

A Macroeconomic Model for North Cyprus

MEMNC

Gazi Özhan (European University of Lefke)

Yinchu Wang (China Economic Information Network of the State
Information Center)

Meral Özhan (European University of Lefke)

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1. Introduction

- A macroeconomic model makes simpler to simulate and forecast the consequences of the choices on the economy in the medium and long term.
- There are other roles of models which justify any attempt to build one for any economy big or small. For example, ‘building models assists and test economists’ understanding on how the economy works’ (Werling, 2010). For more on macroeconomic modeling one should read Almon (2008).

- In the case of North Cyprus, our aim is to build a working model of the economy which enables the policy makers to evaluate the past trends of the main economic aggregates, forecast their possible time paths in the future, and finally, design alternative development programs.

2. Source of Data

- State Planning Organization (SPO) is the main institution that collects and collates the basic statistics about the North Cyprus economy. All available data on the national income are available only on annual basis. Quarterly data are not produced yet.
- Although there is no data concerning Input-output tables, there are some basic statistics on this website.
- There are 36 Excel tables from which we were able to identify the variables (series) that formed the basis of our macroeconomic model.

- Extraction of data from the source tables was not so simple. During the process it is detected that for the following 7 variables GDP deflator is used to convert the current values of these variables to constant values:
 - 1. Private disposable income
 - 2. Public disposable income
 - 3. Private consumption
 - 4. Public consumption
 - 5. Private investment
 - 6. Public investment
 - 7. Inventory changes

- Fortunately, the deflators for the value added by sectors are not the same with the GDP deflator. However adding up real value added by sectors does not identically give the real GDP. The discrepancies were eliminated by scaling, assuming that the GDP deflator on its own is the correct one.
- To find the real values of export and import data we first converted the current dollar values of these variables to Turkish lira using nominal exchange rate. Then by dividing nominal TL values of export and import by GDP deflator the constant values of export and import were derived.

- One final remark about the work of data preparation is that GDP and all other real variables in the SPO source tables are based on 1977 price level. For our data bank it was imperative to shift the base from 1977 to 1998 which is also the base year of macroeconomic model.
- The model is completed in two weeks. The first week was allocated for data preparation and the second week for estimating equations, and building and running the model for historical simulation.

3. Basic Considerations

- A macro model is normally based on a national accounts system. For North Cyprus model, two accounting relationships are used. One is the GDP by expenditure, i.e.
- $$\text{GDP} = \text{Consumption} + \text{Capital Formation} + \text{Export} - \text{Import} \quad (1)$$
- And another is the GDP by sector, that is
$$\text{GDP} = \text{Sum of Value Added by Economic Activities} \quad (2)$$

Table 2. The ratio between public expenditure and public income (%)

1998	1999	2000	2001	2002		
144.9	130.3	212.1	213.3	532.6		
2003	2004	2005	2006	2007	2008	
210.5	174	165.6	172.6	164.3	149.0	

- To have GDP from Equation (1), we do not use the identity, but through a behavioral equation
- $$\text{GDP} = a_0 + a_1 * \text{consumption} + a_2 * \text{investment} + a_3 * (\text{export} - \text{import}) \quad (3)$$

Table 3. The Ratio between Income and GDP (%)

1998	1999	2000	2001	2002		
101	100.9	100.2	100.1	100.8		
2003	2004	2005	2006	2007	2008	
101.6	102.6	102.4	102.8	101.5	101	

- It seems there is some income from outside of North Cyprus. We decided to treat private income as endogenous and to leave public income as exogenous.
- For the price aspect, the most important variable is GDP deflator. According to the real situation, we analyzed the relationship between the two GDP deflators of Turkey and North Cyprus. Figure 1 shows the comparison. We can easily see that the GDP deflator of North Cyprus is higher than that of Turkey and there is an increasing tendency along the time. Therefore, a regression of GDP deflator for North Cyprus is carried out

Table 4. Regression between two deflators

- SEE = 0.33 RSQ = 0.9921 RHO = 0.62 Obser = 11 from 1998.000
- SEE+1 = 0.28 RBSQ = 0.9901 DW = 0.77 DoFree = 8 to 2008.000

- MAPE = 6.06

Variable name	Reg-Coeff	Mexval	Elas	NorRes	Mean	Beta
0 a.gdpD	-----			6.54	---	
1 intercept	-0.57011	28.7	-0.09	218.21	1.00	
2 TurkgdpD	0.99165	867.2	0.81	6.07	5.32	0.739
3 time	0.30711	146.4	0.28	1.00	6.00	0.264

Fig 1. Comparison

Deflator of Turkey and North Cyprus

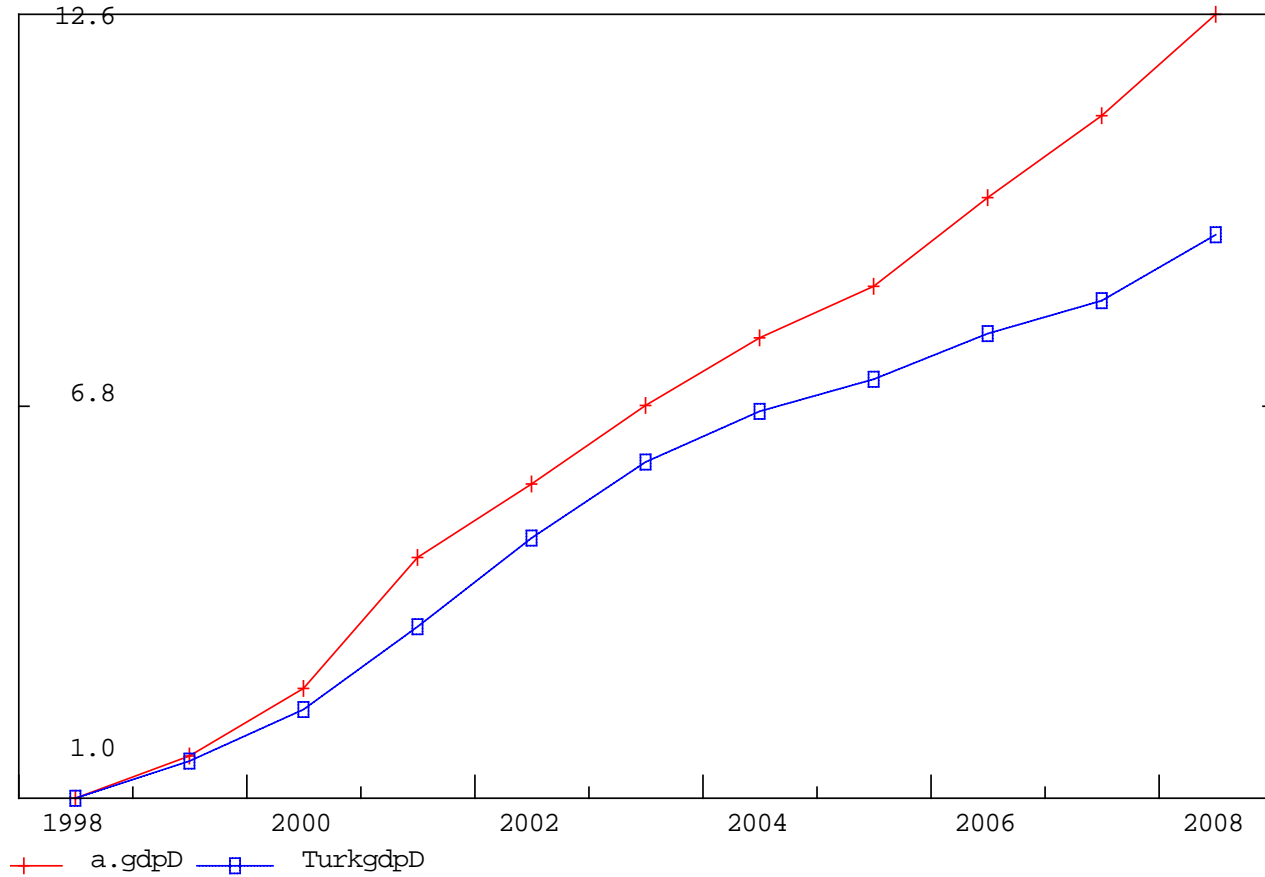


Fig 1 Regression

Deflator of Turkey and North Cyprus

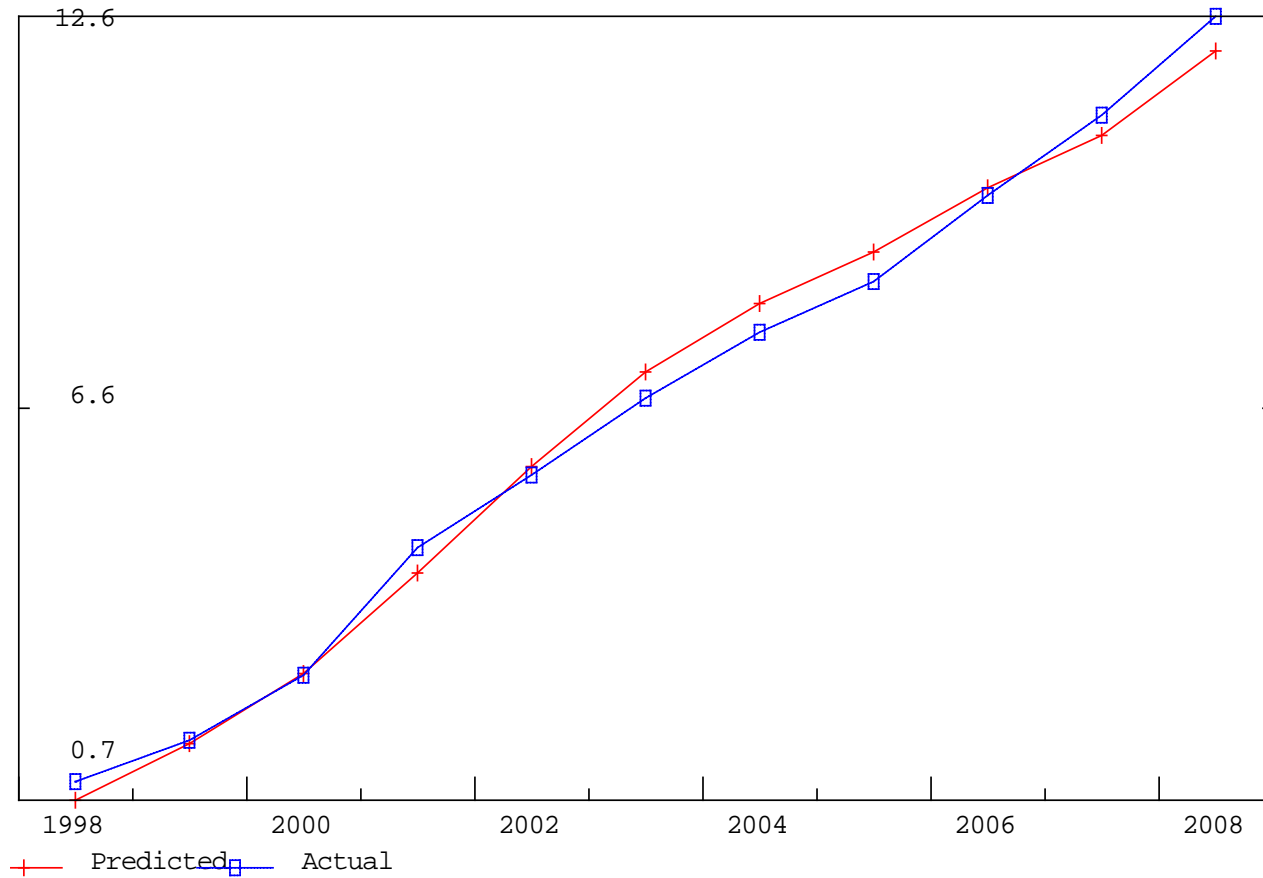


Table 5. List of the Variables to be Used in the Model

The endogenous variables (41):

1	gdpR	GDP in constant price
2	gdpN	GDP in current price
3	gdpD	GDP deflator
4	privincN	Private income, current price
5	privconsN	Private consumption, current price
6	privinvestN	private investment, current price
7	pubconsN	public consumption, current price
8	TotStu	Total number of university students
9	impN	Import, current price, current price
10	expN	Export, current price, current price

- 11 vadN2 vad sec 2, current, current price
- 12 vadN3 vad sec 3, current, current price
- 13 vadN4 vad sec 4, current price
- 14 vadN5 vad sec 5, current price
- 15 vadN6 vad sec 6, current price
- 16 vadN7 vad sec 7, current price
- 17 vadN8 vad sec 8, current price
- 18 vadN9 vad sec 9, current price
- 19 vadN10 vad sec 10, current price
- 20 vadD2 vad deflator, sector 2

- 21 vadD3 vad deflator, sector 3
- 22 vadD4 vad deflator, sector 4
- 23 vadD5 vad deflator, sector 5
- 24 vadD6 vad deflator, sector 6
- 25 vadD7 vad deflator, sector 7
- 26 vadD8 vad deflator, sector 8
- 27 vadD9 vad deflator, sector 9
- 28 vadD10 vad deflator, sector 10
- 29 vadR2 vad sec 2, constant price
- 30 vadR3 vad sec 3, constant price

- 31 vadR4 vad sec 4, constant price
- 32 vadR5 vad sec 5, constant price
- 33 vadR6 vad sec 6, constant price
- 34 vadR7 vad sec 7, constant price
- 35 vadR8 vad sec 8, constant price
- 36 vadR9 vad sec 9, constant price
- 37 vadR10 vad sec 10, constant price
- 38 gdp2N value added of secondary sector, current price
- 39 gdp3N value added of tertiary sector, current price
- 40 totconsN total consumption, current price
- 41 totinvestN total investment, current price

The exogenous variables (11):

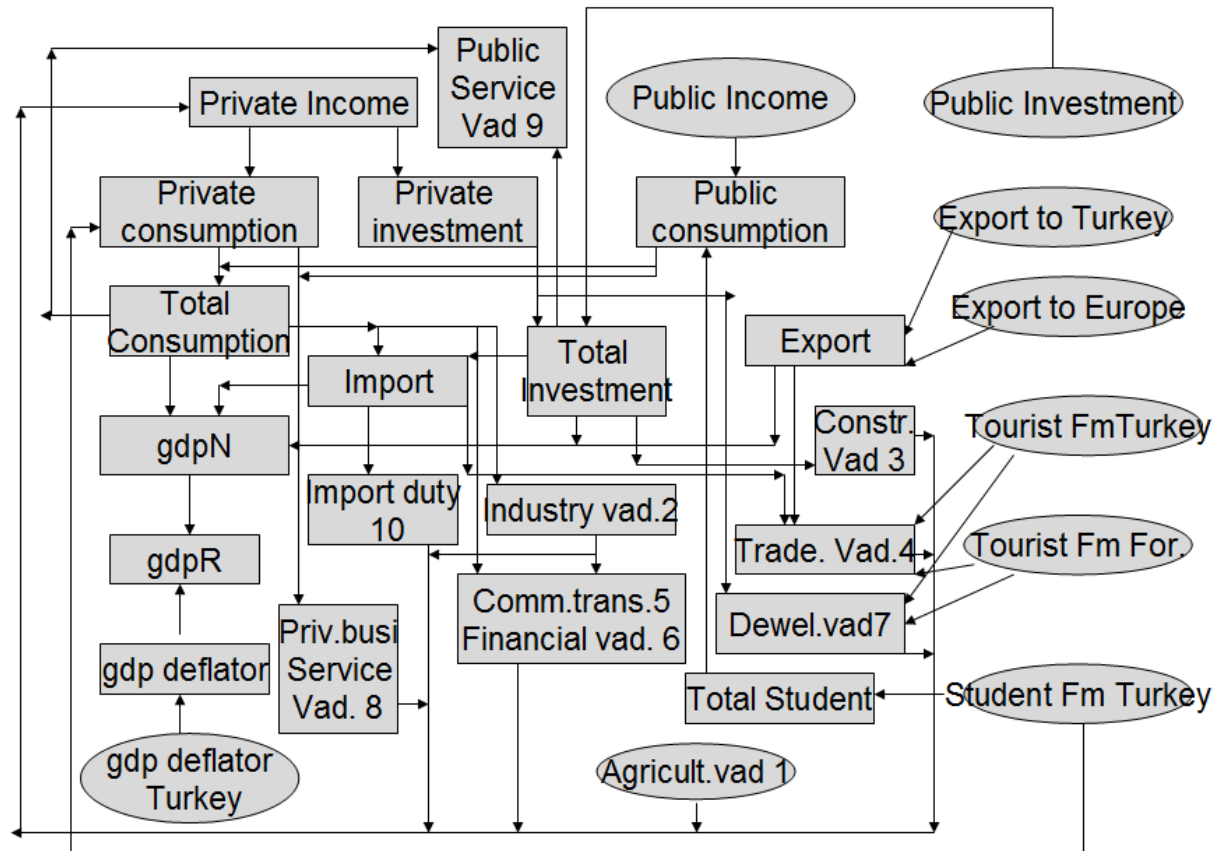
- 1 pubincN public income, current price
- 2 pubinvestN public investment, current price
- 3 vadN1 value added in agriculture, current price
- 4 StuFmTurk Student number from Turkey
- 5 exp2TurkN export to Turkey, current price
- 6 exp2EuN export to Europe, current price
- 7 TurkgdpD gdp deflator of Turkey
- 8 time time tendency
- 9 TouTurk Tourist number from Turkey
- 10 TouFor Tourist number from other foreign countries
- 11 exrate_NC exchange rate used by NC

4. Equations and Logic of the Model

We have GDP data in 10 sectors

- 1. Agriculture, current and constant
- 2. Industry, current and constant
- 3. Construction, current and constant
- 4. Trade and tourism, current and constant
- 5. Transport and communication, current and constant
- 6. Financial institutions, current and constant
- 7. Ownership of dwellings, current and constant
- 8. Business and personal services, current and constant
- 9. Public services, current and constant
- 10. Import duties, current and constant

Flow chart of the model



5. The Simulation of the Model

- The historical simulation results from running the model are listed Table 6 below. In Table 6, for each variable, there are two lines. The first line is the actual value of the variable. The second line is the percentage change of the simulated value comparing with its historical value. For saving print space, the values are displayed for every two year.

Table 6. Simulation Results (Percentage change, %)

GDP in constant price	24883.84	25005.53	31569.88	40489.57	40444.31
	-1.38	-4.01	0.3	2.1	4.89
GDP in current price	64996.44	140770.2	245674.4	398810	507990.8
	-0.6	-1.8	0.92	3.32	1.71
Private inc, current price	54611.84	134330.6	209228.4	334538.9	402269.5
	3.54	2.31	6.04	6.4	7.13
Private consumption	38046.87	85073.54	143314.8	238794.8	321368.6
	4.37	3.56	4.98	4.67	7.62
Private investment	6818.23	14585.3	36207.45	70225.66	76811.69
	5.93	4.91	4.28	5.46	6.43

Table 7. Statistics of Simulation Error

Error Range	<3%	>3% <5%	>5% <10%	>10%	Total
Number	203	105	60	2	370
%	54.86	28.38	16.22	0.54	100

6. Conclusion

- As it is stated in the introduction part of the paper our aim was to build a working model for the North Cyprus economy which mainly can guide policy makers in their decision making process.
- From the simulation results is quite obvious that MEMNC provides satisfactory results in historical simulation so that we can trust it for different policy simulations and forecasting or projections for future planning.
- Still it can be improved with additional data for new variables.
- Furthermore, our effort can encourage other researchers to undertake similar modeling work.