of the CCT program. It is aimed to decrease poverty by means of cash transfers directly in the short run, and it is aimed to invest in children's human capital by providing basic preventative health care, regular school attendance and nutrition in the long run. Under the state of these aims, countries implemented/implementing their own CCT programs considering the regional and local differences.

The CCT program in Turkey was started in order to decrease the adverse effects of economic crisis in 2001 within the SRMP which was financially supported by the World Bank, and was constituted under the SASF. Started as a pilot program in 2003, CCT has rolled-out all over the country and it was adopted by poor families within a short period. The demands for the program have increased significantly over years. To examine these demands over time geographically, multivariate time series models were used and future demands for the CCT program were forecasted.

In the pilot stage of the CCT program in 2003 weekly average number of applicants all over the Turkey was around 2,000. However, after 2004, by rolling out of the program all over the country, the total number of applications rose up quickly. It reached 30,000 in Southeastern Anatolia Region during May 2004. Considering the settlements of the applicants, 55% of them live in urban areas, whereas 45% of them live in rural areas. According to Address Based Population Registration System 2008

Population Census Results, proportion of population living in province and district centers is 75%, whereas proportion of the population living in rural areas is only 25%. According to this fact, the demand for CCT program in rural areas is almost twice of those in urban areas. This result can be verified by the TSI's poverty study revealing that the risk of poverty in rural areas is higher than that in urban areas. Especially with a higher family size, family size being equal or greater than seven, in rural areas the risk of poverty goes up to 50.26% whereas it is 33.14% in urban areas (TUIK, 2008). This surely explains why the tendency to apply for the CCT program in Eastern and Southeastern Anatolia Regions are higher when compared to other regions. Since, the average household size in Integrated Information System for Social Assistance Services for Eastern Anatolia Regions is greater than six, and it is greater than seven in Southeastern Anatolia Region.

In order to model the total number of weekly applicants from each geographical region for the CCT program, a VARX(7,2) model was fitted to data. After the insignificant parameters were removed from the model a restricted VARX(7,2) was obtained. Considering the significant parameters in restricted VARX(7,2) model for the applicants, it can be inferred that the time-varying applicants in regions have an effect on the applicants in neighborhood of the corresponding regions. For example, applicant series in Mediterranean Region is highly affected and explained by household size of that region, its past values and applicants in Eastern and Southeastern Anatolia Regions. According to Wald Test for Granger Causality results for those three regions, applicant series in Eastern and Southeastern Anatolia Regions have a positive effect on the applicants of Mediterranean Region. This is meaningful under the scope of migration phenomenon. Poor families in Eastern and Southeastern Anatolia Regions move/immigrate to Mediterranean Region for a possibility of job and a better standard of living conditions. This results in an increase in the poor population of Mediterranean Region. Besides, these families have high number of household size which makes them vulnerable to decent shocks, economic crises, and these factors increase their risk of poverty. Due to problems that they may face, after they have migrated to a new city or region, it is inevitable for them to apply for the CCT program where they have moved or migrated. In other words, they use the past information about CCT program that they have gathered where they have moved from. This explains the positive relation between applicant series in Mediterranean Region and applicant series in Eastern and Southeastern Anatolia Regions.

Migration discussion can be extended for the regions in the neighborhood of the other regions as well. But the main interest in this study is to analyze the effects of high number of applicants (more than 885,000 applicants) for CCT Program in Eastern and Southeastern Anatolia Regions on the other regions. For example, Marmara Region having the highest density of population in Turkey should be affected by the migrants from other regions in terms of applicants of the CCT program. However

it was not the case according to our VARX(7,2) model. This can be explained due to structural form of scoring formula used in the CCT program for determining the poorest in that region. Household size for the migrants are important to increase the chance of being beneficiary, but the parameter weight of Marmara Region in scoring formula is not as high as Mediterranean, Eastern or Southeastern Anatolia Regions. So, poor migrants from Southeastern or Eastern Anatolia Regions may not become beneficiary easily in the CCT program when they apply it in Marmara Region compared to the applicants in Eastern or Southeastern Anatolia Regions.

Considering the recent economic crises in Turkey that broke out in the middle of 2008, one may expect that application for the CCT program tend to increase after that period. However, it was not the case. As seen in Figure 1, the tendency to apply for the CCT program in 2007 is similar to those in 2008. The highest application rate in those years is observed between time period August and December which seem to follow a seasonal behavior.

To conclude, CCT is a large-scaled social assistance program in Turkey, as well as in many countries in the world. Most of the CCT Programs in the world was started by recent shocks or economic crises by the mediation or leadership of World Bank. These programs are implemented by the help of experience (impact assessments, fieldworks and academic studies) and evidence in the prior programs of CCT. These studies are quite helpful in the implementation period of CCT programs in candidate countries that may start a new CCT program. As it is mentioned in introduction part such studies do not reveal information about when to reach the desired number of people to benefit from the program and whether number of applicants tend to change in specified periods (such as in specified months or weeks). This study is quite helpful to show that demands for the CCT programs can be modeled and predicted by using scientific approaches given the necessary data. Also this study can be extended for the other CCT programs in other countries as well.

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