# Data Preparation and Preliminary Trails with TURINA

# --TURkey's INterindustry Analysis Model

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INFORUM has had her Turkish researcher on Inter-industry model since 1994 when Gazi Özhan visited University of Maryland of College Park as a visiting scholar. The 16th INFORUM international conference was held in 2008 in the European University of Lefke, North Cyprus. Prior to that conference, in the summer of 2008, Paul Salmon, University of Rennes in France and Gazi Özhan, European University of Lefke, cooperated together and worked out an INFORUM Turkey Model Version 1.0, called TinyTurk. In that version of the model, the 2002 Input-output table of Turkey and the time series of GDP by expenditure are used and there are 59 sectors in the model. The model has one vector equation which is that the intermediate output plus final demand is equal to the gross output. This first version of the model was presented in the 16th INFORUM International Conference (Salmon and Özhan, 2008).

From the middle of May to the middle of June of 2010, Wang was invited to go to North Cyprus for cooperation research to do further work on the INFORUM Turkey model. This paper is an overview of that one month work.

The study is organized in six sections. Section 1 describes the general data situation required for the model. The framework of this section is basically inspired by the work of Shantong and Wang (1999). In this section some consistency checks are carried out for main macroeconomic data series. In Section 2 an extensive adjustment analysis is performed on the Input-output tables, namely 1998 and 2010 IO tables. Section 3 describes the treatment of the inconsistencies between IO tables and National Income Accounts. Section 4 introduces the preparation of time series vector data to be used in the model. The framework of the model is presented in Section 5. Finally, Section 6 concludes the study.

## 1. Data Situation

The availability of the data for building a model is always the first priority issue. There are 22 excel files which contain different or duplicate data. Their content, period covered and detail degree and so on are listed in Table1.1. In addition to these excel files, there is a PDF file which is an electronic copy of the book “Statistical Indicators, 1923 - 2008” published by Turkish Statistical Institute in December of 2009.

After looking at all of these files carefully and doing some comparison on data, three points are noticed. They are:

(A) There is Input-output table for 1998 (TurkStat, 2010a);

(B) Some relatively detail sector classification time series started from 1998 (TurkStat, 2010c);

(C) Most economic statistics end at 2008;

From them, 1998-2008 is considered as the sample period of the INFORUM Turkey model version 2.0.

In the meantime, some problems in data aspect are noticed, too. These problems are:

(A). The sector 30 (recycling materials) is blank in 1998 IO table. Sector 6 (Uranium and thorium ores) is blank in 1998 and 2002 tables (TurkStat, 2010b).

(B). The sum of value added (third quadrant, “Value added at basic price” plus “Taxes

less subsidies on products") or sum of final demand (second quadrant, "Final uses at basic prices" minus "imports") from 2002 table is 315867104, which is different from yearbook data "350476089" (about 10% less).

Table 1.1. The Excel Files of Economic Data for Turkey

| Excel file name | content | period covered | detail degree | price |
|---|---|---|---|---|
| 2003-2006YILLIK | gross output and value added by NACE code | 2003-2006 | 4 digits | current |
| Compensation | compensation by activity | 1987-2006 | 11(1+3+7) categories | current |
| Cost components | value added components | 1987-2006 | total | current |
| expendituresGDP_con87 | final demand components | 1987-2006 | consumption 6 categories | constant |
| expendituresGDP_con98 | final demand components | 1998-2007 | total | constant |
| expendituresGDP_cur87 | final demand components | 1987-2006 | Consumption, 6 categories | current |
| expendituresGDP_cur98 | final demand components | 1998-2007 | total | current |
| ExtAccGS_TL | export and import | 1984-2006 | total export, total import | current |
| FinConsExpNResi_con98 | household consumption | 1998-2007 | 10 categories | constant |
| FinConsExpResi_cur98 | household consumption | 1998-2007 | 10 categories | current |
| GDPEcoActivity_con98 | value added by activities | 1998-2007 | 17(2+4+11) categories | constant |
| GDPEcoActivity_cur98 | value added by activities | 1998-2007 | 17(2+4+11) categories | current |
| GDPEcoActivity_Con87 | value added by activities | 1968-2006 | 17(3+4+10) categories | constant |
| GDPEcoActivity_Cur87 | value added by activities | 1968-2006 | 17(3+4+10) categories | current |
| GDPperCapita_cur87 | GDP per capita & growth rate | 1968-2006 | total | current |
| GSYH 1998-2008 | GDP by kind of activity | 1998-2009 | 17 sector value added | basic price |
| IOT1998_bp | 1998 IO Table | 1998 | 59 sectors | basic price |
| IOT2002_bp | 2002 IO Table | 2002 | 59 sectors | basic price |
| quarGNP_con87 | value added by activities | 1987-2006 | 17(3+4+10) categories | constant |
| quarGNP_cur87 | value added by | 1987-2006 | 17(3+4+10) categories | current |

| | | | | |
|---|---|---|---|---|
| | activities | | | |
| TEFE 1994-2009 | Wholesale price index | 1994-2009 | 37 categories | |
| UFE2003-2009 | Monthly producer price index | 2003-2009 | 37 categories | |

(C) The sum of value added (third quadrant, “Value added at basic price” plus “Taxes less subsidies on products”) or sum of final demand (second quadrant, “Final uses at basic prices” minus “imports”) from 1998 table is 53412104, which is different from yearbook data “70203147” (about 30% less).

(D). Further comparison of GDP by expenditure components between the IO tables and the national account, the result is shown in following Table 1.2:

Table 1.2. Comparison of GDP by Expenditure

| | GDP | Consump. Households | Gov. Consump. | Fixed Cap.Frm. | Change in Stocks | Exports | Imports |
|---|---|---|---|---|---|---|---|
| 1998 | | | | | | | |
| Yearbook | 70203147 | 46668561 | 7197730 | 16046649 | -522264 | 14979695 | 14167223 |
| IO Table | 53412104 | 35393369 | 6229189 | 12616470 | 706263 | 13668801 | 15201988 |
| 2002 | | | | | | | |
| Yearbook | 350476089 | 238399083 | 44615308 | 58601708 | 3131331 | 88380641 | 82651981 |
| IO Table | 315867104 | 230311445 | 44372342 | 58009474 | 3125352 | 64538368 | 84489878 |

(E). The comparison of GDP by cost components between IO table and national account is shown in following Table 1.3:

Table 1.3. Comparison of GDP by Cost

| | Gross Domestic Product | compensation | taxes minus subsidies | depreciation | surplus |
|---|---|---|---|---|---|
| 1998 | | | | | |
| Yearbook | 52224943 | 13297030 | 5505409 | 3270051 | 30152453 |
| IO Table | 53412105 | 12878068 | 1705493 | 3548411 | 35280133 |
| 2002 | | | | | |
| Yearbook | 277574055 | 72923558 | 41945074 | 23982153 | 138723270 |
| IO Table | 315867104 | 92431093 | 12265287 | 25227609 | 185943115 |

(F) The inconsistency problem exists not only in the data between Input-output tables and national account, but also in different statistics sources. The GDP from file “Costcomponents.xls, Cost components of the gross domestic product” is about 25%

less than the GDP from file “IST_gostergeler1923-2008.pdf, Table 22.4 ” as shown in Table 1.4 and Table 1.5 below.

Table 1.4. Comparison of GDP Data

| year | Costcomponents.xls | IST_gostergeler1923-2010.pdf | Ratio |
|---|---|---|---|
| 1998 | 52,224,945 | 70203147 | 0.7439 |
| 1999 | 77,415,272 | 104595916 | 0.7401 |
| 2000 | 124,583,458 | 166658021 | 0.7475 |
| 2001 | 178,412,438 | 240224083 | 0.7427 |
| 2002 | 277,574,057 | 350476089 | 0.7920 |
| 2003 | 359,762,925 | 454780659 | 0.7911 |
| 2004 | 430,511,476 | 559033026 | 0.7701 |
| 2005 | 487,202,362 | 648931712 | 0.7508 |
| 2006 | 576,322,230 | 758390785 | 0.7599 |

(G). **“**Exports of Goods and Services” and **“**import of Goods and Services” data from file “ExtAccGs_TL.xls: The external account of goods and services, 1984-2006”, are different from those in file “ST_gostergeler1923-2008.pdf, Table 22.27”. These data are listed in Table 1.5.

Table 1.5. Comparison of Export and Import Data

| | from ExtAccGs_TL.xls | | from ST_gostergeler19322010.pdf, Table 22.27 | |
|---|---|---|---|---|
| | Exports of goods and services | Imports of goods and services | Exports of goods and services | Imports of goods and services |
| 1998 | 14 299 743 | 14 337 700 | 14979695 | 14167223 |
| 1999 | 19 257 606 | 20 493 930 | 20333328 | 20172359 |
| 2000 | 31 501 516 | 38 121 249 | 33494716 | 38488459 |
| 2001 | 61 346 547 | 53 848 174 | 65919607 | 56009082 |
| 2002 | 82 397 354 | 81 383 029 | 88380641 | 82651981 |
| 2003 | 102 366 026 | 108 444 031 | 104575145 | 109320562 |
| 2004 | 129 132 225 | 144 783 529 | 131660988 | 146386256 |
| 2005 | 139 653 638 | 164 232 093 | 141826467 | 164513946 |
| 2006 | 168 552 177 | 206 731 840 | 171926483 | 209172139 |

To have consistent data set is necessary for building any model. Before coming to the steps of building the model, some treatments on data have to be done. In other words, the data treatment is the very essential step of the model building procedure.

## 2. The Initial Adjustments on the Input-output Tables

Although lots of data adjustment work will be done later in related data preparation step, some initial treatment has to be done first, especially for the Input-output tables (Wang, 1998).

(A) **Adjustment for the Concept of Basic Price**. The original Turkey Input-output table for 1998 and 2002 is at basic price. The first sector's data in the third quadrant of the 1998 table, as an example, are shown in Table 2.1 as following:

Table 2.1: The Original Items of the Third Quadrant

| Item | Numbers |
|---|---|
| Intermediate input (A) | 3 186 664 224 |
| Taxes less subsidies on products (B) | 172 544 289 |
| Total intermediate consumption (C=A+B)) | 3 359 208 513 |
| Compensation of employees (D) | 652 584 237 |
| Other taxes on production (E) | 76 930 338 |
| Other subsidies on production (F) | - 121 110 252 |
| Consumption of fixed capital (G) | 225 948 910 |
| Operating surplus, net (H) | 5 166 753 984 |
| Value added at basic prices (I=D+E+F+G+H) | 6 001 107 217 |
| Output at basic prices (J=I+C) | 9 360 315 730 |

On the other hand, one of the essential conditions in a typical INFORUM model is to have the relationship

Sum of value added side = Sum offinal demand side (2.1)

However, the sum of value added by sectors at basic prices will be not equal to the sum of final demand by sectors in the original Turkey IO tables. Their difference comes from the item B (Taxes less subsidies on production) and the simplest method to deal with this problem is to put the item B into value added by combining it with item E (other taxes on production) and F (other subsidies on production) into an item called "taxes minus subsidies" as shown in Table 2.2.

After the adjustment described in Table 2.2, the 1998 and 2002 Turkey IO tables will be subject to the condition (2.1) between the two totals of second quadrant and the third quadrant.

Table 2.2: Adjustment of the Third Quadrant

| Item | Numbers |
|---|---|
| Total intermediate input (=A) | 3 186 664 224 |
| Wages (=D) | 652 584 237 |
| Taxes minus Subsidies (=B+E+F) | 128 364 375 |
| Depreciation (=G) | 225 948 910 |
| Operating Surplus (=H) | 5 166 753 984 |
| Value Added (=I+B) | 6 173 651 506 |
| Gross Output (=A+I+B) | 9 360 315 730 |

(B) **The treatment of Sector 30 in 1998 IO table.** Since the sector 30 “Recycling” or “Secondary raw materials” has all zero values (blank sector) in 1998 Input-output table it is not good for later modeling. A simple method to deal with this problem is to assign values to this sector for the 1998 IO table.

A natural opinion is to “borrow” these values from its neighborhood sector “Manufacturing not elsewhere included, sector 29”.

First idea was through comparing the outputs of sector 29 in 1998 and 2002, their values are 1689896 and 8920805 respectively. Roughly, the ratio between these two numbers is 1:5 or former is about 20% of the later. Therefore, it is assumed that the values of sector 30 in 1998 IO table are 20% of the values of sector 30 in 2002 IO table and their distribution among sectors has the same structure as in 2002 table. When doing that, it happened that some cells of the new sector 29 had negative values and the reason was some “assigned” values in column 30 or row 30 were larger than the corresponding values in column 29 or raw 29. The subtraction operation of the “borrowing” has lad the original values negative.

The second idea was to have the ratio vectors between sector 30 and the sum of sector 29 and 30, by column and row, in 2002 table. Throughout using these ratio vectors, sector 29 is allocated into sector 29 and 30, by column and row, in the table for 1998. It works well.

**(C). The treatment of sector 6 in 1998 and 2002 Input-output tables.** Since sector 6 “Uranium and thorium ores” is blank sector in the two tables, it is better to delete it from the table and then the total sector number is 58, rather than 59.

The classification and definition of the 58 sectors used in the model is listed in Table 3.2.

Table 3.2 58 Sectors and Their Definition

| | | | |
|---|---|---|---|
| 1 | Agriculture, hunting and related services | 30 | Secondary raw materials |
| 2 | Products of forestry, logging and related services | 31 | Electrical energy, gas, steam and hot water |
| 3 | Fish and other fishing products; | 32 | Collected and purified water, distribution |
| 4 | Coal and lignite; peat | 33 | Construction work |
| 5 | Crude petroleum and natural gas; | 34 | Trade, maintenance and repair of motor vehicles |
| 6 | Metal ores | 35 | Wholesale trade and commission trade services, except of motor vehicles and motorcycles |
| 7 | Other mining and quarrying products | 36 | Retail trade services, |
| 8 | Food products and beverages | 37 | Hotel and restaurant services |
| 9 | Tobacco products | 38 | Land transport; transport via pipeline |
| 10 | Textiles | 39 | Water transport services |
| 11 | Wearing apparel; furs | 40 | Air transport services |
| 12 | Leather and leather products | 41 | transport services; travel agency services |
| 13 | Wood and products of wood and cork | 42 | Post and telecommunication services |
| 14 | Pulp, paper and paper products | 43 | Financial intermediation services, except insurance and pension funding services |
| 15 | Printed matter and recorded media | 44 | Insurance and pension funding services, except compulsory social security services |
| 16 | Coke, refined petroleum products and nuclear fuels | 45 | Services auxiliary to financial intermediation |
| 17 | Chemicals, chemical products and man-made fibres | 46 | Real estate services |
| 18 | Rubber and plastic products | 47 | Renting services of machinery and equipment without operator and of personal and household goods |
| 19 | Other non-metallic mineral products | 48 | Computer and related services |
| 20 | Basic metals | 49 | Research and development services |
| 21 | Fabricated metal products, except machinery and equipment | 50 | Other business services |
| 22 | Machinery and equipment n.e.c. | 51 | Public administration and defence services; |
| 23 | Office machinery and computers | 52 | Education services |
| 24 | Electrical machinery and apparatus n.e.c. | 53 | Health and social work services |
| 25 | Radio, television and communication equipment | 54 | Sewage and refuse disposal services, sanitation |
| 26 | Medical, precision and optical instruments, watches and clocks | 55 | Membership organization services n.e.c. |
| 27 | Motor vehicles, trailers and semi-trailers | 56 | Recreational, cultural and sporting services |
| 28 | Other transport equipment | 57 | Other services |

| 29 | Furniture; other manufactured goods n.e.c. | 58 | Private households with employed persons |
|---|---|---|---|

## 3. Treatment of the Inconsistency Between IO Tables and National Accounts

How to deal with the inconsistency among various national account statistics and IO tables is mentioned in (B)-(D) of Section 1. This problem becomes the first priority and has to be solved before going to next step of the modeling work.

To have a consistent data system for INFORUM model, it is necessary to have consistent statistics time series for final demand in total, value added in total which is the GDP series, at least (Zuo and Wang, 1998). According to this consideration, three tables from the electronic book “IST_gostergeler1923-2008” were found and in which there are consistent data as following (TurkStat, 2010e):

From the Table 22.4 of that book, there is following GDP time series (Table 3.1).

Table 3.1. GDP

| | | | |
|---|---|---|---|
| 1998 | 70203147 | 2004 | 559033026 |
| 1999 | 104595916 | 2005 | 648931712 |
| 2000 | 166658021 | 2006 | 758390785 |
| 2001 | 240224083 | 2007 | 843178421 |
| 2002 | 350476089 | 2008 | 950098199 |
| 2003 | 454780659 | | |

From the Table 22.27 of that book, there is GDP by expenditure components as shown in Table 3.2.

Table 3.2. GDP by Expenditure

| | Gross Domestic Product | Consumption Expenditure of Resident Households | Government Consumption | Gross Fixed Capital Formation | Change in Stocks | Exports of Goods and Services | Imports of Goods and Services |
|---|---|---|---|---|---|---|---|
| 1998 | 70203147 | 46668561 | 7197730 | 16046649 | -522264 | 14979695 | 14167223 |
| 1999 | 104595916 | 71641318 | 12791000 | 19809568 | 193060 | 20333328 | 20172359 |
| 2000 | 166658021 | 117499253 | 19542975 | 33986629 | 622907 | 33494716 | 38488459 |
| 2001 | 240224083 | 164299067 | 29778962 | 38293820 | -2058290 | 65919607 | 56009082 |
| 2002 | 350476089 | 238399083 | 44615308 | 58601708 | 3131331 | 88380641 | 82651981 |
| 2003 | 454780659 | 324015751 | 55483632 | 77366472 | 2660221 | 104575145 | 109320562 |
| 2004 | 559033026 | 398559246 | 66802142 | 113716568 | -5319662 | 131660988 | 146386256 |
| 2005 | 648931712 | 465401759 | 76498649 | 136475134 | -6756351 | 141826467 | 164513946 |
| 2006 | 758390785 | 534849206 | 93525263 | 169044693 | -1782719 | 171926483 | 209172139 |
| 2007 | 843178421 | 601238607 | 107815962 | 180598317 | -2960863 | 188224755 | 231738081 |
| 2008 | 950098199 | 662997661 | 121895066 | 188816383 | 18523985 | 227252949 | 269387845 |

From Table 22.9 of that book, there is value added, by 17 economic activities as listed in Table 3.3.

Table 3.3 Value Added by Economic Activities

| | Agriculture, hunting and forestry | Fishing | Mining and quarrying | Manufactur. industry | Electricity, gas and water | Construction |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 1998 | 8520613 | 236870 | 729072 | 16791078 | 1310649 | 4085861 |
| 1999 | 10682740 | 294393 | 988954 | 22889249 | 2139824 | 5687701 |
| 2000 | 16430769 | 386553 | 1658124 | 33454594 | 3276249 | 8405526 |
| 2001 | 20737537 | 499136 | 2353927 | 45829468 | 5656849 | 10702029 |
| 2002 | 35434614 | 623667 | 3225992 | 62361454 | 8013139 | 14707329 |
| 2003 | 44179956 | 958004 | 4538250 | 80627034 | 9826640 | 18405464 |
| 2004 | 51782669 | 1214976 | 5898572 | 97193358 | 10658842 | 24661000 |
| 2005 | 59027013 | 1686734 | 7628517 | 112051658 | 11956714 | 28694134 |
| 2006 | 60819444 | 1843310 | 8952359 | 130393077 | 13452105 | 35849263 |
| 2007 | 62567776 | 1763941 | 10530738 | 141853309 | 16117886 | 41013267 |
| 2008 | 71028634 | 1532592 | 13295133 | 153471162 | 20273715 | 44698068 |

Table 3.3 Value Added by Economic Activities (Cont'd)

| | Wholesale and retail trade | Hotel and Restaur. | Transp.storage, communic. | Financial intermediate. | Ownership and dwelling | Real-estate renting and business activities |
|---|---|---|---|---|---|---|
| | 7 | 8 | 9 | 10 | 11 | 12 |
| 1998 | 9836179 | 1783827 | 7735727 | 5347364 | 3499949 | 1742077 |
| 1999 | 12992298 | 2320671 | 12102368 | 10663270 | 7617159 | 2735086 |
| 2000 | 21121955 | 4041429 | 20299164 | 11641355 | 14494393 | 4251459 |
| 2001 | 29140019 | 5866786 | 31963787 | 20717364 | 21130606 | 6693311 |
| 2002 | 42820198 | 7986333 | 49025450 | 15449977 | 28465425 | 11536129 |
| 2003 | 55754340 | 9797397 | 62934587 | 15545818 | 37546758 | 15069147 |
| 2004 | 70762478 | 12698236 | 76021278 | 18616620 | 48052807 | 18892433 |
| 2005 | 80211869 | 14528348 | 89087295 | 18293386 | 60120175 | 22613950 |
| 2006 | 94856320 | 17041942 | 104123045 | 21860640 | 74467156 | 27822912 |
| 2007 | 103129169 | 19074202 | 117583068 | 27392508 | 91070060 | 34598696 |
| 2008 | 116295314 | 21453270 | 134587118 | 33036646 | 106137796 | 40754444 |

Table 3.3 Value Added by Economic Activities (Cont'd)

| | Public administration | Education | Health and social work | Other community, social and person service | Private household with employed person |
|---|---|---|---|---|---|
| | 13 | 14 | 15 | 16 | 17 |
| 1998 | 2819513 | 1543824 | 842865 | 1090449 | 78665 |
| 1999 | 5088035 | 2744213 | 1479018 | 1688053 | 126760 |
| 2000 | 7428282 | 4042886 | 2187666 | 2702247 | 200360 |
| 2001 | 11405217 | 6019542 | 3148794 | 3918047 | 311222 |
| 2002 | 15995808 | 9462305 | 5067781 | 6343843 | 502390 |
| 2003 | 20804741 | 12576306 | 6870049 | 8752354 | 648764 |
| 2004 | 24980292 | 15136127 | 8139541 | 9358924 | 815906 |
| 2005 | 26018778 | 17773360 | 10339616 | 10687042 | 995880 |
| 2006 | 29620624 | 21241900 | 12061082 | 12784022 | 1229064 |
| 2007 | 32998021 | 24633641 | 13910296 | 14653776 | 1494186 |
| 2008 | 36427878 | 27882049 | 15576853 | 15991052 | 1707442 |

Table 3.3 Value Added by Economic Activities (Cont'd)

| | Total of sectors | Financial intermediation service indirectly measured (-) | Taxes - subsidies | GDP, purchaser's price |
|---|---|---|---|---|
| | 18 | 19 | 20 | 21 |
| 1998 | 67994582 | 3518398 | 5726963 | 70203147 |
| 1999 | 102239791 | 7100638 | 9456762 | 104595916 |
| 2000 | 156023012 | 7358819 | 17993829 | 166658021 |
| 2001 | 226093640 | 12625397 | 26755840 | 240224083 |
| 2002 | 317021834 | 9035085 | 42489340 | 350476089 |
| 2003 | 404835610 | 8594013 | 58539063 | 454780659 |
| 2004 | 494884058 | 9521893 | 73670861 | 559033026 |
| 2005 | 571714470 | 9353841 | 86571083 | 648931712 |
| 2006 | 668418265 | 10490121 | 100462642 | 758390785 |
| 2007 | 754384542 | 12928697 | 101722577 | 843178421 |
| 2008 | 854149163 | 14927534 | 110876571 | 950098199 |

It can be seen that the GDP data at purchaser's price (last column of the table above) is consistent with the ones of the GDP data by expenditure from Table 3.1 and the GDP data in national account from Table 3.3. It is quite good to have value added by 17 sectors, even so the sum of the value added of these 17 sectors is not the same as the GDP. The difference is due to the item of "Financial intermediation service indirectly measured" and "taxes – subsidies". The 17 sectors' value added can be scaled by using the ratio between their sum and the GDP value so that the sum of the resulted 17 sectors' value added can be equal to GDP. After the adjustment operation, the resulted

value added by 17 sectors is shown in following Table 3.4.

Table 3.4 Adjusted Value Added by Economic Activities (Current prices)

| | Agriculture, hunting and forestry | Fishing | Mining and quarrying | Manufacturing industry | Electricity, gas and water | Construction |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 1998 | 8797375 | 244564 | 752753 | 17336477 | 1353221 | 4218576 |
| 1999 | 10928925 | 301177 | 1011745 | 23416734 | 2189136 | 5818775 |
| 2000 | 17550741 | 412902 | 1771147 | 35734962 | 3499568 | 8978473 |
| 2001 | 22033596 | 530331 | 2501043 | 48693727 | 6010392 | 11370886 |
| 2002 | 39173910 | 689480 | 3566420 | 68942250 | 8858739 | 16259344 |
| 2003 | 49630490 | 1076194 | 5098139 | 90574087 | 11038964 | 20676168 |
| 2004 | 58494958 | 1372466 | 6663170 | 109791973 | 12040486 | 27857663 |
| 2005 | 66999355 | 1914549 | 8658844 | 127185646 | 13571619 | 32569638 |
| 2006 | 69006052 | 2091429 | 10157392 | 147944653 | 15262827 | 40674757 |
| 2007 | 69932237 | 1971563 | 11770245 | 158549973 | 18015021 | 45840682 |
| 2008 | 79007485 | 1704752 | 14788614 | 170711020 | 22551120 | 49719131 |

Table 3.4 Adjusted Value Added by Economic Activities (Current prices) (Cont'd)

| | Wholesale and retail | Hotel and Restaurants | Transport, storage, communication | Financial intermediation | Ownership and dwelling | Real-estate renting and business activities |
|---|---|---|---|---|---|---|
| | 7 | 8 | 9 | 10 | 11 | 12 |
| 1998 | 10155673 | 1841768 | 7986995 | 5521054 | 3613633 | 1798662 |
| 1999 | 13291707 | 2374151 | 12381268 | 10909006 | 7792697 | 2798116 |
| 2000 | 22561693 | 4316905 | 21682818 | 12434866 | 15482375 | 4541252 |
| 2001 | 30961217 | 6233449 | 33961466 | 22012162 | 22451231 | 7111631 |
| 2002 | 47338870 | 8829104 | 54198942 | 17080361 | 31469286 | 12753498 |
| 2003 | 62632819 | 11006113 | 70698902 | 17463724 | 42178946 | 16928246 |
| 2004 | 79935010 | 14344235 | 85875478 | 21029785 | 54281615 | 21341350 |
| 2005 | 91045492 | 16490584 | 101119657 | 20764138 | 68240162 | 25668249 |
| 2006 | 107624466 | 19335875 | 118138540 | 24803194 | 84490816 | 31568018 |
| 2007 | 115267857 | 21319307 | 131423034 | 30616709 | 101789346 | 38671092 |
| 2008 | 129359102 | 23863178 | 149705677 | 36747748 | 118060560 | 45332508 |

Table 3.4 Adjusted Value Added by Economic Activities (Current prices) (Cont'd)

| | Public administrat. | Education | Health and social work | Other community social and person service | Private household with employed person | Sum of 17 sectors |
|---|---|---|---|---|---|---|
| | 13 | 14 | 15 | 16 | 17 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1998 | 2911095 | 1593970 | 870243 | 1125868 | 81220 | 70203147 |
| 1999 | 5205289 | 2807454 | 1513102 | 1726954 | 129681 | 104595917 |
| 2000 | 7934617 | 4318462 | 2336784 | 2886440 | 214017 | 166658020 |
| 2001 | 12118022 | 6395752 | 3345588 | 4162918 | 330673 | 240224084 |
| 2002 | 17683792 | 10460830 | 5602567 | 7013288 | 555406 | 350476089 |
| 2003 | 23371447 | 14127860 | 7717615 | 9832142 | 728803 | 454780658 |
| 2004 | 28218343 | 17098136 | 9194623 | 10572067 | 921667 | 559033027 |
| 2005 | 29532942 | 20173876 | 11736111 | 12130462 | 1130386 | 648931711 |
| 2006 | 33607712 | 24101168 | 13684565 | 14504817 | 1394502 | 758390785 |
| 2007 | 36882011 | 27533113 | 15547590 | 16378580 | 1670057 | 843178419 |
| 2008 | 40519926 | 31014120 | 17326646 | 17787373 | 1899244 | 950098202 |

It can be seen that the sum of the 17 sectors' value added is now equal to the GDP from national account (Table 3.1) and the one by expenditure components (Table 3.2). These numbers can be the fundamental framework of the INFORUM model for the Turkish economy.

Having the understanding above, an opinion of adjusting the Input-output table comes out when facing the inconsistency between the GDP components by cost, by expenditure data from the national account and from the Input-output table.

The adjustment includes following steps:

1. Aggregate the 58 sector value added data from Input-output table into 17 sectors defined in the Table 3.4 above. To do the aggregation operation, it is necessary to have a comparison list between these two sector classifications. It is not too difficult to do that because basically each one of the 17 sectors has clear corresponding sector or sectors in the 58 IO sectors except the sector 11 and 12 of the 17 sectors which not clearly and individually correspond to some sector or sectors of the 58 IO sectors. However, if merge these two sectors into one, the result will have clear corresponding sectors in 58 IO sectors. Therefore, the final aggregation guide list is from 58 sectors to 16 sectors and it is shown in Table 3.5 below.

By using the guide list in Table 3.5, aggregation operation was done for the 58 sector Input-output table of 2002. The ratios of the 16 sectors' value added between from national account (originally 17) and from the aggregation of Input-output table for 2002 are shown in following Table 3.6.

Table 3.5. The Guide of Aggregation from IO Sectors to National Account Sectors

| Sector number in 16 sectors | Economic activity | Corresponding sector number in IO table |
|---|---|---|
| 1 | Agriculture, hunting and forestry | 1 and 2 |
| 2 | Fishing | 3 |

| | | |
|---|---|---|
| 3 | Mining and quarrying | 4, 5, 6 and 7 |
| 4 | Manufacturing industry | from 8 to 30 |
| 5 | Electricity, gas and water | 31 and 32 |
| 6 | Construction | 33 |
| 7 | Wholesale and retail | 34, 35, 36 |
| 8 | Hotel and Restaurants | 37 |
| 9 | Transport, storage, communication | from 38 to 42 |
| 10 | Financial intermediation | 43, 44, 45 |
| 11 | Real estate and other business | from 46 to 50 |
| 12 | Public administration | 51 |
| 13 | Education | 52 |
| 14 | Health and social work | 53 |
| 15 | Other community, social and personal service | from 54 to 57 |
| 16 | Private household with employed person | 58 |

Table 3.6. Ratios of 16 Sector Value Added between Two Data Sources for 2002

| SNA 16 Sec | IO 58 Sec | Sector Name | SNA 2002 Value added | IO 2002 Value add | SNA/IO |
|---|---|---|---|---|---|
| 1 | "1, 2 | Agriculture, hunting and forestry | 39173910 | 34123379 | 1.148 |
| 2 | "3 | Fishing | 689480 | 649043 | 1.062 |
| 3 | "4…7 | Mining and quarrying | 3566420 | 3295710 | 1.082 |
| 4 | "8...30 | Manufacturing industry | 68942250 | 62551380 | 1.102 |
| 5 | "31, 32 | Electricity, gas and water | 8858739 | 7778761 | 1.139 |
| 6 | 33 | Construction | 16259344 | 14811283 | 1.099 |
| 7 | "34...36 | Wholesale and retail | 47338870 | 44099262 | 1.073 |
| 8 | "37 | Hotel and Restaurants | 8829104 | 7561761 | 1.168 |
| 9 | "38...42 | Transport, storage, communication | 54198942 | 46212317 | 1.173 |
| 10 | "43...45 | Financial intermediation | 17080361 | 14870439 | 1.149 |
| 11 | "46...50 | Ownership and dwelling real est. | 44222784 | 43913996 | 1.007 |
| 12 | "51 | Public administration | 17683792 | 14949253 | 1.183 |
| 13 | "52 | Education | 10460830 | 9631637 | 1.086 |
| 14 | "53 | Health and social work | 5602567 | 4619662 | 1.213 |
| 15 | "54...57 | Other community, social service | 7013288 | 6297422 | 1.114 |
| 16 | "58 | Private hh. with employed person | 555406 | 501799 | 1.107 |
| Total VA (GDP) | | Sum of 16 sectors | 350476089 | 315867104 | 1.110 |

It can be seen that the biggest ratio happens in sector 14 which is “Health and social work” and there is only one single corresponding sector between two sources. On the other hand, the sector 11 which is merged (from original sector 11 and 12) has the smallest ratio between the two sources, which is close to 1.

2. The second step is to use the ratios in Table 3.6 and the relationship between the two sector classifications in Table 3.5 for scaling the columns of the first and third quadrants of the 2002 Input-output table- i.e. the intermediate input and cost parts

(value added components), including the output by columns. This operation will have the new value added, and therefore the GDP of their total from Input-output table, consistent with the national account numbers. On the other hand, the structure information by column (coefficients of the input-output matrix, shares of the value added components, ration between value added and output) of the new table will keep the same as the original one.

3. The last step is to adjust the second quadrant of the table. It is easy to have the new intermediate output vector. The difference between the output vector and the intermediate output vector is the final demand vector.

How to allocate the final demand vector into different component vectors such as household consumption, government consumption, fixed capital formation, inventory change, export and import? According to the principle of using the national account data as control total, the GDP by expenditure data in Table 3.2 are used as the allocation guide.

In calculation, the vectors of household consumption, government consumption, fixed capital formation, export and import are created first by using the control total from the table 3.2 above and the corresponding shares in the Input-output table. The difference between the final demand vector and the sum of these first calculated vectors is the vector of inventory change. To do so is the negative and positive shares of inventory change vector in the Input-output table which could result in problem when scaling them by one number.

The resulting input-output table will still keep the identities: intermediate output plus final demand equal to output and intermediate input plus value added equal to output. And also the GDP from value added side and from final demand side will be consistent consist with the GDP from national account.

More important thing is that all the structure information by columns such as the ratios between input and output, the coefficient matrix elements in later stage, the ratios among compensation, depreciation, taxes minus subsidies, surplus and value added in one sector, the shares of household consumption, government consumption, fixed capital formation, export and import keep the same as the ones in the original Input-output table except the shares of the inventory change vector.

By using the same principle and the same steps, the adjustment for 1998 Input-output table can be done. The ratios as in Table 3.6 are listed in Table 3.7 for the year 1998.

Table 3.7. Ratios of 16 Sector Value Added between Two Data Sources for 1998

| SNA | IO | | SNA 1998 | IO 1998 | |
|---|---|---|---|---|---|
| 16 Sec | 58 Sec | Sector Name | Value | Value add | SNA/IO |

| | | | added | | |
|---|---|---|---|---|---|
| 1 | "1, 2 | Agriculture, hunting and forestry | 8797375 | 6404772 | 1.3735656 |
| 2 | "3 | Fishing | 244564 | 235597 | 1.0380604 |
| 3 | "4…7 | Mining and quarrying | 752753 | 539364 | 1.3956306 |
| 4 | "8...30 | Manufacturing industry | 17336477 | 12100916. | 1.4326582 |
| 5 | "31, 32 | Electricity, gas and water | 1353221 | 1269096 | 1.0662868 |
| 6 | 33 | Construction | 4218576 | 3840190 | 1.0985329 |
| 7 | "34...36 | Wholesale and retail | 10155673 | 7782527 | 1.3049325 |
| 8 | "37 | Hotel and Restaurants | 1841768 | 1550414 | 1.1879196 |
| 9 | "38...42 | Transport, storage, communication | 7986995 | 7167536 | 1.1143291 |
| 10 | "43...45 | Financial intermediation | 5521054 | 3414376 | 1.6170019 |
| 11 | "46...50 | Ownership and dwelling real est. | 5412295 | 3037870 | 1.7816084 |
| 12 | "51 | Public administration | 2911095 | 4409308 | 0.6602158 |
| 13 | "52 | Education | 1593970 | 169674 | 9.3942721 |
| 14 | "53 | Health and social work | 870243 | 746280 | 1.1661071 |
| 15 | "54...57 | Other community, social service | 1125868 | 724399 | 1.5542090 |
| 16 | "58 | Private hh. with employed person | 81220 | 19780 | 4.1060364 |
| Total VA (GDP) | | Sum of 16 sectors | 70203147 | 53412099 | 1.314368 |

## 4. The Preparation of Time Series Vector Data to Be Used in the Model

A typical INFOURUM model includes two important vector equations:

A*out +fd = out

$$A'p + va/out = p$$

where A is input-output coefficient matrix in constant price, $A'$ is the transpose of matrix A, out is gross output vector in constant price, fd is final demand vector in constant price, va is value added vector in current price and p is price index vector.

Since INFORUM model is also a dynamic model, it is necessary to have all of these matrices and vectors, mentioned above, as time series for the analysis period. However, it is difficult to have statistics and input-output tables which can naturally satisfy this condition. One of the most important tasks of the model builder is to use available statistics and limited input-output tables at hand and to create or close such condition.

The adjusted Input-output tables for 1998 and 2002 mentioned in section 2 and 3 will be the IO data base for TURINA. In this section, the preparation of the time series vectors of value added (va), output (out), final demand (fd) and price index (p) will be described, respectively.

(A) **Final Demand Vector**. There are 6 component vectors of the final demand in fact. These 6 vectors are household consumption, government consumption, fixed capital formation, inventory changes, export and import.

**(A.1) Household Consumption.** The vector of household consumption is considered first because it has more than 66% (for some year it reaches 72%) share in the GDP by expenditure in the Turkish economy as shown in Table 4.1.

Table 4.1 Household Consumption and its Share in GDP by Expenditure

| Year | GDP | Hh_Consumption | Share |
|---|---|---|---|
| 1998 | 70203147 | 46668561 | 0.66 |
| 1999 | 104595916 | 71641318 | 0.68 |
| 2000 | 166658021 | 117499253 | 0.71 |
| 2001 | 240224083 | 164299067 | 0.68 |
| 2002 | 350476089 | 238399083 | 0.68 |
| 2003 | 454780659 | 324015751 | 0.71 |
| 2004 | 559033026 | 398559246 | 0.71 |
| 2005 | 648931712 | 465401759 | 0.72 |
| 2006 | 758390785 | 534849206 | 0.71 |
| 2007 | 843178421 | 601238607 | 0.71 |
| 2008 | 950098199 | 662997661 | 0.70 |

There are household consumption data by 10 categories in table 22.27 of the electronic book “IST_gostergeler1923-2008”. The very important point is that the sum of these 10 category household consumption is slightly inconsistent with the corresponding number of household consumption in GDP by expenditure from national account. These data are listed in Table 4.2 below. The difference is due to both definitions of the household consumption coverage are different: In table 4.2, the household consumption includes

the “Final Consumption Expenditure of Non-Resident Households on the Economic Territory” less the “Final Consumption Expenditure of Resident Households in the Rest of the World” and in Table 4.1 it dose not.

To follow the principle to use consistent data, the data in Table 4.2 should be scaled according to the ratio between the corresponding data from the two tables, if those relatively detailed household consumption data in Table 4.2 to be used. The adjusted data for Table 4.2 are listed in Table 4.3.

On the other hand, to use these relatively detailed consumption data, it seems necessary to build up bridge matrixes for the purpose of converting the 10 categories into 58 Input-output sectors.

Suppose the household consumption by 10 categories is a vector with 10 elements, called hcna, the corresponding consumption vector in 58 IO sectors has 58 elements and called hcio, the bridge matrix, if called B, is a 58*10 (10 columns and 58 rows) matrix which will have

B *hcna = hcio.

By using the both of the 10 category and 58 sector classification consumption data for one same year, the bridge matrix B can be created. Then it can be used for other years in which there is only 10 category consumption data.

Table 4.2. Household Consumption by Category

| | | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| | Total consumption of household | Food, beverages and tobacco | Clothing and footwear | Housing, water, electricity, gas and other rules | Furnishing, household equipment and routine maintenance |
| 1998 | 49694150 | 15030838 | 5980143 | 5382855 | 4655046 |
| 1999 | 74994397 | 21594962 | 6908830 | 10798504 | 6615353 |
| 2000 | 124767959 | 33055531 | 10851844 | 19654749 | 10377319 |
| 2001 | 179986710 | 48854780 | 15860492 | 30290919 | 13611829 |
| 2002 | 259441149 | 72863508 | 23511625 | 42114049 | 18931366 |
| 2003 | 345722739 | 98080388 | 32646831 | 54681334 | 25051003 |
| 2004 | 423619916 | 113674409 | 38475249 | 67064340 | 31408716 |
| 2005 | 490692217 | 130660500 | 35974917 | 81981688 | 40236590 |
| 2006 | 564897493 | 145615509 | 37498147 | 100251987 | 45720439 |
| 2007 | 628733500 | 160435615 | 38985579 | 119516853 | 48989454 |
| 2008 | 694673395 | 179351587 | 39747577 | 141194061 | 49136319 |

Table 4.2. Household Consumption by Category (Cont'd)

| 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|
| Health | Transport and communication | Recreation and culture | Education | Restaurants and hotel | Other goods and service |
| 1283100 | 7079781 | 2929786 | 332127 | 3272651 | 3747824 |
| 2256267 | 11658203 | 3907164 | 583261 | 4403828 | 6268023 |
| 3872675 | 21877991 | 6402344 | 942741 | 7819597 | 9913168 |
| 6358249 | 29017478 | 8253116 | 1351040 | 11517079 | 14871729 |
| 9622740 | 43669843 | 12438450 | 2262001 | 16031265 | 17996302 |
| 12223879 | 61164418 | 15575563 | 3098928 | 19759989 | 23440406 |
| 15374508 | 76494453 | 21001714 | 4293801 | 25548845 | 30283881 |
| 18972774 | 90608811 | 24169846 | 5771305 | 29212583 | 33103203 |
| 22931122 | 105700541 | 26317547 | 7098206 | 34360989 | 39403008 |
| 25596374 | 115682219 | 26564291 | 8199275 | 37753155 | 47010685 |
| 28425443 | 127967975 | 27682870 | 8897270 | 42355458 | 49914835 |

Table 4.3. Adjusted Household Consumption by Category

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | Total consumption of household | Food, beverages and tobacco | Clothing and footwear | Housing, water, electricity, gas and other rules | Furnishing, household equipment and routine maintenance |
| 1998 | 46668562 | 14115697 | 5616047 | 5055124 | 4371627 |
| 1999 | 71641316 | 20629428 | 6599929 | 10315691 | 6319574 |
| 2000 | 117499253 | 31129789 | 10219640 | 18509707 | 9772759 |
| 2001 | 164299068 | 44596597 | 14478091 | 27650762 | 12425422 |
| 2002 | 238399083 | 66953887 | 21604706 | 38698374 | 17395931 |
| 2003 | 324015751 | 91922188 | 30597026 | 51248042 | 23478119 |
| 2004 | 398559246 | 106949615 | 36199115 | 63096922 | 29550627 |
| 2005 | 465401759 | 123926210 | 34120756 | 77756322 | 38162781 |
| 2006 | 534849208 | 137869862 | 35503528 | 94919337 | 43288456 |
| 2007 | 601238607 | 153419669 | 37280716 | 114290309 | 46847116 |
| 2008 | 662997661 | 171173509 | 37935166 | 134755891 | 46895800 |

Table 4.3. Adjusted Household Consumption by Category (Cont'd)

| 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|
| Health | Transport and communication | Recreation and culture | Education | Restaurants and hotel | Other goods and service |

| | | | | | |
|---|---|---|---|---|---|
| 1204979 | 6648734 | 2751408 | 311906 | 3073398 | 3519641 |
| 2155387 | 11136952 | 3732471 | 557183 | 4206928 | 5987773 |
| 3647061 | 20603428 | 6029358 | 887819 | 7364045 | 9335649 |
| 5804064 | 26488314 | 7533774 | 1233283 | 10513250 | 13575509 |
| 8842284 | 40127985 | 11429625 | 2078541 | 14731044 | 16536706 |
| 11456375 | 57324071 | 14597616 | 2904355 | 18519313 | 21968647 |
| 14464977 | 71969165 | 19759287 | 4039787 | 24037417 | 28492336 |
| 17994910 | 85938799 | 22924123 | 5473850 | 27706956 | 31397052 |
| 21711359 | 100078069 | 24917652 | 6720635 | 32533243 | 37307065 |
| 24477029 | 110623366 | 25402619 | 7840716 | 36102187 | 44954880 |
| 27129299 | 122132888 | 26420586 | 8491572 | 40424133 | 47638817 |

It should be noticed that the sum of the vector hcna and the sum of the vector hcio must be the same. Therefore, the household consumption data from Input-output table should be the one from the adjusted table which has the consistent data with national account, rather than the one from the original Input-output table.

The command “ras” in G7 can be used for creating bridge matrix (INFORUM, 2009). For this purpose, it is necessary to prepare initial values for the bridge matrix. The initial values of the cells of the bridge matrix can be 1 or 0. Value 1 represents the corresponding cell will have non-zero value in the resulted bridge matrix and value 0 represents the corresponding cell will have zero value in the resulted bridge matrix. Theoretically, these 1 or 0 are assigned according to the relationship of the components between the household consumption vector by SNA categories and the household consumption vector by IO sectors. Value 1 in cell (i,j) represents there is relationship between the ith component of the consumption vector of IO sectors and the jth component of the consumption vector of national account categories. Value 0 represents there is no such a relationship between the ith component of the sector IO vector and the jth component of the category vector.

However, computation practice points out that the principle above is not suitable for Turkey data which is due to the inconsistency of the consumption data at the sub-group level between the two sector classifications, 10 and 58. For example, the household consumption in “Hotel and restaurant” category is 3073398 from the national account source for 1998, and the household consumption in “Hotel and restaurant service” sector is 1528465 from the source of IO table for 1998. If assign 1 or 0 value to the initial bridge matrix, according to the theory above, there will be only one cell with value 1 and all the others will be zero in the column 9 (“Hotel and restaurant”). The non-zero cell is (37,9) in which 37 is the sector number of “Hotel and restaurant” in 58 sectors and 9 is the category number of “hotel and restaurant” in 10 categories. Since there is no any other cell in the column 9 which can be fund to have relationship with hotel and restaurant service, all the other cells in the column 9 will have zero value in the initial bridge matrix.

Obviously, there will be no such a matrix B which can have the left side vector (hcna) with value 3073398 for element 9 and the right side vector (hcio) with value 1528465 for element 37 for the equation

B *hcna = hcio.

To solve this problem, it is necessary to “eas” the assignment operation of cell’s relationship with each other. For example, for the elements in column 9 (“hotel and restaurant” consumption in 10 categories) of the initial bridge matrix, not only the element 37 (“Hotel and restaurant” consumption in 58 sectors) is assigned value 1.0, but other elements such as element 55 (“Membership organization services n.e.c.”) is also assigned value 1.0 which supposes some expenditure in membership service probably can be put in account of the consumption categories of “Hotel and restaurant”.

After preparing the initial bridge matrix, the command to create the bridge matrix in G7 is just

ras consBM fcehh hhc 1998 (or 2002)

in which the parameter consBM is the name of the initial and the resulted bridge matrix, fcehh (58 sector of consumption in IO ) is the row control sum and hhc (10 category consumption in SNA) is the column control sum. 1998 or 2002 is the year when there is both consumption vector data of 10 categories and 58 sectors. The resulting matrix consBM is the flow bridge matrix for the year 1998 or 2002. To have the coefficient bridge matrix, just use the “coef” command under G7

coef consBM hhc

For the bridge matrices from year 1999 to year 2001, interpolation can be done between the matrix for 1998 and the matrix for 2002. After the interpolation, each column in resulted bridge matrix should be scaled according to the principle that the sum of each column in bridge matrix is equal to 1.0. The reason is obvious.

For the bridge matrices after the year 2002, they can be just the copy of the bridge matrix for 2002.

(A.2) **Government consumption.** It is one component of the final demand. In the data source “IST_gostergeler1923-2008.pdf, T22.27”, there are two columns for government consumption: “Compensation of Employee” and “Purchases of Goods and Services”. Since no more further detailed information for government consumption can be found in various statistics, it is decided that to allocate the government consumption in total into 58 Input-output sectors by using the sector shares of the government consumption from the Input-output tables for year 1998 and 2002. For the years between 1998 and 2002, interpolation and scaling operation will be done to create the consumption vector. For the years after 2002, sector shares of the 2002 vector of the government consumption will be used for creating the vector of consumption by allocating the total government consumption.

(A.3) **Fixed Capital Formation**. There is not any direct information in various statistical sources. However, there is gross investment in tangible goods for non-agriculture sectors as shown in Table 4.4 below.

Table 4.4. Gross Investment in Tangible Goods

| NACE Rev.1.1 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|
| | 40 111 978 110 | 42 583 781 796 | 56 059 170 067 | 136 624 049 402 |
| | 331 840 338 | 540 260 558 | 601 629 839 | 1 374 352 996 |
| 10 | 60 620 900 | 85 775 956 | 158 382 042 | 163 400 843 |
| 101 | (**) | 3 744 370 | 17 914 680 | (***) |
| 1010 | (**) | 3 744 370 | 17 914 680 | (***) |
| 102 | 51 164 446 | 82 031 586 | 140 398 499 | 108 707 293 |
| 1020 | 51 164 446 | 82 031 586 | 140 398 499 | 108 707 293 |
| 103 | (*) | - | 68 863 | (***) |
| 1030 | (*) | - | 68 863 | (***) |
| …… | …… | …… | …… | …… |
| …… | …… | …… | …… | …… |

Source: TurkStat, 2010e. 2003-2006 YILLIK (Annual Industry and Services Statistics)

It is non-agriculture investment by NACE Rev. 1.1 (Classification of Economic Activities in the European Community, Revision 1.1) sector classification. Its two digit code system is basically corresponding to the non-agriculture sectors in the 58 IO sectors. Therefore, it is possible to generate gross investment data by relatively detailed sectors.

Further observation shows there is a problem that the coverage of the data is smaller than the one we want (there are value added data for the same coverage in the same table and those data are smaller than the ones from national account, which gives the conclusion that the investment data has also small coverage).

For the coverage problem, there is way to work out for value added and output vectors because there are comparable and available full coverage data. But for gross investment, there is no such comparable full coverage data. The only thing can be done is to suppose the total gross investment is equal to the total fixed capital formation. Further assumption is that the structure of the gross investment with full coverage will have the same total as the one worked out from the Table 4.4.

On the basis of these two assumptions, gross investment by sectors can be worked out and two investment bridge matrices can be created for the year 1998 and 2002. Then these two matrices can be used for generating the fixed capital formation vector.

(A.4) **Inventory change.** This vector will simple be worked out by allocation operation on the control total number from “IST_gostergeler1923-2008.pdf, T22.27” because

there is no any further available information.

(A.5) **Export and Import**. There are three different sources about the export and import data and they are listed in following three tables.

Table 4.5. Export and Import of Goods and Services

| | Exports of Goods and Services | Imports of Goods and Services |
|---|---|---|
| 1998 | 14979695 | 14167223 |
| 1999 | 20333328 | 20172359 |
| 2000 | 33494716 | 38488459 |
| 2001 | 65919607 | 56009082 |
| 2002 | 88380641 | 82651981 |
| 2003 | 104575145 | 109320562 |
| 2004 | 131660988 | 146386256 |
| 2005 | 141826467 | 164513946 |
| 2006 | 171926483 | 209172139 |
| 2007 | 188224755 | 231738081 |
| 2008 | 227252949 | 269387845 |

Source: TurkStat, IST_gostergeler1923-2008.pdf, T22.27.

The export and import numbers in Table 4.5 are the components of the GDP by expenditure and they are consistent with other data to be used in the model. The main problem of the data in this table is that they are total and no sector detail information, even for the classification of goods and service. Therefore, they should be considered as control total used in the model, on one hand. On the other hand, it is necessary to find some sector information on export and import. A natural idea is to look at the custom's SITC statistics. They are the data listed in Table 4.6.

Table 4.6-1. Export (1000$)

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|

| | Exchange rate | SITC total | Food and live animals | Beverages and tobacco | Crude materials and inedibles (except fuels) | Mineral fuels, lubricants and related materials |
|---|---|---|---|---|---|---|
| 1998 | 260701.46 | 26973952 | 3771436 | 644535 | 806773 | 259086 |
| 1999 | 421678.65 | 26587225 | 3190315 | 602799 | 815381 | 336760 |
| 2000 | 624581.59 | 27774906 | 2890691 | 528910 | 789565 | 329094 |
| 2001 | 1237311.55 | 31334216 | 3316180 | 471093 | 786783 | 444540 |
| 2002 | 1514781.03 | 36059089 | 3117721 | 426112 | 865162 | 691466 |
| 2003 | 1489212.26 | 47252836 | 3943800 | 488613 | 1143358 | 980128 |
| 2004 | 1429971.95 | 63167153 | 5044325 | 590940 | 1461488 | 1429137 |
| 2005 | 1.35 | 73476408 | 6512342 | 736445 | 1660074 | 2641024 |
| 2006 | 1.44 | 85534676 | 6594517 | 819962 | 2278620 | 3566212 |
| 2007 | 1.3 | 107271750 | 7821739 | 804555 | 2930995 | 5147843 |
| 2008 | 1.29 | 132027196 | 9155020 | 890691 | 3320779 | 7531525 |

Table 4.6-1. Export (1000$), (cont'd)

| | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|
| | Animal and vegetable oils, fats and wax | Chemical and related products | Manufacturing goods classified chiefly by materials | Machinery and transport equipment | Miscellaneous manufactured articles | Commodities not classified elsewhere in the SITC |
| 1998 | 239298 | 1152184 | 7781268 | 4091711 | 8227435 | 226 |
| 1999 | 255845 | 1120571 | 7588180 | 5036820 | 7640381 | 172 |
| 2000 | 100279 | 1242851 | 8224474 | 5740470 | 7927460 | 1111 |
| 2001 | 180495 | 1366721 | 9453053 | 7152538 | 8118549 | 44264 |
| 2002 | 97870 | 1522911 | 10589747 | 8631877 | 10045860 | 70363 |
| 2003 | 254730 | 1893460 | 13204590 | 12370222 | 12842658 | 131277 |
| 2004 | 205450 | 2566153 | 18632995 | 18275352 | 14762629 | 198685 |
| 2005 | 405300 | 3060505 | 20408929 | 21608977 | 16051491 | 391320 |
| 2006 | 437581 | 3923133 | 23854853 | 26385878 | 16745825 | 928093 |
| 2007 | 290073 | 4739297 | 29982854 | 34250969 | 20019335 | 1284090 |
| 2008 | 570268 | 6121809 | 40595314 | 39147395 | 20794913 | 3899481 |

Source: IST_gostergeler1923-2008.pdf, T18.3

* Exchange rate is TL/$ for 1998-2004, TRY/$ for 2005 and after

Table 4.6-2. Import (1000$)

| | | | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| | Exchange rate | SITC total | Food and live animals | Beverages and tobacco | Crude materials and inedibles (except fuels) | Mineral fuels, lubricants and related materials |
| 1998 | 259103.02 | 45921392 | 1165407 | 319377 | 3502470 | 4506151 |
| 1999 | 422535.15 | 40669272 | 1074615 | 308035 | 2521715 | 5375272 |
| 2000 | 627987.35 | 54502821 | 1159158 | 365302 | 3304138 | 9529252 |
| 2001 | 1221046.69 | 41399083 | 735742 | 296431 | 2435055 | 8339221 |
| 2002 | 1520541.77 | 51553797 | 1055585 | 218013 | 3668975 | 9203594 |
| 2003 | 1491566.61 | 69339692 | 1604012 | 250248 | 5160440 | 11574886 |
| 2004 | 1431997.65 | 97539766 | 1817608 | 270022 | 6969911 | 14407061 |
| 2005 | 1.35 | 116774151 | 1615881 | 298876 | 7660514 | 21254831 |
| 2006 | 1.44 | 139576174 | 1729774 | 295909 | 9190841 | 28858774 |
| 2007 | 1.3 | 170062715 | 3083604 | 353112 | 12240193 | 33882782 |
| 2008 | 1.28 | 201963574 | 5024155 | 456269 | 16199453 | 48280963 |

Table 4.6-2. Import (1000$), (Cont'd)

| | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|
| | Animal and vegetable oils, fats and wax | Chemical and related products | Manufacturing goods classified chiefly by materials | Machinery and transport equipment | Miscellaneous manufactured articles | Commodities not classified elsewhere in the SITC |
| 1998 | 521366 | 6579178 | 7989470 | 18230351 | 3107446 | 176 |
| 1999 | 436392 | 6286466 | 6539283 | 15378178 | 2749299 | 17 |
| 2000 | 375408 | 7414710 | 8465051 | 20508596 | 3336200 | 45005 |
| 2001 | 321011 | 6243084 | 6642758 | 12700581 | 2537177 | 1148022 |
| 2002 | 414760 | 7908770 | 8813569 | 15609359 | 2976739 | 1684435 |
| 2003 | 512099 | 10427505 | 11623540 | 21509599 | 3796001 | 2881362 |
| 2004 | 531907 | 14211408 | 16523009 | 33704294 | 5354338 | 3750208 |
| 2005 | 744730 | 16438811 | 19989659 | 38028088 | 6705895 | 4036866 |
| 2006 | 932701 | 18407548 | 24883843 | 43036564 | 7941179 | 4299041 |
| 2007 | 828962 | 22106732 | 32163219 | 49858008 | 9873953 | 5672150 |
| 2008 | 1702286 | 25541690 | 36294982 | 51594786 | 11486319 | 5382668 |

Source: TurkStat (2010c), IST_gostergeler (Statistical Indicators) 1923-2008.pdf, T18.4.

* Exchange rate is TL/$ for 1998-2004, TRY/$ for 2005 and after.

It can be seen that the export and import in Table 4.6 are relatively detailed for goods, but the service part of the foreign trade is not included.

Table 4.7. Export and Import

| | Exports of goods and services | Exports of goods | Exports of services | Imports of goods and services | Imports of goods | Imports of services |
|---|---|---|---|---|---|---|
| 1998 | 14299744 | 8119077 | 6180667 | 14337701 | 11777538 | 2560162 |
| 1999 | 19257606 | 12387013 | 6870594 | 20493931 | 16792110 | 3701820 |
| 2000 | 31501516 | 19201323 | 12300194 | 38121250 | 33071670 | 5049580 |
| 2001 | 61346547 | 42525080 | 18821467 | 53848175 | 46512514 | 7335660 |
| 2002 | 82397354 | 60766425 | 21630929 | 81383030 | 72073385 | 9309645 |
| 2003 | 102366027 | 76226094 | 26139932 | 108444032 | 97275239 | 11168793 |
| 2004 | 129132225 | 95872917 | 33259308 | 144783530 | 130213174 | 14570356 |
| 2005 | 139653639 | 103724661 | 35928977 | 164232093 | 148898894 | 15333199 |
| 2006 | 168552177 | 132631442 | 35920736 | 206731841 | 190641814 | 16090027 |

Source: TrukStat (2010f), ExtAccGs_TL.xls

It can be seen from Table 4.7 that the export and import data are separated into two parts: goods and services. However, the total (goods plus service) data are not consistent with the ones in Table 4.5 which are the ones to be used in model as control total. Another problem is that there are no data for 2007 and 2008.

Through further observation, it is found that the differences between the corresponding data in table 4.5 and 4.7 are not very big and their ratios are listed in Table 4.8 below.

Table 4.8. The Ratios between the Corresponding Data in Table 1 and Table 3.

| | Export of goods and service | Import of goods and services |
|---|---|---|
| 1998 | 1.047549904 | 0.988109838 |
| 1999 | 1.055859574 | 0.984308938 |
| 2000 | 1.06327313 | 1.009632671 |
| 2001 | 1.074544697 | 1.040129628 |
| 2002 | 1.072615033 | 1.015592334 |
| 2003 | 1.021580583 | 1.008082789 |
| 2004 | 1.01958274 | 1.01106981 |
| 2005 | 1.015558696 | 1.001716185 |
| 2006 | 1.020019353 | 1.011804172 |

To use the data in these three tables above, five steps were taken.

Step 1. Calculate the ratios between goods and service in export and import data in Table 4.7.

Step 2. Split the export and import data in Table 4.5 into two parts: goods and service by using those ratios from step 1.

Step 3. Allocate the goods part of the export and import data resulted from step 2 into

10 SITC categories, according to the SITC classification category shares of export and import data of goods in the Table 4.6.

Step 4. Create export and import bridge matrices for the year 1998 and 2002 for the purpose of projecting the import and export by 11 categories (10 SITC goods categories plus service) resulted from the step 3 and step 2 into 58 Input-output sectors

Step 5. Extend the export and import bridge matrices for other years so that there will be export and import by 58 Input-output sectors.

To finish these five steps described above, there is no technical problem except the shortage of 2007 and 2008 data in Table 4.7. It was solved just by using the ratios from the year 2006 because the 2007 and 2008 data could not be found.

(B) **Price Index Vector.** There is not a ready made price index vector with 58 sectors. The price index vector has been constructed at three steps using four different sources:

(a). Wholesale Price Index Data for 35 sectors, 1994 = 100, T19.7 from IST_gostergeler1923-2008; Table 4.9 in this report.
(b). Consumer Price Index Data Table for 6 sectors, 1994 = 100, T19.14 from IST_gostergeler1923-2008; Table 4.10 in this report.
(c). GDP at current prices, for 17 sectors, Table 3.4 in this report.
(d). GDP at constant prices at 1998 prices, for 17 sectors, Table 4.11 in this report.

The first two tables are available in the electronic book Statistical Indicators 1923-2008. The last two tables are available in TurkStat website. The four tables, except for Table 3.4, are given below just for 2000 to 2008 in their original form with only two-year intervals.

Price index numbers for the following 44 sectors are directly obtained from the first two tables, i.e. from Table 4.9 and Table 4.10: IO Sectors: 1-32, 37, 38, 48 – 50, 52 – 58.

In national accounts statistics GDP data are available for only 17 broad economic sectors but not for all IO sectors. Table 4.11 gives the constant price GDP values by 17 sectors and their corresponding values in current price are the ones as the same as in the Table 3.3 of last section. Both of them can produce implicit GDP price deflator by 17 sectors. For our purpose price indices for the following 14 sectors are obtained form Table 3.3 and 4.11 implicitly: IO sectors 33 – 36, 39 – 47, 51.

Therefore, 44 IO sectors price index vector is obtained from either Wholesale price index number or CPI index number. The remaining 14 price indices are implicitly derived from SNA data for the Turkish economy.

The resulting 58-sector IO price index numbers are provided in Table 4.12 below.

Table 4.9 Wholesale Price Index Data, 1994 = 100

| | | 2000 | 2002 | 2004 | 2006 | 2008 |
|---|---|---|---|---|---|---|
| Agriculture, Hunting, forestry and fishing | 1 | 2647 | 5891 | 8959 | 9682 | 11681 |
| Agriculture and hunting | 2 | 2681 | 5990 | 8973 | 9797 | 11834 |
| Forestry and logging | 3 | 2305 | 4864 | 9360 | 9689 | 11058 |
| Fishing, running of fisheries | 4 | 2113 | 4315 | 8067 | 7114 | 6720 |
| Mining and stone quarrying | 5 | 2595 | 6428 | 8916 | 11336 | 15227 |
| Coal, lignite and peat production | 6 | 1991 | 5635 | 8112 | 9549 | 13310 |
| Crude petroleum and natural gas | 7 | 4269 | 8846 | 11995 | 18394 | 27727 |
| Metallic ore mining | 8 | 2775 | 7373 | 8958 | 12589 | 20154 |
| Stone quarrying and other mining | 9 | 1842 | 4459 | 6459 | 7188 | 7977 |
| Manufacturing industry | 10 | 2278 | 5631 | 7740 | 9431 | 11128 |
| Manufacture of food, beverages | 11 | 2406 | 5708 | 8015 | 8470 | 10543 |
| Tobacco | 12 | 2777 | 7034 | 12372 | 14212 | 14427 |
| Textile | 13 | 1649 | 4176 | 5491 | 5722 | 6263 |
| Wearing | 14 | 2204 | 5675 | 8408 | 9027 | 9979 |
| Leather and suitcase, bag | 15 | 2307 | 5595 | 7621 | 8511 | 9326 |
| Wood and cork products | 16 | 1697 | 3337 | 4935 | 5403 | 6099 |
| Paper and paper product | 17 | 1882 | 4292 | 4892 | 5353 | 5645 |
| Printing and publishing | 18 | 2177 | 4680 | 5487 | 6268 | 7439 |
| cock, products of refined petroleum | 19 | 3629 | 9723 | 13327 | 23049 | 31555 |
| chemical items and products | 20 | 2046 | 4832 | 5727 | 5982 | 6985 |
| Plastic and rubber | 21 | 2144 | 4673 | 5687 | 6595 | 7476 |
| Other non-metallic mineral prod. | 22 | 2151 | 5177 | 6626 | 8173 | 9229 |
| Basic metal industries | 23 | 1923 | 4675 | 8059 | 10512 | 13775 |
| fabricated metal products (except machinery) | 24 | 1767 | 4049 | 5312 | 6198 | 7893 |
| machinery and equipment | 25 | 1940 | 4988 | 6726 | 7619 | 8704 |
| Information processing machines | 26 | 1520 | 3645 | 3838 | 3590 | 3246 |
| electrical machines not elsewhere classified | 27 | 1744 | 3849 | 5047 | 6618 | 7575 |
| Communication equipment | 28 | 1425 | 3553 | 3515 | 3553 | 3130 |
| Medical tools, optical tools and clocks | 29 | 2171 | 5070 | 5498 | 5703 | 5542 |
| Motor vehicles trailers and half trailers | 30 | 2111 | 5335 | 7105 | 7251 | 7608 |
| Theatre transport vehicles | 31 | 1833 | 5481 | 7557 | 12651 | 4782 |
| furniture products | 32 | 1865 | 4897 | 7261 | 8870 | 10303 |
| Electricity, gas and water | 33 | 2330 | 6619 | 7277 | 8333 | 11667 |
| Electricity production and | 34 | 2305 | 6515 | 6754 | 7923 | 11258 |

| | | | | | | |
|---|---|---|---|---|---|---|
| distribution of gas | | | | | | |
| Water collection treatment and distribution | 35 | 2460 | 7136 | 9898 | 9809 | 12414 |

Table 4.10 Consumer Price Index Data, 1994 = 100

| | | 2000 | 2002 | 2004 | 2006 | 2008 |
|---|---|---|---|---|---|---|
| Health | 36 | 3664 | 7545 | 10608 | 11960 | 12582 |
| Transport | 37 | 3351 | 8050 | 10907 | 13824 | 15763 |
| Leisure, entertainment and culture | 38 | 2606 | 5573 | 6601 | 7593 | 8024 |
| Education | 39 | 3827 | 8141 | 13231 | 16385 | 18752 |
| Hotels and restaurants | 40 | 3275 | 6452 | 10356 | 13399 | 16891 |
| Other goods and services | 41 | 2632 | 6417 | 8734 | 9857 | 10690 |

Table 4.11 GDP in 1998 Constant prices, by Kind of Economic Activity in Basic Prices

| | | 2000 | 2002 | 2004 | 2006 | 2008 |
|---|---|---|---|---|---|---|
| Agriculture, hunting and forestry | 1 | 8258027 | 8890031 | 8063027 | 8894755 | 8769371 |
| Fishing | 2 | 235467 | 224335 | 224875 | 202775 | 214847 |
| Mining and quarrying | 3 | 701035 | 695495 | 641772 | 632414 | 623369 |
| Manufacturing | 4 | 16384063 | 17556938 | 16007532 | 16625565 | 18160474 |
| Electricity, gas and water supply | 5 | 1327830 | 1410716 | 1345313 | 1403322 | 1482678 |
| Construction | 6 | 4069299 | 4276792 | 3486016 | 4007886 | 4352673 |
| Wholesale and retail trade | 7 | 9180624 | 9892830 | 8193812 | 8842177 | 9925338 |
| Hotels and Restaurants | 8 | 1511064 | 1752509 | 1828709 | 1873613 | 1771680 |
| Transport, storage and communication | 9 | 8236845 | 9180670 | 8728576 | 9875556 | 10835648 |
| Financial intermediation | 10 | 5827315 | 6091661 | 6973234 | 6612763 | 6326348 |
| Ownership and dwelling | 11 | 3745690 | 3937912 | 4035352 | 4215658 | 4385066 |
| Real estate, renting and business activities | 12 | 1690441 | 1732822 | 1763726 | 1990905 | 2104417 |
| Public administration and defence; compulsory social security | 13 | 2983388 | 3052039 | 3182289 | 3227742 | 3229772 |
| Education | 14 | 1613201 | 1605448 | 1656605 | 1748872 | 1765786 |
| Health and social work | 15 | 861557 | 879752 | 904783 | 985849 | 1000971 |
| Other community, social and personal service activities | 16 | 1137273 | 1175867 | 1192145 | 1287625 | 1293772 |
| Private household with employed persons | 17 | 77452 | 80579 | 81586 | 92355 | 95981 |
| GDP | | 67840570 | 72436399 | 68309352 | 72519831 | 76338193 |

Table 4.12. Price Vector for 58 Sectors , 1998 =1.000

| | | 2000 | 2002 | 2004 | 2006 | 2008 |
|---|---|---|---|---|---|---|
| Agriculture, hunting and related services | 1 | 1.968 | 4.398 | 6.588 | 7.193 | 8.689 |
| Products of forestry, logging and related services | 2 | 1.996 | 4.211 | 8.104 | 8.389 | 9.574 |
| Fish and other fishing products; | 3 | 1.595 | 3.257 | 6.088 | 5.369 | 5.072 |
| Coal and lignite; peat | 4 | 2.098 | 5.938 | 8.548 | 10.062 | 14.025 |
| Crude petroleum and natural gas; | 5 | 5.937 | 12.303 | 16.683 | 25.583 | 38.563 |
| Metal ores | 6 | 2.390 | 6.351 | 7.716 | 10.843 | 17.359 |
| Other mining and quarrying products | 7 | 1.870 | 4.527 | 6.557 | 7.297 | 8.098 |
| Food products and beverages | 8 | 2.141 | 5.078 | 7.131 | 7.536 | 9.380 |
| Tobacco products | 9 | 3.240 | 8.208 | 14.436 | 16.583 | 16.834 |
| Textiles | 10 | 2.193 | 5.553 | 7.302 | 7.609 | 8.328 |
| Wearing apparel; furs | 11 | 2.235 | 5.756 | 8.527 | 9.155 | 10.121 |
| Leather and leather products | 12 | 2.140 | 5.190 | 7.070 | 7.895 | 8.651 |
| Wood and products of wood and cork | 13 | 2.047 | 4.025 | 5.953 | 6.517 | 7.357 |
| Pulp, paper and paper products | 14 | 2.493 | 5.685 | 6.479 | 7.090 | 7.477 |
| Printed matter and recorded media | 15 | 1.883 | 4.048 | 4.747 | 5.422 | 6.435 |
| Coke, refined petroleum products and nuclear fuels | 16 | 3.503 | 9.385 | 12.864 | 22.248 | 30.458 |
| Chemicals, chemical products and man-made fibres | 17 | 2.489 | 5.878 | 6.967 | 7.277 | 8.498 |
| Rubber and plastic products | 18 | 2.621 | 5.713 | 6.952 | 8.062 | 9.139 |
| Other non-metallic mineral products | 19 | 2.341 | 5.633 | 7.210 | 8.893 | 10.042 |
| Basic metals | 20 | 2.348 | 5.708 | 9.840 | 12.835 | 16.819 |
| Fabricated metal products, except machinery and equipment | 21 | 2.017 | 4.622 | 6.064 | 7.075 | 9.010 |
| Machinery and equipment n.e.c. | 22 | 2.298 | 5.071 | 6.650 | 8.719 | 9.980 |
| Office machinery and computers | 23 | 2.269 | 5.440 | 5.728 | 5.358 | 4.845 |
| Electrical machinery and apparatus n.e.c. | 24 | 2.160 | 5.555 | 7.490 | 8.484 | 9.693 |
| Radio, television and communication equipment | 25 | 2.039 | 5.083 | 5.029 | 5.083 | 4.478 |
| Medical, precision and optical instruments, watches and clocks | 26 | 2.312 | 5.399 | 5.855 | 6.073 | 5.902 |
| Motor vehicles, trailers and semi-trailers | 27 | 2.190 | 5.534 | 7.370 | 7.522 | 7.892 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Other transport equipment | 28 | 2.146 | 6.418 | 8.849 | 14.814 | 5.600 |
| Furniture; other manufactured goods n.e.c. | 29 | 2.151 | 5.648 | 8.375 | 10.231 | 11.884 |

Table 4.12. Price Vector for 58 sectors , 1998 =1.000 (Cont'd)

| | | 2000 | 2002 | 2004 | 2006 | 2008 |
|---|---|---|---|---|---|---|
| Sec. raw materials | 30 | 2.151 | 5.648 | 8.375 | 10.231 | 11.884 |
| Electrical, gas, hot | 31 | 2.503 | 7.110 | 7.816 | 8.951 | 12.532 |
| water, distribution | 32 | 2.257 | 6.547 | 9.081 | 8.999 | 11.389 |
| Construction work | 33 | 2.025 | 3.768 | 5.136 | 5.763 | 7.393 |
| Trade of motor v. | 34 | 2.200 | 4.972 | 6.482 | 7.464 | 8.785 |
| Wholesale trade | 35 | 2.200 | 4.972 | 6.482 | 7.464 | 8.785 |
| Retail trade | 36 | 2.200 | 4.972 | 6.482 | 7.464 | 8.785 |
| Hotel, restaurant | 37 | 2.579 | 5.080 | 8.154 | 10.550 | 13.300 |
| Land transport; | 38 | 2.696 | 6.476 | 8.775 | 11.121 | 12.681 |
| Water transport | 39 | 2.279 | 5.097 | 6.555 | 7.529 | 8.986 |
| Air transport | 40 | 2.279 | 5.097 | 6.555 | 7.529 | 8.986 |
| travel agency | 41 | 2.279 | 5.097 | 6.555 | 7.529 | 8.986 |
| Post telecomm. | 42 | 2.279 | 5.097 | 6.555 | 7.529 | 8.986 |
| Financial inter. | 43 | 1.969 | 2.399 | 2.671 | 2.423 | 3.058 |
| Insurance services | 44 | 1.969 | 2.399 | 2.671 | 2.423 | 3.058 |
| financial intermed. | 45 | 1.969 | 2.399 | 2.671 | 2.423 | 3.058 |
| Real estate | 46 | 2.528 | 5.949 | 8.202 | 9.731 | 11.710 |
| Renting of machi. | 47 | 1.969 | 2.399 | 2.671 | 2.423 | 3.058 |
| Computer services | 48 | 2.474 | 6.031 | 8.209 | 9.264 | 10.047 |
| R & D services | 49 | 2.474 | 6.031 | 8.209 | 9.264 | 10.047 |
| Other services | 50 | 2.474 | 6.031 | 8.209 | 9.264 | 10.047 |
| Public adm. | 51 | 2.508 | 5.088 | 7.765 | 9.675 | 11.722 |
| Education services | 52 | 2.831 | 6.021 | 9.786 | 12.119 | 13.870 |
| Health and social | 53 | 2.836 | 5.840 | 8.211 | 9.257 | 9.738 |
| Sewage& disposal | 54 | 2.474 | 6.031 | 8.209 | 9.264 | 10.047 |
| Membership n.e.c. | 55 | 2.474 | 6.031 | 8.209 | 9.264 | 10.047 |
| Recreat.& cultural | 56 | 2.231 | 4.771 | 5.652 | 6.501 | 6.870 |
| Other services | 57 | 2.474 | 6.031 | 8.209 | 9.264 | 10.047 |
| Private households with emp. | 58 | 2.474 | 6.031 | 8.209 | 9.264 | 10.047 |
| GDP Deflator | | 2.457 | 4.838 | 8.184 | 10.458 | 12.446 |

(C) **Value Added Vector.** There are detailed value added data by sectors for the years from 2003 to 2006 in file "2003-2006 YILLIK". The format of the data in that file is as in the Table 4.13 below. The whole table in the source file occupies 717 lines and 27 columns, i.e. the range spanning from A1 to AA717.

The left side of the table is the code of non-agriculture economic activities of NACE (Classification of Economic Activities in the European Community) Revision 1.1 and the numbers are the value added at factor cost for corresponding detailed sectors or subsectors. Its two digit system is corresponding to the 59-sector classification of Input-output table of Turkey (in our case, it is 58 sectors because sector 6 has be removed). Therefore, it is easy to use its two-digit sector classification to get value added by sector details for the years from 2003 to 2006 from this table.

Table 4.13. Value added at Factor Cost (Nace Rev. 1.1, Section C)

| NACE | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|
| Türkiye | 143 318 607 847 | 174 004 663 245 | 185 797 967 886 | 210 976 441 499 |
| Kısım C | 2 086 505 693 | 2 806 543 731 | 2 910 069 228 | 3 945 235 469 |
| 10 | 643 288 674 | 935 295 142 | 1 148 153 576 | 967 092 152 |
| 101 | (**) | 87 527 898 | 96 653 137 | (***) |
| 1010 | (**) | 87 527 898 | 96 653 137 | (***) |
| 102 | 577 181 216 | 847 775 326 | 1 051 256 645 | 831 139 365 |
| 1020 | 577 181 216 | 847 775 326 | 1 051 256 645 | 831 139 365 |
| 103 | (*) | - 8 082 | 243 794 | (***) |
| 1030 | (*) | - 8 082 | 243 794 | (***) |
| …… | …… | …… | …… | …… |
| …… | …… | …… | …… | …… |

Source: TurkStat (2010e). Annual Industry and Service Statistics.

The results from the two digits code of the table above are show in Table 4.14.

Table 4.14. Value Added for Non-agriculture Economic Activities from Table 4.14.

| No. | Economic activity | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|
| 4 | Coal and lignite; | 643 289 | 935 295 | 1 148 154 | 967 092 |
| 5 | Crude petroleum, natural gas | 529 948 | 680 072 | 668 387 | 809 487 |
| 6 | Metal ores | 313 863 | 314 180 | 399 853 | 937 610 |
| 7 | Other mining and quarrying | 599 406 | 876 997 | 693 676 | 1 231 046 |
| 8 | Food and beverages | 7 388 274 | 7 733 971 | 7 381 421 | 8 000 666 |
| 9 | Tobacco products | 797 556 | 920 353 | 719 027 | 1 273 010 |
| 10 | Textiles | 7 792 715 | 8 578 811 | 6 862 870 | 8 498 864 |
| 11 | Wearing apparel; furs | 5 124 750 | 5 205 151 | 4 034 546 | 4 786 849 |
| 12 | Leather and leather products | 609 972 | 609 292 | 789 828 | 733 109 |
| 13 | Wood and products and cork | 522 558 | 636 184 | 856 459 | 867 986 |
| 14 | Paper and paper products | 892 943 | 1 093 677 | 1 117 200 | 1 471 147 |
| 15 | Printed and recorded media | 1 031 465 | 1 255 724 | 1 578 847 | 1 369 686 |
| 16 | Coke, refined petroleum | 1 167 327 | 1 429 694 | 2 476 588 | 1 545 080 |
| 17 | Chemicals, man-made fibres | 5 480 218 | 5 918 204 | 4 061 249 | 5 105 527 |
| 18 | Rubber and plastic products | 2 539 259 | 3 054 266 | 2 688 512 | 3 597 256 |

| | | | | | |
|---|---|---|---|---|---|
| 19 | Other non-metallic mineral | 3 411 778 | 4 732 338 | 5 016 873 | 7 016 932 |
| 20 | Basic metals | 4 186 842 | 6 075 475 | 4 096 225 | 7 198 236 |
| 21 | Fabricated metal products, | 1 936 952 | 2 549 047 | 2 745 988 | 3 487 544 |
| 22 | Machinery and equip. n.e.c. | 3 634 251 | 4 343 941 | 4 506 913 | 5 913 370 |
| 23 | Office machinery computers | 43 857 | 50 641 | 43 046 | 48 420 |
| 24 | Electrical machinery | 1 364 145 | 1 827 909 | 1 708 889 | 2 346 909 |
| 25 | Radio, tv & commu. Equi. | 1 059 412 | 1 204 600 | 1 115 913 | 1 377 878 |
| 26 | Medical, watches and clocks | 282 385 | 293 645 | 297 098 | 393 256 |
| 27 | Motor vehicles, | 4 764 824 | 6 586 868 | 5 498 840 | 6 486 888 |
| 28 | Other transport equipment | 539 193 | 689 030 | 831 396 | 1 133 156 |
| 29 | Furniture;other manuf. n.e.c. | 1 776 684 | 2 116 968 | 1 800 940 | 2 131 228 |
| 30 | Secondary raw materials | 9 561 | 18 881 | 16 255 | 14 618 |
| 31 | Electrical, gas, hot water | 6 006 076 | 8 144 287 | 7 992 482 | 5 509 066 |
| 32 | Water coll. ,distribution | 2 100 057 | 2 478 548 | 2 758 087 | 2 786 286 |
| 33 | Construction work | 7 185 434 | 8 055 128 | 9 586 013 | 14 645 610 |
| 34 | Trade, of motor vehicles | 7 817 995 | 8 060 972 | 8 752 631 | 8 508 281 |
| 35 | Wholesale, except of motor | 19 775 338 | 24 417 338 | 31 523 801 | 29 404 604 |
| 36 | Retail trade services, | 13 219 170 | 15 100 497 | 16 225 914 | 18 634 031 |
| 37 | Hotel and restaurant services | 2 807 981 | 3 389 949 | 4 377 914 | 4 589 324 |
| 38 | Land transport; | 5 644 751 | 6 418 957 | 6 515 250 | 7 642 858 |
| 39 | Water transport services | 1 074 624 | 1 583 236 | 2 079 701 | 1 738 251 |
| 40 | Air transport services | 1 123 305 | 1 255 354 | 1 221 701 | 1 053 235 |
| 41 | travel agency | 2 273 103 | 4 246 500 | 5 356 637 | 4 878 797 |
| 42 | Post and tele. service | 6 749 661 | 8 746 933 | 9 283 115 | 10 105 704 |
| 43 | Financial intermediate. | | | | |
| 44 | Insurance and funding | | | | |
| 45 | Services to financial interm. | | | | |
| 46 | Real estate services | 522 898 | 674 267 | 589 082 | 1 142 635 |
| 47 | Renting services | 114 133 | 187 437 | 228 531 | 418 296 |
| 48 | Computer services | 608 362 | 746 222 | 909 109 | 1 124 947 |
| 49 | Research and development | 5 769 | 11 110 | 12 539 | 33 371 |
| 50 | Other business services | 4 610 127 | 6 295 579 | 9 271 104 | 11 990 842 |
| 51 | Public administration | | | | |
| 52 | Education services | 1 234 262 | 1 592 546 | 2 066 281 | 2 483 486 |
| 53 | Health and social work | 1 102 667 | 1 700 174 | 2 389 652 | 3 245 980 |
| 54 | Sewage and refuse disposal | 122 668 | 187 821 | 364 155 | 574 523 |
| 55 | Membership org. services | | | | |
| 56 | Recreational, cultural, | 548 290 | 700 360 | 858 669 | 1 303 122 |
| 57 | Other services | 228 511 | 280 235 | 280 609 | 420 344 |
| 58 | Private househ. with empl. | 313 863 | 314 180 | 399 853 | 937 610 |

It seems good to have these data detailed in sectors. However, there are two problems. One is some sectors with no data and they are the agricultural sectors 1, 2, 3 and sectors

43, 44, 45 which are financial related sectors, and sector 51 (Public administration and defence services), sector 55 (Membership organization services n.e.c.), and finally sector 57 (other service). For those sectors, their value added for the years 2003-2006 should be obtained. This problem is solved quite well because the value added (and output) data of 1998-2008 for crops of agriculture and for 3 financial sectors (43-45) are found. Also the value added for sectors 51, 55 and 57 are estimated finally.

The second problem is, if comparing these numbers with the value added statistics by 17 sectors from the national account listed in the Table 22.9 of the published book "IST_gostergeler1923-2008" (Table 3.3 in this paper), there are quite big differences between these two sources. For example, for sector 33 (Construction), its value added from two sources are listed in following table (Table 4.15). The sums of the total value added by all sectors from two sources are listed in Table 4.16 In these two tables, the SNA numbers which do not include the items "taxes minus subsidies" and "less financial intermediation service indirectly measured" are used because they are closer the concept of "value added at factor cost" .

Table 4.15. Comparison of value added of construction sector between two sources

| | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|
| From Table 4.14 | 7185434 | 8055128 | 9586013 | 14645610 |
| From SNA | 18405464 | 24661000 | 28694134 | 35849263 |
| SNA/Table 4.14 | 2.561 | 3.062 | 2.993 | 2.448 |

Table 4.16. Comparison of total value added between two sources

| | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|
| From Table 4.14 | 143318607 | 174004663 | 185797967 | 210976441 |
| From SNA | 404835610 | 494884058 | 571714470 | 668418265 |
| SNA/Table 4.14 | 2.825 | 2.844 | 3.077 | 3.168 |

It can be seen, from the two tables above, that the data from SNA are nearly all two times or more than the data in Table 4.14. A reasonable assumption is that the data from Table 4.14 have smaller coverage than the ones from SNA.

How do we use these quite detailed value added data in Table 4.14? A natural idea is to use the 17 sector classification data from national account as control total to allocate them into 58 sectors by using the structure information created from Table 4.14 as the guide for allocation operation. In fact, the first two sectors are agriculture related in the 17 sector classification of SNA, the control total allocation operation will be done among the remaining 15 sectors. The results from this operation are the value added vector for the years 2003-2006.

The actual operation to create this table should be done on the basis of Table 3.4, rather than the Table 3.3 in Section 3 of this paper. Why? It is that the SNA definition value added is the one we want.

For the value added vector of year 2007 and 2008, there are output index data for 27 industry sectors (described in next part of “output vector”). The growth rate in constant price and the price vector are used for creating the first initial estimation for these industry sectors’ value added. For service sectors, since there are 11 service sectors’ value added data from 1998-2008 in Table 3.4 and other 3 finance related sectors found in yearbook, their data for 2007-2008 are more or less ready.

For the value added vector between 1998 and 2002, since we have consistent Input-output tables with 17 sector SNA data for these two years, the value added vectors between the two years can be worked out firstly by interpolation among these two years’ value added by sectors. Then by using the control total of 17 sector value added from SNA to adjust them into proper values for the year 1999, 2000 and 2001.

After doing all the work mentioned above, the value added vector time series for the model TURINA are ready and they are listed in Table 4.17 for every two years (the sector names are omitted in that table).

Table 4.17 Value Added Data to be used in TURINA (1000 TRY)

| Sector | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 |
|---|---|---|---|---|---|---|
| 1 | 8479915 | 17033626 | 38077944 | 56858452 | 67075480 | 76797104 |
| 2 | 317460 | 517115 | 1095966 | 1636510 | 1930578 | 2210388 |
| 3 | 244564 | 412902 | 689481 | 1372466 | 2091429 | 1704752 |
| 4 | 231583 | 632237 | 1310208 | 2220536 | 2489872 | 5770324 |
| 5 | 110613 | 305142 | 633516 | 1614597 | 2084104 | 3633483 |
| 6 | 76833 | 144067 | 274494 | 745911 | 2413968 | 2896438 |
| 7 | 333725 | 689701 | 1348202 | 2082126 | 3169446 | 2488368 |
| 8 | 3307829 | 6817416 | 13152184 | 12687819 | 15824779 | 20912062 |
| 9 | 257625 | 480311 | 902041 | 1509868 | 2517929 | 2088778 |
| 10 | 1467737 | 4912049 | 10391947 | 14073804 | 16810182 | 16367053 |
| 11 | 940972 | 2931417 | 6136660 | 8539210 | 9468066 | 9323752 |
| 12 | 180445 | 466987 | 947050 | 999562 | 1450039 | 2031876 |
| 13 | 276488 | 428306 | 757617 | 1043679 | 1716817 | 2726848 |
| 14 | 300534 | 806298 | 1646198 | 1794212 | 2909830 | 3014279 |
| 15 | 385506 | 693724 | 1289425 | 2060054 | 2709146 | 4493774 |
| 16 | 2277166 | 1664683 | 1742054 | 2345457 | 3056065 | 9181426 |
| 17 | 1048409 | 2708825 | 5491796 | 9708996 | 10098390 | 11496930 |
| 18 | 516455 | 1240628 | 2478926 | 5010618 | 7115130 | 7437882 |
| 19 | 1087692 | 2185948 | 4190076 | 7763546 | 13879021 | 13773013 |
| 20 | 824245 | 1955794 | 3897837 | 9967004 | 14237627 | 16274090 |
| 21 | 781869 | 1306716 | 2373074 | 4181790 | 6898128 | 8704845 |
| 22 | 1089368 | 2450578 | 4827322 | 7126368 | 11696249 | 13823009 |
| 23 | 50234 | 57984 | 89763 | 83077 | 95771 | 101172 |
| 24 | 379210 | 935242 | 1878845 | 2998741 | 4642028 | 5261962 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 25 | 326210 | 555942 | 1016058 | 1976183 | 2725349 | 1558259 |
| 26 | 41976 | 117595 | 241946 | 481735 | 777833 | 755901 |
| 27 | 823393 | 1465595 | 2715150 | 10805960 | 12830629 | 14462754 |
| 28 | 107722 | 331327 | 692237 | 1130375 | 2241307 | 1076918 |
| 29 | 860316 | 1215092 | 2073411 | 3472952 | 4215426 | 5796367 |
| 30 | 5079 | 6506 | 10628 | 30975 | 28914 | 48073 |
| 31 | 1095967 | 2652317 | 6643662 | 9231168 | 10136270 | 17421484 |
| 32 | 257254 | 847251 | 2215077 | 2809318 | 5126558 | 5129636 |
| 33 | 4218576 | 8978473 | 16259344 | 27857664 | 40674756 | 49719132 |
| 34 | 1639641 | 3931784 | 8379826 | 13542875 | 16193618 | 19474160 |

Table 4.17 Value Added Data to be used in TURINA(1000 TRY) (Continued)

| sector | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 |
|---|---|---|---|---|---|---|
| 35 | 4451544 | 8806729 | 17990872 | 41022468 | 55965116 | 67260936 |
| 36 | 4064487 | 9823177 | 20968172 | 25369664 | 35465732 | 42624020 |
| 37 | 1841768 | 4316905 | 8829104 | 14344235 | 19335874 | 23863178 |
| 38 | 5657705 | 13653461 | 33500176 | 24773336 | 35521528 | 45013032 |
| 39 | 401105 | 1420232 | 3672094 | 6110344 | 8078824 | 10237522 |
| 40 | 335754 | 767522 | 1865487 | 4844916 | 4895093 | 6203084 |
| 41 | 484813 | 3069583 | 8318696 | 16388949 | 22675064 | 28733938 |
| 42 | 1107619 | 2772020 | 6842486 | 33757932 | 46968032 | 59518096 |
| 43 | 5196623 | 11522296 | 15746121 | 18858838 | 21717680 | 32754760 |
| 44 | 225114 | 570225 | 811318 | 1027672 | 2029243 | 2498099 |
| 45 | 99318 | 342345 | 522923 | 1143276 | 1056272 | 1494890 |
| 46 | 3132635 | 14107969 | 31838564 | 6442516 | 9015096 | 14168536 |
| 47 | 148512 | 268607 | 517319 | 1790932 | 3300247 | 5186818 |
| 48 | 188308 | 467537 | 970636 | 7130042 | 8875539 | 12844390 |
| 49 | 119978 | 236908 | 467277 | 106156 | 263286 | 381018 |
| 50 | 1822863 | 4942604 | 10428992 | 60153320 | 94604664 | 130812304 |
| 51 | 2911095 | 7934616 | 17683792 | 28218344 | 33607712 | 40519928 |
| 52 | 1593970 | 4318462 | 10460830 | 17098136 | 24101168 | 31014120 |
| 53 | 870243 | 2336784 | 5602567 | 9194623 | 13684565 | 17326646 |
| 54 | 4252 | 100572 | 279339 | 421084.9 | 577726.1 | 708470 |
| 55 | 601756 | 1373091 | 3270071 | 4929416 | 6763131 | 8293681 |
| 56 | 342391 | 1086767 | 2722064 | 4103331 | 5629746 | 6903803 |
| 57 | 177469 | 326011 | 741814 | 1118236 | 1534213 | 1881417 |
| 58 | 81220 | 214017 | 555406 | 921667 | 1394502 | 1899244 |

These 27 industrial sector production indexes, combined with price index vector, can create 27 industrial sectors' output value: first generate output in constant price by using these indexes and the output values in 2002 and then convert them into in current price by using the price vector.

For construction and service sectors, there is the same table as the Table 4.13 for output in file “2003-2006 YILLIK”. Can we use it to create output values like the analysis for value added vector? The answer is No because there is no corresponding output by sector data from national account, even a single number for control total.

Table 4.18 The 27 Sectors with Production Index from 1997 -2008

| Output Index | IO sector | |
|---|---|---|
| 1 | 4 | Coal and lignite; peat |
| 2 | 5 | Crude petroleum and natural gas; services incidental to oil and gas extraction excluding surveying |
| 3 | 6 | Metal ores |
| 4 | 7 | Other mining and quarrying products |
| 5 | 8 | Food products and beverages |
| 6 | 9 | Tobacco products |
| 7 | 10 | Textiles |
| 8 | 11 | Wearing apparel; furs |
| 9 | 12 | Leather and leather products |
| 10 | 13 | Wood and products of wood and cork (except furniture); articles of straw and plaiting materials |
| 11 | 14 | Pulp, paper and paper products |
| 12 | 15 | Printed matter and recorded media |
| 13 | 16 | Coke, refined petroleum products and nuclear fuels |
| 14 | 17 | Chemicals, chemical products and man-made fibres |
| 15 | 18 | Rubber and plastic products |
| 16 | 19 | Other non-metallic mineral products |
| 17 | 20 | Basic metals |
| 18 | 21 | Fabricated metal products, except machinery and equipment |
| 19 | 22 | Machinery and equipment n.e.c. |
| 20 | 23 | Office machinery and computers |
| 21 | 24 | Electrical machinery and apparatus n.e.c. |
| 22 | 25 | Radio, television and communication equipment and apparatus |
| 23 | 26 | Medical, precision and optical instruments, watches and clocks |
| 24 | 27 | Motor vehicles, trailers and semi-trailers |
| 25 | 28 | Other transport equipment |
| 26 | 29 | Furniture; other manufactured goods n.e.c. |
| 27 | 31 | Electrical energy, gas, steam and hot water |

A possible way to have output values for construction and service sectors is to use the ratio between corresponding value added and output for one same year and one same sector in the file “2003-2006 YILLIK” and to project it to the resulted value added in Table 4.17 for that year and that sector. For example, the output and value added of Construction sector in 2003 are 24829284 and 7185433 in the file “2003-2006 YILLIK”, respectively. So the ratio is 24829284/7185433 (=3.4555). On the other hand, the value added finally created by the method mentioned in sub-section (C) **Value Added Vector** above for sector construction in 2003 is 20676168. Therefore, the output for sector construction in 2003 is

20676168 * 24829284/7185433 = 71446556.

For the year 2007 and 2008, the growth rate of value added in construction and service sectors are used to be created the output values for those sectors.

For sectors 1, 43, 44 and 45, output data from 1998 to 2008 are found in statistical yearbook. For sectors 2, 3, 51, 55 and 57, their output from 2003 to 2008 are estimated by corresponding ratio between output and value added in IO table of 2002 and their value added data created in the last section “Value Added Vector” since there are no these sectors’ data in Table 4.13.

For the year 1998 to 2002, a first estimation of the output vector can be obtained after the interpolation between 1998 and 2002 Input-output tables. Then they can be scaled by using the same factor when adjusting the value added by using the control total of 17 sector value added from SNA for the year 1999, 2000 and 2001.

After doing all the work mentioned above, the output vector time series are ready and they are listed in Table 4.19 for every two years (the sector names are omitted in this table).

Table 4.19 The Output Vector Data for TURINA (Million TRY)

| | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 |
|---|---|---|---|---|---|---|
| 1 | 12857007 | 25825902 | 57387256 | 85691352 | 101089432 | 117523256 |
| 2 | 362594 | 563200 | 1277294 | 1907272 | 2249994 | 2576098 |
| 3 | 302636 | 508167 | 905556 | 1788414 | 2725269 | 2275692 |
| 4 | 352566 | 944455 | 2048510 | 3529401 | 3786885 | 8688655 |
| 5 | 143896 | 374886 | 839161 | 6506792 | 3985428 | 12687756 |
| 6 | 119685 | 144675 | 584875 | 1667524 | 5569892 | 6684834 |
| 7 | 426523 | 1198806 | 3130966 | 5930928 | 7497974 | 9382421 |
| 8 | 9196317 | 20765036 | 51193192 | 77043472 | 97497240 | 130216800 |
| 9 | 752602 | 1474512 | 2708504 | 3578633 | 4014235 | 4938421 |
| 10 | 3678486 | 14722541 | 38274072 | 51107160 | 53355220 | 56142152 |
| 11 | 2746615 | 5438133 | 22530620 | 35071140 | 44735992 | 47810760 |
| 12 | 649992 | 1309772 | 3519107 | 5271190 | 6849536 | 6691978 |
| 13 | 932207 | 1499236 | 2921872 | 4976280 | 7772124 | 10633704 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | 763766 | 3316663 | 6388222 | 8221326 | 10997334 | 13026540 |
| 15 | 788403 | 2057370 | 3510948 | 6807897 | 8863156 | 11144287 |
| 16 | 3387704 | 6179631 | 10087434 | 14383664 | 26293234 | 35708792 |
| 17 | 2982235 | 10512915 | 18927944 | 27828962 | 38949800 | 50240672 |
| 18 | 1555450 | 4742652 | 9613876 | 15320382 | 21784092 | 26687760 |
| 19 | 2113818 | 5386038 | 11796468 | 18229052 | 30429864 | 34961396 |
| 20 | 3082582 | 9550188 | 17410380 | 37955968 | 65358968 | 96830520 |

Table 4.19 The Output Vector Data for TURINA (Continued)

| | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 |
|---|---|---|---|---|---|---|
| 21 | 2025712 | 4015662 | 8015361 | 12084127 | 25854160 | 33337666 |
| 22 | 2574055 | 7101582 | 13281430 | 26871516 | 47397728 | 54823784 |
| 23 | 101664 | 151420 | 235622 | 423582 | 1930256 | 1710404 |
| 24 | 1035946 | 2615094 | 6897170 | 9854447 | 13258304 | 21792844 |
| 25 | 702645 | 2315281 | 5454350 | 8759873 | 8407579 | 11644750 |
| 26 | 103178 | 466545 | 832251 | 977187 | 1878980 | 2299409 |
| 27 | 2081980 | 5686865 | 12092004 | 33681344 | 40343384 | 49099312 |
| 28 | 190353 | 665885 | 1995902 | 2228022 | 4917742 | 4823271 |
| 29 | 2092265 | 4590440 | 8310113 | 12070874 | 24083542 | 34188112 |
| 30 | 10400 | 29367 | 51048 | 69351 | 151457 | 218595 |
| 31 | 2339681 | 12972476 | 20673784 | 27749442 | 37856544 | 57392024 |
| 32 | 395317 | 1749161 | 2592144 | 3587190 | 5862186 | 6353760 |
| 33 | 9874482 | 21107666 | 33444116 | 63324320 | 93302472 | 105637048 |
| 34 | 2111786 | 7011396 | 15816781 | 25990188 | 32877072 | 41037328 |
| 35 | 5620512 | 18110666 | 30715652 | 69775448 | 95191520 | 114404664 |
| 36 | 5001698 | 17762762 | 30523828 | 42032908 | 57625752 | 71789568 |
| 37 | 3802082 | 9971256 | 17039440 | 28028246 | 37711576 | 47018464 |
| 38 | 8459702 | 29579866 | 56028820 | 58017384 | 83757088 | 110645304 |
| 39 | 773939 | 3402800 | 6117702 | 10152987 | 13277370 | 16825140 |
| 40 | 867014 | 2760306 | 5018452 | 10221973 | 12201751 | 15409174 |
| 41 | 1142938 | 2977216 | 16651399 | 31309562 | 43097772 | 54588780 |
| 42 | 1738633 | 8049039 | 11318060 | 36659760 | 50876428 | 63940072 |
| 43 | 6565940 | 14276846 | 23756070 | 31624572 | 38995368 | 54520164 |
| 44 | 321204 | 744707 | 1320228 | 1756402 | 2861004 | 3285398 |
| 45 | 197761 | 568149 | 1214109 | 2654430 | 2452425 | 3470797 |
| 46 | 2958500 | 9318896 | 41760396 | 72821976 | 106026024 | 138378128 |
| 47 | 195988 | 447085 | 1016488 | 3121878 | 5959861 | 8318343 |
| 48 | 284852 | 714221 | 1671614 | 1810086 | 2531428 | 3203825 |
| 49 | 191687 | 603890 | 1524983 | 3535161 | 9327044 | 10980925 |
| 50 | 2343761 | 7083077 | 17928192 | 12874528 | 20373148 | 24757930 |
| 51 | 5116660 | 13882146 | 25066540 | 37441084 | 51972176 | 67395624 |
| 52 | 457379 | 1363596 | 12459043 | 19452068 | 27109304 | 34673488 |
| 53 | 1326855 | 3044171 | 9066845 | 14047279 | 19581164 | 24960964 |
| 54 | 5772 | 257478 | 506994 | 768794 | 1067778 | 1341824 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 55 | 797950 | 1937105 | 5620665 | 9005322 | 12242837 | 15078112 |
| 56 | 703773 | 2549168 | 4867058 | 7439108 | 10540170 | 13314778 |
| 57 | 243695 | 581327 | 1255606 | 2019203 | 2744746 | 3385805 |
| 58 | 81220 | 214017 | 555406 | 921667 | 1394502 | 1899244 |

## 5. The Framework of the Model[1]

It has to be realized that the data preparation described above is not the whole work before getting into the regression and simulation steps which some people think that it is the real modeling work. In fact, there are still, at least, two steps needed to go in data processing stage. The first one is to have the across-the-row procedure to create Input-output coefficient matrices which, together with the output vector, are consistent with the national account data of GDP by expenditure (final demand) and GDP by cost (value added). The second thing is to convert the GDP expenditure components and the Input-output coefficient matrixes from current price into constant price. After this stage, the equation

$$A'p + va/out = p$$

can be applied. These two steps were done in the last days of one month working period. On this data base which has Input-output table for every year between 1998 and 2008 and their value added side and final demand side are consistent with the national account data and also are subject to the price vector equation, the initial framework of the model TURINA was designed by the calculation approach summarized in the following steps:

Step 1. Give an assumed per capita disposable income in constant price for the year when the model runs.

Step 2. Use the per capita disposable income to calculate the per capita household consumption in constant price by 58 sectors according to the equations resulted from the regression in the sample period 1998-2008.

Step 3. Get total household consumption by 58 sectors through multiplying out the population in that year by the calculated household consumption per capita.

Step 4. Get final demand vector “fd” if all the other component vectors such as government consumption, fixed capital formation, inventory changes, export and import are exogenously given.

[1] The framework of the model is based on the general guidelines set by Almon (2008a, 2008b), Meade (1996), and Inforum (2009).

Step 5. Calculate the gross output vector, in constant price, according to the equation

$$out = (I-A)^{-1} * fd$$

Step 6. Calculate the value added vector “va”, in current price, according to the relationship analysis between output and value added from the sample period 1998-2008.

Step 7. Calculate the price index vector, p, according to the equation

$$A'p + va/out = p$$

Step 8. Have GDP in current price and in constant price, which is the sum of value added vector and final demand vector, respectively.

Step 9. Have GDP per capita in constant price and in current price, and the GDP deflator.

Step 10. Estimate the disposable income per capita in current price and in constant price according to the regression analysis from the sample period 1998 and 2008.

Step 11. If the resulted disposable income per capita is very close to the one used in step 2, the model finishes the run for that year and goes to the next year. Otherwise, use this new disposable income per capita and go to step 2 for the next iteration of the model.

Obviously, the logical structure of the model is quite simple in this stage and its key point is the relationship analysis between value added vector in current price and gross output vector in constant price as in other countries INFORUM models.

Further development of TURINA can be done to make other final demand component vectors endogenous. Or it can be extended to have value added by cost component vectors, plus employment and productivity. Also it is possible to develop the accounting block to include total taxes, government revenue, and so on.

However, the modeling practice got trouble from the very beginning which caused by the most simple time series data “personal disposable income”. There is no official report directly about the variable “personal disposable income” in Turkish statistics. From the annual report of Turkish national planning agency, there is data about personal disposable income of previous year or years. According to these data, a time series of personal disposable income of Turkey was obtained. However, the name of this income series is “Private disposable income” but not “Personal disposable income” for some unexplained reason. A comparison between this series and the household consumption series from the GDP by expenditure in National Accounts is listed in the following table (Table 5.1).

Table 5.1 The Comparison of Disposable Income and Consumption, million TRY

| | Private Disposable Income (DY) | Consumption (C) | Ratio (C/DY) |
|---|---|---|---|
| 1998 | 48173 | 46668 | 0.97 |
| 1999 | 73280 | 71641 | 0.98 |
| 2000 | 116903 | 117499 | 1.01 |
| 2001 | 170723 | 164299 | 0.96 |
| 2002 | 255670 | 238399 | 0.93 |
| 2003 | 331947 | 324015 | 0.98 |
| 2004 | 382847 | 398559 | 1.04 |
| 2005 | 408426 | 465401 | 1.14 |
| 2006 | 467756 | 534849 | 1.14 |
| 2007 | 744124 | 601238 | 0.81 |
| 2008 | 830368 | 662997 | 0.80 |

Source: For DY, SPO *Annual Programme 2000*, *Annual Programme 2001*, …, *Annual Programme 2010*.

The ratio in Table 5.1 which implies the average propensity to consume gives the impression:

(A).The expenditure is very close, or even is in excess of the income in many years which means Turkish households have very low saving rate or, even negative average saving rates in many years.

(B).The disposable income in nominal real terms of the year 2007 is about 50% more than its value in 2006 (the GDP deflator in 2007 is around 10% with 1998 = 1.00), which is unacceptable.

From the impressions above, it is concluded that the disposable income from the Annual Programs of the State Planning Organization of Turkey is not consistent with the consumption data from the national accounts statistics. The idea to use it in the model has to be given up.

Other efforts were tried. For example, there is Table 22.1 “Distribution of annual incomes by quintiles ordered by household disposable income, 2006-2007” in the “Turkey’s Statistical Yearbook, 2009”. The average household disposable income from this survey is 15102 TRY and 18827 TRY in 2006 and 2007, respectively. If these numbers are multiplied by the number of households, the total disposable income for 2006 and 2007 will be 267148 and 326421 million TRY respectively. Now, total disposable income is 35.2 percent and 38 percent of GDP in these two years respectively, which are too small to accept.

Now Table 5.1 should be supported with Table 5.2 to have a further idea about the

disposable income data.

Table 5.2 Household Disposable Income Estimate from TurkStat soureces

| | Number of households | Disposable Income (1000 TL) | Disposable income/GDP | Population | Average family size | Per capita disposable income (TL) |
|---|---|---|---|---|---|---|
| 2006 | 17689552 | 267148 | 0.352 | 69421 | 3.92 | 3848 |
| 2007 | 17337894 | 326421 | 0.387 | 70256 | 4.05 | 4646 |

Source: TurkStat: i. Stattistical Yearbook 2009, Table 22.1; ii. TurkStat Web Page, Household Consumption Expenditure by Types of Expenditure (which gives number of households). Our calculations are based on these two sources.

As the average family size increases from 3.92 in 2006 to 4.05 in 2007, which are contrary to expectations, the income figures in Table 5.2 are neither reliable nor comparable.

Finally, it was given up to use the personal disposable income in the model and the consumption per capita in constant price is directly explained by GDP per capita in constant price.

At aggregate level, the regression result between consumption per capita in constant price and the GDP per capita in constant price is shown as following:

: Consumption per capita, real

SEE = 15.57 RSQ = 0.9809 RHO = 0.35 Obser = 11 from 1998.000
SEE+1 = 15.83 RBSQ = 0.9787 DW = 1.31 DoFree = 9 to 2008.000
MAPE = 1.55

| Variable name | Reg-Coef | Mexval | Elas | NorRes | Mean | Beta | t-value | F-Stat |
|---|---|---|---|---|---|---|---|---|
| 0 phhconsR | | - - - - - - - - - - - - - - - - - | | | 853.78 | - - - - - - - - - - - | | |
| 1 intercept | -94.48297 | 22.5 | -0.11 | 52.24 | 1.00 | | -2.125 | |
| 2 pgdpR | 0.77641 | 622.8 | 1.11 | 1.00 | 1221.35 | 0.990 | 21.475 | 461.16 |

The simulation effect is shown in Figure 5.1 in the next page.

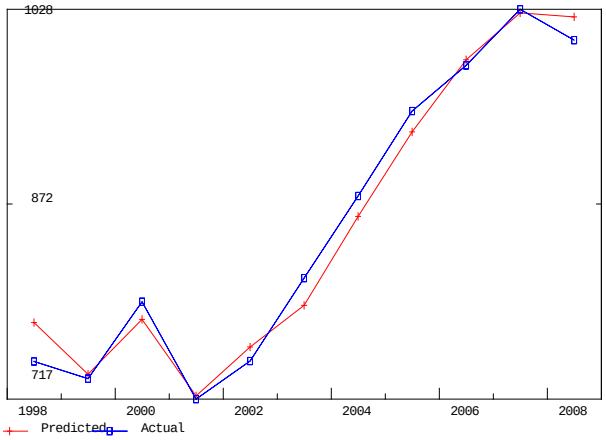


Figure 5.1 Simulation of Consumption Per Capita at Aggregate Level

## 6. Concluding Remarks

We can conclude our study in six points.

(1). To build up an Interindustry Model for a country, it is necessary to have time series vector data for output, value added, price index, household consumption, fixed investment, import and export, and at least one year Input-output table.

(2). There are Input-output tables for 1998 and 2002 and lots of different statistics about output, value added, price index, household consumption, fixed investment, import and export, all at quite detailed sector level, from different sources in Turkey.

(3). After careful comparison and analysis, it was found that these data are not consistent with each other in many aspects and could not be used directly for building model.

(4) Lots of works have been done in treating the inconsistency among the data from different sources. The treatment is based on the national account of GDP by expenditure. The works include the adjustments of Input-output table for 1998 and 2002, the processing on nearly every time series vector to be used, and the across-the-row

procedure plus the conversion from current price to constant price.

(5) After the data comparison, analysis and treatment, one data bank, which has consistent data from 1998 to 2008, is ready to be used for building an interindustry model for Turkey. In that data bank, there are Input-output tables for each year from 1998 to 2008 and the aggregation values from these Input-output tables are consistent with the national account data of GDP by expenditure (final demand) and GDP by cost (value added) for every year.

(6) The disposable income data, which normally is a key variable in the model iteration mechanism, was found not acceptable. It was decided to use the relationship between per capita GDP and per capita consumption to replace the relationships between per capita GDP and per capita disposable income and between per capita disposable income and per capita consumption when starting the next step of the model build for Turkey.

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