T.R. PRIME MINISTRY • STATE PLANNING ORGANIZATION

NINTH DEVELOPMENT PLAN 2007 2013

DPTMAKRO-ARZ MACROECONOMETRIC MODEL

T.R. PRIME MINISTRY
STATE PLANNING ORGANIZATION

NINTH DEVELOPMENT PLAN

DPTMAKRO-ARZ

MACROECONOMETRIC MODEL

ECONOMIC MODELING DEPARTMENT

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PREFACE

Many developed and developing countries use econometric modeling as a technical method for policy and strategy formation, implementation, monitoring and evaluation within the process of economic and social development. Today, modeling is employed extensively for policy analysis and forecasting purposes.

In Turkey, State Planning Organization (SPO) has been using macroeconomic modeling in the process of development planning starting from the First Development Plan. Starting from the one-sector Harrod-Domar type growth model used in the First Five Year Development Plan up to the DPTMAKRO-ARZ model of the Ninth Development Plan, macroeconomic modeling practices in SPO have evolved in line with the modeling practices in the world.

This study presents DPTMAKRO-ARZ, which is a supply side model developed for forecasting long-term trends of the Turkish economy. A version of this model was used in building the macroeconomic fundamentals of the Ninth Development Plan.

Apparently, there is no perfect model or a model that can answer all economic questions. Economic models are tools that should be revised and whose forecasting and analysis capacity should be enhanced continuously considering the changing conditions. On the other hand, development is a cumulative process which can be achieved with contributions of various parties over a long period. DPTMAKRO-ARZ model also has a potential for further improvement in the forthcoming years.

I hope that this study, which introduces DPTMAKRO-ARZ model used for the Ninth Development Plan, will be beneficial for researchers. Hereby, I would like to express my gratitude to all my colleagues who have contributed to this work.

Ahmet TIKTIK, PhD
Undersecretary

CONTENTS

1. INTRODUCTION

Since its establishment, State Planning Organization (SPO) has assumed a significant role in the economic and social development process of Turkey. In order to fulfill its responsibilities, SPO has been following economic and social developments both at global and national levels, and also developments in theory and practice.

In order to support economic and social decision making processes, SPO attaches an utmost importance to the use of analytical tools in the preparation of development plans and programs, and analysis of the economic situation in Turkey. However, among all of these mentioned, the preparation of development plans stand apart in terms of utilization of economic models.

The experience of State Planning Organization in the field of economic modeling, dates back to the establishment of the organization. Starting from the First Five Year Development Plan, economic models have been used in all of the development plans, and they have played a major role in establishing consistent macroeconomic frameworks in development plans. While building the models used in the development plans, the accomplishments in the contemporary economic theory and modeling techniques have been considered and the most appropriate theory and techniques have been picked diligently. Thereby, starting from the First Plan, SPO has made progress in terms of economic modeling in each plan preparation, and utilization of macroeconomic modeling techniques has become a tradition. With the introduction of DPTMAKRO-ARZ model, the same approach has also continued in the Ninth Development Plan.

DPTMAKRO-ARZ model, which has been developed for the Ninth Development Plan (2007-2013), covers the demand and supply sides of the economy simultaneously. Nevertheless, the supply side of the economy is predominant in the determination of the medium-term trends in the model. A model with a medium-long term focus was preferred, as the Plan covers a period of seven years.

Total factor productivity growth has a key role in determining the dynamics of the economy in the model. Therefore, success of Plan implementation and attainment of targeted productivity levels are of utmost importance for the realization of the Plan projections.

With this study, DPTMAKRO-ARZ model, a version of which was used in the Ninth Development Plan preparation, has been made public and available to researchers. Thereby, an opportunity for further improvement of the model is created with the discussions and suggestions put forward.

Rather than a perfect tool solving all problems, it is more appropriate to view economic models as an important and technical tool, supporting Plan preparation and policy setting process together with other platforms such as the ad-hoc committees comprised of professionals and experts from public and private sector institutions and NGOs.

This study consists of seven chapters. Following the introduction, modeling experience of the State Planning Organization is covered in the second chapter. In the third chapter, a compact form of DPTMAKRO-ARZ model and its functioning is presented. The blocks of the model are explained in detail in the fourth chapter. An overall evaluation of the model is made in the fifth chapter and the behavioral equations in the model are presented in the sixth chapter. The parameter and variable definitions used in the model are presented in the last chapter.

2. DEVELOPMENT PLANS AND MACROECONOMIC MODELS

SPO has been preparing Development Plans since 1962, as a constitutional duty. Within this context, macroeconomic modeling and forecasting efforts in SPO date back to its foundation. The models, solely used for plan preparations at the beginning, started to be utilized also for analysis and forecasting purposes later on.

Macroeconomic modeling practice in SPO could be analyzed in 3 stages. In the first stage, Harrod-Domar type growth models (First Five Year Development Plan), in the second stage multi-sector linear input-output consistency models with fixed relative prices (Second-Fifth Five Year Development Plans), and in the third stage macroeconometric models, which work independently or with the input-output models (from Sixth to Ninth Development Plans) were used. Economic models used in the previous plans are presented briefly in this chapter.

FIRST FIVE YEAR DEVELOPMENT PLAN MODEL (1963-1967)

A Harrod-Domar type single sector growth model was used in the First Five Year Development Plan. Technical structure of the model was constructed by Professor Jan Tinbergen, who was working as a consultant for the Turkish Government. Within this structure, first, the growth rate is determined through a Harrod-Domar type model, then sectoral production targets consistent with the growth rate are calculated (Yağcı, 1979).

Harrod-Domar type growth models are closed economy models and assume constant capital/output ratio. Marginal capital/output ratio is the main factor in the determination of growth. In a standard Harrod-Domar type growth model, growth rate is defined as follows;

$$g = (\frac{s}{\theta}) - \delta - n \qquad (1)$$

In Equation (1), g stands for growth rate, s for saving rate, θ for marginal capital/output ratio, δ for depreciation rate and n for population growth rate. Given other variables, the only way of increasing the growth rate is to increase the saving rate.

In the First Five Year Development Plan, an augmented version of the above model is used, and the growth rate is defined as follows:

$$g = k * s_1 * (1 - t_d) + k * s_2 * (t_V + t_y) + k * b \qquad (2)$$

In Equation (2), g stands for growth rate, k for marginal capital/output ratio, s_1 for private sector saving rate, s_2 for public sector saving rate, b for foreign trade balance to national income ratio, t_d for direct taxes, t_v for indirect taxes. According to this model, increasing the savings rate is required to increase the growth rate.

SECOND FIVE YEAR DEVELOPMENT PLAN MODEL (1968-1972)

A multi sector model is used in the Second Five Year Development Plan, unlike the First Plan. The exogenously determined macroeconomic targets of the Plan are distributed to sectors through a 6 sector input-output consistency model. The model has 8 blocks, namely, supply-demand equilibrium, consumption, investment, import, government revenues, savings, employment and identities. A significant improvement of the model is the inclusion of the trade block. Since sectoral export ratios, net invisible transactions for the overall economy and factor income from abroad are exogenously determined in the model, import requirement of the economy is linked to foreign savings. In line with the import substitution policies, the import requirement of the economy is used in the calculation of the required production of import substitutes (Polat 1986).

THIRD FIVE YEAR DEVELOPMENT PLAN MODEL (1973-1977)

The Third Five Year Development Plan model is similar to the model of the Second Plan in structure. However, the model covers 37 sectors and it is comprised of 70 equations. Utilization of single sector macro model simulations for setting macroeconomic aggregates during the preliminary work of this Plan is regarded as an important progress. Moreover, a three-sector macro model, which classifies the sectors of the economy as investment goods, intermediary goods and consumption goods, is used to analyze the distribution of investment among productive sectors and to test alternative scenarios.

The importance of a long-term perspective was emphasized during the preparation of this Plan (SPO 1970). Starting from this Plan, the five year Plans, which basically cover the medium term, became part of long term perspective. In this context, the dynamic linear optimization model, which was set up for the Third Five Year Development Plan, was simulated for the 1972-1987 period. In line with the ongoing import substitution policies, the import requirement of the economy was met by corresponding productive sectors.

FOURTH FIVE YEAR DEVELOPMENT PLAN MODEL (1979-1983)

The model used in the Fourth Five Year Development Plan is very similar to the previous plan model, though the number of sectors is increased to 64. The model is comprised of 105 equations. The single sector model built in the previous Plan was used in setting the macroeconomic targets, while the three sector model is used in distributing investment among sectors. As in the previous Plans, the macroeconomic targets are made consistent on a sectoral basis through an input-output model consisting of 105 equations. In addition to increasing the sectoral detail of the input-output model, efforts towards increasing the number of behavioral relations continued. The most significant progress towards this end was the improvement of the model to include functional distribution of income.

FIFTH FIVE YEAR DEVELOPMENT PLAN MODEL (1985-1989)

In the Fifth Five Year Development Plan preparation, the model of the Fourth Plan was used. In the model, the number of sectors was 64, and the number of equations 51. Unlike the Third and Fourth Plan preparations, alternative models were not used for determining alternative macroeconomic aggregates and determining the long term growth potential.

SIXTH FIVE YEAR DEVELOPMENT PLAN MODEL (1990-1994)

Macroeconometric modeling first came into the agenda in 1987, with the need to determine the main macroeconomic aggregates of the annual programs, which are implementation documents of the five year development plans. For this purpose, a macroeconometric model consisting of 100 equations was built. Consistency of the annual targets with the program-budget appropriations, and several policy analyses (real devaluation, export subsidies, composition of public finances etc.) were simulated using this model.

The macroeconometric model is improved and used in the Sixth Five Year Development Plan preparation which started in 1988. The relations of real sector and public finances with monetary quantities were covered for the first time in the Sixth Five Year Development Plan Model. In the model, supply-demand equilibrium on sectoral basis was established via input-output table. Moreover, the consistency of balance of payments,

public sector balance and monetary quantities with macroeconomic targets was established.

Monetary aggregates were estimated for the first time in this model. Thereby, the relation between real sector and monetary sector was established in the model. Inclusion of inflation equation in this model was an important step forward as it enabled several policy analyses (Sixth Five Year Development Plan, 1991).

SEVENTH FIVE YEAR DEVELOPMENT PLAN MODEL (1996-2000)

During the Seventh Plan preparations, the macroeconometric model used in the Sixth Five Year Development Plan was revised to cover the transformations in the Turkish economy and innovations in forecasting methodology.

This period covers the years which witnessed a series of radical innovations (cointegration, error correction mechanisms, structural time series modeling etc.) in econometrics. SPO macroeconometric model was revised to include methodological innovations. "Hendry Method" and "Johansen Approach" were used for the first time in the Seventh Five Year Development Plan preparatory period. These approaches, which are used in the models of several countries, were adapted to Plan model in a short timeframe.

DPTMAKRO Model (1995)[1] of the Seventh Plan had a Neo-Keynesian structure like many country models and used annual data. Unlike most Neo-Keynesian models, DPTMAKRO implicitly includes the supply constraint of the economy. The model was mainly comprised of six blocks. These blocks were Goods Market-Demand, Goods Market-Supply, Labor Market, Money Market, Foreign Exchange-Balance of Payments and lastly Public Sector Balance blocks. None of the blocks was block recursive, they rather covered simultaneous relations.

The input-output relation in the model was established using the 1994 input-output table. 1994 input-output matrix was an updated version of the 1990 input-output table published by TURKSTAT.

[1] http://ekutup.dpt.gov.tr/ekonomi/makro/dptmakro.pdf

EIGHTH FIVE YEAR DEVELOPMENT PLAN MODEL (2001-2005)

The main analytical tool used in the Eighth Plan was the SPO Quarterly Seasonal Macroeconometric Simulation Model, DPTMAKROM (2000)[2]. This model was an enhanced version of DPTMAKRO model that was used in the Seventh Plan, and this model used quarterly data. The preliminary work of DPTMAKROM model was initiated in early 1990s after TURKSTAT started publishing quarterly national accounts. DPTMAKROM became functional during 2000 Annual Program preparations, as the number of observations reached sufficient levels.

The most important superiority of DPTMAKROM over DPTMAKRO is the significantly shorter data lags and the fact that the data realizations within a year can be utilized in analyses. Thereby, short-term forecasting power of the model is increased. DPTMAKROM mainly has a Neo-Keynesian structure and it is supported by several satellite models. These satellite models enable full reflection of weak and model consistent expectations and debt dynamics to the model. Supply block, current account and public sector are also covered in DPTMAKROM.

NINTH DEVELOPMENT PLAN MODEL (2007-2013)

DPTMAKRO-ARZ Model, which uses annual data, was employed in the Ninth Development Plan. The main difference of DPTMAKRO-ARZ from other models is that output is determined from supply side.

Due to the extension of Plan period to seven years, a necessity for a model that will emphasize the supply constraint and thereby enable long-term analysis has emerged. The superiority of DPTMAKRO-ARZ over DPTMAKROM is its convenience for long-term analysis and its larger scale.

[2] State Planning Organization, June 2000, "DPTMAKROM-SPO Quarterly Seasonal Macro Econometric Simulation Model".

3. COMPACT FORM AND FUNCTIONING OF DPTMAKRO-ARZ MODEL

Before explaining blocks and functioning of DPTMAKRO-ARZ model extensively, this section presents a simple compact form. Functioning of the compact form is the same as the original model but it is easier to follow as it includes only the fundamental equations and identities. Furthermore, as the compact form gives a broad view of the fundamental equations and identities, it reflects integral structure of the model[3].

3.1. COMPACT FORM

$$GDP_P = Y + MTAX$$
$$GDP_E = CP + CG + IP + IG + S + (X - M)$$
$$GDP_P = GDP_E = GDP$$
$$Y + MTAX = CP + CG + IP + IG + S + (X - M)$$

GOODS MARKET-SUPPLY

$$Y = Y_{agr} + Y_{ind} + Y_{ser}$$
$$Y_{agr} = f(L_{agr}, K_{agr}, A_{agr})$$
$$Y_{ind} = f(L_{ind}, K_{ind} * CU, A_{ind})$$
$$Y_{ser} = f(L_{ser}, K_{ser}, A_{ser})$$

$$CU = f\left(\frac{GDP}{K}, IP\right)$$

$$K = K_{agr} + K_{ind} + K_{ser}$$
$$K_{agr} = K_{agr}(-1) * (1 - \delta_{agr}) + I_{agr}$$
$$K_{ind} = K_{ind}(-1) * (1 - \delta_{ind}) + I_{ind}$$
$$K_{ser} = K_{ser}(-1) * (1 - \delta_{ser}) + I_{ser}$$

[3] Variable and parameter definitions are presented in Chapter 6. In this book, underscore "…_" indicates the nominal value of the variable, overline "$\overline{...}$" indicates the variable is exogeneous, "…(-1)" indicates one period lagged value of the variable, dollar sign "…$" indicates the variable is in dollar terms. All real variables are in constant 1987 prices.

$$I_{agr} = (IP + IG) * \psi_{agr}$$
$$I_{ind} = (IP + IG) * \psi_{ind}$$
$$I_{ser} = (IP + IG) * (1 - \psi_{agr} - \psi_{ind})$$

$$MTAX = MCIF * \tau_m$$

GOODS MARKET-DEMAND

$$CP = f(GDP, RER, R\_, CP(-1))$$
$$IP = f(GDP, RER, IP(-1), R)$$
$$CG = CG\_ / CGDEF$$
$$IG = IG\_ / IGDEF$$
$$S = S(-1)$$
$$XFOB\$ = f\left(\overline{YWR}, \frac{PX}{PM}, RER, XFOB\$(-1)\right)$$
$$XFOB = XFOB\$ * ER_{87}$$
$$XOTH = \frac{\overline{XOTH\ \$\_}}{PX} * ER_{87}$$
$$X = XFOB + XOTH$$

$$M = MCIF + MOTH$$
$$MOTH = \frac{\overline{MOTH\ \$\_}}{PX} * ER_{87}$$

LABOR MARKET

$$N15 = N15(-1) * (1 + n)$$
$$LS = N15 * \overline{PART}$$

$$LD = L_{agr} + L_{ind} + L_{ser}$$
$$L_{agr} = f(t)$$
$$L_{ind} = f\left(\frac{W_{man}\_}{CPI}, IP(-1), t\right)$$
$$L_{ser} = f\left(\frac{W\_}{CPI}, (IP(-1) + IG(-1)), t\right)$$
$$U = \frac{(LS - LD)}{LS}$$

MONETARY AGGREGATES

$$M2Y\_ = f\left(GDP\_, R\_, ER, \frac{CREDIT\_}{GDP\_}\right)$$

$$\frac{CREDIT\_}{CPI} = f\left(GDP, \frac{CREDIT\_(-1)}{CPI(-1)}, \frac{IP}{GDP}, \frac{PSBR\_(-1)}{GDP\_(-1)}\right)$$

WAGES AND PRICES

$$CPI = f\left(CPI(-1), (GDP - GDPPOT)/GDPPOT, ER, W(-1)\right)$$

$$PX = f\left(\overline{PXWR}, \frac{Y_{ind}}{L_{ind}}, RER, \overline{PM}\right)$$

$$\frac{W_{man}\_}{CPI} = f\left(\frac{Y_{ind}(-1)}{L_{ind}(-1)}, U, \frac{W_{man}\_(-1)}{CPI(-1)}\right)$$

$$W\_ = W\_(-1) * \frac{W_{man}\_}{W_{man}\_(-1)}$$

$$R\_ = f\left(\frac{DDS\_}{GDP\_}, \frac{CPI}{CPI(-1)}\right)$$

$$R = R\_ * \frac{CPI(-1)}{CPI}$$

$$RER = f\left(RER(-1), RESERV, NALP, INF(-1)\right)$$

$$ER = \frac{CPI}{\overline{USCPI} * RER}$$

BALANCE OF PAYMENTS

$$XFOB\$\_ = XFOB\$ * PX$$

$$MCIF\$\_ = \frac{MCIF}{ER_{87}} * \overline{PM}$$

$$TRB\$\_ = XFOB\$\_ + \overline{SHUTTLE\$\_} + FREIGHT\$\_ + \overline{NMG\$\_} - MCIF\$\_$$

$$SRB\$\_ = FREIGHTX\$\_ - FREIGHTM\$\_ + \overline{OTRX\$\_} - \overline{OTRM\$\_} + \overline{TOURX\$\_}$$
$$- \overline{TOURM\$\_} + \overline{CONST\$\_} + \overline{FINX\$\_} - \overline{FINM\$\_} + \overline{OTRDX\$\_} - \overline{OTRDM\$\_}$$
$$+ \overline{OFSERX\$\_} - \overline{OFSERM\$\_} + \overline{OSERX\$\_} - \overline{OSERM\$\_}$$

$$INCB\ \$\_ = DIRECTX\ \$\_ - DIRECTM\ \$\_ + \overline{PORTX\ \$\_} - PORTM\ \$\_ + \overline{INTX\ \$\_} - INTM\ \$\_$$

$$CTRANS\ \$\_ = \overline{WREM\ \$\_} + \overline{OFTR\ \$\_}$$

$$CAB\ \$\_ = TRB\ \$\_ + SRB\ \$\_ + INCB\ \$\_ + CTRANS\ \$\_$$

$$FA\$\_ = FDI\$\_ + PORT\$\_ + OTINV\$\_$$

$$RESERV\$\_ = -CAB\$\_ - FA\$\_ - \overline{NEO\$\_}$$

PUBLIC SECTOR

$$GREV\_ = GREVO\_ + MTAX\_$$
$$GREVO\_ = \tau * GDP\_$$
$$MTAX\_ = \frac{MTAX}{ER_{87}} * \overline{PM} * ER$$

$$GEXP\_ = CG\_ + IG\_ + INTPAY\_ + OTRANS\_$$
$$CG\_ = GDP\_ * \gamma_{CG}$$
$$IG\_ = GDP\_ * \gamma_{IG}$$
$$OTRANS\_ = GDP\_ * \gamma_{OTR}$$
$$INTPAY\_ = INTPAY_d\_ + INTPAY_f\_$$
$$INTPAY_d\_ = DDS\_(-1) * R\_$$
$$INTPAY\$\_ = FDS\$\_(-1) * \overline{RF\_}$$
$$INTPAY_f\_ = INTPAY\$\_ * ER$$

$$PSBR\_ = GREV\_ - GEXP\_$$
$$PRS\_ = GREV\_ - (GEXP\_ - INTPAY\_)$$
$$DDS\_ = DDS\_(-1) + INTPAY_d\_ - PRS\_ * \lambda$$
$$FDS\$\_ = FDS\$\_(-1) + INTPAY\$\_ - \frac{PRS\_}{ER} * (1 - \lambda)$$
$$FDS = FDS\$\_ * ER$$

3.2. FUNCTIONING OF THE MODEL

DPTMAKRO-ARZ Model, which covers the period 1980-2006, is comprised of 96 equations, of which 28 are behavioral. There are 138 variables in the model, of which 96 are endogenous and others exogenous.[4]

DPTMAKRO-ARZ Model is mainly comprised of 7 blocks. These are Goods Market-Supply, Goods Market-Demand, Labor Market, Money, Wages and Prices, Balance of Payments and Public Sector blocks. DPTMAKRO-ARZ, which is developed to forecast long-term trend of the economy, is mainly a supply-side model. But, none of the blocks, including the supply block, is block recursive. Therefore, the main mechanism that determines the dynamics of the model is the transmission channels among the blocks. In this section, functioning of the model and relations among the blocks are briefly discussed.

In the supply block of DPTMAKRO-ARZ, the value-added in agriculture, industry, and services sectors are estimated with constant returns to scale Cobb-Douglas production functions. The link between the supply block and other blocks is established through sectoral capital stock and labor demand variables of production functions. Capital stock is calculated with perpetual inventory method using total fixed capital investment determined in the demand block. Thereby, the link between supply and demand blocks is established. Labor demand, which is determined in the labor market block, establishes the link between supply and labor market blocks.

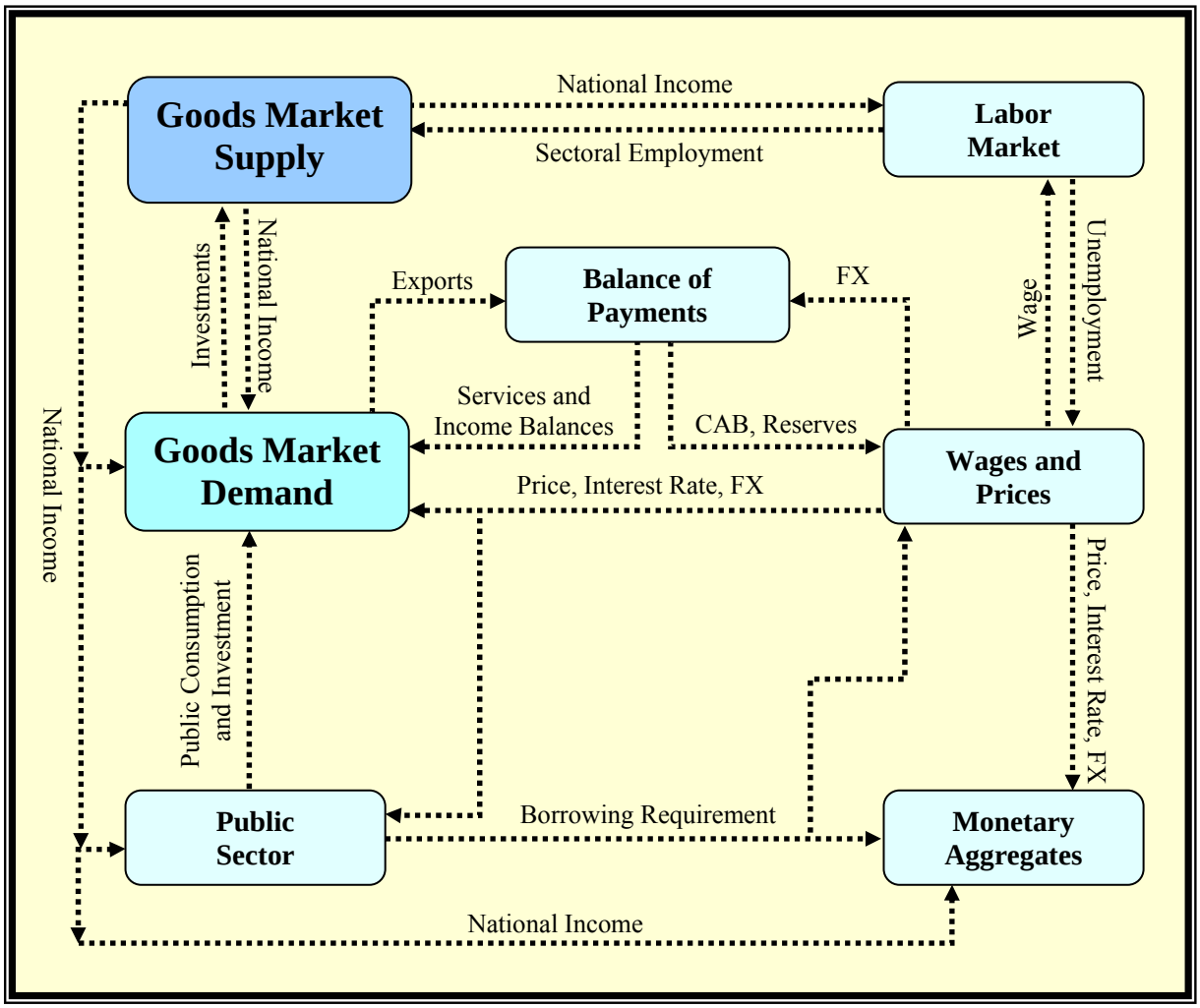
The demand block of the model includes expenditure items. While private consumption, private fixed capital investment and exports of goods are determined behaviorally, exports and imports of services are determined exogenously in balance of payments block. Public consumption and investment expenditures are obtained from public sector block and connect the demand block to fiscal block. Imports of goods is the variable that closes the system and ensures equilibrium of the economy in the model.

In the labor market block, sectoral labor demands, total labor supply and unemployment rate are estimated. Labor supply is determined considering demographic trends and participation rates. Labor demand is modeled using a trend in agricultural sector, while it is estimated using real wages and investments in industry and services sectors. Unemployment rate is calculated using the difference between labor supply and

[4] DPTMAKRO-ARZ Model is simulated using E-Views.

labor demand. Labor demand facilitates the connection among wages and prices block, supply block and demand block in the model. Thus, labor demand is an important variable helping the interaction among the blocks of the model.

Diagram: Functioning of DPTMAKRO-ARZ Model



In the money block, broad money demand and real credit volume are determined. Money block basically shows the financing requirement of the economy. The upward and downward movements of public sector borrowing requirement arise as the factors affecting the distribution of the funds provided by banks between credits and government bonds in Turkish economy. This effect is incorporated into the model through the link between public sector and money block.

Another block of DPTMAKRO-ARZ is wages and prices block. In this block, mainly wage levels in manufacturing industry and overall economy, real exchange rate, interest rate, export prices and consumer price index are estimated. As mentioned before,

wage level is important for labor demand. Real exchange rate affects balance of payments and demand blocks, through investment, consumption and export channels. Interest rate affects the demand block through its effect on consumption and investment decisions, and affects public sector block through its effect on public expenditures. Export prices, which is a competitiveness indicator of a country, affects trade balance and demand block. Consumer price index is another important variable stochastically determined in this block. Consumer price index is the main price used to forecast the real credit and wage levels. Besides, consumer price inflation is one of the important determinants of interest rates.

In balance of payments block, interactions of the economy with the rest of the world are modeled. Exports of services, imports of services and net factor income from abroad are estimated in balance of payments block and these variables establish the link between the balance of payments block and the demand block. Furthermore, developments in capital flows are also modeled in this block.

In the public sector block, public revenue and expenditure items and public sector borrowing requirement are determined. Public consumption and investment expenditures, which are determined in demand block, make the connection between public sector block and demand block. Another important role of this block is that public sector borrowing requirement affects the interest rates and consequently level of the economic activity. Besides, after the determination of the public sector borrowing requirement, public debt stock is calculated.

4. BLOCKS OF DPTMAKRO-ARZ

DPTMAKRO-ARZ model is composed of seven blocks, namely, supply, demand, labor market, money, wage and price, balance of payments and public sector blocks. In this chapter, blocks of DPTMAKRO-ARZ are explained in details.

4.1. GOODS MARKET-SUPPLY

Total value added of the economy is determined by the supply side in DPTMAKRO-ARZ model. Total value added is derived by summing up separately forecasted value added of agriculture, industry and services sectors. In the Goods Market-Supply block, sectoral value added is estimated by constant returns to scale Cobb-Douglas production functions. As a result, value added for each sector is estimated as a function of labor, capital stock and technological progress. First, capital and labor elasticities of Cobb-Douglas production function are derived by restricted regression method, then sectoral total factor productivity (TFP) is found as residual using the growth accounting method[5]. Sectoral TFP growth is determined exogenously, whereas sectoral capital stock and labor demand is forecasted with behavioral equations in the forecast period[6].

4.1.1. SECTORAL VALUE ADDED

Value added for each sector (Y_i) is estimated by labor (L_i), capital stock (K_i) and TFP (A_i) of the related sectors. On the other hand, the value added of the industry sector is estimated using the capital stock adjusted with the capacity utilization rate of manufacturing industry ($CU*K_{ind}$), thereby the fact that all of the capital stock cannot be utilized in production is considered.

In this respect, the functional forms of the estimated production functions of agriculture, industry and services sectors are as follows:

$$Y_{agr} = \overline{A_{agr}} K_{agr}^{\ \alpha} L_{agr}^{\ 1-\alpha} \quad (1)$$

$$Y_{ind} = \overline{A_{ind}} (CU * K_{ind})^{\beta} L_{ind}^{\ 1-\beta} \quad (2)$$

$$Y_{ser} = \overline{A_{ser}} K_{ser}^{\ \theta} L_{ser}^{\ 1-\theta} \quad (3)$$

[5] SOLOW, R.M., "A Contribution to the Theory of Economic Growth", *Quarterly Journal of Economics*, Vol. 70, 1956, pp.65-94.
[6] See the Box "Total Factor Productivity Forecast Methodology", pp. 16.

By summing up value added of sectors, total value added (Y) is obtained.

$$Y = Y_{agr} + Y_{ind} + Y_{ser} \tag{4}$$

The sub-indices in equations (agr, ind, ser) represent agriculture, industry and services sectors, respectively.

Manufacturing sector capacity utilization rate (CU) is explained by output-capital ratio (GDP/K) and private sector investment (IP). It is considered that there is a positive relation between output-capital ratio, which is a sign of revival in economic activity, and capacity utilization rate. A long-term positive relation is found between private sector investments and capacity utilization rate.

$$CU = f\left(\frac{GDP}{K}, IP\right) \tag{5}$$

BOX: THE ESTIMATION METHODOLOGY OF TOTAL FACTOR PRODUCTIVITY

Total factor productivity is estimated as a residual under the assumption that the value added of the related sector is a function of capital stock and labour.

$$Y_i = F(K_i, L_i, A_i) \qquad i = agriculture, industry, services \tag{i}$$

In the equation above, Y represents total value added, K and L represent physical capital stock and labour, respectively. A is the level of total factor productivity (TFP).

Total factor productivity used in DPTMAKRO-ARZ model is estimated by the growth accounting methodology suggested by R. M. Solow (1956, 1957). Constant returns to scale Cobb-Douglas production functions can be presented as follows:

$$Y_i = A_i \; K_i^{\alpha} L_i^{1-\alpha} \qquad 0 < \alpha < 1 \tag{ii}$$

The parameters α and $(1-\alpha)$ in the equation above stand for the capital stock and labour elasticities of output, respectively. Under the constant returns to scale assumption, these elasticities also represent capital and labour shares in output.

TFP is derived from the Cobb-Douglas production function (Equation-ii) as follows:

$$A_i = \frac{Y_i}{K_i^{\alpha} L_i^{1-\alpha}} \tag{iii}$$

By taking the natural logarithms of both sides of the above equation, the following equation is reached:

$$\log(A_i) = \log(Y_i) - \alpha \log(K_i) - (1-\alpha)\log(L_i) \tag{iv}$$

Equation (iv) shows the calculation of TFP data, after estimation of the parameter (α) in Equation (ii).

4.1.2. SECTORAL CAPITAL STOCK

Calculation of sectoral capital stock is important in DPTMAKRO-ARZ, which is a model that total value added is estimated from the supply side. In the model, sectoral capital stocks (K_i; i = agr, ind, ser) are calculated by perpetual inventory method. The methodology suggests that capital stock in any sector is derived from the previous period's capital stock by adding up the related sector's fixed capital investment and subtracting the previous period's depreciation.

$$K = \sum_i K_i \quad , i = agr, ind, ser \tag{6}$$

$$K_{agr} = K_{agr}(-1) * (1 - \delta_{agr}) + I_{agr} \tag{7}$$

$$K_{ind} = K_{ind}(-1) * (1 - \delta_{ind}) + I_{ind} \tag{8}$$

$$K_{ser} = K_{ser}(-1) * (1 - \delta_{ser}) + I_{ser} \tag{9}$$

In DPTMAKRO-ARZ model, sectoral fixed capital investments (I_i; *i=agr, ind, ser*) are calculated as a predetermined share of the sum of public sector fixed capital investment (IG) and private sector fixed capital investment (IP). The mentioned sectoral distribution of investment is determined by considering the foreseen sectoral transformations for the Plan period. The total fixed capital investments (IP+IG), determined in the demand block, is the major variable that sets up the link between the demand and supply blocks.

$$I_{agr} = (IP + IG) * \psi_{agr} \tag{10}$$

$$I_{ind} = (IP + IG) * \psi_{ind} \tag{11}$$

$$I_{ser} = (IP + IG) * (1 - \psi_{agr} - \psi_{ind}) \tag{12}$$

4.2. GOODS MARKET- DEMAND

In the goods market-demand block of the model, the demand variables of the goods market are determined. In the goods market, Gross Domestic Product (GDP) is defined as the sum of the final expenditure items. The expenditure components of GDP are private consumption (CP), public consumption (CG), private fixed capital investment (IP), public fixed capital investment (IG), change in stocks (S), exports of goods and services (X) and imports of goods and services (M). Private consumption expenditure, private fixed capital

investment and exports of goods are the expenditure items determined by stochastic equations. Public consumption and investment items are derived from the budget of the public sector block. Change in stocks is assumed to have zero contribution to growth. Imports and exports of services are determined exogenously in the balance of payments block. Imports of goods, on the other hand, is the variable that closes the system and ensures equilibrium between the supply and the demand blocks.

PRIVATE CONSUMPTION

Private consumption expenditure (CP) is the major expenditure component of GDP. Private consumption expenditure, in the long-run, is estimated using GDP, real exchange rate (RER), nominal interest rate (R_) and its own lag.

$$CP = f\left(GDP, RER, R\_, CP(-1)\right) \tag{13}$$

In modeling attempts of private consumption expenditures, the relation between the interest rate and consumption expenditures is also analyzed. As the net effect of interest rate on consumption is determined by income and substitution effects in theory, the sign of the net effect is indeterminate. Due to the substitution effect, the decrease in the interest rates has an increasing effect on the consumption expenditures for the current period. The income effect on private consumption depends on whether households are borrowers or lenders. If the consumer is a net lender, then the decrease in interest rates results in a decrease in real income, thereby a decrease in consumption expenditures, for the current period. However, if the consumer is a net borrower, the decrease in interest rates improves real income and thereby increases current consumption expenditures. Although it is known that in the short run interest rates are effective on consumption decisions, for the Turkish case, the analysis for the 1980-2006 period suggests that in the long run the relation between interest rate and consumption expenditures is negative but not statistically significant.

Another determinant of private consumption is real exchange rate. It is observed that the real exchange rate appreciation causes the imports to be relatively cheaper and results in an increase in imports of consumption goods and thereby an increase in private consumption. In other words, there is a positive relation between real exchange rate appreciation and private consumption.

To sum up, the structural determinants of private consumption expenditures are found to be as income level and real exchange rate on the other hand the effect of the interest rate appears to be limited.

PRIVATE FIXED CAPITAL INVESTMENTS

Private fixed capital investments (IP) is estimated as a function of the first lag of investments (IP(-1)), GDP (GDP), real exchange rate (RER) and real interest rate (R).

$$IP = f\left(GDP, RER, IP(-1), R\right) \tag{14}$$

In private fixed capital investments equation, lagged value of investments is statistically significant.

GDP is included in the private fixed capital investments equation as an explanatory variable in order to reflect the positive relationship between the output level and the private fixed capital investments.

The real exchange rate represents the cost item, as the machinery and equipment investments, which constitute a big portion of private sector capital investments, are mostly fulfilled via imported machinery and equipment. As expected, a positive relation between investments and real exchange rate appreciation.

The real interest rate represents the opportunity cost of investment in the private fixed capital investments equation. In this framework, although the relation between the real interest rate and private investment is negative, it is observed that the coefficient is statistically insignificant. This situation is considered as a result of the dynamics of the Turkish economy for the sample period of the model (particularly high inflation). On the other hand, real interest rate is kept in the equation due to the new findings for the recent period that support the improvement of the relation between the investments and real interest rate, and considering the fact that real interest rate is an important variable in terms of investment decisions in economic theory.

PUBLIC CONSUMPTION AND PUBLIC FIXED CAPITAL INVESTMENTS

Public consumption (CG) and public fixed capital investment (IG) are not estimated by behavioral equations in the model. The main reason behind this is the fact that they are used as policy variables. Public consumption and public fixed capital investments are derived from the related budget values, which are predetermined as ratios to the GDP, compatible with the targets of the Ninth Development Plan (2007-2013). Real public consumption and public fixed capital investments are calculated from their nominal values using their deflators.

$$CG = CG\_ / CGDEF \tag{15}$$

$$IG = IG\_ / IGDEF \tag{16}$$

CHANGE IN STOCKS

It is assumed that the net contribution of the change in stocks to GDP will be zero for the Ninth Development Plan period. Thus, total change in stocks is made equal to the value of the base year.

$$S = S(-1) \tag{17}$$

TOTAL EXPORTS OF GOODS AND SERVICES

Exports of goods (XFOB$) is estimated as a function of world output (YWR), terms of trade $\left(\frac{\mathrm{PX}}{PM}\right)$, real exchange rate (RER) and first lag of exports of goods (XFOB$(-1)).

$$XFOB\$ = f\left(\overline{\mathrm{YWR}}, \frac{\mathrm{PX}}{PM}, RER, XFOB\$(-1)\right) \tag{18}$$

Export performance of Turkey is mainly determined by the external demand and competitiveness of the economy. In this framework, world output represents the external demand, whereas the other explanatory variables are included in the equation as proxies for different indicators of competitiveness.

Terms of trade is one of these competitiveness indicators and increases in this indicator deteriorate Turkey's competitiveness and therefore its export performance. Increases in the real exchange rate variable (RER), which mean real appreciation,

deteriorate the export performance through the increase in price of exporting goods in terms of foreign currency. Thus, both $\left(\frac{PX}{PM}\right)$ and RER variables are expected to have negative relation with exports. Additionally, previous export performance (XFOB$(-1)) that can be considered as the continuation of the market share is an important indicator for determining the future export performance.

As suggested in equation (18), real exports of goods in constant YTL prices are calculated by multiplying real exports of goods in dollar terms with 1987 base year exchange rate.

$$XFOB = XFOB\$ * ER_{87} \tag{19}$$

Real exports of services (XOTH) is calculated by deflating the exports of services in nominal dollar prices (XOTH$_) determined exogenously in the balance of payments. Afterwards, real exports of goods and services is calculated by summing up real exports of goods and real exports of services.

$$XOTH = \frac{\overline{XOTH\$\_}}{PX} * ER_{87} \tag{20}$$

$$X = XFOB + XOTH \tag{21}$$

TOTAL IMPORTS OF GOODS AND SERVICES

In DPTMAKRO-ARZ model, imports of goods (MCIF) is considered as the variable that ensures the equality between the GDP by production approach (GDP_P) and the GDP by expenditure approach (GDP_E) and closes the system. Thus, imports of goods is not estimated stochastically, but is the variable that ensures the equilibrium between supply and demand blocks.

GDP by production approach (GDP_P) is obtained by summing up the value added of sectors (Y) and import taxes ($MTAX$). Import taxes is determined as a share of imports of goods ($MCIF$).

$$GDP_P = Y + MTAX \tag{22}$$

$$MTAX = MCIF * \tau_m \tag{23}$$

GDP by expenditure approach (GDP_E) is calculated by summing up private consumption (*CP*), public consumption (*CG*), private fixed capital investments (*IP*), public fixed capital investments (*IG*), change in stocks (*S*) and exports of goods and services (*X*) and then subtracting imports of goods and services (*M*).

$$GDP_E = CP + CG + IP + IG + S + (X - M) \tag{24}$$

Real imports of services (*MOTH*) is obtained by deflating the imports of services in nominal dollar prices (*MOTH$_*), which is determined exogenously in balance of payments. Accordingly, real imports of goods (*MCIF*) which is the only unknown variable in the identity equation (27) between GDP by production approach and GDP by expenditures approach.

$$MOTH = \frac{\overline{MOTH\$\_}}{PM} * ER_{87} \tag{25}$$

$$GDP_P = GDP_E = GDP \tag{26}$$

$$Y + MTAX = CP + CG + IP + IG + S + X - (MCIF + MOTH) \tag{27}$$

$$Y + MCIF * \tau_m = CP + CG + IP + IG + S + X - (MCIF + MOTH) \tag{28}$$

$$MCIF * (1 + \tau_m) = CP + CG + IP + IG + S + X - MOTH - Y \tag{29}$$

$$MCIF = \frac{CP + CG + IP + IG + S + X - MOTH - Y}{(1 + \tau_m)} \tag{30}$$

Total imports of goods and services (*M*) is calculated by summing up the above mentioned real imports of goods in YTL (*MCIF*) with the real imports of services in YTL (*MOTH*) in the model.

$$M = MCIF + MOTH \tag{31}$$

GROSS DOMESTIC PRODUCT

GDP with 1987 prices is calculated using equation (22) in the model. GDP in nominal prices (*GDP_*) is calculated by multiplying real GDP with the GDP deflator (*GDPDEF*). The information about GDP deflator is given in the wage and price blocks.

$$GDP\_ = GDP * GDPDEF \tag{32}$$

GROSS NATIONAL PRODUCT

To obtain Gross National Product (GNP), factor income from abroad (NFIX$_) and factor expenditures to abroad (NFIM$_), which are determined in balance of payments in current dollar prices, are deflated by 1987 YTL prices and thereby YTL denominated net factor income (NFI) is obtained. Gross National Product is obtained by adding net factor income to Gross Domestic Product.

$$NFIX = \frac{NFIX\$\_}{PM} * ER_{87} \tag{33}$$

$$NFIM = \frac{NFIM\$\_}{PX} * ER_{87} \tag{34}$$

$$NFI = NFIX - NFIM \tag{35}$$

$$GNP = GDP + NFI \tag{36}$$

4.3. LABOUR MARKET

SUPPLY

Demographic properties which are important for labor market are taken into account in estimation of labor supply. TURKSTAT definition for the working age population covers those aged 15 and above. Working age population (*N15*) is determined by using the population growth rate estimates of TURKSTAT for the related age group (*n*).

$$N15 = N15(-1) * (1 + n) \tag{37}$$

Active labor force or labor supply (*LS*) is then calculated by multiplying the working age population with labor force participation rate ($\overline{PART}$).

$$LS = N15 * \overline{PART} \tag{38}$$

The low levels of labor force participation rate, is one of the problematic areas in Turkish labor market. Labor force participation rate is not only very low compared to international averages, EU average in particular, but also displays a declining trend. Because of this structural problem, labor force participation rate has been determined as a policy variable in the Development Plan. As a result of the policies to be implemented throughout the Plan period, it is expected that the downward trend in labor force

participation rate will be reversed and participation rate will display a moderate increase. Therefore, labor force participation rates are exogenous in the model.

DEMAND

In the model, labor demand (*LD*) is forecasted on sectoral basis for agriculture, industry and services. Each sector has a separate labor demand equation and the aggregate employment level is calculated as the sum of sectoral labor demands.

$$LD = L_{agr} + L_{ind} + L_{ser} \tag{39}$$

Labor demand in agriculture sector (L_{agr}) has been displaying a downward trend since 1990s. Thus, labor demand in agriculture is estimated using a time trend *(t)*.

$$L_{agr} = f(t) \tag{40}$$

Labor demand in industry sector (L_{ind}) is estimated as a function of real wage index in manufacturing industry ($\frac{W_{man}=}{CPI}$), lagged private sector investments (*IP(-1)*) and a time trend (*t*). Real wage index in manufacturing industry has a negative coefficient in this equation, whereas private investments has a positive coefficient. According to the behavioral patterns in industry, private investments do not lead to substitution of labor with capital; on the contrary capital and labor are complementary. In order to cover the long term trends in labor demand, time trend is also included in the equation.

$$L_{ind} = f\left(\frac{W_{man}=}{CPI}, IP(-1), t\right) \tag{41}$$

Labor demand in services (L_{ser}) is determined with a similar structure to industry. Labor demand in services (L_{ser}) is modeled as a function of the aggregate real wage index$\left(\frac{W=}{CPI}\right)$, sum of the lagged values of investments in the private and public sectors (*IP(-1)+IG(-1)*) and a time trend. While aggregate real wage index has a negative relation, lagged investments has a positive relation with labor demand in services sector.

$$L_{ser} = f\left(\frac{W=}{CPI}, (IP(-1) + IG(-1)), t\right) \tag{42}$$

UNEMPLOYMENT RATE

In DPTMAKRO-ARZ, where long term trends and structural aspects are prominent, labor supply is mainly determined by demographic trends. While labor supply is inelastic to wages, labor demand responds to wages. So, together with investments the wages determine the magnitude of the imbalance in the labor market. Since DPTMAKRO-ARZ does not have the labor market clearance assumption, it diverges from the classical model approach and shows a Keynesian characteristic.

Within this structure, unemployment rate (U) is obtained by dividing the difference between labor supply and labor demand to the labor supply.

$$U = \frac{(LS - LD)}{LS} \tag{43}$$

4.4. MONEY MARKET

MONEY DEMAND

Developments in the financial system and diversification of monetary instruments complicate the estimation of a stable money demand equation in practice. The difficulty of estimating a stable money demand equation has also been widely discussed in the literature. Nevertheless, estimation of a stable money demand equation has vital importance for the implementation of monetary policy.

The first problem in this sense is to identify which monetary aggregate is the appropriate measure of liquidity. In this context, M2Y (currency in circulation + YTL demand and time deposits + FX deposits) has been determined as the appropriate liquidity measure in DPTMAKRO-ARZ. As it is well known, money demanded for transactions is usually measured by currency in circulation and demand deposits. However, because of its long-lasting high-inflation experience, the average maturity of time deposits is very low in Turkey. Furthermore, the high share of FX deposits in M2Y is also the result of economic agents' efforts to protect the value of money against increases in inflation. Therefore, both time deposits and FX deposits, which is part of M2Y, can be considered as measure of liquidity. For all these reasons, M2Y is used as the appropriate measure of liquidity in Turkey.

Another issue in the estimation of the money demand equation is to determine the opportunity cost of holding liquidity. For the case of Turkey, compound Treasury bill rates are used as the opportunity cost of holding money.

In this context, money demand (M2Y_) is modeled as a function of nominal Gross Domestic Product (GDP_), nominal Treasury bill rate (R_), nominal exchange rate (ER) and the ratio of domestic credit stock to GDP, which is considered as a measure of financial depth.

$$M2Y\_ = f\left(GDP\_, R\_, ER, \frac{CREDIT\_}{GDP\_}\right) \tag{44}$$

DOMESTIC CREDIT VOLUME

The second equation in the monetary block is the volume of domestic credits. The volume of domestic bank credits $\left(\frac{CREDIT\_}{CPI}\right)$ is modeled as a function of GDP, the lagged ratio of public sector borrowing requirement to GDP $\left(\frac{PSBR\_(-1)}{GDP\_(-1)}\right)$ as an indicator of fiscal dominance, lagged value of the volume of domestic credits $\left(\frac{CREDIT\_(-1)}{CPI(-1)}\right)$ and the share of private investment in GDP $\left(\frac{IP}{GDP}\right)$.

The volume of domestic credits is expected to have a positive relation with GDP. Public sector borrowing requirement is expected to affect the credit demand negatively since it diverts the loanable funds from the private sector to the public sector. Additionally, the share of private investment in GDP is expected to have a positive coefficient in domestic credit demand since increases in investment leads to an increase in the financing requirement. The lagged value of the dependent variable is included in the model in order to capture the fast transformation of the financial system in the late 1990s, therefore this variable is also expected to have a positive relation with the volume of domestic credits.

$$\frac{CREDIT\_}{CPI} = f\left(GDP, \frac{CREDIT\_(-1)}{CPI(-1)}, \frac{IP}{GDP}, \frac{PSBR\_(-1)}{GDP\_(-1)}\right) \tag{45}$$

4.5. WAGES AND PRICES

In the wages and prices block, manufacturing sector wages, aggregate wages, export prices, real exchange rates and interest rates are modeled together with various deflators.

CONSUMER PRICES[7]

One of the prices which is estimated by a behavioral equation in DPTMAKRO-ARZ is the consumer price index (CPI). In this context, the dynamics of consumer prices is determined in this block.

$$CPI = f\left(CPI(-1), (GDP - GDPPOT)/GDPPOT, ER, W(-1)\right) \quad (46)$$

Output gap, which is an indicator of the economy's position in the business cycle, is one of the most important determinants of inflation. In this context, output gap, which is defined as the percentage deviation of actual output from potential output[8] ($(GDP - GDPPOT)/GDPPOT$), is included in the price equation. Fluctuations in exchange rates also affect the domestic price level through the changes in domestic price of imported goods. For this reason, nominal exchange rate (ER) is also used as an explanatory variable in order to capture exchange rate pass-through.

Another variable used in price estimation is economy-wide wage level (W_) which is an important determinant of production costs. Besides, lagged value of CPI (CPI(-1)), representing the inflationary inertia in Turkish economy, which has experienced high inflation for a long period of time, is included in the model.

PUBLIC EXPENDITURE AND INVESTMENT DEFLATORS

In the model, public expenditure deflator and public investment deflator are not determined through behavioral equations. Price increases in public consumption and investment are associated to CPI inflation.

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[7] Consumer prices (CPI) are modeled by SPO in order to have a complete macroeconomic setup in DPTMAKRO-ARZ. However, inflation targeting is one of the major macroeconomic policy aspects in the 9th Plan period and all the other macroeconomic policies, including the fiscal balances, are determined in compliance with the inflation targets that are determined together by the government and Central Bank. Therefore, the macroeconomic forecasts and targets in the 9th Plan were also set in line with the inflation targets and consumer prices were taken exogenously. In this respect, inflation targets announced by Central Bank are used in the Plan.

[8] Aggregate potential output is obtained as the sum of potential output levels for agriculture, industry and services sectors, which are estimated using the linear trend method.

$$CGDEF = CGDEF(-1) * \frac{CPI}{CPI(-1)} \tag{47}$$

$$IGDEF = IGDEF(-1) * \frac{CPI}{CPI(-1)} \tag{48}$$

GROSS DOMESTIC PRODUCT DEFLATOR

Similarly, GDP deflator is also associated to the CPI which is the main price index of the model.

$$GDPDEF = GDPDEF(-1) * \frac{CPI}{CPI(-1)} \tag{49}$$

EXPORT PRICES

Export price index (PX) is estimated as a function of world export price index ($\overline{PXWR}$), industry sector labor productivity$\left(\frac{Y_{ind}}{L_{ind}}\right)$, real exchange rate (RER) and import price index ($\overline{PM}$) in the model. Due to being a small open economy, the most important determinant of export prices in Turkey is world export prices. In addition to world export prices, various factors that influence production cost are effective in the determination of export prices. These factors are identified as labor productivity, real exchange rate and import prices. While labor productivity in industry sector affects export prices negatively, real exchange rate and import prices have a positive impact on export prices.

$$PX = f\left(\overline{PXWR}, \frac{Y_{ind}}{L_{ind}}, RER, \overline{PM}\right) \tag{50}$$

IMPORT PRICES

As a small open economy, Turkey does not have a noteworthy impact on import prices. Therefore, import prices ($\overline{PM}$) are determined exogenously in the model.

WAGES

One of the variables that connect supply and demand blocks in the model is real wages. On the supply side, real wages affect sectoral value added by determining sectoral labor demands. On the demand side, real wages affect export of goods and services as a proxy variable for competitiveness of the domestic economy.

In the model, manufacturing sector wages ($W_{man\_}$) play a determining role for economy-wide wages (W_). Manufacturing industry wages are determined mainly as a result of the bargaining power of employers and employees. Although, the share of employees whose wages are determined directly by collective bargaining is relatively small, general conditions of the labor market determine the bargaining capacity of also those who are not subject to collective bargaining.

Productivity increases recorded in the sector, unemployment rate and existing level of real wages emerge as determinants of bargaining power among parties. According to this approach, real manufacturing industry wage index ($\frac{W_{man\_}}{CPI}$) is modeled as a function of lagged value of labor productivity in industry $\left(\frac{Y_{ind}(-1)}{L_{ind}(-1)}\right)$ which is ratio of industrial output to industrial employment, unemployment rate (U) and lagged value of real wages ($\frac{W_{man\_}(-1)}{CPI(-1)}$).

$$\frac{W_{man\_}}{CPI} = f\left(\frac{Y_{ind}(-1)}{L_{ind}(-1)}, U, \frac{W_{man\_}(-1)}{CPI(-1)}\right) \tag{51}$$

While a positive relationship between labor productivity and real wages is expected, a negative relationship is expected between real wages and unemployment rate which decreases the bargaining capacity of the employees. The coefficient of lagged value of real wages, which is used in order to capture wage rigidity, is expected to be positive.

Considering the determining role of manufacturing industry wage increases on the economy-wide wage level, economy-wide wage inflation is equalized to manufacturing industry wage inflation.

$$W\_ = W\_(-1) * \frac{W_{man}\_}{W_{man}\_(-1)} \tag{52}$$

REAL EXCHANGE RATE

In DPTMAKRO-ARZ model, another price indicator, which is determined as behavioral, is real exchange rate (RER). Lagged value of real exchange rate (RER(-1)), international reserve accumulation (RESERV$_), non-agricultural labor productivity (NALP) and lagged value of inflation rate (INF(-1)) are used as variables affecting real exchange rate in the long-term. In the model, an increase in real exchange rate implies an appreciation of the domestic currency.

$$RER = f\left(RER(-1), RESERV\_, NALP, INF(-1)\right) \tag{53}$$

A positive relationship is expected between lagged and current values of real exchange rate. Similarly, international reserve accumulation, which represents net results of transactions of the economy with the rest of the world, is expected to have a positive relationship with the real exchange rate.

Under the assumption that increases in labor productivity in non-agricultural sectors mostly result from the increases in labor productivity recorded in tradable goods, a positive relationship is expected between labor productivity in non-agricultural sectors and real exchange rate in line with Balassa-Samuelson hypothesis. On the other hand, a negative relation between inflation, which is assumed as an uncertainty indicator for Turkish economy, and the real exchange rate is estimated.

After the estimation of real exchange rate stochastically with the above model, nominal exchange rate (*ER*) is obtained by using the following real exchange rate definition.

$$ER = \frac{CPI}{\overline{USCPI} * RER} \tag{54}$$

INTEREST RATE

The main interest rate variable used in the model is the weighted average interest rate realized in Treasury auctions. In other words, the main interest rate in the model is determined by the public sector borrowing requirement.

$$R\_ = f\left(\frac{DDS\_}{GDP\_}, \frac{CPI}{CPI(-1)}\right) \tag{55}$$

In this context, nominal interest rate (*R_*) is estimated as a function of the ratio of public domestic debt stock to nominal GDP$\left(\frac{DDS_}{GDP_}\right)$ and consumer price inflation$\left(\frac{CPI}{CPI(-1)}\right)$. Real interest rate (*R*) is obtained by deflating the nominal interest rates (R_) by consumer price inflation.

Estimated real interest rate is used in private investment equation as an opportunity cost of investment decisions and by this way the link between the price block and the demand block and thereby the supply block of the model is ensured.

$$R = R\_ * \frac{CPI(-1)}{CPI} \tag{56}$$

4.6. BALANCE OF PAYMENTS

Current account transactions and capital flows are discussed in balance of payments block. In DPTMAKRO-ARZ model, current account balance includes four main balances; trade balance, services balance, income balance and current transfers.

TRADE BALANCE

Export f.o.b. and import c.i.f. in trade balance include value of goods excluding insurance and freight. Exports of goods (XFOB$) is modeled stochastically in the model. As explained in the demand block of the model, imports of goods is a variable which ensures the equilibrium between GDP by production and GDP by demand.

As explained in Section 4.2, real exports of goods are estimated using equation (18) and nominal value of exports of goods (*XFOB$_*) is calculated using export price index as below.

$$XFOB\$\_ = XFOB\$ * PX \tag{57}$$

Behavioral relations in determination of export price index are explained in the prices and wages block of the model.

Shuttle trade, which is an item in trade balance, is an export item not included in the exports of goods and included in the model as an exogenous variable.

Real YTL value of goods imports (MCIF), which is estimated in the demand block, is used in calculation of nominal dollar value of goods imports (MCIF$_). Import price index (PM) used in the model is an exogenous variable, that is assumed according to forecasts of various international bodies.

$$MCIF\$\_ = \frac{MCIF}{ER_{87}} * \overline{PM} \tag{58}$$

In the model, imports of services (OTM$_) is obtained by the sum of travel expenditures ($\overline{\text{TOURM\$_}}$), other transportation expenditures ($\overline{\text{OTRM\$_}}$), financial services expenditures ($\overline{\text{FINM\$_}}$), other business services expenditures ($\overline{\text{OTRDM\$_}}$), government services expenditures ($\overline{\text{OFSERM\$_}}$), other services expenditures ($\overline{\text{OSERM\$_}}$) and freight expenditures (FREIGHTM$_). Except freight expenditures, aforementioned variables are exogenous in the model. Freight expenditures are estimated as a fix share of imports of goods as a definition.

$$\begin{aligned} OTM\$\_ = {} & FREIGHTM\$\_ + \overline{TOURM\$\_} + \overline{OTRM\$\_} + \overline{FINM\$\_} + \overline{OTRDM\$\_} \\ & + \overline{OFSERM\$\_} + \overline{OSERM\$\_} - FREIGHT\$\_ * \alpha_{OTM} \end{aligned} \tag{59}$$

$$FREIGHTM\$\_ = MCIF\$\_ * \alpha_{FRGM} \tag{60}$$

$$FREIGHT\$\_ = MCIF\$\_ * \alpha_{FRG} \tag{61}$$

In the DPTMAKRO-ARZ model, exports of services (OTX$_) is defined as the sum of travel revenues ($\overline{\text{TOURX\$_}}$), other transportation revenues ($\overline{\text{OTRX\$_}}$), financial services revenues ($\overline{\text{FINX\$_}}$), other business services revenues ($\overline{\text{OTRDX\$_}}$), government services revenues ($\overline{\text{OFSERX\$_}}$), other services revenues ($\overline{\text{OSERX\$_}}$) and freight revenues (FREIGHTX$_). Except freight revenues, these variables are exogenous in the model. Travel revenues is exogenously determined in line with the fact that the capacity of tourism sector and its share in world tourism revenues is increasing. Freight revenues (FREIGHTX$_) are projected as a fix share of exports of goods (XFOB$_).

$$OTX\$\_ = FREIGHTX\$\_ + \overline{TOURX\$\_} + \overline{SHUTTLE\$\_} + \overline{OTRX\$\_} + \overline{FINX\$\_} + \overline{OTRDX\$\_} + \overline{OFSERX\$\_} + \overline{OSERX\$\_} + FREIGHT\$\_ * \alpha_{OTX} \quad (62)$$

$$FREIGHTX\$\_ = XFOB\$\_ * \alpha_{FRGX} \quad (63)$$

BALANCE OF INVESTMENT INCOME

Balance of investment income (*INCB$_*) includes direct investments, portfolio investments and other investments. Direct investments refer to the net of direct investments income, credit (*DIRECTX$_*) and direct investments income, debit (*DIRECTM$_*). Revenues from direct investments abroad is a function of the sum of direct investments abroad (*FDIF$_*) for the last 10 years. Similarly, transfers from direct investments in Turkey is estimated using the sum of foreign direct investments in Turkey (*FDIH$_*) for the last 5 years.

$$DIRECTX\$\_ = f\left(\sum_{i=t-9}^{t} \overline{FDIF\$\__i}, AR(1)\right) \quad (64)$$

$$DIRECTM\$\_ = f\left(\sum_{i=t-4}^{t} FDIH\$\__i\right) \quad (65)$$

Portfolio investments, another important item of balance of investment income, include revenues from and expenditures on instruments like stocks and bonds that are not classified as direct investment. Revenues of portfolio investments (PORTX$_), is a function of sum of the assets item of portfolio investments (PORTA$_) under capital and financial account for the last 5 years. On the other hand, portfolio investment expenditures (PORTM$_) is an exogenous variable in the model.

$$PORTX\$\_ = f\left(\sum_{i=t-4}^{t} \overline{PORTA\$\__i}\right) \quad (66)$$

Other investments, the last item of balance of investment income, cover interest revenues and expenditures regarding deposits, loans and trade credits. Interest revenues (INTX$_) is exogenous in the model. On the other hand, interest expenditures (INTM$_) is a function of its lagged value and liabilities of other investments.

$$INTM\$\_ = f\left(\sum_{i=t-3}^{t} \overline{OTINVL\$\__i}, INTM\$\_(-1)\right) \quad (67)$$

Current transfers account covers workers' remittances and official transfers. Both variables are exogenous in the model.

Consequently, current account balance is the sum of trade balance (*TRB$_*), balance of services (*SRB$_*), balance of investment income (*INCB$_*) and current transfers (*CTRANS$_*).

$$CAB\$\_ = TRB\$\_ + SRB\$\_ + INCB\$\_ + CTRANS\$\_ \tag{68}$$

$$TRB\$\_ = XFOB\$\_ + \overline{SHUTTLE\$\_} + FREIGHT\$\_ + \overline{NMG\$\_} - MCIF\$\_ \tag{69}$$

$$\begin{aligned} SRB\$\_ = {} & FREIGHTX\$\_ - FREIGHTM\$\_ + \overline{OTRX\$\_} - \overline{OTRM\$\_} + \overline{TOURX\$\_} \\ & - \overline{TOURM\$\_} + \overline{CONST\$\_} + \overline{FINX\$\_} - \overline{FINM\$\_} + \overline{OTRDX\$\_} \\ & - \overline{OTRDM\$\_} + \overline{OFSERX\$\_} - \overline{OFSERM\$\_} + \overline{OSERX\$\_} - \overline{OSERM\$\_} \end{aligned} \tag{70}$$

$$\begin{aligned} INCB\$\_ = {} & DIRECTX\$\_ - DIRECTM\$\_ + PORTX\$\_ - \overline{PORTM\$\_} \\ & + \overline{INTX\$\_} - INTM\$\_ \end{aligned} \tag{71}$$

$$CTRANS\$\_ = \overline{WREM\$\_} + \overline{OFTR\$\_} \tag{72}$$

Net factor income that enables the transition from GDP to GNP, covers various items in the balance of payments.

Factor income (*NFIX$*) is the sum of workers' remittances (*WREM$_*), direct investment income (*DIRECTX$_*), portfolio income (*PORTX$_*) and interest income (*INTX$_*) from investment income balance, and construction services revenues (*CONST$_*) from services balance.

$$NFIX\$\_ = \overline{WREM\$\_} + DIRECTX\$\_ + PORTX\$\_ + \overline{INTX\$\_} + \overline{CONST\$\_} \tag{73}$$

On the other hand, factor expenditures (*NFIM$*) is the total of direct investment expenditures (*DIRECTM$_*), portfolio expenditures (*PORTM$_*) and interest expenditures.

$$NFIM\$\_ = DIRECTM\$\_ + \overline{PORTM\$\_} + INTM\$\_ \tag{74}$$

Net factor income (*NFI$*), is the net of factor income and factor expenditures.

$$NFI\$\_ = NFIX\$\_ - NFIM\$\_ \tag{75}$$

CAPITAL AND FINANCIAL ACCOUNT

While transactions related to flows of goods and services are presented in the current account, financing of these flows is presented in the capital and financial account. Capital and financial account covers short and long term capital flows of private and public institutions. Financial account excluding official reserves (*FA$_*) is the sum of direct investments (*FDI$_*), portfolio investments (*PORT$_*) and other investments (*OTINV$_*).

$$FA\$\_ = FDI\$\_ + PORT\$\_ + OTINV\$\_ \tag{76}$$

Direct investments (*FDI$_*) has two components: direct investments of Turkish residents abroad (FDIF$_) and direct investments of foreign residents in Turkey (FDIH$_). While direct investments abroad are exogenous in the model, direct investments in Turkey are estimated as a share of GDP.

$$FDI\$\_ = FDIH\$\_ + \overline{FDIF\$\_} \tag{77}$$

$$FDIH\$\_ = GDP\$\_ * \beta_{FDI} \tag{78}$$

Portfolio investments (*PORT$_*) includes the transactions of equity and debt securities. Portfolio investments-assets (*PORTA$_*) is an exogenous variable.

Portfolio investments-liabilities (*PORTL$_*) represents the liabilities abroad resulting from equity (*PORTLEQ$_*) and debt securities (*PORTLDEBT$_*). Debt securities include liabilities of general government (*PORTLG$_*), of banks (*PORTLBANK$_*) and of Central Bank (*PORTLCB$_*). These variables are exogenous in the model.

$$PORT\$\_ = PORTL\$\_ + \overline{PORTA\$\_} \tag{79}$$

$$PORTL\$\_ = \overline{PORTLEQ\$\_} + PORTLDEBT\$\_ \tag{80}$$

$$PORTLDEBT\$\_ = \overline{PORTLCB\$\_} + \overline{PORTLG\$\_} + \overline{PORTLBANK\$\_} \tag{81}$$

Similarly, assets (*OTINVA$_*) and liabilities (*OTINVA$_*) of other investment (*OTINV$_*) under capital and financial account are determined exogenously in the model. Credits drawn from International Monetary Fund (IMF) and their repayments are also part of liabilities of other investments.

$$OTINV\$\_ = \overline{OTINVA\$\_} - \overline{OTINVL\$\_} \tag{82}$$

In the balance of payments, reserve assets (RESERV$_) are calculated as a residual in Equation (83). The item of net errors and omissions (NEO$_) is assumed to be zero in the projections.

$$RESERV\$\_ = -CAB\$\_ - FA\$\_ - \overline{NEO\$\_} \tag{83}$$

4.7. PUBLIC SECTOR

In this block, public revenues, expenditures and public sector financing requirement are modeled. In The Ninth Development Plan, public sector balances are classified as consolidated budget, SEEs balance and other public sector balances. Most of the public sector items are either exogenous or modeled as a share of GDP in accordance with the Plan targets.

In this study public sector balances are discussed at an aggregate level. This choice doesn't have any drawback to describe the relationship among the blocks and mechanism of the model.

PUBLIC REVENUES

In the DPTMAKRO-ARZ model, revenues of public sector except import taxes (tax revenues + non-tax revenues + factor revenues + funds) (GREVO_) are modeled as a share of current GDP. In this context, a parameter (ϕ) that represents the effective tax rate in the economy is used. On the other hand, import tax revenues (MTAX_) are calculated by using real import taxes, which are previously determined in the demand block of the model, and import price index.

$$GREV\_ = GREVO\_ + MTAX\_ \tag{84}$$

$$GREVO\_ = \phi * GDP\_ \ ^{9} \tag{85}$$

$$MTAX\_ = \frac{MTAX}{ER_{87}} * \overline{PM} * ER \tag{86}$$

[9] To simplify presentation, the general structure of public revenues is given. In the operational model, public revenues are forecasted in detail as tax revenues, non-tax revenues, factor revenues and funds using corresponding tax rates of each item. Therefore, the parameter ϕ represents the weighted average of all tax rates.

PUBLIC EXPENDITURES

Total public expenditures (GEXP_) are composed of public current expenditures (CG_), public investment expenditures (IG_), interest expenditures (INTPAY_) and other transfers (OTRANS_). Public expenditures are modeled as a share of current GDP in this block of the model. On the other hand, public interest expenditures are disaggregated as domestic debt interest payments ($INTPAY_{d}$_) and foreign debt interest payments ($INTPAY_{f}$_). Domestic debt interest payments are obtained by multiplying one period lagged domestic debt stock (DDS_(-1)) with domestic borrowing interest rate (R_). Foreign debt interest payments in dollars (INTPAY$_) are obtained by multiplying one period lagged foreign debt stock (FDS$_(-1)) with foreign borrowing interest rate (RF_). Afterwards, this value is multiplied by the exchange rate so that foreign debt interest payments ($INTPAY_{f}$_) are converted to YTL.

$$GEXP\_ = CG\_ + IG\_ + INTPAY\_ + OTRANS\_ \tag{87}$$

$$CG\_ = GDP\_ * \gamma_{CG} \tag{88}$$

$$IG\_ = GDP\_ * \gamma_{IG} \tag{89}$$

$$OTRANS\_ = GDP\_ * \gamma_{OTR} \tag{90}$$

$$INTPAY\_ = INTPAY_{d}\_ + INTPAY_{f}\_ \tag{91}$$

$$INTPAY_{d}\_ = DDS\_(-1) * R\_ \tag{92}$$

$$INTPAY\$\_ = FDS\$\_(-1) * \overline{RF\_} \tag{93}$$

$$INTPAY_{f}\_ = INTPAY\$\_ * ER \tag{94}$$

PUBLIC BALANCE AND DEBT STOCK

After determining public revenues and expenditures as explained above, main indicators of public fiscal performance, namely public sector borrowing requirement (*PSBR_*) and primary surplus (*PRS_*), are calculated. In addition, public domestic debt stock (*DDS_*) and public foreign debt stock (*FDS_*) are calculated under the assumption that (λ) per cent of primary surplus will be used to finance the domestic debt stock and (1– λ) per cent of primary surplus will be used to finance the foreign debt stock.

$$PSBR\_ = GREV\_ - GEXP\_ \tag{95}$$

$$PRS\_ = GREV\_ - (GEXP\_ - INTPAY\_) \tag{96}$$

$$DDS\_ = DDS\_(-1) + INTPAY_d\_ - PRS\_ * \lambda \tag{97}$$

$$FDS\$\_ = FDS\$\_(-1) + INTPAY\$\_ - \frac{PRS\_}{ER} * (1 - \lambda) \tag{98}$$

$$FDS = FDS\$\_ * ER \tag{99}$$

5. OVERALL ASSESSMENT

The DPTMAKRO-ARZ model, which is used for setting macro balances of the Ninth Development Plan, includes both supply and demand sides of economy simultaneously. Supply side of the model has a more significant role in determining the medium term developments, in line with the Plan perspective. There are two main reasons behind focusing on the supply side of the economy. Firstly, extension of the time span of Ninth Development Plan to seven years necessitated a model focusing on the long-term. Secondly, focus of the Plan's development axes on relaxing supply side constraints, required a model that focuses on supply side of the economy.

Main factors that determine the development dynamics of the economy are total factor productivity growths in agriculture, industry and services sectors along with the developments in capital and labor markets. Yet, total factor productivity has a crucial role among these factors. Implementation success of proposed policies in the Plan and attaining targeted productivity levels are critically important for the realization of Plan projections.

On the other hand, DPTMAKRO-ARZ model of the Ninth Development Plan obviously has room for improvement. The model is based on three sectors, namely agriculture, industry and services. Depending on removal of data restrictions especially on sectoral capital stock levels, it would be possible to increase the sectoral details of the model. Additionally, the model might be improved further by using more flexible type of production function other than Cobb-Douglas production function used for sectoral production. Moreover, it should be kept in mind that each model has its own dynamic considering the given assumption set and new set of assumptions could bring new/different models.

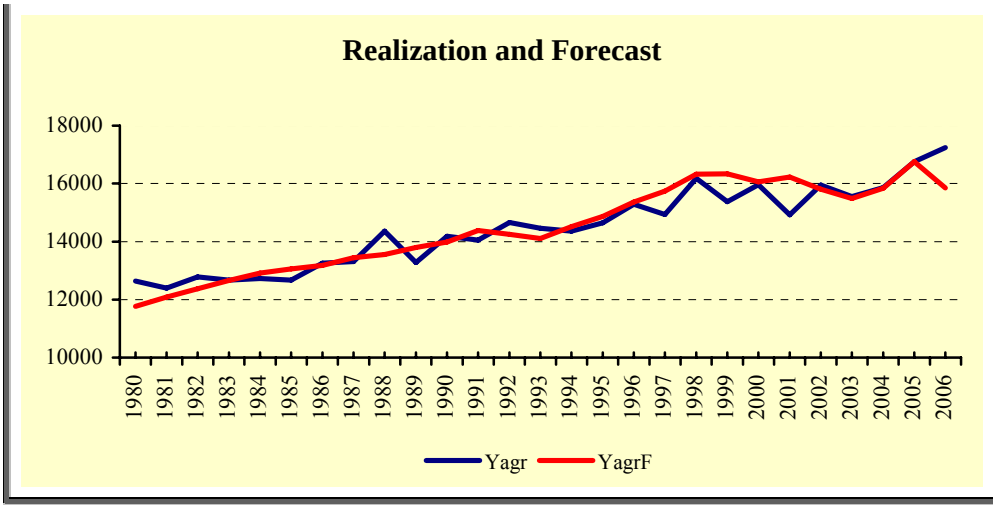
6. BEHAVIORAL EQUATIONS[10]

6.1. AGRICULTURAL SECTOR VALUE ADDED

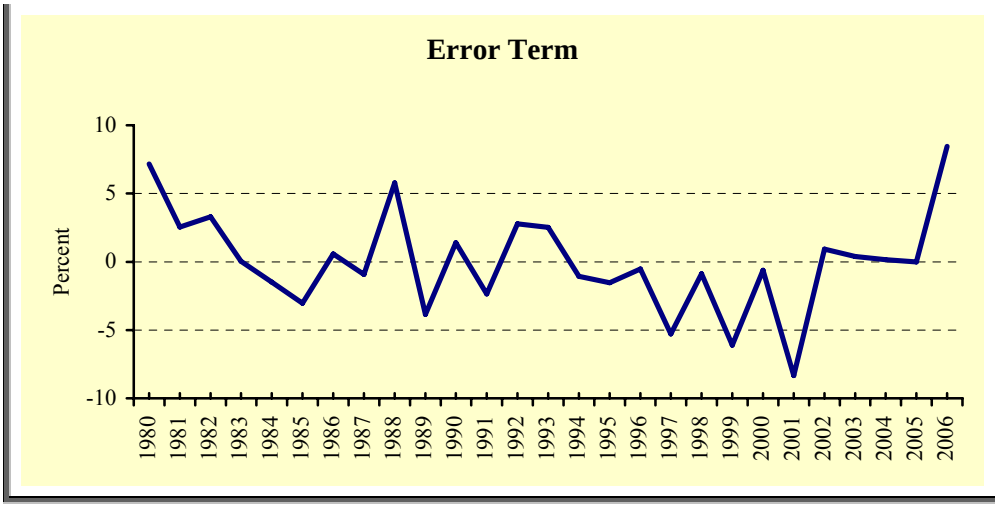
$$LOG(Y_{agr}) = \beta_0 + \beta_1 LOG(L_{agr}) + (1-\beta_1) LOG(K_{agr}) + \beta_2 DUM05$$

Dependent Variable: LOG(Y_{agr})
Method: Least Squares (Restricted Regression)
Observation Period: 1980 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	0.096091	0.024821	3.871331	0.0007
Log(L_{agr})	0.276746	0.037805	7.320319	0.0000
Log(K_{agr})	0.723254	---	---	---
DUM05	0.066219	0.043326	1.528384	0.1395
R^2	0.847507	Durbin-Watson Stat.		1.621934
Adjusted R^2	0.834799	F-Statistic		66.69217
S.E. of Regression	0.038915			



Y_{agr} : Agricultural Sector Value Added (Thousand YTL, with 1987 Prices)
Y_{agr}F: In-sample Forecast for Agricultural Sector Value Added



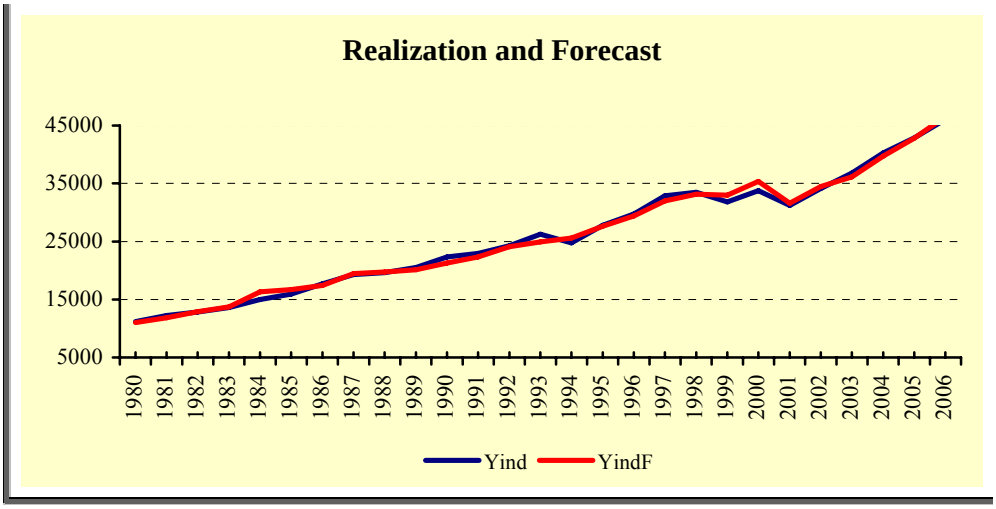
[10] The explanatory variables, which are important theoretically but have statistically insignificant coefficients, were included in the equations to ensure more reliable policy analyses.

6.2. INDUSTRY SECTOR VALUE ADDED

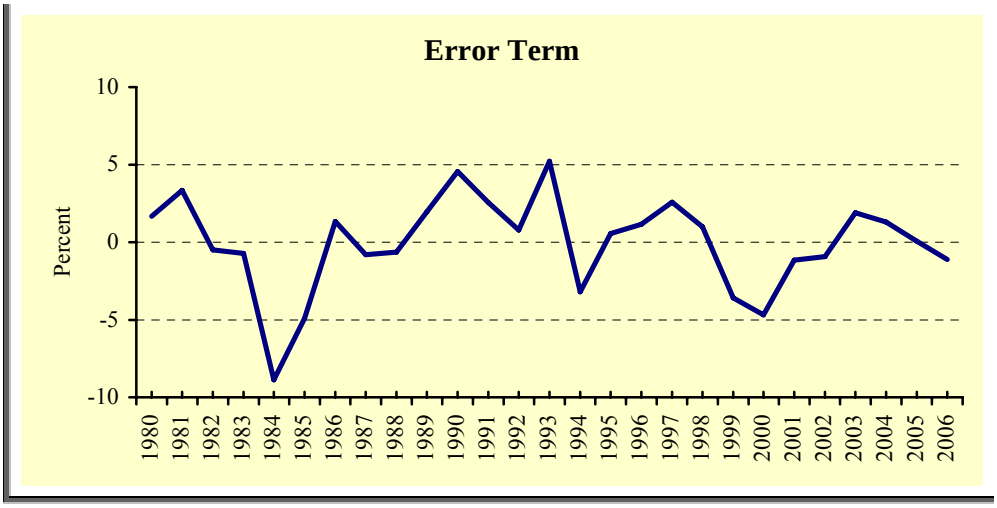
$$LOG(Y_{ind}) = \beta_0 + \beta_1 LOG(L_{ind}) + (1-\beta_1) LOG(K_{ind} * CU) + \beta_2 T + \beta_3 DUMSB$$

Dependent Variable: LOG(Y_{ind})
Method: Least Squares (Restricted Regression)
Observation Period: 1980 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-0.167130	0.234341	-0.713191	0.4829
Log(L_{ind})	0.402107	0.077233	5.206445	0.0000
Log(K_{ind}*CU)	0.597893	---	---	---
T	0.024950	0.001293	19.29010	0.0000
DUMSB	-0.101250	0.021566	-4.694810	0.0001
R^2	0.994430	Durbin-Watson Stat.		1.323371
Adjusted R^2	0.993703	F-Statistic		1368.702
S.E. of Regression	0.032043			



Y_{ind} : Industry Sector Value Added (Thousand YTL, at 1987 Prices)
Y_{ind}F: In-sample Forecast for Industry Sector Value Added

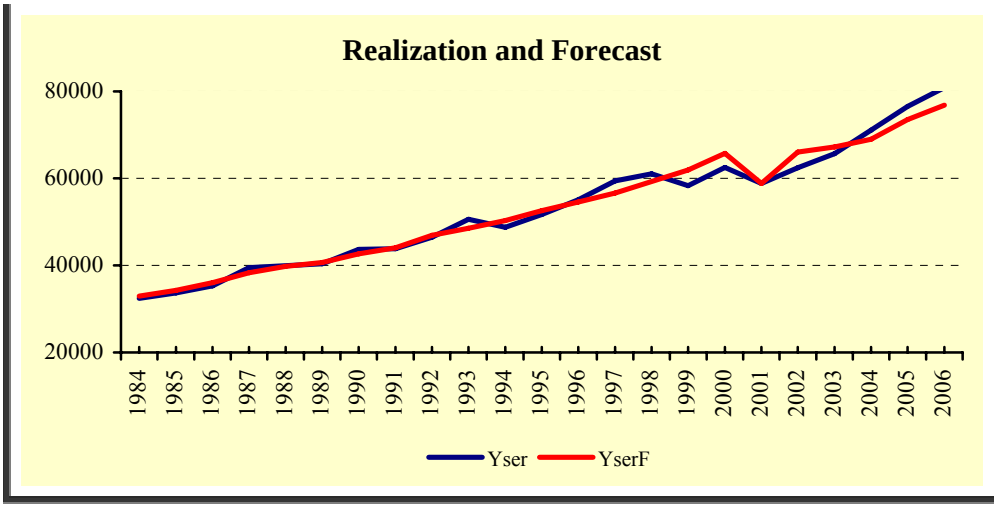


6.3. SERVICES SECTOR VALUE ADDED

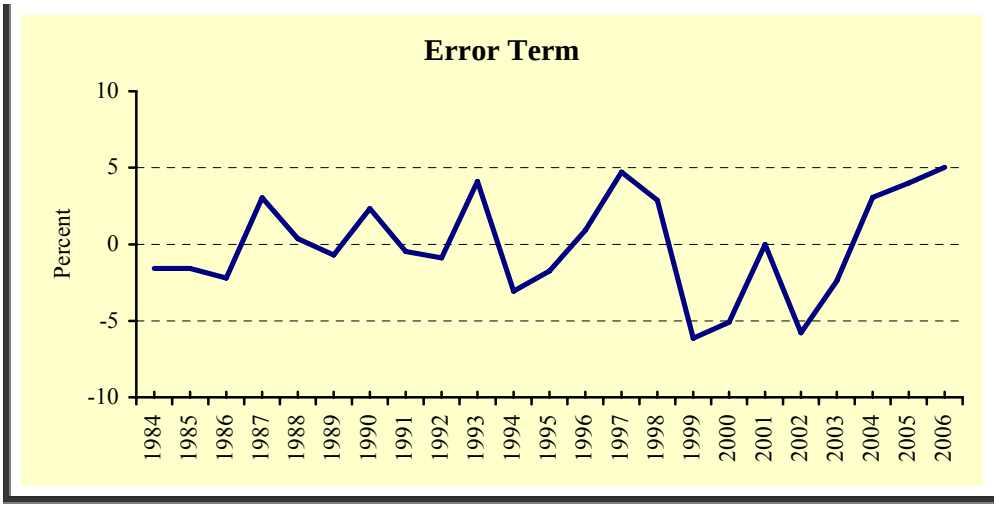
$$LOG(Y_{ser}) = \beta_0 + \beta_1 LOG(L_{ser}) + (1-\beta_1) LOG(K_{ser}) + \beta_2 DUM01$$

Dependent Variable: LOG(Y_{ser})
Method: Least Squares (Restricted Regression)
Observation Period: 1984 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	1.084901	0.118586	9.148644	0.0000
Log(L_{ser})	0.754897	0.038499	19.60836	0.0000
Log(K_{ser})	0.245103	---	---	---
DUM01	-0.089674	0.036500	-2.456851	0.0233
R^2	0.983893	Durbin-Watson Stat.		1.416740
Adjusted R^2	0.982283	F-Statistic		610.8644
S.E. of Regression	0.034568			



Y_{ser} : Services Sector Value Added (Thousand YTL, with 1987 Prices)
Y_{ser}F: In-sample Forecast for Services Sector Value Added

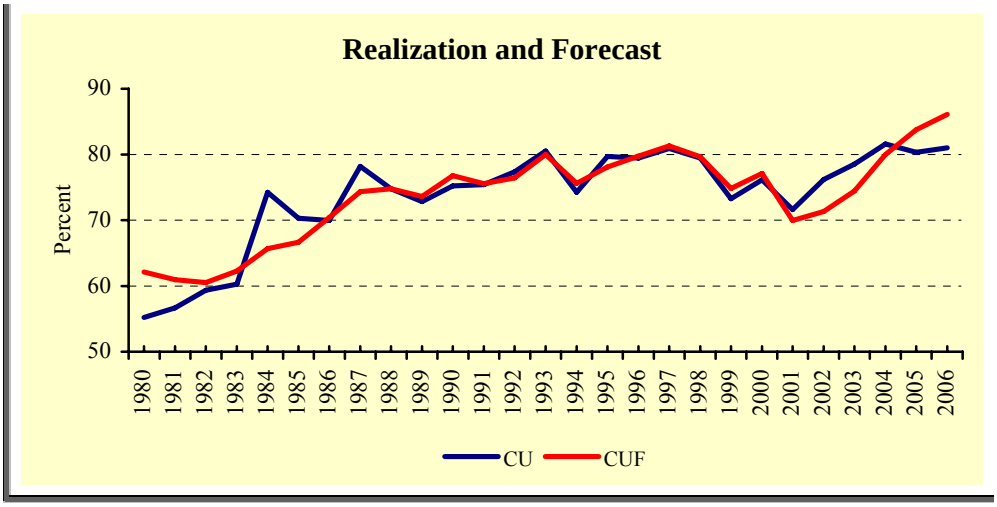


6.4. CAPACITY UTILIZATION RATE

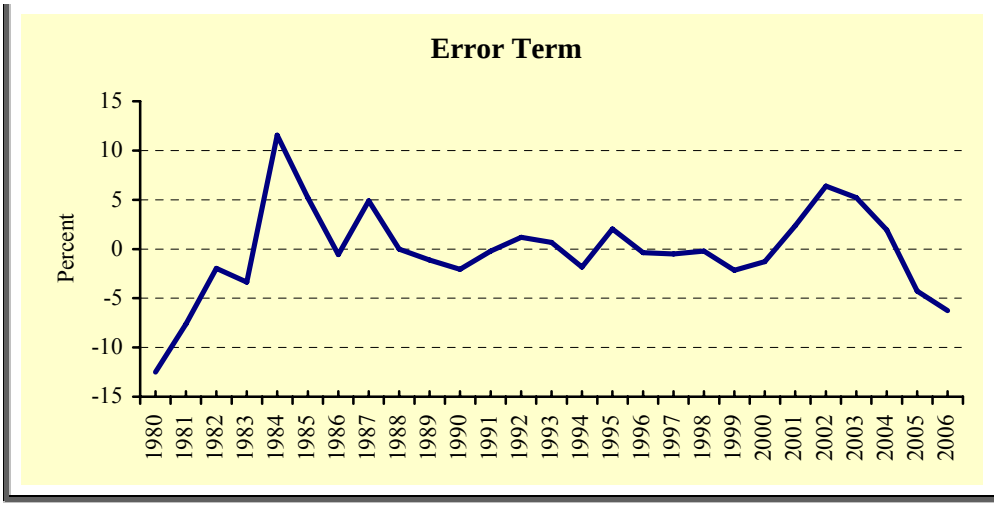
$$LOG(1+CU) = \beta_0 + \beta_1 LOG(1+GDP/K) + \beta_2 LOG(IP)$$

Dependent Variable: LOG(1+CU)
Method: Least Squares
Observation Period: 1980 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-0.216496	0.090359	-2.395952	0.0247
LOG(1+GDP/K)	0.790464	0.264536	2.988113	0.0064
LOG(IP)	0.057229	0.005790	9.883386	0.0000
R^2	0.820854	Durbin-Watson Stat.		1.016230
Adjusted R^2	0.805926	F-Statistic		54.98462
S.E. of Regression	0.019746			



CU : Capacity Utilization Rate
CUF: In-sample Forecast for Capacity Utilization Rate

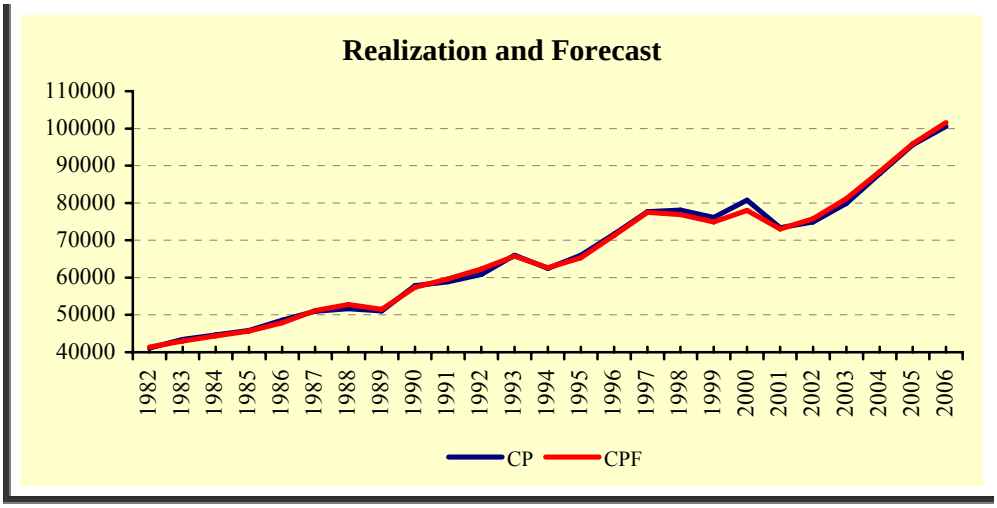


6.5. PRIVATE CONSUMPTION EXPENDITURES

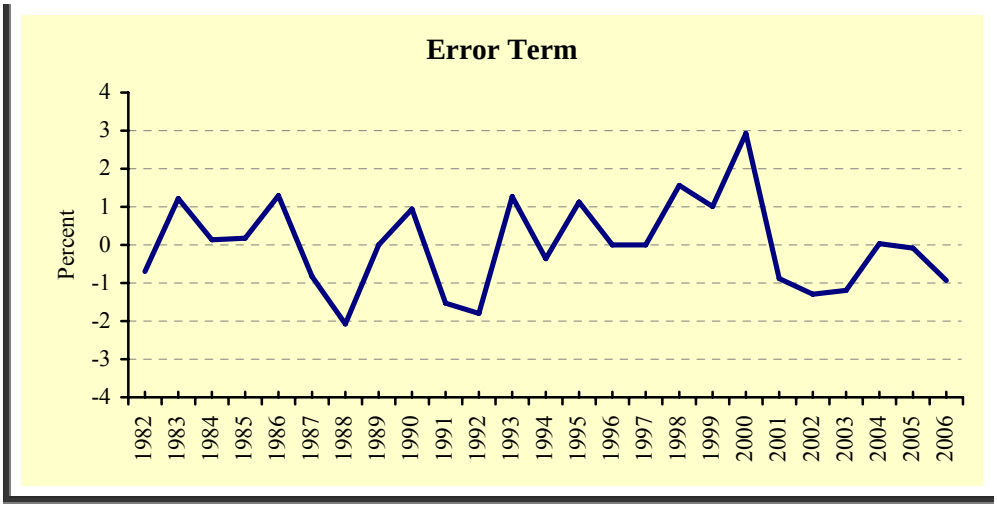
$$LOG(CP) = \beta_0 + \beta_1 LOG(GDP) + \beta_2 LOG(RER) + \beta_3 LOG(1 + R\_) + \beta_4 LOG(CP(-1)) + \beta_5 DUM89 + \beta_6 DUM96 + \beta_7 DUM97$$

Dependent Variable: LOG(CP)
Method: Least Squares
Observation Period: 1982 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	1.307673	0.153728	8.506423	0.0000
LOG(GDP)	0.501608	0.068580	7.314256	0.0000
LOG(RER)	0.112416	0.027680	4.061259	0.0008
LOG(1+R_)	-0.040950	0.021512	-1.903567	0.0740
LOG(CP(-1))	0.364097	0.073248	4.970771	0.0001
DUM89	-0.048098	0.014846	-3.239834	0.0048
DUM96	0.042932	0.016429	2.613132	0.0182
DUM97	0.061494	0.016401	3.749324	0.0016
R^2	0.997766	Durbin-Watson Stat.		1.787993
Adjusted R^2	0.996846	F-Statistic		1084.579
S.E. of Regression	0.014347			



CP : Private Consumption Expenditures (Thousand YTL, with 1987 Prices)
CPF : In-sample Forecast for Private Consumption Expenditures

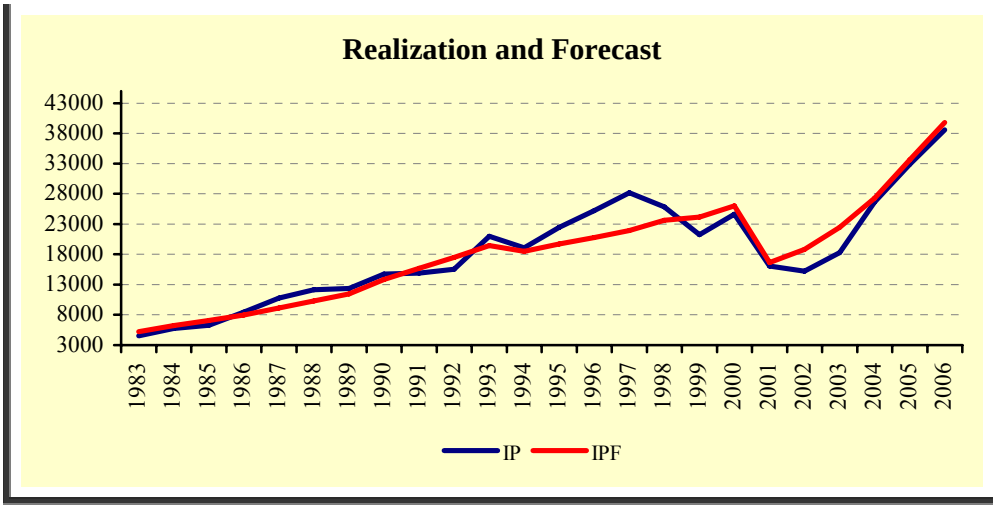


6.6. PRIVATE INVESTMENT EXPENDITURES

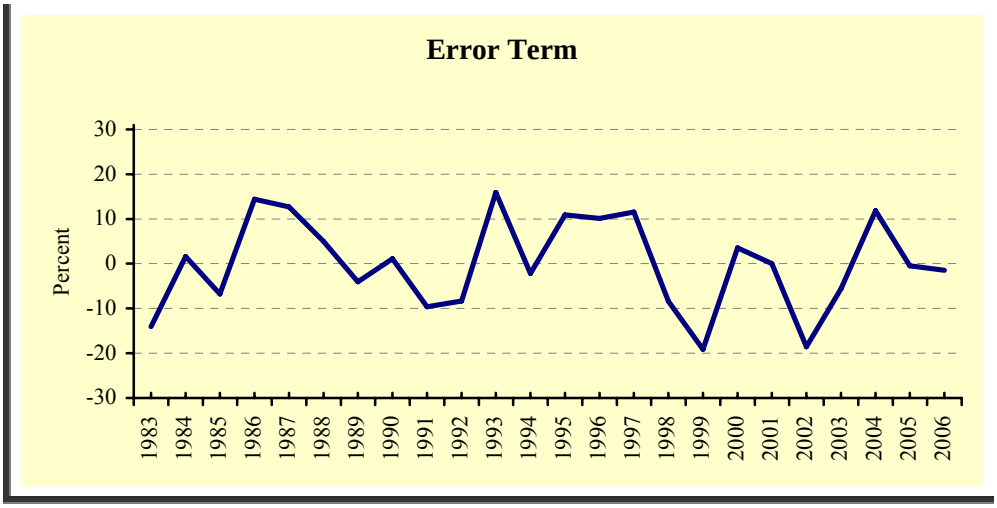
$$LOG(IP) = \beta_0 + \beta_1 LOG(IP(-1)) + \beta_2 LOG(1+R) + \beta_3 LOG(GDP) + \beta_4 LOG(RER) + \beta_5 DUM01$$

Dependent Variable: LOG(IP)
Method: Least Squares
Observation Period: 1983 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-1.555073	2.057429	-0.755833	0.4595
LOG(IP(-1))	0.699249	0.092696	7.543426	0.0000
LOG(1+R)	-0.102089	0.362409	-0.281695	0.7814
LOG(GDP)	0.392129	0.237741	1.649394	0.1164
LOG(RER)	0.365964	0.239753	1.526422	0.1443
DUM01	-0.341369	0.142225	-2.400203	0.0274
R^2	0.965933	Durbin-Watson Stat.		1.729274
Adjusted R^2	0.956470	F-Statistic		102.0738
S.E. of Regression	0.115486			



IP : Private Investment Expenditures (Thousand YTL, with 1987 Prices)
IPF : In-sample Forecast for Private Investment Expenditures

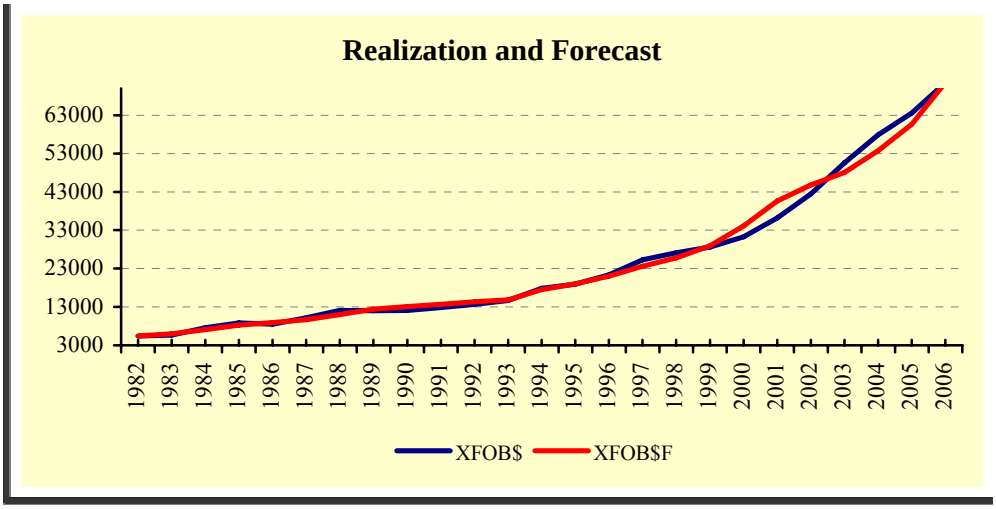


6.7. EXPORTS OF GOODS

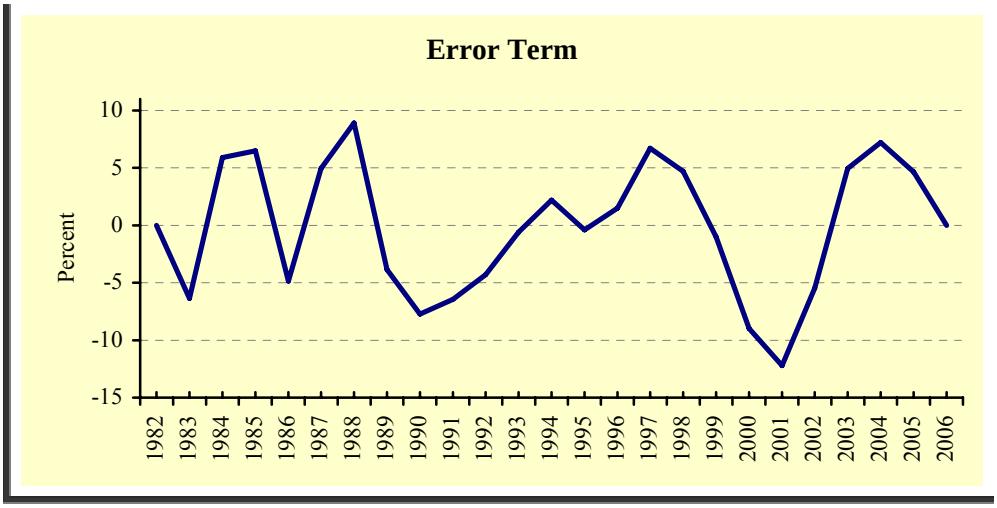
$$LOG(XFOB\$) = \beta_0 + \beta_1 LOG(YWR) + \beta_2 LOG(1 + PX\$/PM\$) + \beta_3 LOG(RER) + \beta_4 LOG(XFOB\$(-1))$$

Dependent Variable: LOG(XFOB$)
Method: Least Squares
Observation Period: 1982 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	6.410398	2.047078	3.131488	0.0055
LOG(YWR)	2.153598	0.691092	3.116225	0.0057
LOG(1+(PX$/PM$))	-0.561492	0.404181	-1.389208	0.1808
LOG(RER)	-0.210537	0.104746	-2.009986	0.0588
LOG(XFOB$(-1))	0.346950	0.219899	1.577767	0.1311
R^2	0.994305	Durbin-Watson Stat.		1.539908
Adjusted R^2	0.993107	F-Statistic		829.3816
S.E. of Regression	0.059817			



XFOB$: Exports of Goods (Real Million Dollars, with 1987 Prices)
XFOB$F : In-sample Forecast for Exports of Goods

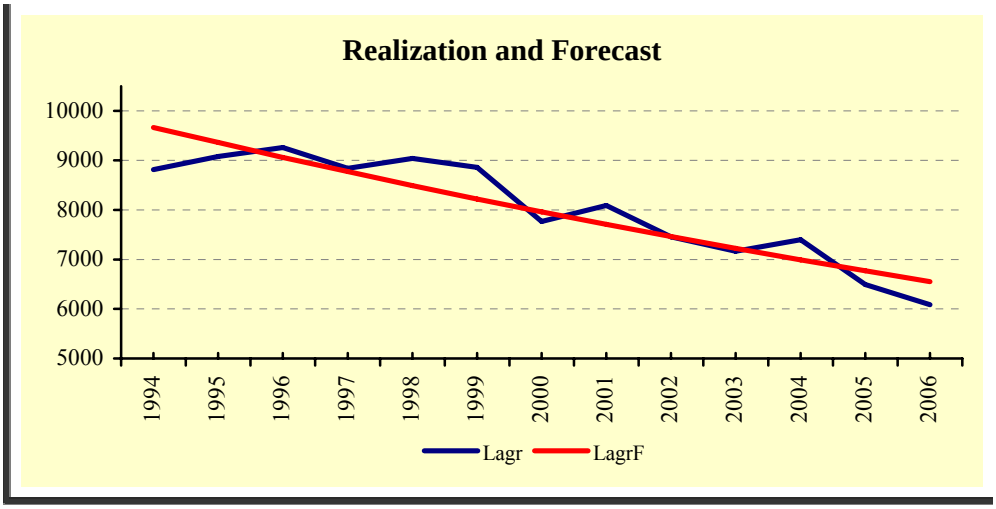


6.8. AGRICULTURAL SECTOR LABOR DEMAND

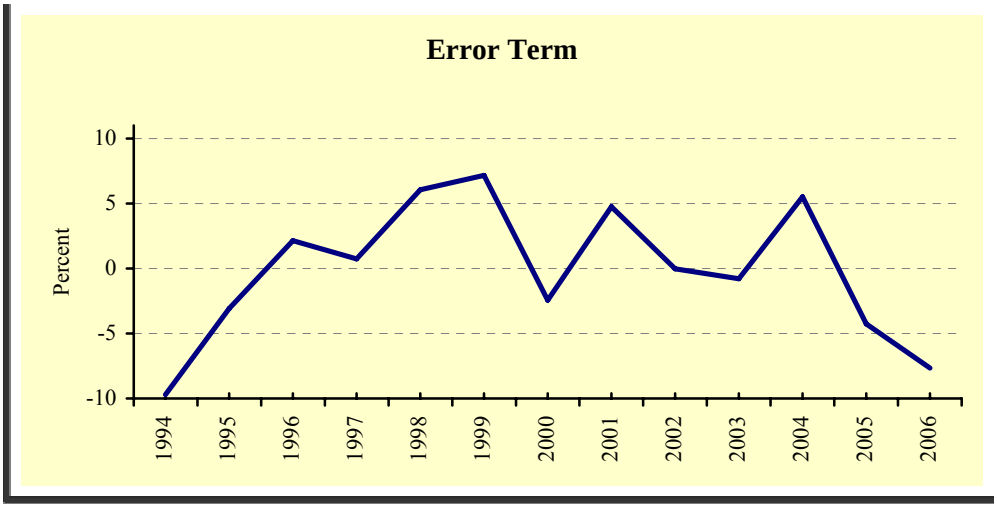
$$LOG(L_{agr}) = \beta_0 + \beta(T)$$

Dependent Variable: LOG(L_{agr})
Method: Least Squares
Observation Period: 1994 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	9.630089	0.082384	116.8920	0.0000
T	-0.032397	0.004049	-8.001360	0.0000
R^2	0.853376	Durbin-Watson Stat.		1.288358
Adjusted R^2	0.840046	F-Statistic		64.02176
S.E. of Regression	0.054624			



L_{agr} : Agricultural Sector Labor Demand (Thousand People)
L_{agr}F: In-sample Forecast for Agricultural Sector Labor Demand

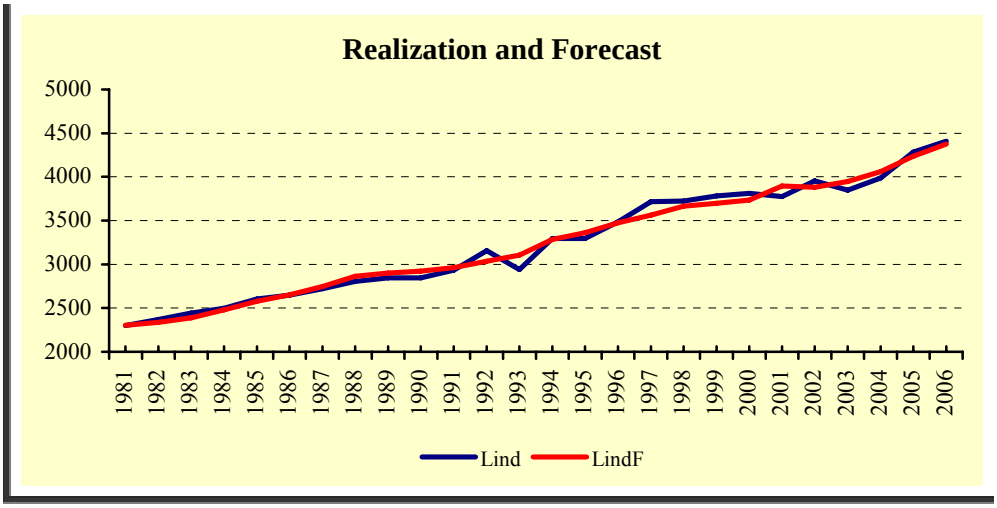


6.9. INDUSTRY SECTOR LABOR DEMAND

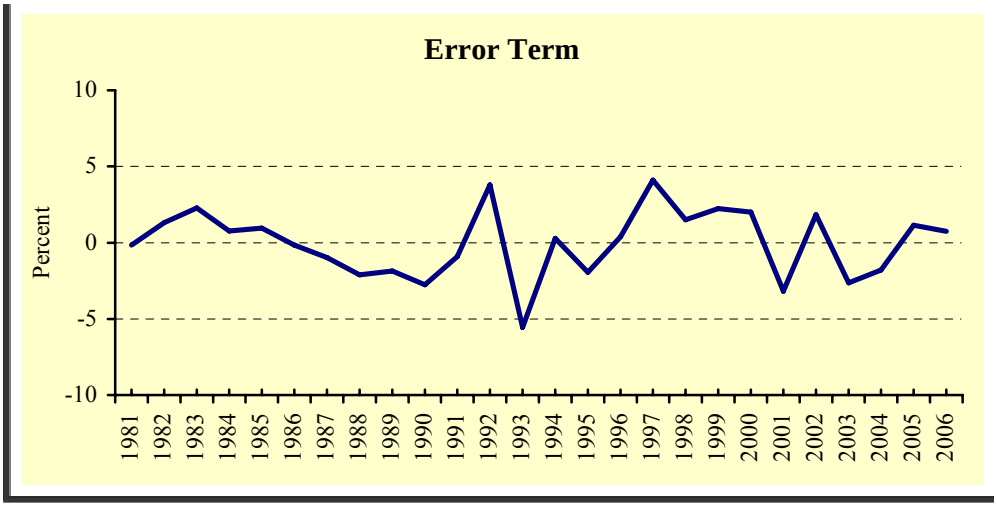
$$LOG(L_{ind}) = \beta_0 + \beta_1 LOG(W_{man\_}/CPI) + \beta_2 LOG(IP(-1)) + \beta_3 T$$

Dependent Variable: LOG(L_{ind})
Method: Least Squares
Observation Period: 1981 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	7.177434	0.151647	47.32976	0.0000
LOG($W_{man\_}$/CPI)	-0.073178	0.031877	-2.295658	0.0316
LOG(IP(-1))	0.063442	0.018219	3.482156	0.0021
T	0.020875	0.001441	14.48274	0.0000
R^2	0.986617	Durbin-Watson Stat.		2.092529
Adjusted R^2	0.984792	F-Statistic		540.6263
S.E. of Regression	0.024077			



L_{ind} : Industry Sector Labor demand (Thousand People)
L_{ind}F: In-sample Forecast for Industry Sector Labor demand

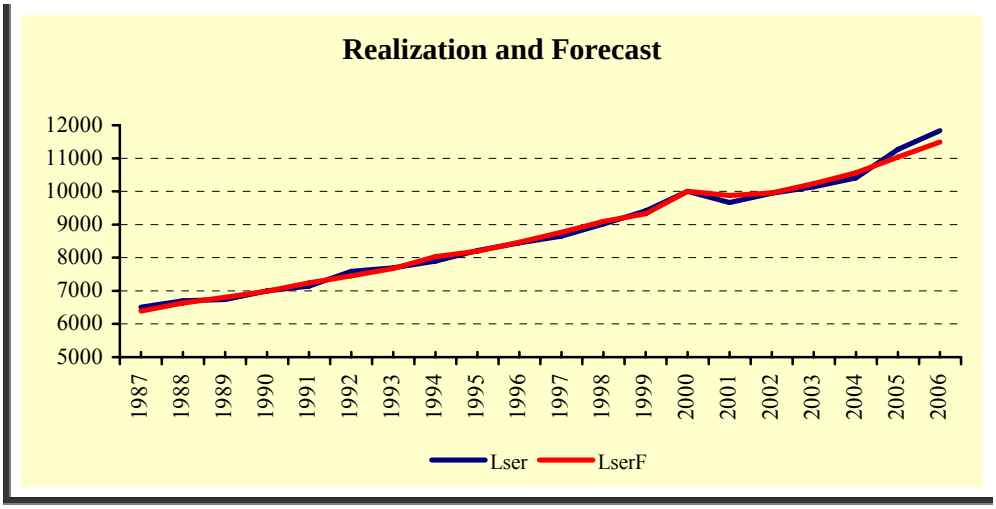


6.10. SERVICES SECTOR LABOR DEMAND

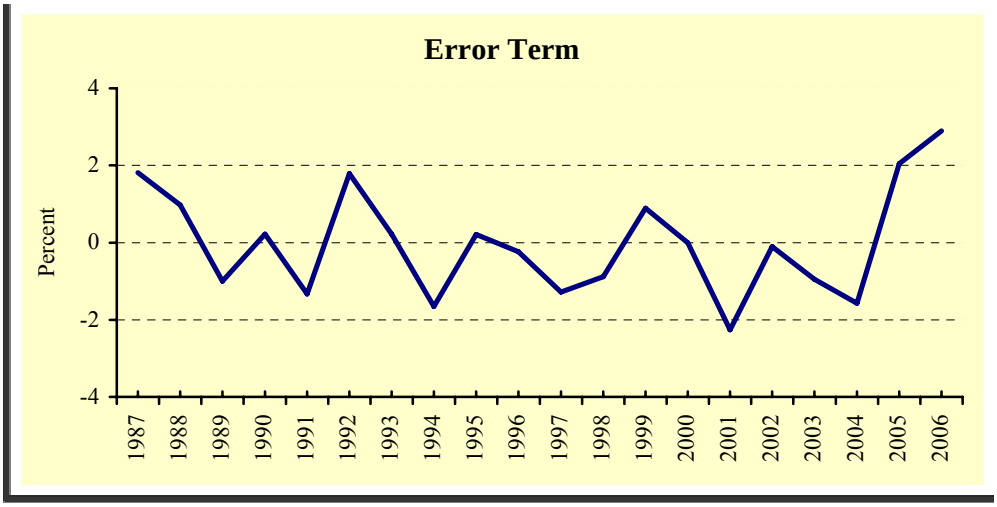
$$LOG(L_{ser}) = \beta_0 + \beta_1 LOG(IP(-1) + IG(-1)) + \beta_2 LOG(W\_/CPI) + \beta_3 T + \beta_4 DUM00$$

Dependent Variable: LOG(L_{ser})
Method: Least Squares
Observation Period: 1987 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	7.987775	0.215878	37.00140	0.0000
LOG(IP(-1)+IG(-1))	0.056725	0.022678	2.501350	0.0244
LOG(W_/CPI)	-0.014478	0.028143	-0.514421	0.6145
T	0.028318	0.000932	30.38485	0.0000
DUM00	0.052112	0.016720	3.116724	0.0071
R^2	0.993929	Durbin-Watson Stat.		1.528531
Adjusted R^2	0.992310	F-Statistic		613.8983
S.E. of Regression	0.015837			



L_{ser} : Services Sector Labor Demand (Thousand People)
L_{ser}F: In-sample Forecast for Services Sector Labor Demand

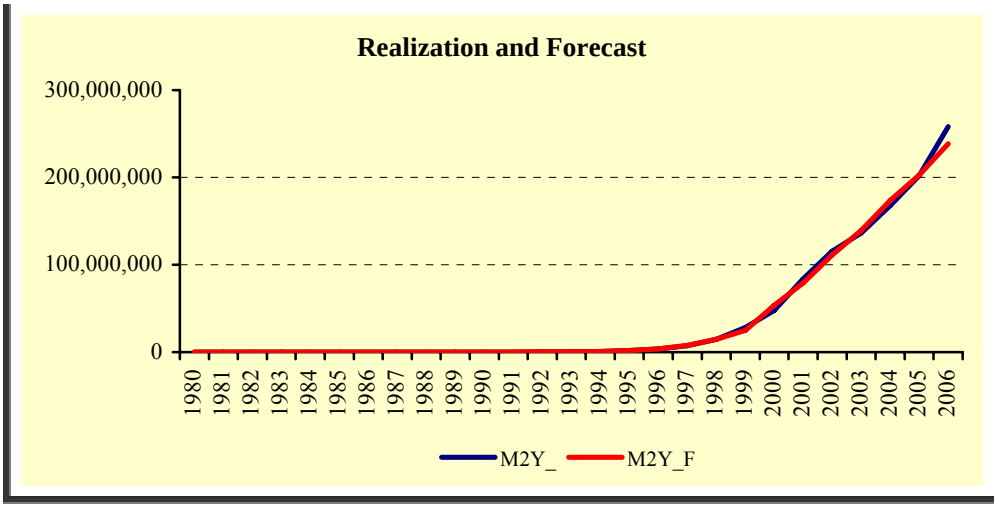


6.11. DEMAND FOR BROAD MONEY

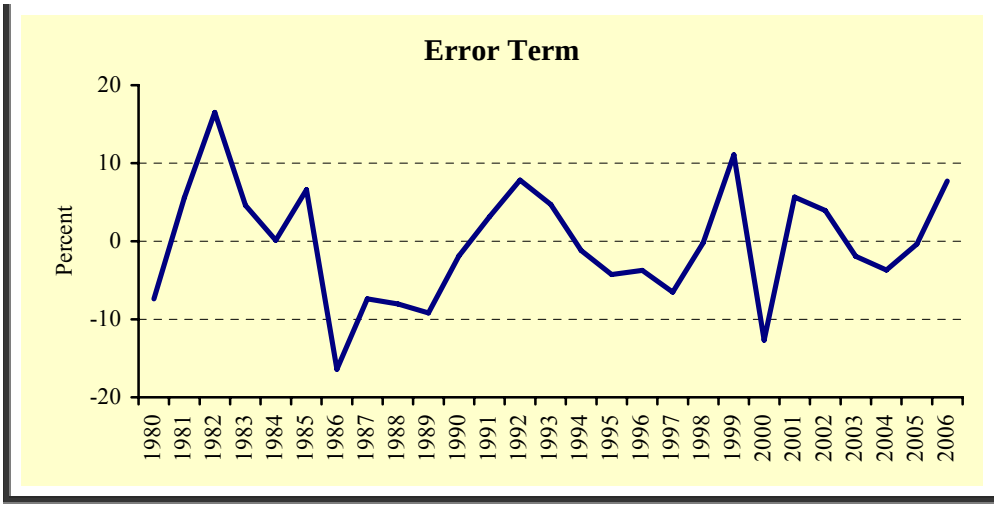
$$LOG(M2Y\_) = \beta_0 + \beta_1 LOG(GDP\_) + \beta_2 LOG(1+R\_) + \beta_3 LOG(ER) + \beta_4 LOG(CREDIT\_/GDP\_)$$

Dependent Variable: LOG(M2Y_)
Method: Least Squares
Observation Period: 1980 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	5.095315	0.929211	5.483487	0.0000
LOG(GDP_)	0.480212	0.074931	6.408689	0.0000
LOG(1+R_)	-0.758163	0.091649	-8.272426	0.0000
LOG(ER)	0.667323	0.084894	7.860706	0.0000
LOG(CREDIT_/GDP_)	0.266127	0.094611	2.812848	0.0101
R^2	0.999684	Durbin-Watson Stat.		1.651742
Adjusted R^2	0.999627	F-Statistic		17403.96
S.E. of Regression	0.082054			



M2Y_ : Demand for Broad Money (Million YTL)
M2Y_F: In-sample Forecast for Demand for Broad Money

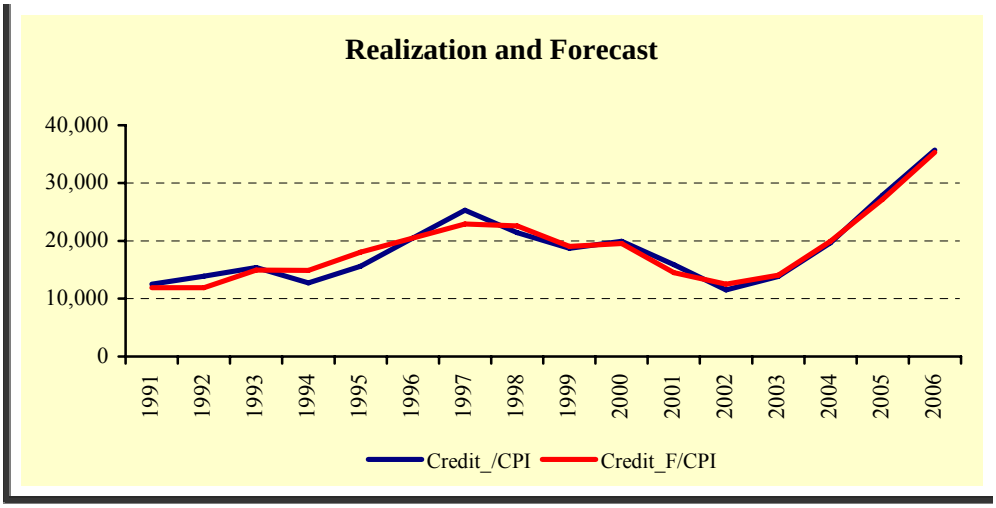


6.12. DEMAND FOR REAL DOMESTIC CREDIT

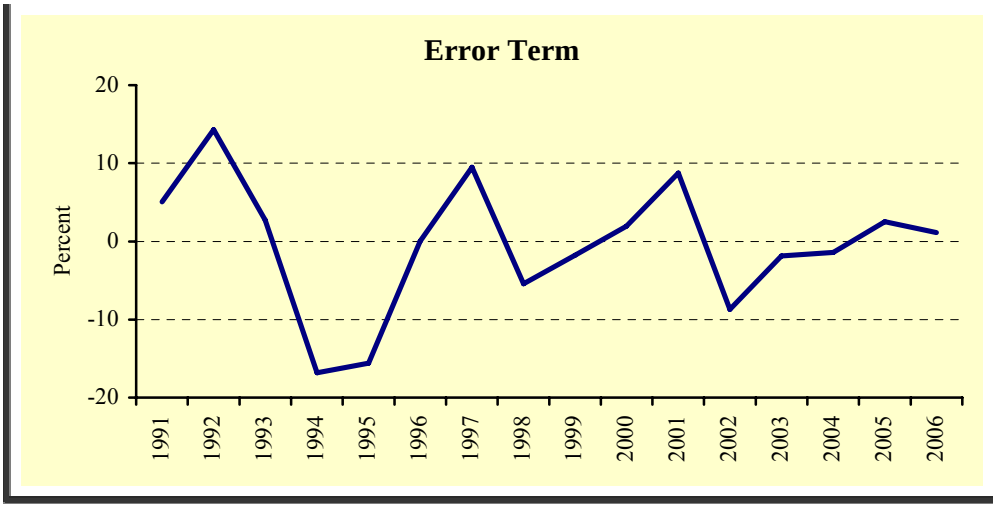
$$LOG(\frac{CREDIT}{CPI}) = \beta_0 + \beta_1 LOG(GDP) + \beta_2 LOG(\frac{CREDIT\_(-1)}{CPI(-1)}) + \beta_3 LOG(\frac{IP}{GDP}) + \beta_4 LOG(\frac{PSBR\_(-1)}{GDP\_(-1)} + 1)$$

Dependent Variable: LOG(CREDIT_/CPI)
Method: Least Squares
Observation Period: 1991 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-2.623207	1.696085	-1.546625	0.1502
LOG(GDP)	0.906503	0.166419	5.447128	0.0002
LOG(CREDIT_(-1)/CPI(-1))	0.321144	0.118660	2.706434	0.0204
LOG(IP/GDP)	0.734294	0.178477	4.114223	0.0017
LOG(PSBR_(-1)/GDP_(-1)+1)	-0.738545	0.842341	-0.876777	0.3994
R^2	0.933546	Durbin-Watson Stat.		1.840807
Adjusted R^2	0.909380	F-Statistic		38.63171
S.E. of Regression	0.094892			



CREDIT_/CPI : Demand for Real Domestic Credit (Thousand YTL, with 1987 Prices)
CREDIT_F/CPI : In-sample Forecast for Demand for Real Domestic Credit

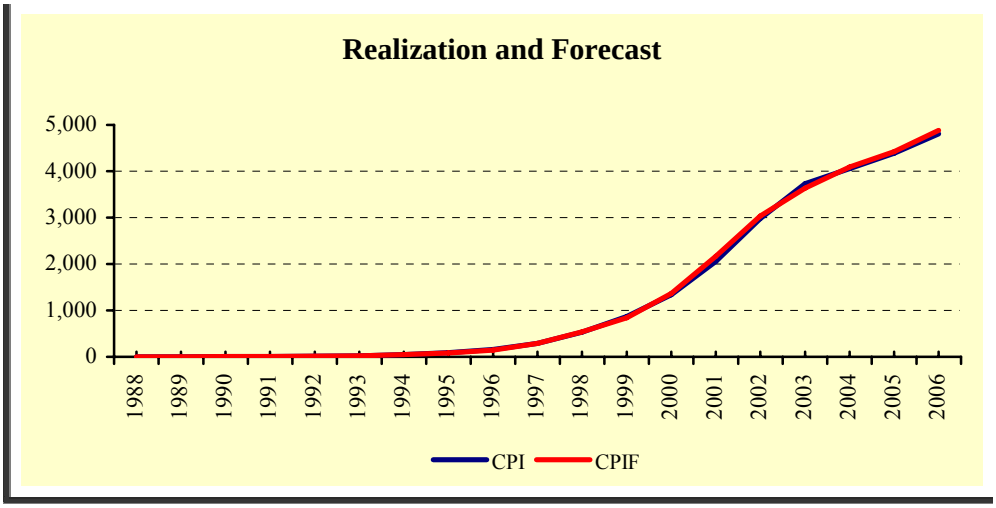


6.13. CONSUMER PRICES INDEX

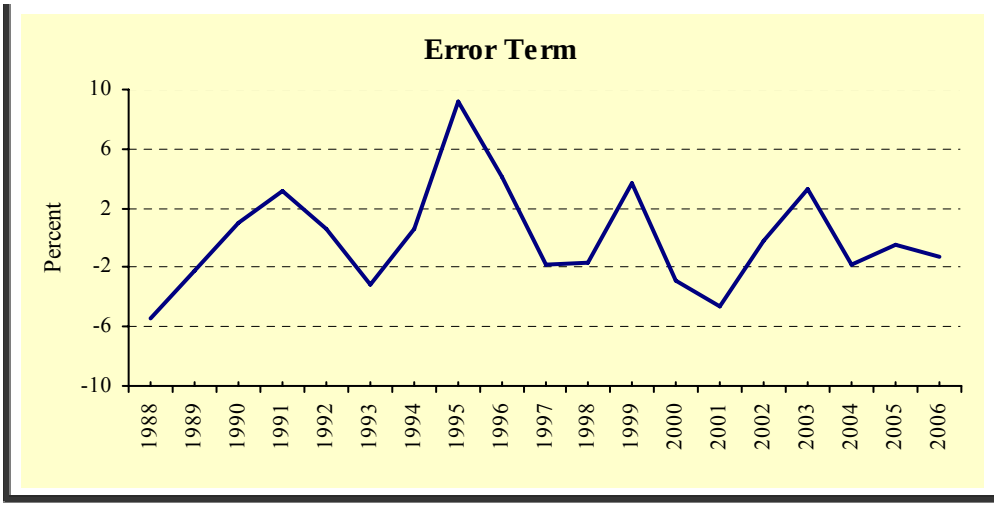
$$LOG(CPI) = \beta_0 + \beta_1 LOG(CPI(-1)) + \beta_2 LOG(ER) + \beta_3 LOG(W(-1)) + \beta_4 LOG((GDP - GDPPOT)/GDPPOT))$$

Dependent Variable: LOG(CPI)
Method: Least Squares
Observation Period: 1988 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	3.904063	0.237810	16.41676	0.0000
LOG(CPI(-1))	0.313053	0.071362	4.386818	0.0006
LOG(ER)	0.508344	0.036100	14.08164	0.0000
LOG(W(-1))	0.202093	0.066915	3.020132	0.0092
LOG(1+(GDP-GDPPOT)/GDPPOT)	1.247386	0.254005	4.910879	0.0002
R^2	0.999836	Durbin-Watson Stat.		1.478633
Adjusted R^2	0.999790	F-Statistic		21380.71
S.E. of Regression	0.040025			



CPI : Consumer Prices Index (1987=1)
CPIF: In-sample Forecast for Consumer Prices Index

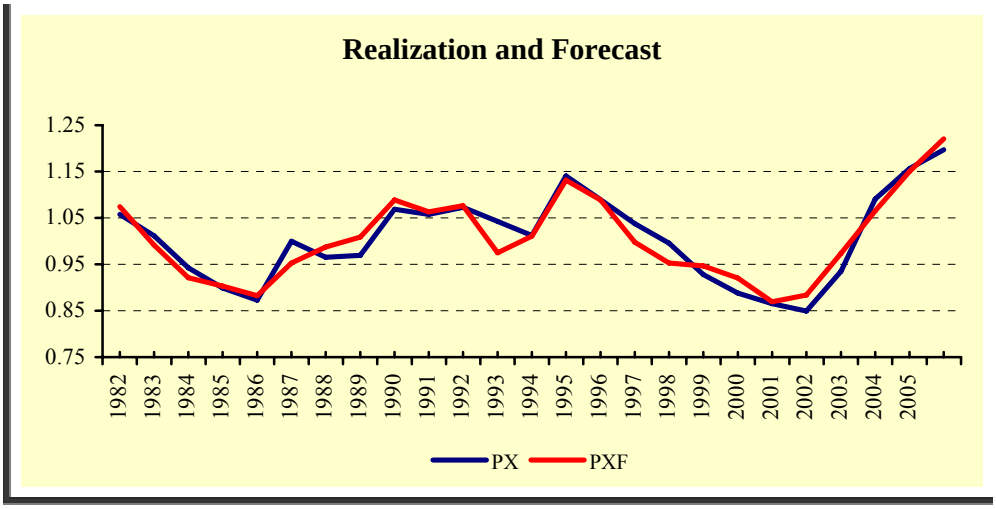


6.14. EXPORT PRICES

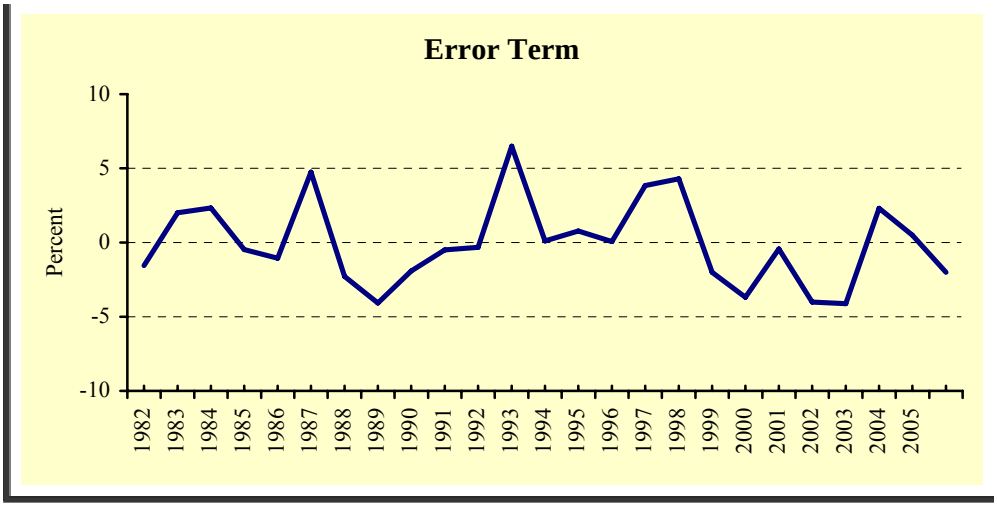
$$LOG(PX) = \beta_0 + \beta_1 LOG(PXWR) + \beta_2 LOG(Y_{ind} / L_{ind}) + \beta_3 LOG(RER) + \beta_4 LOG(PM)$$

Dependent Variable: LOG(PX)
Method: Least Squares
Observation Period: 1982 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	0.537769	0.125173	4.296191	0.0004
LOG(PXWR)	0.670468	0.104368	6.424070	0.0000
LOG(Y_{ind}/L_{ind})	-0.308590	0.063803	-4.836625	0.0001
LOG(RER)	0.189832	0.072274	2.626546	0.0162
LOG(PM)	0.297084	0.082941	3.581871	0.0019
R^2	0.905238	Durbin-Watson Stat.		1.696711
Adjusted R^2	0.886286	F-Statistic		47.76378
S.E. of Regression	0.031643			



PX : Export Prices Index (1987=1)
PXF : In-sample Forecast for Export Prices Index

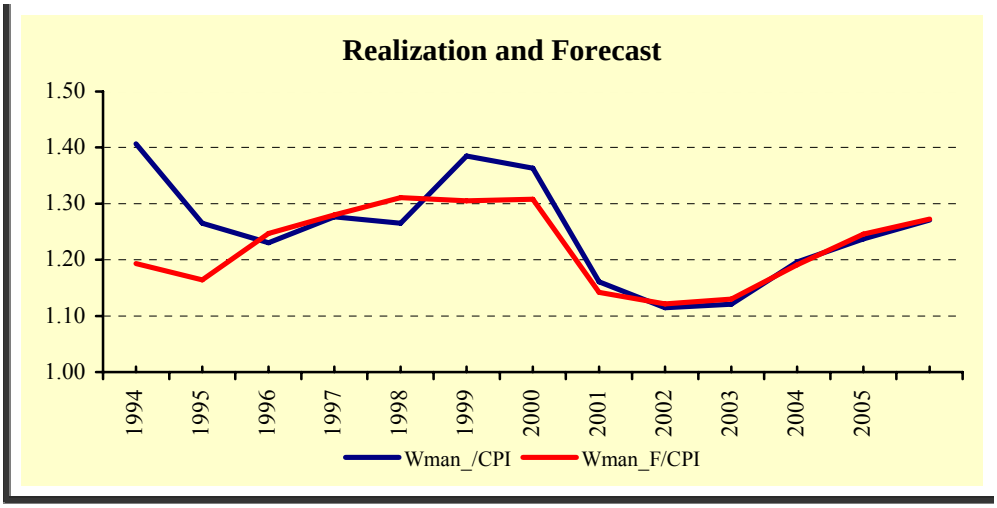


6.15. REAL WAGES IN MANIFACTURING INDUSTRY

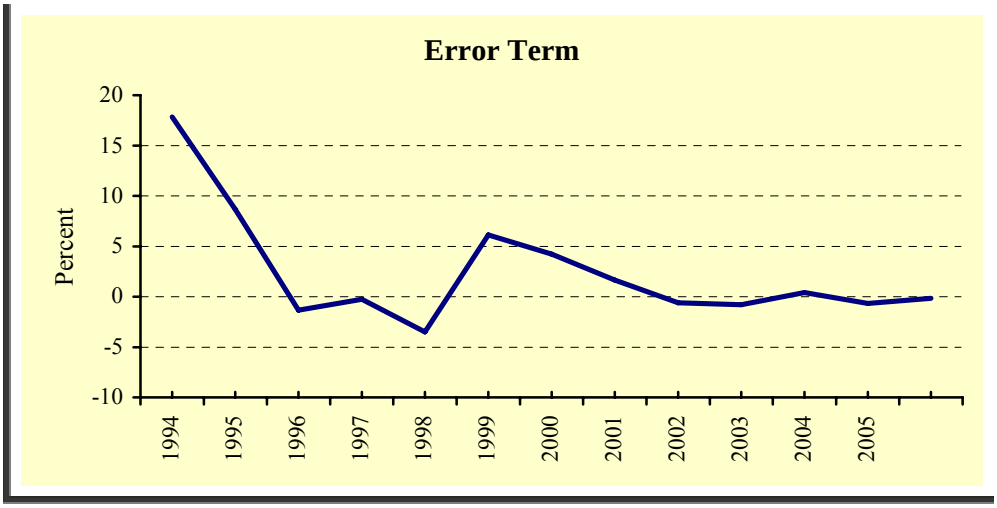
$$LOG(W\_MAN/CPI) = \beta_0 + \beta_1 \text{LOG}(\text{Y}_{\text{ind}}(\text{-1})/\text{L}_{\text{ind}}(\text{-1})) + \beta_2 LOG(W\_MAN(-1)/CPI(-1)) + \beta_3 LOG(U) + DUM01$$

Dependent Variable: LOG(W_MAN/CPI)
Method: Least Squares
Observation Period: 1994 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-1.315972	0.415718	-3.165536	0.0133
LOG(Y_{ind}(-1)/L_{ind}(-1))	0.435918	0.146305	2.979511	0.0176
LOG(W_MAN(-1)/CPI(-1))	0.393645	0.094278	4.175347	0.0031
LOG(U)	-0.201594	0.065657	-3.070430	0.0153
DUM01	-0.107630	0.037165	-2.895989	0.0200
R^2	0.849621	Durbin-Watson Stat.		2.499271
Adjusted R^2	0.774432	F-Statistic		11.29974
S.E. of Regression	0.035163			



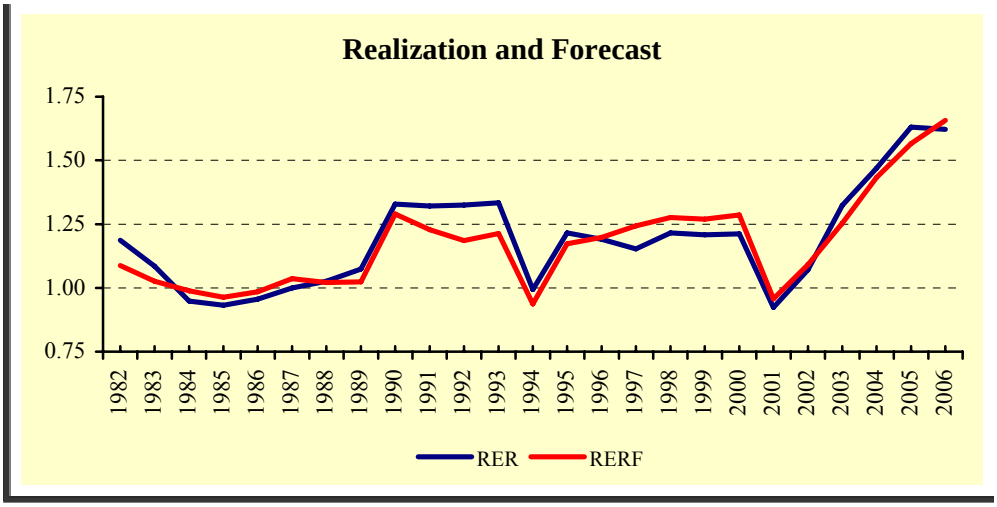
$W_{man\_}$/CPI : Real Wages in Manufacturing Industry (1987=1)
$W_{man_}$F/CPI: In-sample Forecast for Real Wages in Manufacturing Industry



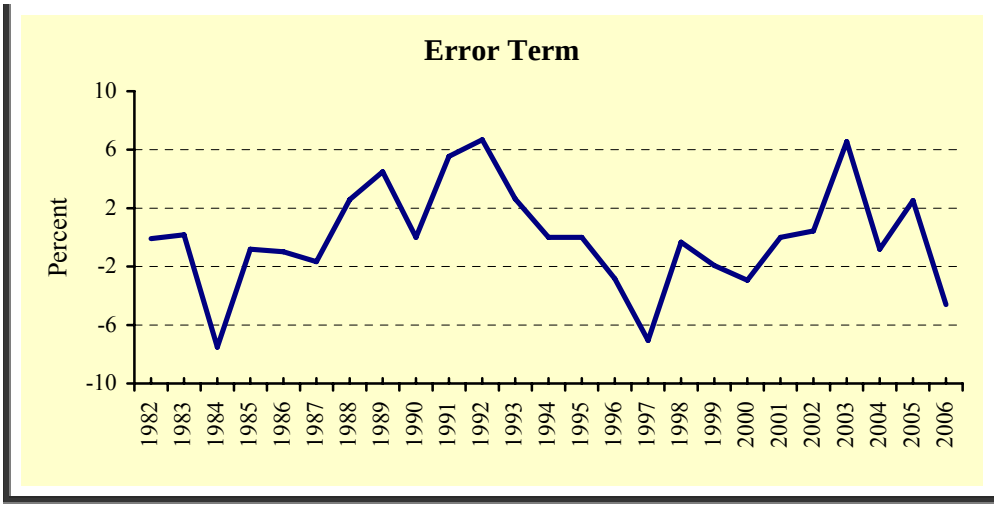
6.16. REAL EXCHANGE RATE

$$LOG(RER) = \beta_0 + \beta_1 LOG(RER(-1)) + \beta_2 LOG(RESERV\$\_) + \beta_3 LOG(PEND) + \beta_3 LOG(NALP) + DUM90 + DUM94 + DUM95 + DUM01$$

Dependent Variable: LOG(RER)				
Method: Least Squares				
Observation Period: 1982 2006				
Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-0.991540	0.205088	-4.834699	0.0002
LOG(RER(-1))	0.611420	0.069685	8.774088	0.0000
LOG(RESERV$_)	0.012659	0.013666	0.926335	0.3680
DLOG(PEND)	-0.171695	0.068117	-2.520595	0.0227
LOG(NALP)	0.535802	0.153553	3.489372	0.0030
DUM90	0.181553	0.012546	14.47042	0.0000
DUM94	-0.187866	0.033691	-5.576138	0.0000
DUM95	0.144002	0.021009	6.854226	0.0000
DUM01	-0.274654	0.016359	-16.78916	0.0000
R^2	0.951059	Durbin-Watson Stat.		1.409336
Adjusted R^2	0.926589	F-Statistic		38.86590
S.E. of Regression	0.044088			



RER : Real Exchange Rate (1987=1)
RERF : In-sample Forecast for Real Exchange Rate

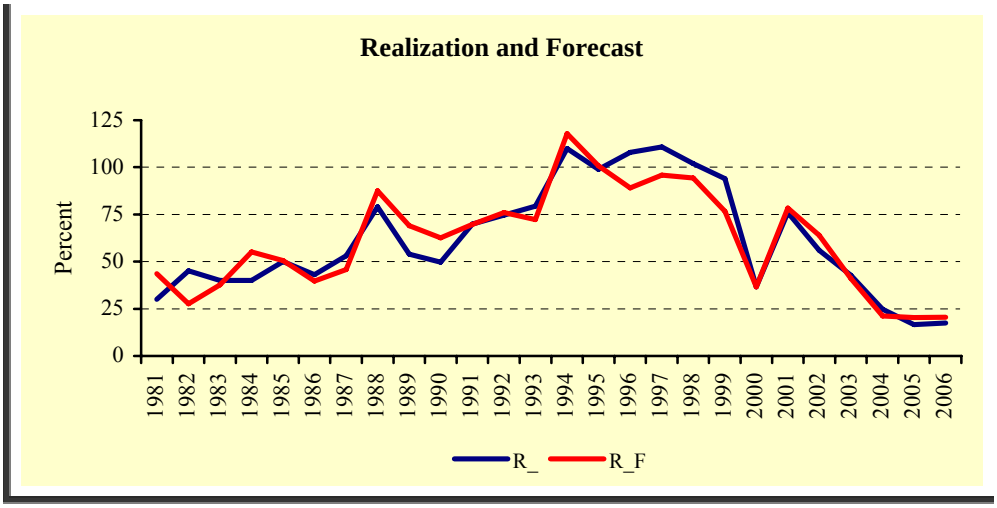


6.17. NOMINAL DOMESTIC BORROWING INTEREST RATE

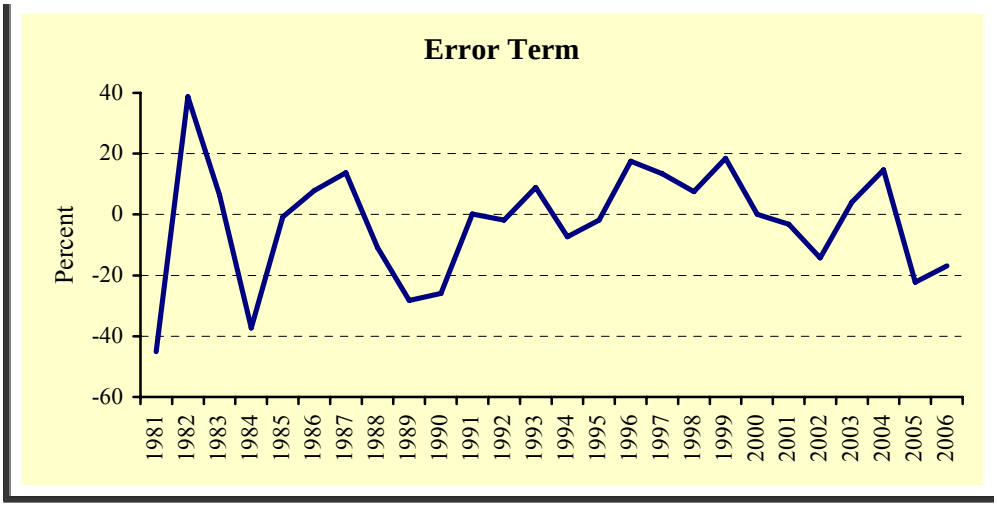
$$LOG(1+R\_) = \beta_0 + \beta_1 LOG(DDS/GDP\_) + \beta_2 LOG(CPI/CPI(-1)) + \beta_3 DUM00$$

Dependent Variable: LOG(1+R_)
Method: Least Squares
Observation Period: 1981 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	0.162705	0.042184	3.857004	0.0009
LOG(DDS/GDP_)	0.086834	0.030916	2.808745	0.0102
LOG(CPI/CPI(-1))	1.040524	0.083746	12.42480	0.0000
DUM00	-0.222957	0.067655	-3.295510	0.0033
R^2	0.887894	Durbin-Watson Stat.		1.657485
Adjusted R^2	0.872607	F-Statistic		58.08111
S.E. of Regression	0.064223			



R_ : Nominal Domestic Borrowing Interest Rate
R_F : In-sample Forecast for Nominal Domestic Borrowing Interest Rate

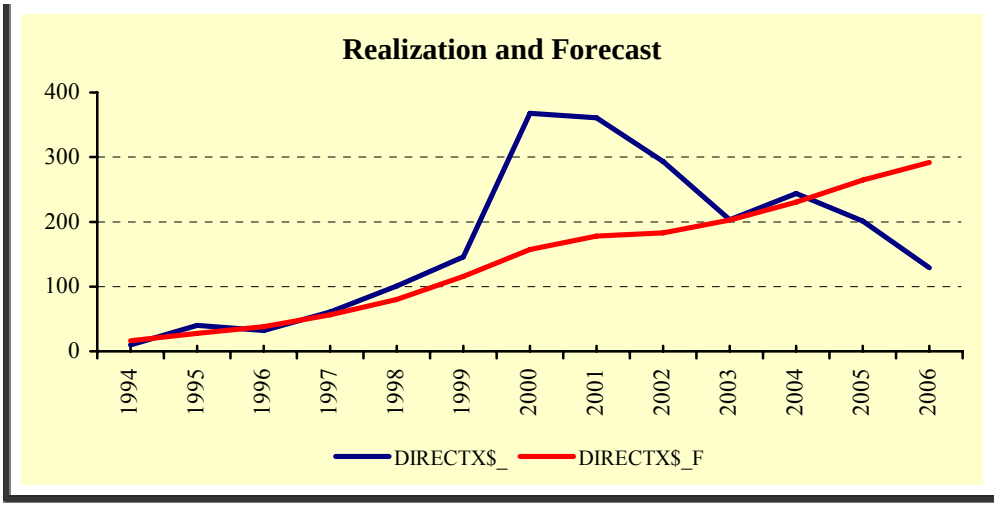


6.18. DIRECT INVESTMENTS INCOME, CREDIT

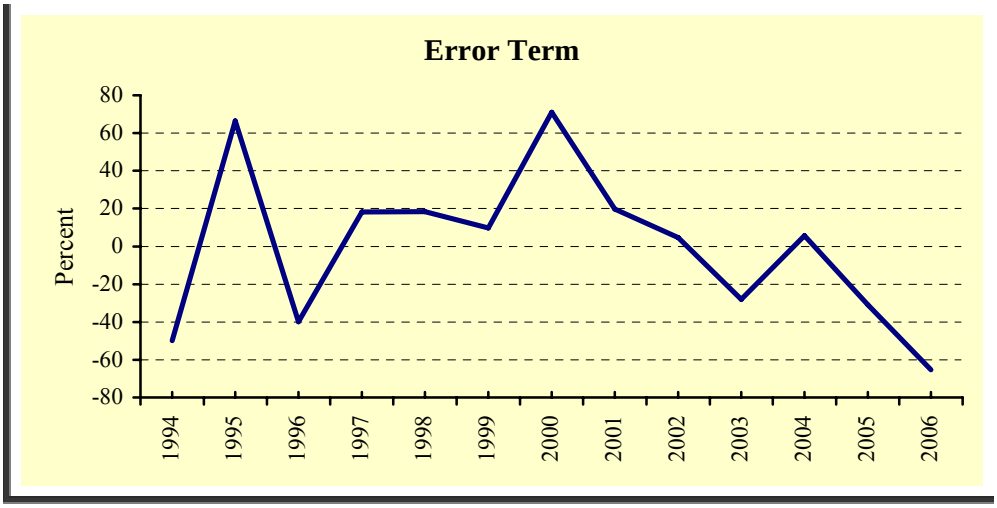
$$LOG(DIRECTX\$\_) = \beta_0 + \beta_1 \text{LOG}(\sum_{i=t-9}^{t} \text{FDIF\$\_}_i) + AR(1)$$

Dependent Variable: LOG(DIRECTX$_)
Method: Least Squares
Observation Period: 1994 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-0.281539	2.855184	-0.098606	0.9234
$\text{LOG}\left(\sum_{i=t-9}^{t} FDIF\$\__i\right)$	0.683986	0.367891	1.859207	0.0926
AR(1)	0.599843	0.330891	1.812809	0.0999
R^2	0.851338	Durbin-Watson Stat.		1.909896
Adjusted R^2	0.821605	F-Statistic		28.63327
S.E. of Regression	0.455266			



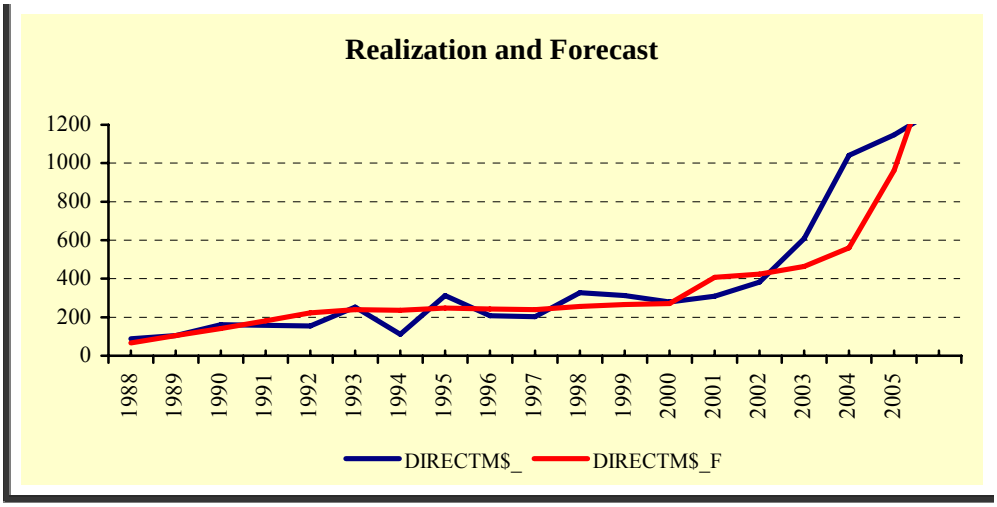
DIRECTX$_ : Direct Investments Income, Credit (Million Dollars)
DIRECTX$_F: In-sample forecast for Direct Investments Income, Credit



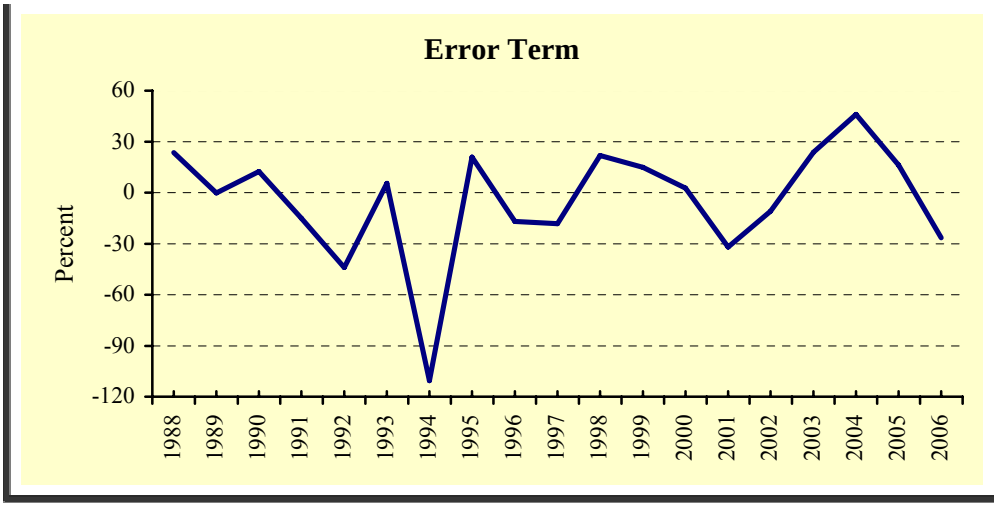
6.19. DIRECT INVESTMENTS INCOME, DEBIT

$$LOG(DIRECTM\$\_) = \beta_0 + \beta_1 \text{LOG}(\sum_{i=t-4}^{t} \text{FDIH\$\_}_i)$$

Dependent Variable: LOG(DIRECTM$_)				
Method: Least Squares				
Observation Period: 1988 2005				
Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-1.420740	0.712485	-1.994063	0.0624
$\text{LOG}\left(\sum_{i=t-4}^{t} FDIH\$\__i\right)$	0.841220	0.084337	9.974510	0.0000
R^2	0.854066	Durbin-Watson Stat.		1.903105
Adjusted R^2	0.845481	F-Statistic		99.49086
S.E. of Regression	0.309232			



DIRECTM$_ : Direct Investments Income, Debit (Million Dollars)
DIRECTM$_F: In-sample forecast for Direct Investments Income, Debit

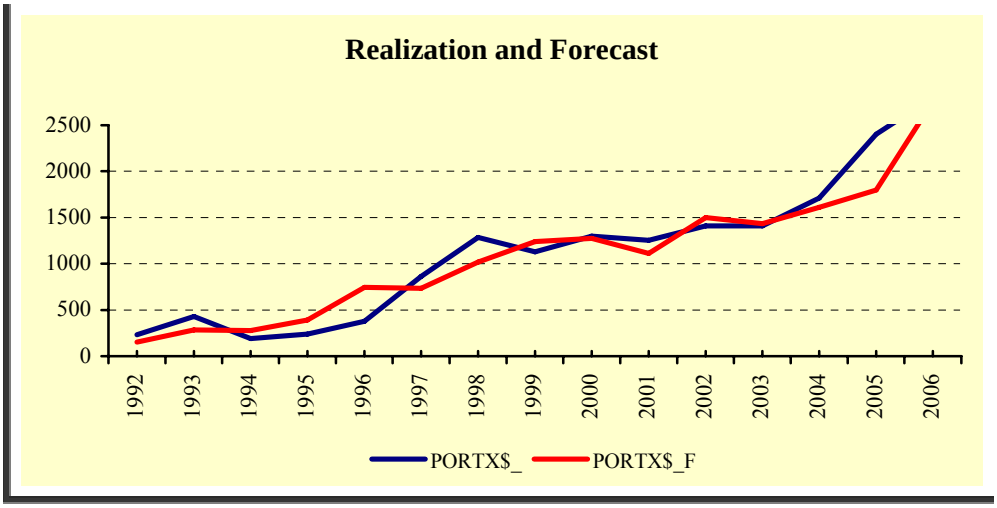


6.20. PORTFOLIO INVESTMENTS INCOME

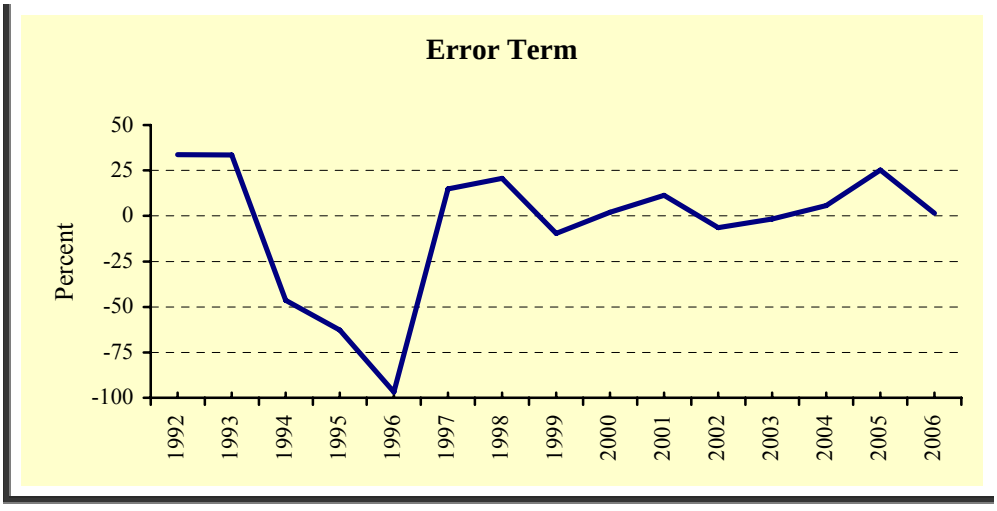
$$LOG(PORTX\$\_) = \beta_0 + \beta_1 \text{LOG}(\sum_{i=t-4}^{t} \text{PORTA\$\_}_i)$$

Dependent Variable: LOG(PORTX$_)
Method: Least Squares
Observation Period: 1992 2005

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-2.339138	0.964789	-2.424508	0.0306
$\text{LOG}\left(\sum_{i=t-4}^{t} PORTA\$\__i\right)$	1.112522	0.117793	9.444736	0.0000
R^2	0.872802	Durbin-Watson Stat.		1.220932
Adjusted R^2	0.863018	F-Statistic		89.20304
S.E. of Regression	0.324511			



PORTX$_ : Portfolio Investments Income (Million Dollars)
PORTX$_F : In-sample forecast for Portfolio Investments Income

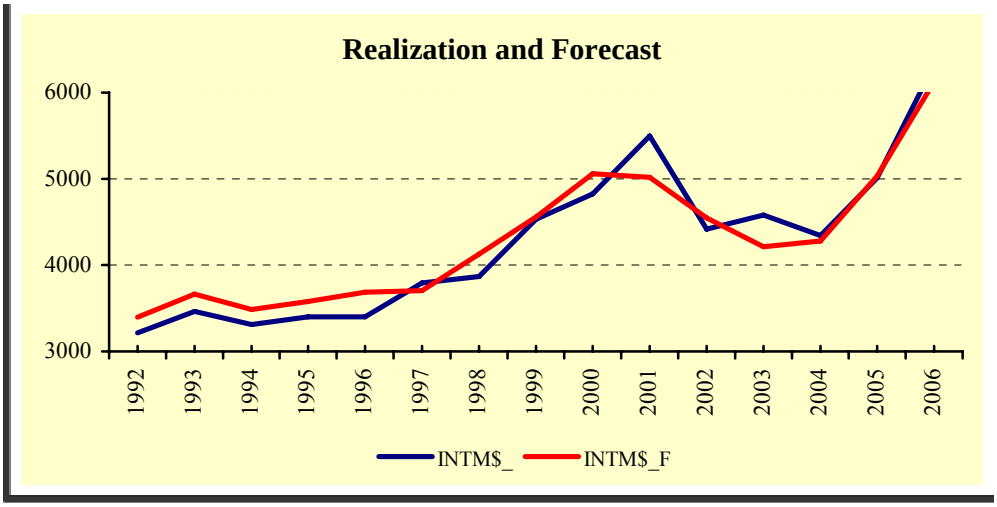


6.21. INTEREST EXPENDITURES

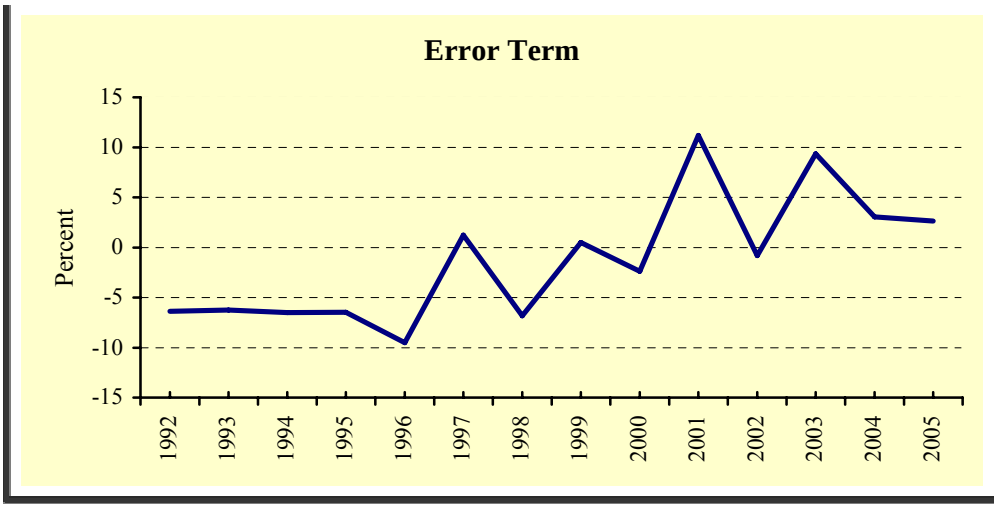
$$LOG(INTM\$\_) = \beta_0 + \beta_1 LOG(INTM\$(-1)) + \beta_2 \mathrm{LOG}(\sum_{i=t-3}^{t} OTINVL\_i)$$

Dependent Variable: LOG(INTM$_)
Method: Least Squares
Observation Period: 1992 2006

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	0.124343	0.981987	0.126624	0.9013
LOG(INTM$(-1))	0.864709	0.121569	7.112900	0.0000
LOG($\sum_{i=t-3}^{t} OTINVL\_i$)	0.108573	0.026049	4.168008	0.0013
R^2	0.877799	Durbin-Watson Stat.		3.484836
Adjusted R^2	0.857432	F-Statistic		43.09949
S.E. of Regression	0.076737			



INTM$_ : Interest Expenditures (Million Dollars)
INTM$_F: In-sample Forecast for Interest Expenditures



7. VARIABLE DEFINITIONS

REAL ENDOGENOUS VARIABLES

VARIABLE	DEFINITION
CG	Public Consumption Expenditures
CP	Private Consumption Expenditures
CU	Manufacturing Industry Capacity Utilization Rate
GDP	GDP at 1987 Prices
GDP_E	GDP by Expenditures
GDP_P	GDP by Production
GDPPOT	Potential GDP
GNP	Gross National Product
I_{agr}	Fixed Capital Investments in Agriculture Sector
I_{ind}	Fixed Capital Investments in Industry Sector
I_{ser}	Fixed Capital Investments in Services Sector
IG	Public Fixed Capital Investments
IP	Private Fixed Capital Investments
K	Total Capital Stock
K_{agr}	Capital Stock in Agriculture Sector
K_{ind}	Capital Stock in Industry Sector
K_{ser}	Capital Stock in Services Sector
L_{agr}	Labor Demand in Agriculture Sector
L_{ind}	Labor Demand in Industry Sector
L_{ser}	Labor Demand in Services Sector
LD	Labor Demand
LS	Labor Supply
M	Total Imports of Goods and Services
MCIF	Imports of Goods
MCIF$	Imports of Goods (1987 Prices in Dollars)
MOTH	Imports of Services
MTAX	Import Tax
NALP	Non-Agricultural Labor Productivity $[(Y_{ind} + Y_{ser}) / (L_{ind} + L_{ser})]$
N15	Working Age Population
NFI	Net Factor Income
NFIM	Factor Expenditures to Abroad
NFIX	Factor Income from Abroad
R	Ex-Ante Real T-Bill Interest Rate
RER	Real Exchange Rate
S	Change in Stocks
U	Unemployment Rate
X	Exports of Goods and Services
XFOB	Exports of Goods
XFOB$	Exports of Goods in Dollar Terms
XOTH	Exports of Services
Y	Total Value Added
Y_{agr}	Value Added of Agriculture
Y_{ind}	Value Added of Industry
Y_{ser}	Value Added of Services

NOMINAL ENDOGENOUS VARIABLES

VARIABLE	DEFINITION
CAB$_	Current Account Balance
CG_	Public Current Expenditures
CGDEF	Public Expenditure Deflator
CPI	Consumer Price Index
CREDIT_	Domestic Credit Stock
CTRANS$_	Current Transfers
DDS_	Public Sector Domestic Debt Stock
DIRECTM$_	Direct Investments Income, Debit
DIRECTX$_	Direct Investments Income, Credit
ER	Exchange Rate
FA$_	Financial Account
FDI$_	Foreign Direct Investments
FDIH$_	Foreign Direct Investments in Turkey
FDS_	Public Sector Foreign Debt Stock
FREIGHT$_	Net Freight Expenditures
FREIGHTM$_	Freight Expenditures
FREIGHTX$_	Freight Revenues
GDP$_	GDP in Dollar Terms
GDP_	GDP in Nominal Prices
GDPDEF	GDP Deflator
GEXP_	Total Public Expenditures
GREV_	Total Public Revenues
GREVO_	Public Sector Revenues Excluding Import Taxes
IG_	Public Investment Expenditures
IGDEF	Public Investment Expenditure Deflator
INCB$_	Balance of Investment Income
INF	Inflation Rate
INTM$_	Interest Expenditures
INTPAY_	Public Sector Interest Expenditures
$INTPAY_d$_	Public Sector Interest Payments of Domestic Borrowing
$INTPAY_f$_	Public Sector Interest Payments of Foreign Borrowing
M$_	Imports of Goods and Services in Dollar Terms
M2Y_	Money Supply
MCIF$_	Imports of Goods in Dollar Terms
MTAX_	Import Taxes
NFIM$_	Factor Income to Abroad
NFIX$_	Factor Income from Abroad
OTINV$_	Other Investments, Net
OTM$_	Imports of Services
OTRANS_	Transfer Expenditures excluding Interest Payments
OTX$_	Exports of Services
PIP	Private Investment Deflator
PORT$_	Portfolio Investments
PORTL$_	Portfolio Investments Liabilities
PORTLDEBT$_	Portfolio Investments Liabilities, Notes Payable
PORTX$_	Portfolio Investments Income
PRS_	Primary Surplus
PSBR_	Public Sector Borrowing Requirement
PX	Export Price Index
R_	T-Bill Interest Rate, Simple Average
RESERV$_	Reserve Assets
SRB$_	Balance on Services
TRB$_	Trade Balance
W_	Economy-wide Wage Level
Wman_	Manufacturing Industry Wage Index
X$_	Total Exports of Goods and Services in Dollars Terms
XFOB$_	Exports of Goods in Dollars Terms

EXOGENEOUS VARIABLES

VARIABLE	DEFINITION
A_{agr}	Total Factor Productivity in Agricultural Sector
A_{ind}	Total Factor Productivity in Industry Sector
A_{ser}	Total Factor Productivity in Services Sector
CONST$_	Construction Revenues, Net
ER_{87}	Exchange Rate of 1987
FDIF$_	Foreign Direct Investments Abroad
FINM$_	Financial Services Debit
FINX$_	Financial Services Credit
INTX$_	Interest Revenues
LIBOR	London Interbank Offered Rate
MOTH$_	Imports of Services, in Dollar Terms
NEO$_	Net Errors and Omissions
NMG$_	Non-monetary Gold
OFSERM$_	Official Services Debit
OFSERX$_	Official Services Credit
OFTR$_	Official Transfers
OSERM$_	Other Services Debit
OSERX$_	Other Services Credit
OTINVA$_	Other Investments, Assets
OTINVL$_	Other Investments, Liabilities
OTRDM$_	Other Business Services Debit
OTRDX$_	Other Business Services Credit
OTRM$_	Other Transportation Debit
OTRX$_	Other Transportation Credit
PART	Labor Force Participation Rate
PM	Imports Price Index
PORTA$_	Portfolio Investment, Assets
PORTLBANK$_	Portfolio Investment, Liabilities, Debt Securities, Other Sectors
PORTLCB$_	Portfolio Investment, Liabilities, Debt Securities, Central Bank
PORTLEQ$_	Portfolio Investment, Liabilities, Equity Securities
PORTLG$_	Portfolio Investment, Liabilities, Debt Securities, General Government
PORTM$_	Portfolio Investment, Debit
PXWR	World Export Price Index
RF_	Foreign Borrowing Interest Rate
RINT_	Interbank Overnight Interest Rate
SHUTTLE$_	Shuttle Trade
TOURM$_	Travel Expenditures
TOURX$_	Travel Revenues
USCPI	Consumer Price Index of US
WREM$_	Workers' Remittances
XOTH$_	Exports of Services
YWR	World Income

DUMMY VARIABLES

VARIABLE	DEFINITION
DUM89	1989 Dummy Variable
DUM90	1990 Dummy Variable
DUM94	1994 Dummy Variable
DUM95	1995 Dummy Variable
DUM96	1996 Dummy Variable
DUM97	1997 Dummy Variable
DUM00	2000 Dummy Variable
DUM01	2001 Dummy Variable
DUM05	2005 Dummy Variable
DUMSB	Dummy Variable Representing the Structural Shift in 1987

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