FORECASTING ECONOMIC GROWTH RATE: THE CASE OF NORTH CYPRUS

Turgut TÜRSOY*

ABSTRACT

While GDP is a key indicator of economic activity, it is unfortunately published quite late in North Cyprus. In order to make more accurate forecasting, an auto-aggressive moving average (ARMA) model was used in this study to forecast the real growth rates of the economy. The growth forecasting models that was developed is based on the Box-Jenkins approach which identifies the models, and was used to apply it to *ex-ante* forecasting. The results indicate that the forecasts relating to the *ex-post* period real growth rates, that the developed models gave, were reasonably accurate. Based on this result an attempt is made to forecast the *ex-ante* period real growth rates of North Cyprus.

Jel Classifications: C53, E37

Keywords: *ARMA Models, Forecasting, Box-Jenkins, Model Selection.*

ÖZET

EKONOMİK BÜYÜME ORANININ TAHMİNİ: KUZEY KIBRIS ÖRNEĞİ

GDP, ekonomik faaliyetlerin en ciddi göstergelerinden biri olmasına rağmen, Kuzey Kıbrıs'ta bu veriler oldukça geç yayınlanmaktadır. Bu yüzden ekonomide daha isabetli tahmin gerçekleştirebilmek için mevcut veriler kullanarak ARMA Modeli ile ekonominin reel büyüme oranları tahmini yapılmıştır. Ekonomik tahmin modelleri Box-Jenkins yaklaşımı temelinde belirlenerek ex-ante tahminleri için kullanılmıştır. Sonuçlar, elde edilen ex-post dönem reel büyüme tahminlerinin, makul seviyede isabetli olduğunu göstermektedir. Bu sonuçlara dayanarak bu çalışmada Kuzey Kıbrıs'ın reel ex-ante büyüme oranlarının tahminleri yapılmaya çalışılmıştır.

Jel Sınıflandırması: C53, E37

Anahtar Kelimeler: *ARMA Modelleri, Tahmin, Box-Jenkins, Model Seçimi.*

* Yrd. Doç. Dr., Yakın Doğu Üniversitesi, Bankacılık ve Finans Bölümü (ttursoy@neu.edu.tr)

Introduction

Information on the current state of economic activity is a crucial ingredient for policy making, as the choice of the appropriate policy stance relies on updated knowledge of the macroeconomic framework (see Baffigi et al*.*, 2004). In North Cyprus, unfortunately, important economic indicators that provide a comprehensive picture of the overall economy are published after substantial time lags. Mitchell (2009) provides an explanation for the same situation of time lags that; "inevitably… means that economists and policymakers neither know where we are now, nor yet where we might be in the future". When national data are available with substantial delay, this weakens their role as a support to policy making and understanding the economic situation earlier or at the necessary time. This is also explained by Schumacher & Breitung (2008) that macroeconomic policy-making in real-time faces the problem of needing to assess the current state of the economy with incomplete statistical information and important economic variables are released with considerable time lags. As a key indicator of real economic activity, GDP and its growth rate are published with a considerable delay. Therefore, in order to understand where the economy is now, there is a need for forecasting the *ex ante* economic variables. Policy actions that have an impact on the economy take time to show effect. Therefore, in order to formulate current policy, policymakers must rely on forecasts of future economic activity. Giannone et al. (2008) states that monetary policy decisions in real time are based on assessments of current and future economic conditions using incomplete data. Because most data are published with time lags or delays, and therefore both forecasting and assessing current conditions are important tasks for authorities.

The purpose of this study is to forecasts real GDP growth rates of North Cyprus economy. GDP is an important indicator as it represents an overall measure of the status of the economy. However, GDP data is published with some delay in all economies. In the case of North Cyprus, delay is substantially large (one year) and therefore, building models for forecasting GDP growth would be a very valuable contribution to the policy makers. Thus, this paper attempts to forecast real GDP growth rates using Box-Jenkins approach to choose which models to use. While there are studies[1] on various aspects of the economy of North Cyprus, so far there has not been to the best of my knowledge any study aimed at forecasting the economic growth rates in the country.

[1] Katircioglu (2006) & Feridun et al. (2011).

1. Literature Review

There are several studies[2] that forecast the real GDP growth. Ashiya (2005) examined the real GDP forecasts of 38 Japanese private institutions over the past 22 years. Clements et al. (2007) analysed the Federal Reserve Green book forecasts of real GDP, inflation and unemployment for the period 1974-1997. Mitchell (2009) considers forecasting quarterly GDP growth by directly using both regression and factor based models. Banbura & Rünstler (2011) derive forecast weights and uncertainty measures for assessing the roles of individual series in a dynamic factor model (DFM) for forecasting the euro area GDP from monthly indicators. This study use the model to forecast euro area GDP growth rates from a set of 76 monthly series, comprising real activity measures, financial data and surveys.

A forecast might reasonably be judged “successful” if it was close to the outcome, but that judgment depends on how “close” is measured (Clements & Hendry, 2004, p. 5). Ascher (1978, p. 1) stated that the art of forecasting is intrinsically difficult. The challenge facing a policy-maker is to decide whether and how to use the projections supplied by forecasting specialist, in the light of the problematical nature of forecasting (Ascher, 1978, p. 1). However, policy-makers continually use forecasts. Therefore, the accuracy of the forecasts is needed to be evaluated. Ashiya (2005) state that accuracy of real GDP growth forecast is crucial to those who look to real GDP as a guide to what is happening to the economy. There are numerous studies that investigate the accuracy and rationality of forecasts.[3] For example, Batchelor & Dua (1991) develops tests for rationality in forecasts made by economists who contribute to the Blue Chip Economic indicators consensus forecasting service, and tries, by means of a questionnaire on forecasting methods, to determine why some forecasters appeared more rational than others. Jansen & Kishan (1996) examine the accuracy, reliability and efficiency of U.S. Federal Reserve System green book forecasts. Joutz & Stekler (2000) explain that, to successfully implement monetary policy the Federal Reserve System (FED) must make forecasts about the future state of the economy. This paper examines some of the characteristics of these forecasts. Ashiya (2005) investigates accuracy of the forecasts relative to naive forecasts, VAR, VECM, and the Japanese government.

---

[2] Romer & Romer (1996); Joutz & Stekler (2000); Diron (2006); Ashiya (2005, 2007); Mitchell (2009); Banbura, et al. (2010).

[3] Batchelor & Dua (1991); Jansen & Kishan (1996); Joutz & Stekler (2000); Ashiya (2005).

2. The Methodology

In this section, the macroeconomic modelling will be discussed to see whether it could be used to develop models to explain the growth expansion in North Cyprus. After the models to be used have been chosen, they are used to predict the forecasts of real economic growth rates for North Cyprus.

Univariate time series models forecasts by relating a variable's future values to its past values. The trend, cyclical, seasonal and random components contained in stationary series can usually be described by either an Autoregressive (AR) process in which there is dependence between the successive observations in the series, or a Moving Average (MA) process in which there is dependence between the successive error terms (Griffith & Vere, 2000, p. 156). Joyeux & Abelson (2000, pp. 24-25) point out that the key attempts to approximate a more complex reality that has also been used widely in forecasting is the Autoregressive Moving Average (ARMA) model, based especially on Box & Jenkins (1976) approaches. The autoregressive part corresponds to the regression of the variable against itself. The residual correspond to the moving average part. Adding the moving average part to the model allows forecasts to compensate for previous forecasts errors. ARMA models have been found to perform extremely well for short horizon forecasting (see Joyeux & Abelson, 2000, p. 25).

The details of an ARMA model might be described briefly as follows. In the ARMA model, the key feature of the modelling is the way that the model deals with lags in the time series and in the residuals. A series is called to follow an ARMA *(p,q)* process when it can be modelled as an ARMA model with p lags of the series and q lags in the residual. A process y_t follows an autoregressive process of order p if the present observation y_t is a function of past observation going back p periods:

$$y_t = \varphi_1 y_{t-1} + \varphi_2 y_{t-2} + \dots + \varphi_p y_{t-p} + \varepsilon_t \tag{1}$$

where y_t is the t^{th} observation (t = 1,2,..., T) on the variable to be modelled after subtracting its mean. ε_t is an error term with zero mean and constant variance that is not autocorrelated. Such an error term is usually called white noise. A more parsimonious representation is reached by including q lags of the error terms. Such a model is an ARMA *(p,q)* model:

$$y_t = \varphi_1 y_{t-1} + \varphi_2 y_{t-2} + \ldots + \varphi_p y_{t-p} + \varepsilon_t - \theta_1 \varepsilon_{t-1} - \theta_2 \varepsilon_{t-2} - \ldots - \theta_q \varepsilon_{t-q} \quad (2)$$

where ε_t is a white noise process. These models describe stationary time series process in which the residuals are serially independent and are randomly distributed as a white noise process. To develop a univariate time series model for forecasting the real growth rate, the general form of ARMA model is as follows: ARMA (p,q)

$$\left(1 - a_1 L - \cdots - a_p L^p\right) y_t = \left(1 + \beta_1 L + \cdots + \beta_q L^q\right) \varepsilon_t \quad (3)$$

where the *a(L)* and *β(L)* are the AR and MA components of order p and q respectively.

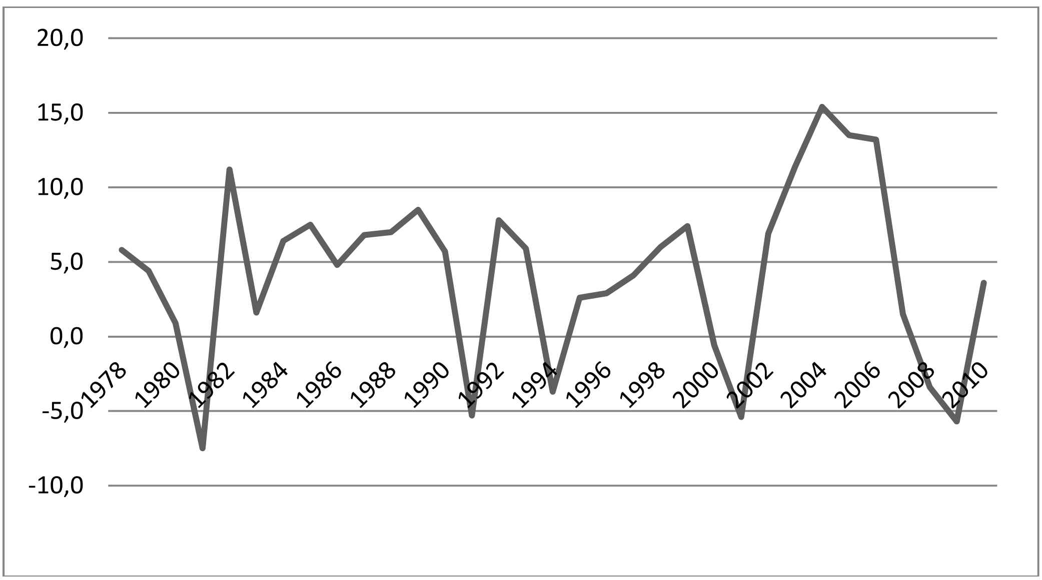
ARMA models are the centrepiece of the Box-Jenkins framework. ARMA models are simple combinations of the autoregressive and moving average models, and they have the potential to approximate the dynamics more parsimoniously than purely autoregressive or moving average models (Diebold, 1998). Harvey & Todd (1983) specify that, in the traditional Box-Jenkins framework, the main tools for specifying a suitable model are the correlogram and, to a lesser extent, the sample partial autocorrelation function. Box and Jenkins popularized a three-stage method aimed at selecting an appropriate model for the purpose of estimating and forecasting a univariate time series (Enders, 2004, p. 76). The way to find the best fitted model (ARMA) is to use the Box-Jenkins steps, namely; identification, estimation and diagnostic check. First step include deciding the order lag for model to require the accurate model. Of course, with *acf* and *pacf* from correlogram and graphical view provide necessary information about the time series lag structure. The second way to conclude lag structure is using a AR (1) technique to know with residual to the maximum lag length. Last step is to have whether the specified model is accurate. Although, first the models run out and then finding the best fitted model with the other models for using AIC, SBC, and *acf*, *pacf* or Ljung-Box test.[4] The diagnostic test for specified model in selection process is to using autocorrelation test. This is the usual way to find parsimonious model and this is the way to find the best in all alternative models. In this study, ARCH and White heteroskedasticity tests are also applied for diagnostic tests.

[4] Enders (2004) stated that AIC and SBC parameters are used to select parsimonious model.

3. Forecasting Real Growth Rate for North Cyprus

In this section, the applications of the univariate time series approach were estimated with the construction of models for forecasting the yearly real growth rate of North Cyprus. The yearly time frame was chosen; because of the data availability from the State Planning Organization is on an annual basis. The pattern of the real growth rate is showing high peaks and troughs (see figure 1). This is showing a non-stable economic growth path for North Cyprus in the period of 1978-2010. Economic growth forecasts are thus important task for providing information about future prospects of the economy.

Figure 1: Yearly Real Growth Rate of North Cyprus, 1978-2010



The Box-Jenkins method of identification, estimation, diagnostic checking and forecasting incorporates both judgmental subjective elements and quantitative elements in the formal statistical estimation and validation procedures (Griffith & Vere, 2000, p. 165-166). Univariate time series modelling stresses the derivation of structures which adequately explain the series pattern. When such a model has been determined, it can be used for forecasting to obtain future values of the data series.

Table 1: Unit Root Tests for Real Growth Rate

TEST		Levels		First Differences	
	k	Test statistics	*P* value	Test statistics	*P* value
Augmented Dickey-Fuller	1	-3.269	0.0286	-4.344	0.0026
Philips-Perron	1	-3.007	0.0491	-4.854	0.0008

k: lag length. The unit root tests were produced with an intercept and with one lag term. The lag length was determined by the general to specific procedure.

First step in the identification process is to determine the characteristic of the stationarity of the data. A number of unit root tests were performed on the real growth rate data and the results are reported in Table 1. These test confirm that, at the level, real growth rate series is I(0) or is a stationary series.[5]

Table 2: Estimated Models of the Real Growth Rate

	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*[a]
	$p = 1$ $q = 1$	$p = 1$ $q = 1, 4$	$p = 2$ $q = 1$	$p = 2$ $q = 1, 4$	$p = 2$ $q = 1$
a_0	4.469 (2.383)	4.851 (3.047)	2.795 (0.828)	4.685 (6.137)	4.293 (4.978)
a_1	0.077 (0.183)	0.738 (2.450)	1.368 (5.248)	1.064 (3.908)	1.282 (6.436)
a_2			-0.575 (-2.503)	-0.521 (-2.391)	-0.634 (-2.982)
β_1	0.483 (1.253)	-1.635 (-3.739)	-1.741 (-3.086)	-1.541 (-3.020)	-1.738 (-4.266)
β_4		-0.376 (-0.796)		-0.496 (-0.923)	
D_{crises}					-7.369 (-2.547)
$\bar{R}^2$	0.15	0.58	0.67	0.69	0.78
AIC	154.9	139.6	134.2	133.6	125.9
SBC	158.3	144.1	138.8	139.3	131.6
Heteroskedasticity: *White*	[0.543]	[0.681]	[0.277]	[0.728]	[0.900]
ARCH	[0.760]	[0.992]	[0.822]	[0.568]	[0.343]

[5] It is observed that the data used in model construction are stationary, thus only ARMA models will be considered further.

***Q*(8)**	5.099 (0.531)	14.250 (0.014)	7.898 (0.162)	4.447 (0.349)	4.125(0.532)
***Q*(12)**	6.006 (0.815)	15.147 (0.087)	9.253 (0.414)	5.446 (0.709)	5.994(0.740)
***Q*(16)**	7.191 (0.927)	15.318 (0.288)	10.128 (0.683)	6.591 (0.883)	10.736(0.633)

Notes: Each coefficient is reported with the associated *t*-statistics for the null hypothesis that the estimate value is equal to zero. P-values are represented in square brackets. For comparability, the AIC and SBC values are reported for estimations. These criteria can be used to aid in selecting the most appropriate model; the smallest values are preferred. *Q(n)* reports the Ljung-Box *Q*-statistic for the autocorrelations of the *n* residuals of the estimated model. Significant levels are in parentheses.
[a] D_{crises} denotes that dummies of crises was included in the estimated model.

ARMA models for the real growth rate series is identified estimated and applied (table 2). Five ARMA models for the real growth rate, which differ in terms of their *p* and *q* components, are identified, estimated and three of them applied to have both *ex post* and *ex ante* forecasts. These models show that it is possible to construct different models for forecasting the real growth rate series with changing the AR and MA components. To having different models allows the model's forecasts to be comparatively evaluated. The models are identified and estimated using yearly data on the real growth rate from 1988 to 2010. Sixteen lags used in the calculation of the *Q*-statistics. With the *(p,q)* notation and *t*-values in parentheses, the estimated ARMA(*(p,q*) models are given above.

The terminology ARMA (1,1) indicates that there is AR(*p*) term (*p*=1) and MA(*q*) term (*q*=1). The *t*-statistics under the estimated coefficients indicate low levels of significance, all coefficient are statistically insignificant. Also, the adjusted R^2 suggests that a substantial part of the variation in the real growth rate is unexplained by this model. In the second model, the ARMA (1,1) model estimated with an additional moving average coefficient at lag 4. The coefficient of the estimated ARMA(1,(1,4)) model are highly significant with *t*-statistics of 3.047, 2.450 and -3.739 except the MA(4) term. Forming the Ljung-Box *Q*-statistic for 8 lags of residuals yield a value of 14.25; it can be reject the null that *Q*(8)=0 at the 5 percent significant level. Hence, the lagged residuals of this model show substantial serial autocorrelation. In the third model, there are two term of AR and one term of MA. The residuals are white noise, and more than half of the variation in the real growth rate is explained. The coefficients of the estimated ARMA(2,1) model are highly significant. In the model of ARMA(2,(1,4)), there are two terms of each AR and MA type. The residuals are white noise, and a similar portion of the variation explained with this model when it is compared with the previous one. The *Q*-statistics indicate that the autocorrelations of the residuals are not significant. Notice that all coefficients have significant *t*-values except MA(4) term. In the Model 5, ARMA (2,1) model estimated with additional dummy variable for crises. D_{crises} represent crises dummy variable such that the value of dummy is one during the crisis period and zero otherwise. Gunsel (2007) states that the North Cyprus economy has experienced two banking sector distress periods; the first took place in 1994 and the second took place in 2000s. Therefore, the crises dummy was added to the model for the years of 1994 and 2001 to check whether crises have any effects on the real growth rate. The coefficient of the dummy has been negative and it was statistically significant.

To evaluate whether the models are correctly specified, White heteroskedasticity and ARCH tests in the residuals are applied to the models. Table 2 reports *p*-values from tests of the null hypotheses of no ARCH and no heteroskedasticity. It could be note that these hypotheses cannot be rejected at conventional significance levels for any models.

The estimates from the models show that the real growth rate of North Cyprus can be described by different ARMA processes. The model 3, 4 and model 5 would be appropriate for forecasting real growth rates. Growth forecasts were produced for each three models, over the known data from 2002 to 2010 (*ex post* forecasts) and further than the known data to 2013 (*ex ante* forecasts) (table 3). The accuracy of the *ex post* forecasts was estimated by comparison with the actual data and forecasts based on the Mean Absolute Percent Errors (MAPE), Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) methods (table 3).

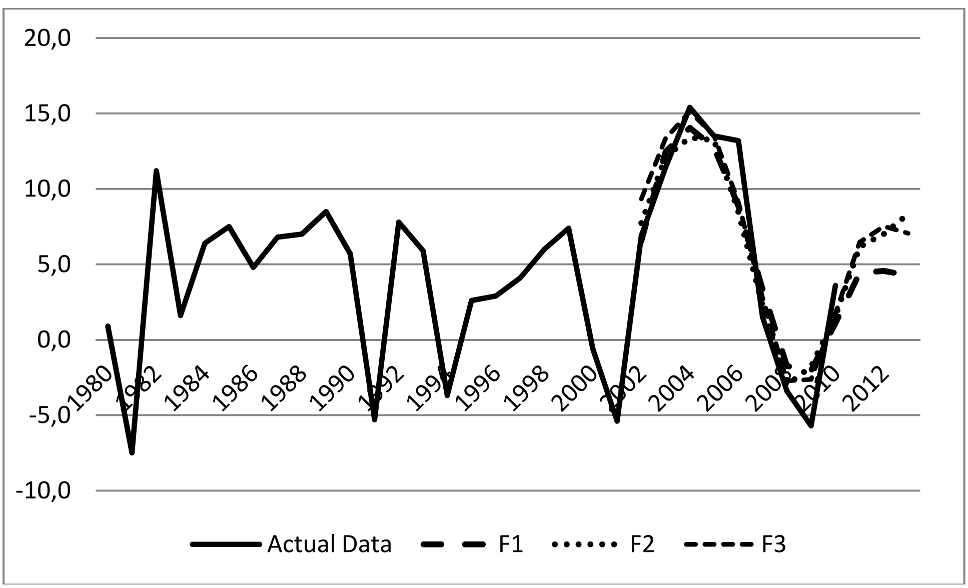
Table 3: Forecasts of Real Growth Rate

		Forecasts			**Mean Absolute Percent Errors**		
Year	***Actual Data***	***Model 3***	***Model 4***	***Model 5***	***Model 3***	***Model 4***	***Model 5***
2002	6.9	6.52	7.73	9.33	0.05	0.12	0.35
2003	11.4	12.46	12.13	13.34	0.09	0.06	0.17
2004	15.4	14.05	13.40	15.12	0.08	0.13	0.02
2005	13.5	12.75	13.23	13.54	0.05	0.02	0.00
2006	13.2	8.88	8.48	9.12	0.32	0.35	0.31
2007	1.5	3.35	2.24	2.78	1.23	0.49	0.85
2008	-3.4	-1.74	-3.00	-2.72	0.48	0.11	0.20

2009	-5.7	-2.04	-1.78	-2.62	0.64	0.68	0.54
2010	3.6	1.10	1.55	*1.71*	0.69	0.56	0.52
2011	-	*4.42*	*6.15*	*6.47*	-	-	-
2012	-	*4.56*	*7.01*	*7.52*	-	-	-
2013	-	*4.27*	*8.34*	*7.05*	-	-	-
MAPE					**0.408**	**0.284**	**0.329**
RMSE					**2.311**	**2.306**	**2.147**
MAE					**1.947**	**1.740**	**1.743**

The assessment of the forecasting performance of the ARMA(2,1), ARMA(2,(1,4)) and ARMA(2,1) with crises dummy can be done by using the mean absolute percent errors tests. The three models were estimated using all available observation through 2010 and nine *n*-step-ahead forecasts were obtained.

Figure 2: Actual Growth Rate and Forecasts



When evaluate over nine year period, the MAPE result indicated that each of the three models produced reasonable *ex post n*-step-ahead growth forecasts. Makridakis (1993) argued that MAPE (mean absolute percentage error) is a relative measure that incorporates the best characteristics among the various accuracy criteria. The mean absolute percent error of the model 3 was 40 percent; the means of the model 4 and 5 were 28 percent and 32 percent, respectively. As such, there is an advantage in the forecasting performance of the model 4. However, Model 3 forecasts for the period of 2011 to 2013 were close to the predictions of State Planning Organization (SPO). The SPO's predictions for the years between 2011 and 2013 were 4.21%, 3.97% and 4.09%, respectively.

All models substantially estimated actual growth rate in the years between 2002 and 2005 and succeed to predict the continued growth expansion start with 2003 till 2006. Also, the models succeed to predict the unusual negative growth rates in the years 2008 and 2009. These negative values could be explained by the global crises in the world that started at the year of 2008. Thus, estimated growth rates responses do accurately reflect what happening in the real growth rate in the *ex post* forecasts period. Thus, the univariate time series models did a reasonable job of forecasting the real growth rates in the past periods, hence, these models used to obtain future forecasts until the year of 2013 like the State Planning Organization. However, the high growth rate in the 2006 and the low growth rate in 2007 failed to predict accurately by the models. Also, all models failed to predict accurately the growth rates in 2006 till 2010. However, the succeed forecasts would have been expected to have substantially smaller forecasts errors. As a result, it is important to recognise that the MAPE result of the three models produced reasonable *ex post* *n*-step-ahead growth forecasts. With this paper, it is assumed that the *ex ante* forecasts of real growth rate might be helpful to understand the future movements in the North Cyprus economy.

Conclusion

Statistical data on the current state of the economy is crucial to policymakers to early understanding the economic situation. However, the national data of GDP and its growth rates are released usually with a delay. Therefore, forecasts are made essentially because they are useful to the policymakers to understanding the current state and the future prospects of the economy. Time series forecasting involves attempting to forecast the future values of a series given its previous values and error terms. ARMA model states that the current value of a series depends on its own previous values plus a combination of current and previous values of an error term. Therefore, the forecasts of the real growth rates of North Cyprus are obtained with the ARMA models. GDP as a key indicator of real economic activity is published with considerable delay in North

Cyprus; therefore, the real growth rate of GDP is selected in this study to providing forecasts for *ex-post* and *ex-ante* periods. The construction of the real economic growth forecasting models follow the Box-Jenkins time series procedures of identifying the underlying time series components of the forecasts series, estimating the models and applying it to *ex ante* forecasting. The estimates of the models showed that the real growth rate can be described by different ARMA processes. Estimated three models used to generate *ex post* and *ex ante* forecasting for the real growth rate. Growth forecasts were produced for each model, both over the known data from 2002 to 2010 and further than known data to 2013. It was found that Model 3 *ex ante* forecasts of real growth rates were close to the SPO's predictions for the years between 2011 and 2013. Also, the accuracy of the forecasts was estimated with the forecast performance measures.

BIBLIOGRAPHY

Ascher, W. (1978). *Forecasting, an Appraisal for Policy-Makers and Planners*. London: The Johns Hopkins University Press.

Ashiya, M. (2005). "Twenty-two Years of Japanese Institutional Forecasts". *Applied Financial Economic Letters*, 1, 79-84.

Ashiya, M. (2007). "Forecast Accuracy of the Japanese Government: Its Year-ahead GDP Forecast is too Optimistic". *Japan and the World Economy*, 19, 68-85.

Baffigi, A., Golinelli, R. & Parigi, G. (2004). "Bridge Models to Forecast the Euro Area GDP". *International Journal of Forecasting*, 20, 447-460.

Banbura, M., Giannone, D. & Reichlin, L. (2010). "Nowcasting". *ECB Working Paper Series No. 1275.*

Banbura, M. & Rünstler, G. (2011). "Look into the Factor Model Black Box: Publication Lags and the Role of Hard and Soft Data in Forecasting GDP. *International Journal of Forecasting*, 27, 333-346.

Batchelor, R. & Dua, P. (1991). "Blue Chip Rationality Tests". *Journal of Money, Credit and Banking,* 23 (4), 692-705.

Box, G. & Jenkins, G. (1976). *Time Series Analysis, Forecasting, and Control,* San Francisco: Holden Day.11

Clements, M. P. & Hendry, D. F. (2004). "An Overview of Economic Forecasting". In M. P. Clements and D. F. Hendry (Eds), *A Companion to Economic Forecasting* (pp.1-18). Australia: Blackwell.

Clements, M. P., Joutz, F. & Stekler, H. O. (2007). "An Evaluation of the Forecasts of the Federal Reserve: A Pooled Approach". *Journal of Applied Econometrics*, 22 (1), 121-136

Diebold, F. X. (1998). "The Past, Present and Future of Macroeconomic Forecasting". *Journal of Economic Perspectives*, 12, 175-192.

Diron, M. (2006). "Short-term Forecasts of Euro Area Real GDP Growth, an Assessment of Real-time Performance Based on Vintage Data". *ECB Working Paper No. 622.*

Enders, W. (2004). *Applied Econometric Time Series.* John Wiley and Sons. 2nd Edition.

Feridun M., Sawhney, B. & Shahbaz, M. (2011). "The Impact of Military Spending on Economic Growth: The Case of North Cyprus". *Defence and Peace Economics,* 22 (5), 555-562

Giannone, D., Reichlin, L. & Small, D. (2008). "Nowcasting: The Real-time Informational Content of Macroeconomic Data". *Journal of Monetary Economics,* 55, 665-676.

Griffith, G. & Vere, D. (2000). "Forecasting Agricultural Commodity Prices. In P. Abelson & R. Joyeux (eds.). *Economic Forecasting* (pp. 151-174). Australia: Allen & Unwin.

Günsel, N. (2007). "Financial Ratios and the Probabilistic Prediction of Bank Failure in North Cyprus". *European Journal of Scientific Research,* 18 (2), 191-200.

Harvey, A. C. & Todd, P. H. J. (1983). "Forecasting Economic Time Series with Structural and Box-Jenkins Model: A Case Study". *Journal of Business & Economic Statistics,* 1 (4), 299-307.

Jansen, D. W. & Kishan, R. P. (1996). "An Evaluation of Federal Reserve Forecasting". *Journal of Macroeconomics,* 18 (1), 89-109.

Joyeux R. & Abelson, P. (2000). "Forecasting Methods: An Overview". In P. Abelson & R. Joyeux (eds.). *Economic Forecasting* (pp. 17-49). Australia: Allen & Unwin,

Joutz, F. & Stekler, H.O. (2000). "An Evaluation of the Predictions of the Federal Reserve". *International Journal of Forecasting,* 16 (1), 17-38.

Katircioglu, S. T. (2006). “Causality Between Agriculture and Economic Growth In a Small Nation under Political Isolation: A Case from North Cyprus”. *International Journal of Social Economics,* 33 (4), 331-343.

Makridakis, S. (1993). “Accuracy Measures: Theoretical and Practical Concerns”. *International Journal of Forecasting,* 9 (4), 527-529.

Mitchell, J. (2009). “Where Are We Now? The UK Recession and Nowcasting GDP Growth Using Statistical Models”. *National Institute Economic Review No. 209.*

Romer, C. D. & Romer, D. H. (1996). “Federal Reserve Private Information and the Behavior of Interest Rate”. *NBER Working Paper No. 5692*.

Schumacher, C. & Breitung, J. (2008). “Real-time Forecasting of German GDP Based on a Large Factor Model with Monthly and Quarterly Data”. *International Journal of Forecasting*, 24 (3), 386-398.