ECONOMETRIC MODEL FOR THE LIBYAN ECONOMY: 1970-2006

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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I declare that the research contained in this thesis was carried out by me. It has not been previously submitted to this or any other Institution for the award of a degree or any other qualification.

Signed: ....

Date..

ABSTRACT

The implicit aim in this kind of study, especially within developing countries, is to provide a tool that allows an economic decision maker to stand on solid ground and to reduce the problems that arise from the stochastic decisions in such countries. One of most effective tools, in this regard, is the econometric model.

Accordingly, in pursuit of achieving this aim, this study constructed a small econometric model for the Libyan economy with a view to assessing the existing and alternative economic policies, specifically fiscal and monetary policies, and then aimed to explore their transmission mechanisms and interaction. Therefore, the model is designed to capture the main characteristics of the economy whilst also exploiting the developments in economic theory and econometric analytical tools. The model consists of six blocks, namely, the aggregate demand, the aggregate supply, the balance of payments, the government, the monetary, and the price.

The model has been estimated utilizing time-series data spanning the period from 1970 to 2006. Also, the single equation of the model was estimated by using the ‘Gets’ technique which involves the formulation of a ‘general’ unrestricted model ‘GUM’ that is congruent with the data and the application of a ‘testing down’ process, eliminating variables with coefficients that are not statistically significant leading to a simpler ‘specific’ congruent model that encompasses rival models. This step achieves the first objective of the use of econometric models which is the structural analysis.

In addition, this study has carried out the remaining two objectives of econometric studies, namely forecasting and policy analysis. Accordingly, in order to fulfil this aim the model of the study has been solved as a whole, simultaneously using the dynamic simulation technique.

It is evident from the dynamic simulation of the model that the model's performance is, generally, quite satisfactory, whereby the model tracking behaviour clarified a good fit, and this is realized for most of the equations which performed much better than would be expected for a model of a developing country such as Libya.

The evaluation of the forecast accuracy of the model using the (MAPE), (RMSPE), and the Theil inequality coefficient (U) asserted the relatively good performance of the model.

The simulations' experiments in this study have evaluated the potential influences of the two major policy options, fiscal policy and monetary policy. As expected, with regard to the analysis of the monetary policy scenario and compared with the fiscal policy scenario, it can be concluded that monetary policy is less efficient compared to fiscal policy, according to this proposed model for the analysis of economic policy in Libya.

In addition, also, it is evident that fiscal policy should play a key role in the management of the Libyan economy and the role of monetary policy should be confined to supporting fiscal policy.

CHAPTER ONE: BACKGROUND AND INTRODUCTION

1.1 Introduction

This study constructs a small econometric model for the Libyan economy with a view to assessing existing and alternative economic policies. The model is designed to capture the main characteristics of the economy whilst also exploiting the developments in economic theory and econometric analytical tools.

The model consists of six blocks, namely, the aggregate demand block, the aggregate supply block, the balance of payments' block, the government block, the monetary block, and the price block. The model will be estimated utilizing time-series data spanning the period from 1970 to 2006. In addition, the model will be estimated by using the latest version of the (Gets) technique, which is named 'Autometrics' (Doornik, Hendry, 2006). This algorithm involves the formulation of a 'general' unrestricted model which is congruent with the data and the application of a 'testing down' process, eliminating variables with coefficients that are not statistically significant, leading to a simpler 'specific' congruent model that encompasses rival models (Campos, Ericsson, and Hendry, 2005).

1.2 The research problem

The last three decades have witnessed several economic policy regime shifts in Libya without the desired improvements in its economic performance. Economic performance continued to be based on a market system in the first few years after changing the authority in Libya in 1969, but soon after that, the economy was modified to rely on comprehensive economic planning based on the socialist system. This, in turn, shifted once more to relying once again on the market system at the end of 1990s. It should be noted that all of these changes in the economic system and, subsequently, in the economic policy of Libya have occurred because of exceptional circumstances that were encountered due to the global oil market. Oil prices and revenues sharply increased at the beginning of the period of the study and decreased later on, due to the oil shocks in the mid-1970s, early 1980s and the mid-1990s.

The Libyan government adopted expansionary economic policies and were building ambitious socio-economic plans during periods of boom in the global oil market. However, when oil prices went down and the government was unable to finance those plans, the government tightened its grip again and adopted austere economic policies. All these policies were implemented methodically –systematically- without any prior knowledge of their various impacts, which can cause considerable damage to the economy. This method of implementation of policies was due primarily to the absence of an official econometric model in the Libyan economy that enables the decision-makers to predict the various impacts of differing economic policies which can then reduce the problems that arise from such stochastic and arbitrary decisions.

1.3 The importance of econometric modelling

The importance of this study is manifested in construction of a reliable econometric model which is considered the utmost importance if robust economic policy decisions are to be taken and followed. The entire handling of profound macroeconomic management depends on the ability of the model to capture adequately and reasonably the key characteristic features of the economy under consideration (Matlanyane, 2005).

The need to build an econometric model is very important, especially in a developing country such as Libya. Whereas in developing countries' economies, practical experience is used as a means, through trial and error, to predict the behaviour of economic variables, because of the conventional economic tenets are either non-existent in these countries or it do not work as expected (Matlanyane, 2005). Most practical economists use econometric models

that is, they have a framework for the interpretation and analysis of quantitative data that allows them to form assumptions about economic policy and external environments leading to a prediction of the likely state of the economy (Wallis, 1993; 113).

Therefore, the general aim of this study is to construct and develop a small econometric model for the Libyan economy suitable for the simulation of the effects of fiscal and monetary policy.

The model that will be constructed in this study will take advantage of the available data, improved analytical techniques, and relevant economic theory. Its merits exist not only in its capacity to capture all the complexities of the Libyan economy but also in its ability to produce reasonable and straightforward results within a consistent framework.

Furthermore, this model will differ from other Libyan models in the following ways:

1. It will use, as will be elucidated in chapter five, the latest estimation techniques which rely on Hendry's general to specific methodology by utilizing the latest 'Gets' procedure algorithm, which is the Autometrics algorithm (for more details see Doornik; 2009, and also Campos, Ericsson, and Hendry; 2005)
2. Both fiscal and monetary policies will receive the same considerable importance (unprejudiced) in the context of policy simulation. This means that the model does not discuss a solution for a particular economic argument or dialectic, insofar as it is trying to determine the different

effects on the variables of the model when pursuing a particular economic policy.

1.4 The objectives of the study

Economic policies (specifically fiscal and monetary policies) have several impacts on macroeconomic variables (in particular on real, government, and monetary sectors) that have, in turn, various impacts on the economic development of the whole economy. So, this study aims to construct a small econometric model for the Libyan economy that will produce not only an analysis of the potential impacts of these policy measures but also an illustration of the implications of interaction and cooperation between fiscal and monetary policies.

This aim will be reached through achieving these specific objectives:

1- Estimating a macroeconometric model that captures the practical and theoretical developments and the main elements of the Libyan economy,
2- Evaluating the relationships between economic policy variables and predicting their effects on the Libyan economy as whole, by running different policy scenarios based on the different simulation experiments.

1.5 Research questions

This research attempts to answer many fundamental questions, which have a close and strong relevance to the research topic. Moreover, it attempts to deduce the existence of interaction between the model equations and components.

These questions can be summarised by the following:

1- What are the components of the policy instruments available for both fiscal and monetary policy in the Libyan economy?

2- What are the theoretical monetary and fiscal policies' transmission mechanisms in the Libyan economy?
3- What is the nature of the impact of the fiscal and monetary policy in the Libyan economy, and what is their relationship?

1.6 Research methodology

John Stuart Mill stated in his seminal work, which was written in the 19th century, that "*Many practitioners of political economy actually held faulty conceptions of what their science covered and the methods used*''(Pagan,1987; 3). In addition, he highlighted that "*in many instances, it was easier to practise a science than to describe how one was doing it*" (Pagan, 1987; 3). He lastly derived that *"sound methodology was not a necessary condition for the practice of sound methods"* (Pagan, 1987; 3). Furthermore, in the same context, Edward Leamer stated, "*doing econometrics is like trying to learn the laws of electricity by playing the radio*" (Leamer, 1983; 31).

This prelude illustrates how difficult it is dealing with research methodology in economics, especially when one is dealing with econometric modelling. Gilbert (1986) concluded that models are not right or wrong but can be useful or deceptive for specific purposes (Gilbert, 1986). According to this point of view, it would be useful to introduce a detailed summary of econometrics' methodology and the debate conducted upon it.

Although practical analysis in economics has a long history which began with the publication of the widely known book by Adam Smith "The Wealth of Nations" in 1776, econometrics in its contemporary form emerged in the mid-nineteen-forties (Cook, 2003; 59). Furthermore, until the mid-nineteen seventies there was no dominant stream of econometric methodology, which could provide tenets for guiding econometric research and achieve a consensus by economists. All of these changes occurred after econometric modelling experienced a crisis concerning the predictive failure of large-scale models (Pagan, 1987).

Since 1975, there have been many attempts by a number of econometricians to build and rebuild methodologies for econometric analysis.

Implicit in these actions has been the notion that works along the prescribed lines to produce 'better' econometrics in at least three ways. First, the methodology would (and should) provide a set of tenets to guide work in all its facts. Second, by codifying this body of knowledge it should greatly facilitate the transmission of such knowledge. Finally, a style of reporting should naturally arise from the methodology that is informative, succinct, and readily understood (Pagan, 1987; 4).

Several methodologies in the field of econometrics have emerged (as mentioned above) since 1975. Each of these is concerned with the design of practical steps that should be followed in applied economic studies. These approaches (methodologies) emphasize the relationship between economic theory and the statistical modelling of data. Moreover, these approaches can be classified according to the "*different roles that they assign to theory and to the degree of independence from theory that they assign to the characterization of data*" (Hoover, 2005; 22). However, it can be said that the dispute among econometricians about the best methodology can be divided into two mainstreams. Firstly, there is the traditional approach, which is called the bottom-up approach that is also known as average economic regression (AER) (Gujarati, 1995), and the specific-to-general approach (Campos, Ericsson and Hendry, 2005).

This specific-to-general approach was invented by the work of the Cowles Commission in the late nineteen-forties. The main concern of this approach was how to provide a bridge between theory and data (Hoover, 2005; 23). The basic notion behind this approach is that

the model can never be a completely accurate description of reality; to describe reality one may have to develop such a complex model that it will be of little practical use ... some amount of abstraction or simplification is inevitable in any model building (Gujarati, 1995; 453).

Thus according to this notion, the model should be shown in its simplest form or, as Friedman said "*A hypothesis 'model' is important if it explains much by little*" (Gujarati, 1995; 454). The researcher, according to this approach, has formulated the simplest possible model that should - based on Koopmans' notion - obey the underlying economic theory (Hoover, 2005; cf. Asteriou, 2006).

After the estimation process, the model was subjected to three levels of evaluation in order to determine whether it was satisfactory or not. A satisfactory model (as shown in Figure 1.1 below) in this sense would be one that:

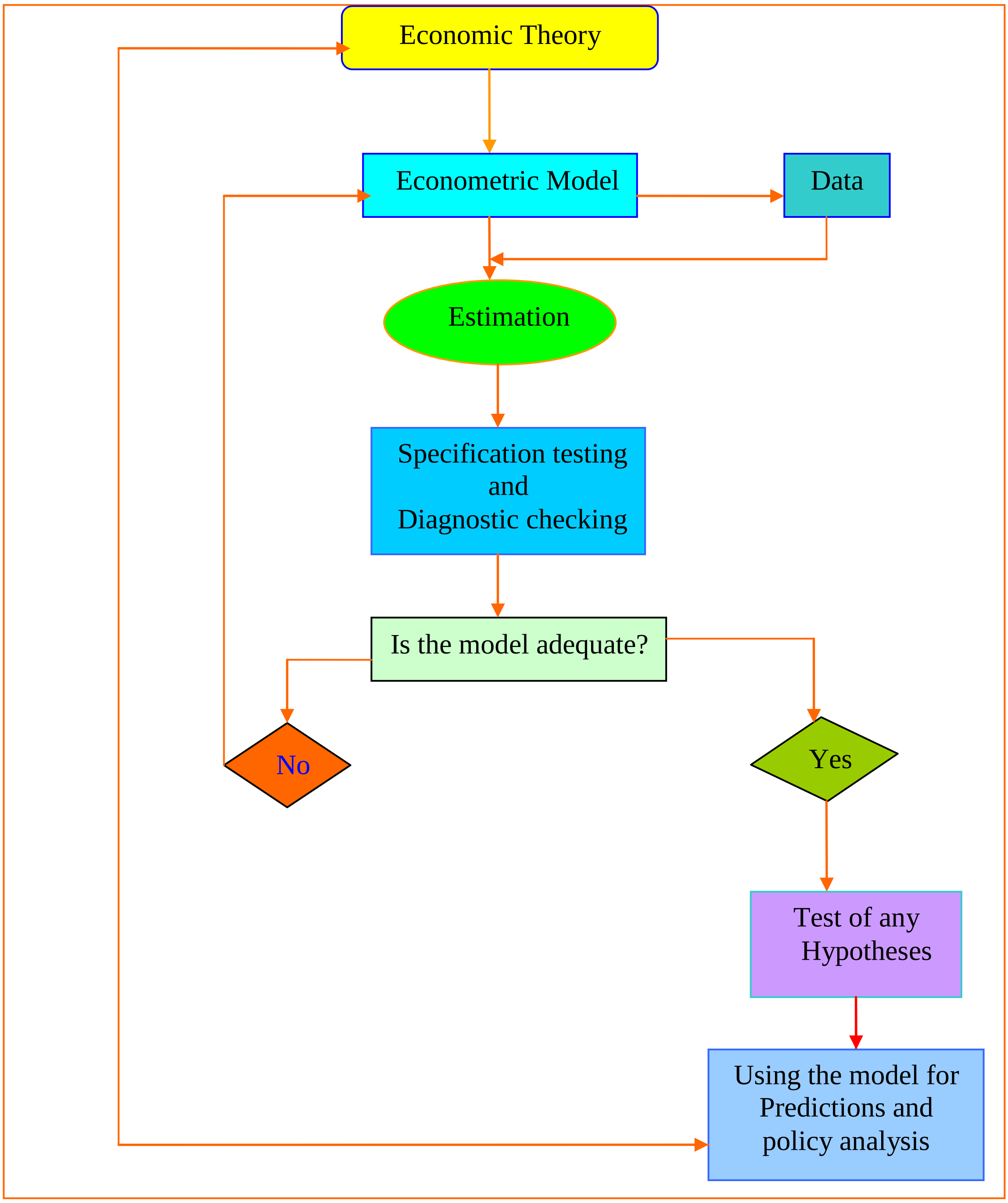
(a) has coefficients signs that correspond with the conventional economic theory predictions; this evaluation is called economic evaluation,

(b) has both significant (i.e. high t ratio) and good fit coefficients (i.e. high R^2) which is called the statistical evaluation, and

(c) has residuals that do not suffer from autocorrelation or heteroskedasticity which is named the econometric evaluation (Asteriou, 2006)

If at least one of these points has been violated, then the researcher has to re-examine the model to check whether significant variables have been omitted from the model, or whether dispensable variables have been included in the model, or to examine alternative forms of functional forms, and so on (Asteriou, 2006; 189). The second procedure in this case is to attempt to find another estimation technique to improve the model (Gujarati, 1995).

Figure 1.1 the Stages of applied econometric analysis



Source: Based on Asteriou, 2006

The second methodology is the Hendry or London School of Economics' (LSE) methodology which is also popularly known as the top-down or general-to-specific approach (Hendry, 2000; Chao, 2002; Hoover, 2005; and Greene, 2012).

This "*methodology is closely related to a wider range of work on integrated and cointegrated systems*" (Hoover, 2005; 26). The (LSE) methodology starts with a model with several regressors and then it is filtered down to a model containing only the 'important' variables (Gujarati, 1995; and for more details about this methodology see Sucarrat, 2010). The pivotal point of this methodology is Hendry's theory of data reduction, which is centred on "*the analysis of 'Exogeneity' in the seminal article of Engle, Hendry, and Richard (1983)*" (Hoover, 2005; 27).

In practical terms the theory of general-to-specific attempts to explain ''*how data can be characterized in a way that is partial or simpler than the true* (DGP) *data-generating process*'' (Hoover, 2005; 27) without loss of information relative to the question of interest. Furthermore, the general-to-specific (Gets) can be simplified as a process where, in Hendry's words,

in general-to-specific modeling, empirical analysis starts with a general statistical model that captures the essential characteristics of the underlying dataset, i.e., that general model is congruent. Then, that general model is reduced in complexity by eliminating statistically insignificant variables, checking the validity of the reductions at every stage to ensure congruence of the finally selected model (Campos, Ericsson and Hendry, 2005; 3).

In this regard it is worthwhile noting that the notion of general-to-specific is not a new idea because its roots back to Sargan's works, particularly to his seminal paper of 1964 (Pagan, 1987; 4, and for further details c.f. Phillips, 2003; Mizon, 1995; Campos, Ericsson and Hendry, 2005) where he was prevalently motivated by the empirical issues of dynamic specification.

Furthermore, the application of general-to-specific (Gets) model selection procedures could not have existed without the immense advances in computer automation and computational power (for further details see Doornik, 2009). The existence of such a kind of automation which has saved wasting time has been the cornerstone behind the existence of such types of selection procedures. Concisely, the significant part for any model-selection procedure is the costs of inference and the costs of search (Campos, Ericsson and Hendry, 2005; 23).

As mentioned above, this approach involved starting with as broad a general specification as possible and then it tries to explain how econometric models are derived from the data-generating process (DGP). Finally, an important question arose, that is, how does the researcher know what the final simplified model should be? Hendry and Richard answered this question and suggested that the simplified model should:

(1) be data admissible; (2) be consistent with the theory; (3) use regressors that are not correlated with u_t; (4) exhibit the parameter constancy; (5) exhibit purely random data (white noise); and (6) include all possible rival models (be encompassing) (Asteriou, 2006; 190).

1.7 Data and computer software

Sets of economic data come in numerous forms (for more details see Gujarati, 1995; 23-27, cf. Asteriou, 2006; 8-10). The following paragraphs describe the important forms of data sets that are utilized in model study work. Furthermore, illustrated below are some of the problems facing econometric research in developing countries. Also below is the reason for choosing the period of the study and information on the data sources and the programmes that will be used in the study.

The most widely used types of data are time series' data that are defined as a set of observations on one or several variables over time. "*So, time series data are arranged in chronological order and can have different time frequencies, low or high, such as biannual, annual, quarterly, monthly, weekly, daily and hourly*" and so on (Asteriou, 2006; 8). This type of data can be collected in two forms, quantitative - such as money supply, gross domestic products, and consumption; and qualitative - such as, male or female, employed or not employed (Gujarati, 1995). Although time series' data have some problems, such as being in non-stationary series, econometricians rely heavily on this type of data in many econometric researches where such time series' data are mainly associated with macroeconomic applications, which are deemed the major field in economic studies (Asteriou, 2006).

The second type of data sets are cross-sectional data, which consist of one or more variables collected at the same point of time, such as a sample of firms, countries or people in a certain period (Asteriou, 2006).

As with the time series' data, the cross-sectional data, too, have their own problems, such as heterogeneity. In spite of that, cross-sectional data sets are widely used in economics and are particularly associated with applied microeconomics (Asteriou, 2006; 8).

The final category of data is panel data which has elements of both cross-sectional and time series' data, where the data consist of a time series for each cross-sectional member under observation (Asteriou, 2006; 9). Data on gross domestic products or on the money supply of 20 countries over 20 years are examples of panel data.

The availability of appropriate data, in terms of quantity and quality, is one of the conclusive elements in achieving the desired objectives easily and smoothly. It can be also said that a lack of data, discontinuities in data, changes in definitions and missing observations can be considered to be the main problems that hinder the development of applied research in developing countries. According to Shourie (1972), databases in developing countries comprise three problems: ‘‘*(i) shortness of available time-series for macro-variables, (ii) a very low reliability, and (iii) too frequent data revisions*’’ (Sastry, 1975; 156).

Based on a review of a number of macroeconometric models which have been constructed for many developing countries by several international organizations, Shourie comes to the conclusion that the available data for these models is so poor and unreliable that “*there is every likelihood that the models and their equations are grossly misspecified*” (Sastry, 1975; 156). Consequently, the “*apparent faith in these models is unwarranted*” (Sastry, 1975; 156).

The question that is imposed in this context is “*does the limited availability of data in the developing countries necessarily render any econometric model based on them hopeless?*” (Abohobiel, 1983; 39). It is obvious to ‘‘*say that the poorer the database of an economy, the less useful is any model for that economy*’’ (Sastry, 1975; 157) so this criticism could be levelled against models constructed for any country where ‘‘*economic data cannot be classified into two groups: good data and bad data. Quality of data is a matter of degree*’’ (Sastry, 1975, 157). This point was enhanced by the research undertaken by Sastry in that since the creation of United Nations Conference on Trade and Development (UNCTAD), the UNCTAD secretariat has undertaken the construction of a large number of models for developing countries based on the available data (Sastry, 1975). Furthermore, this criticism is not only directed to developing countries; accordingly, it is important to incorporate all aspects of data, explicitly, in constructing the models for such economies, because econometric modelling can still be useful despite these aspects if its effects, which have already taken place, are taken into account (Matlanyane, 2005).

Libyan data are available from 1962 to-date in an annual time series' base for all variables. Additionally, monetary data are also available in a quarterly time series for the same period. Accordingly, this study is based on the time series' annual data and the year 1970 will be the initial year because the year 1970 witnessed the beginning of a new political and economic era in Libya after changing the regime in 1969. Furthermore, the period that is covered by this study witnessed the main oil shocks of 1974, 1980 and 1996 that have influenced the Libyan economy as a whole. Additionally, many major development plans were implemented during this period. Eventually, the Libyan economy during this period suffered from increasing domestic banking debts, as well as being subjected to waves of inflation and unemployment during the late 1980s and 1990s.

With respect to the data sources, the annual data for Libya for the period 1970-2006 are available from these sources:

1- The publications of the Secretariat of Planning: national accounts and socio-economic indicators,
2- The publications of the Libyan Central Bank (LCB): economic bulletins and annual reports,

With regard to this study, the first and the second sources are deemed the main sources of the data.

The practical part of the study will be undertaken using standard econometric packages such as EViews that utilizes the model simulation process and PcGive that uses automatic model selection (Autometrics). These types of econometric software provide the necessary facilities to estimate the model and test its predictive ability, in addition to simulating various policies to be proposed after the completion of the construction of the study model.

1.8 Outline of the study

The study will be organised into seven chapters. The first chapter will pave a way to the study theme by providing an introduction and background to the study. The second chapter highlights an overview of the Libyan economy and is presented in two parts. Part one will introduce a detailed survey of the Libyan economy during the pre-oil era while part two will survey the model variables. The literature relating to the model of the study will be covered in two chapters. While the third chapter looks at a survey of econometric modelling in general with an emphasis on econometric modelling in developing countries in particular, chapter four considers the theoretical base for the model of the study and the specification of the relationship between its equations. Similarly, chapter five will be divided into two parts, where the first part will discuss the estimation technique, which will be utilized in this study, and the second part will present an estimation of the single equations in model. The sixth chapter clarifies and evaluates the study model by solving its simultaneous equations and will show policy analysis through conducting various simulation experiments and will assess the proposed policy implications. Lastly, chapter seven will provide a summary of the study that contains the results of the findings and draws conclusions based on the analysis.

CHAPTER TWO: AN OVERVIEW OF THE LIBYAN ECONOMY DURING: 1970-2006

2.1 Introduction:

To study the structure and features of any model that aspires to explain the behaviour of an economy, as well as undertaking the design and careful analysis of policies and obtaining accurate forecasts of the economy, requires a complete knowledge of all aspects of the economy under consideration. Therefore, the purpose of this chapter is to introduce a detailed review of the Libyan economy.

This chapter will be divided into two parts as follows: The first part provides a brief survey of the Libyan economy during the pre-oil era. The second part will review the most relevant characteristics of the Libyan economy during the period 1970-2006 (the study period). This review, in turn, will provide a brief discussion of the main variables and components in the model.

2.2 The Libyan economy during the pre-oil era:

Before the discovery of oil in Libya in 1959 and the commencement of its commercial production in 1961, the Libyan economy had the same idiosyncrasies of other developing countries. Most economists, who studied the case of the Libyan economy, at that time, had deep doubts about the development potential of the Libyan economy (El Hassia and El-Megarbi, 1984). Furthermore, many economists described the Libyan economy as a deficiency economy (Farley, 1971). At that time, there was a deficit in the government budget and the balance of payments and the surplus that achieved later was a result of military aid and foreign investment (Higgins and Royer, 1967).

The total population in the 1954 Census was 1.1 million and increased to 1.4 million by 1959 (see Table 2.1). Around 65% of the population was concentrated in the city of Tripoli and its suburbs, about 25% lived on the east coast of the country in the territory of Cyrenaica, and the residual 10% lived in the south and other various parts of the country. More than 80% of the population during that period were engaged in primitive agricultural activities, and the rest were involved in textiles and handicrafts' industries, which were extremely limited and devoted mainly to consumer goods such as olive oil refining, fish canning and leather tanning (Higgins & Royer, 1967; 819).

Creation of new jobs in the industrial sector was not available as a solution because Libya did not have the necessary resources to establish these industries. "*The labour force was largely unskilled and therefore the manpower problem took the form of inadequate skills and low productivity rather than insufficiency of total number of workers*" (Abohobiel, 1983; 49).

Unemployment exceeded 33.35% of the labour force and it was exacerbated by seasonal changes when it reached 80% of the labour force (Higgins & Royer, 1967; 821). Furthermore, ''*in 1952, the unemployment rate was estimated as 25.5 % of the population of the two biggest cities, Benghazi and Tripoli, and in 1959, the urban unemployment was estimated as 8.5 percent*'' (Abohobiel, 1983; 51).

As can be deduced from rows 14 and 15 in Table 2.1, the per capita GDP increased from Libyan Dinar (henceforth L.D) 37 in 1957 to L.D 62 in 1961. Despite this fact, the share of the agricultural sector's output in the GDP was not more than 16% in that time of period (Abohobiel, 1983; 50). In this regard, Abohobiel stated that "*however, the country did not produce enough, to maintain even its low standard of living*" (Abohobiel, 1983; 50). Table 2.1 shows that the total imports CIF exceeded 50% of the gross domestic product *GDP* (rows 2 and 14). Moreover, about 20% of the foreign exchange allocated for imports was provided from the proceeds of exports, while the rest was obtained from aid and grants (especially from the USA and UK as rent for their military bases in Libya).

In general, Table 2.1 shows that nearly 50% of all government expenditure was financed by domestic sources (rows 8 and 9) and the rest by foreign sources. In addition, row 10 in the same Table shows that customs' duties contributed more than 50% in domestic income as compared to the total government revenue.

There was an important stimulus for the aggregate expenditure introduced into the Libyan economy in the late 1950s. This was oil companies' expenditure which injected large amounts of money into the Libyan economy within a short period.

Table 2.1 Libyan data from the pre-oil era

Millions L.D

	1954	1955	1956	1957	1958	1959	1960	1961
Export (fob)	3.9	4.6	4.1	5.5	5.1	4.3	4	5.8
Import(CIF)	11.2	14.4	16.6	28.1	34.5	40.6	60.4	53.3
Oil companies imports (cif)	0	0	0	0	8	13	21	13
Total foreign aid	10.7	14.6	20.9	17.3	16.3	21.9	19.9	19.9
Military expenditure	5.6	6.2	10.8	9.8	6.9	6.9	6.9	6.9
Official donation	5.1	8.4	10.1	7.5	9.4	15	13	13
Balance of payments	2.6	3.9	4.5	4.6	5.1	6.5	4.3	2.3
Government expenditure	8.8	12.98	15.4	17	20	20.6	28.3	34.5
Total government revenues (domestic)	5.11	6.6	7.8	9.113	9.82	11.1	14.97	18.02
Tariffs	2.6	3.6	4.1	5.1	4.997	5.95	9.35	10.4
Money supply (M1)	NA	NA	13.8	13.8	15.2	18.6	22.2	26.1
Demand deposits	NA	NA	8.8	7.6	8	9.6	11.8	13.3
Consumer price index (PCP)	NA	100	109	104	109	114	128	127
GDP	NA	NA	0	45	52.2	57.5	75.3	86.6
Population "in millions of persons"	1.1	1.13	1.17	1.21	1.26	1.3	1.35	1.4
Oil companies expenditure in Libya	NA	NA	4.5	13.5	24	35	61	72

Source: Abohobiel, 1983, P.53
NA refers to not applicable

Table 2.1 shows that oil companies' expenditure in Libya increased from L.D 13.5 million in 1957 to L.D 72 million in 1961 (row 16).

Local expenditures by these companies exceeded L.D 3.5 million in 1957, of which L.D 0.54 million were paid in wages and salaries to Libyans who were directly employed by these firms and most remaining expenditure was *represented by purchases of supplies through local contractors* (Abohobiel,1983; 52).

When Libya gained its independence from Italy in 1951, there was no Libyan currency. In addition, there was no existence of a monetary sector (Fayad, 2000). In the beginning, the monetary authority in Libya was founded under the name of the Libyan Currency Commission in 1951. This name was changed later to the National Bank of Libya, and finally in 1963 the name was settled on as the Central Bank of Libya (Otman and Karlberg 2007). In practice, the Central Bank of Libya did not begin its work until 1956 when it issued Libyan pounds. The bank was divided into two departments, the issue department, and the banking department. The Bank's objectives at that time were

to regulate the issue of bank notes and coins, to keep reserves with a view to maintain monetary stability in Libya, and the external value of Libyan pound, to influence the credit situation to the Kingdom's advantage and to act as banker to the government and to provincial administration (Fayad, 2000; 10-11, and see The International Bank Report, 1960).

According to the data that is shown in Table 2-1, the money supply increased from L.D 13.8 million in 1956 to L.D 26.1 million in 1961 with a growth rate of 89%. Furthermore, the demand deposits slowly increased from L.D 8.8 million in 1956 to L.D 13.3 million in 1961. In addition, the consumer price index increased in the same period from 109% to 127%.

Higgins summarized all these retardant characteristics in 1959 when he said,

Libya has great merit as a prototype of a poor country, we need not an abstract model of an economy, where the bulk of people live on a subsistence level, where per capita income is well below $40 per year, where there are no sources of power and no mineral resources, where agricultural expansion is severely *limited by climatic conditions, where capital formation is zero or less, where there is no skilled labour supply and no indigenous entrepreneurship... Libya combines within the borders of one country virtually all the obstacles that can be found of anywhere geographic, economic, political, sociological, and technological. If Libya can be brought to a stage of sustained growth, there is hope for every country in the world* (Higgins, 1959; 26-27).

Although the Libyan economy was classified amongst the poorest countries in the world at that time, there was a kind of equilibrium between aggregate supply and aggregate demand. This equilibrium "*was not a result of an efficiency of production … but was the outcome of the balancing between the elements of economic backwardness and poverty*" (Zarmouh, 1998; 19). The economy was in dire need of a big push to rid it of pernicious equilibrium which besieged it.

The discovery of oil in the late 1950s and its export at the beginning of 1960s (in September 1961 the first crude oil shipment left Libya for Europe) brought remarkable changes in the Libyan economy. Its gross domestic product GDP increased, the standard living improved and the Libyan economy changed from a primitive agricultural economy to one based on petroleum, so it stopped being an example of a poor and underdeveloped economy and became an example of unbalanced development. At the same time, the discovery of oil brought with it the problem of the relative factors' endowment.

The main characteristic of developing countries is an abundance of labour while suffering from a scarcity of capital. Libya is not an exception and this was the case in the pre-oil era in Libya. However, this situation changed drastically after the discovery of oil, where the economy became one that had an abundance of capital and a shortage of labour (Abohobiel, 1983). Therefore, the disadvantages that were indicated by Higgins (1959) rapidly changed after the commencement of oil production in commercial quantities. The period between discovering the oil and the early nineteen-seventies witnessed significant developments in the economic and social levels in Libya.

By 1962, the oil gave the economy of Libya new dimensions. It became (and remains) the engine of Libyan economic development, especially after having created financial abundance. This plentiful supply of money, in turn, was utilized to fund government expenditure and to transform the Libyan economy from an aid recipient to an aid donor. Moreover, it transformed the Libyan economy from one with capital scarcity, as mentioned above, to a capital abundant one (Khader, 1987). Subsequently it,

exposed the economy to a number of important structural changes, including the dominance of the oil sector, the growth of the service sector and a dependence on foreign markets. The increasing income from oil made people think that the country's permanent financial deficit was a thing of the past (Ghanem, 1987; 58).

The dominance of the oil sector has enabled the government (the recipient of oil revenues) to positively participate in the country's economic life. Therefore, this situation put the government under tremendous pressure because it became responsible for satisfying all the needs of society and providing for all its wants, on the one hand, and it also became responsible for finding the best way to achieve all those targets, on the other hand. As a result, the oil sector is considered as the leading sector for the entire economy and its revenues are utilized as a tool for economic growth (Ghanem, 1987).

The main objective of first Economic and Social Development Plan (1963-1968) was to encourage the private sector to develop the entire economy and to limit the role of the public sector. Therefore, ''*the plan's priorities were for infrastructural projects... which aimed to allow the private sector to benefit from the external effects such an infrastructure might create*'' (Ghanem, 1987;59).

The total allocated fund to this plan was L.D 169 million

to be spent on the various sectors of the economy. Although the plan was thought to be over-ambitious and the estimated income from oil was considered over-optimistic, the real oil income during those five years exceeded all expectations, and the plan was also extended for one more year until 1969. By the end of 1969, the allocation of funds for the plan had reached L.D 625 million, while the total actual spending amounted to L.D 551 million (Ghanem, 1987; 59).

Macroeconomic variables during this period started showing a clear increase in their growth rates whereby, after the first plan was implemented, the gross domestic product GDP increased from L.D 86.6 million in 1961 (as shown in Table 2.1) to L.D 1288.3 million in 1970 (as shown in Table 2.2). This was accompanied by an increase in both total government expenditure *GETOT* from L.D 34.5 million to L.D 396 million, as shown in Table 2.4, in these two years respectively, and total imports from L.D 53.3 million to L.D 303.3 million in the years 1961 and 1970 respectively. Furthermore, both money supply and total government revenue increased in 1970 to L.D 241 million and L.D 536 million respectively as compared with L.D 26.1 million and L.D 18.02 million in 1961 respectively.

All of these changes ‘‘*gave a chance for the commercial banks to give the private sector suitable loans to establish commercial firms to produce and import goods and services to meet the increasing demand in the domestic market*’’(Fayad, 2000; 12). These loans (in nominal terms) amounted to L.D 88.846 million in 1969 compared with L.D 6.031 million in 1956 (Fayad, 2000).

2.3 The Libyan economy during the period: 1970-2006

There are two fundamental considerations that should be taken into account, when examining the Libyan economy in the period 1970-2006. Firstly, the Libyan economy was a developing one with a relatively large geographical area (1.754 million square kilometres), a small population base (5.7 million in 2006), and was heavily dependent (as mentioned formerly) on oil which is, of course, a depletable resource. Secondly, the economy was being developed according to a philosophy of socialism (during most of the study period: 1970-2006) which limited private ownership of enterprise, encouraged partnership in organisations and production, advocated self-reliance, and promoted industrialisation, particularly in the area of import-substituting industries.

In this regard, Libya’s economy was developed according to a philosophy of capitalism until September 1975. After this time, the Libyan government changed the country’s philosophy to planning despite the flourishing of the private sector in the early nineteen-seventies with a growth rate far greater than was expected at the end of the nineteen-sixties decade (Ghanem, 1987).

The new regime became an advocate of socialism. Therefore, in line with this changing trend, the government embarked on several measures to accelerate the pace of transformation and started policies of self-reliance, in particular with regard to self-sufficiency in food. In this regard ‘‘*although the socialism in the third world meant different things to different countries, in Libya it was taken to mean expanding the public sector and shrinking the private sector*’’ (Ghanem,1987;62).

The Libyan economy, since early 1970s, has faced new changes. These changes were intended to reform the economy from being a market economy to being a socialist one (Fayad, 2000, 12). Therefore, *the first of these changes was introduced in September 1975, when the Libyan government started the process of nationalizing the foreign trade. Government agencies and corporation replaced the private sector in importing and trading most goods and services. Two years later the government abolished wholesale and retail trading* (Abdussalam, A, 1985; 77, cited in Fayad, 2000, 13).

However, the government planning continued but - as mentioned above - with a different strategy.

The trajectory of development in Libya in this period was determined, to a large degree, by the development programmes carried out on a five- and three-year basis within the framework of a national development plan.

Various development plans (for either three-year or five-year periods) have been undertaken since 1970. There were no implemented plans between 1981 and 2006 where the last transformation plan (1981-1985) was stopped[1] in 1982 and the economy in this time span was managed on a yearly basis because funds were directed to financing the Man-Made River project and confronting the fiscal crisis in the early 1980s.

The first plan in the studied period was a three-year' economic and social plan (1970-1972), followed by a three-year plan (1973-1975). After that came the 'transformation' plan (1976-1980) which was the last implemented plan in the Libyan economy. Through these three plans, covering a period of 11 years, L.D 10497.9 million was spent on development projects distributed among the different sectors.

The role of the government in economic activities was enhanced after the first three-year plan (1970-1972). Direct government intervention in the all non-oil

[1] However, some of heavy industry projects have not been stopped, such as the Misratah steel mill, the aluminium complex in Zwarah, and a number of petrochemical projects in al-Brega and Ras-Lanuf (Ghanem, 1987; 68).

sectors took place, in the hope of increasing the domestic output and achieving self-sufficiency in goods and services through the government-run projects. Therefore, during the first years of the 1970s, the public sector co-existed with the private sector. The latter continued to thrive and benefited a great deal from the credit facilities rendered by the banks. However, the government virtually started tightening its grip on the economy as a whole in the second half of 1970s.

The philosophy of planning and the objectives of each plan are important in charting the future evolution of any given sector. Therefore, El-Jehaimi (1987) summarised the main objectives, which were relevant for long term planning in Libya as follows:

first, to alter the structure of the economy in favour of agriculture and industry. Second, to reduce the role of the oil sector and to limit exports to the financing requirements of other sectors and third to achieve a greater degree of self-sufficiency in broad agricultural and industrial products, particularly in certain key food groups and industries catering for people's basic needs. Fourth, to build industries based on oil and natural gas, to capitalise on areas where the country possesses clear advantages for exports. Lastly, to develop an indigenous manpower base capable in due course of carrying out the development effort with minimum foreign participation; therefore it can be said that the above planning objectives naturally reflect the fundamental conditions of the economy and articulate its governing philosophy (El-Jehaimi, 1987, cited in Fayad, 2000, 13).

In the following subsections, it is necessary to use the available stock of data relevant to Libyan economy to depict the basic steps in the economy evolution. As well as surveying the available and the potential resources through reviewing the performance of the different economic sectors which contribute to the composition of major economic components by evaluating the main macroeconomic variables.

In this review, it should be taken into consideration that the Libyan economy witnessed three fundamental stages during the period 1970-2006 which affected its macro performance, as well as giving it divergent features. Oil had a major role in charting all of these three stages.

The country had been on a growth path for several years and as the oil exports' value increased so did the all-important macroeconomic variables, which had a positive relationship with, oil exports. These stages can be classified as follows:

- The first stage was in the 1970s, where the Libyan economy had a period of financial abundance due to the increase in oil revenues which resulted from the boom that happened in the world oil markets due to the Arab oil embargo in 1973-1974.
- In the second stage, (the 1980s), Libyan economy, in effect, underwent of a retrogradation in some important macroeconomic variables. This had negative effects in the macro performance of the entire economy. These unfavourable effects, which happened in the Libyan economy during the shocks of the world oil market in 1979-1980 and 1986-1987, occurred due to the Iranian Revolution and Iran-Iraq war. Furthermore, at this stage, the interested observer will have noted the instability and oscillation, which occurred in the entire economy because of government intervention that was followed by the dominance of uncertainty in the environment of the economy and this led, in turn, to reluctance of the investors to participant in economic activity.
- The last stage began in 1990 and continued until the end of the study period in 2006. This stage was similar to the first one (except in the early 1990s, specifically in 1991, 1992 and 1993, where the Libyan economy witnessed some exceptional circumstances that adversely affected the

macroeconomic performance). The most influential of the adverse conditions were the sanctions, which were imposed on Libya by the United Nations during the period 1992-1993. After that, it continued the same increasing pattern of most macroeconomic variables, especially when the price of oil in the world markets exceeded the barrier of $50 per barrel in the year 1994.

An overview of these stages can be seen through the study of relevant macroeconomic variables' behaviour during these three stages and by noting down the changes that occurred in this period. This will be introduced in these following subsections.

2.3.1 The aggregate supply component

In macroeconomic literature, aggregate supply is the total supply of goods and services produced by a national economy during a specific period. In addition, it is a total amount of output in the economy available at all possible price levels, so the aggregate supply component shows the quantity of goods and services that firms choose to produce and sell at each price level.

Libyan national accounts are published for fifteen output sectors in an annual series. Furthermore, the Libyan Central Bank Economic Bulletin disaggregates the Libyan economy into four sectors as follows:

(1) Production by the commodity sector (manufacturing, oil, gas and agriculture),

(2) The economic service sector (housing, construction, electricity, transportation and communication),

(3) The social service sector (labour force, health and information and culture) and

(4) The rest of the (the other) sectors (social affairs and security, economic planning, sports, rural area development and marine wealth) (Fayad, 2000, 14).

To achieve the aim of the study, the aggregate supply, gross domestic product GDP components will be divided into the production of the oil sector *XOIL* and the production of the nonoil sector *XNOIL*. Table (2.2) shows the values of *GDP:* oil and nonoil, their relative contribution to gross domestic product GDP, *XOCGDP),* and *XNCGDP* respectively and the production of oil per million barrels *XOILMB*, in addition to real gross domestic product *GDPR* and its rate of growth.

Many industrialized countries with the assistance of the International Energy Agency (IEA) began in the early nineteen-eighties to take several measures designed to reduce their dependence on OPEC oil. This measure, in addition to the recession that hit the global economy in that period, led to a decline in the demand for OPEC oil; therefore, ‘‘*in 1983,* OPEC *itself had to accept a general reduction of the government sale price of crude by $5 from the prices of February 1983*’’ (Ghanem, 1987; 67).

In this regard, Libya as one of the OPEC countries was affected by this crisis, where oil production fell from - as shown in Table 2.2 below - more than 0.76 mb/d in 1979, to 0.67 mb/d and 0.42 mb/d in the years 1981 and 1982 respectively. Furthermore, ‘‘*not only did the volume of production go down, but the market price of crude oil could not resist the pressure on demand and had to go down too*’’ (Ghanem, 1987; 67). Consequently, ‘‘*the Libyan crude oil ‘Brega’ government sale price went down to $30.5/barrel, $5 less than the price of February 1983, and $10.5/ barrel less than price prevailing in January 1981*’’ (Ghanem, 1987; 67).

Table 2.2[(a)] Oil and Non-oil GDP

Millions L.D

YEAR	GDP	XOIL	XNOIL	XOCGDP	XNCGDP	PGDP	RGDP	$RGDP_G$	XOILMB
1970	1288.3	812.6	475.7	63.07537	36.92463	0.232854	5532.643	-	1225.4
1971	1586.5	922.7	663.8	58.15947	41.84053	0.280469	5656.599	0.022404	1003.3
1972	1753	920.6	832.4	52.51569	47.48431	0.284157	6169.118	0.090605	813.5
1973	2182.3	1131.8	1050.5	51.86271	48.13729	0.348055	6269.983	0.01635	739.5
1974	3795.7	2385.3	1410.4	62.84216	37.15784	0.492454	7707.725	0.229305	555.3
1975	3674.3	1961.1	1713.2	53.37343	46.62657	0.460807	7973.62	0.034497	540.1
1976	4768.1	2750	2018.1	57.67496	42.32504	0.486806	9794.67	0.228384	707.3
1977	5612.7	3275.9	2336.8	58.36585	41.63415	0.525246	10685.85	0.090986	753.1
1978	5496.1	2808.7	2687.4	51.10351	48.89649	0.501809	10952.58	0.024962	713.7
1979	7603.0	4545.3	3057.7	59.78298	40.21702	0.635304	11967.51	0.092665	763.6
1980	10553.8	6525.7	4028.1	61.8327	38.1673	0.850422	12410.07	0.036981	668.1
1981	8798.8	4403.3	4395.5	50.04432	49.95568	0.921485	9548.503	-0.23058	429.9
1982	8932.4	4235.8	4696.6	47.42063	52.57937	0.880457	10145.19	0.06249	414.6
1983	8511.7	3823.6	4688.1	44.9217	55.0783	0.873945	9739.396	-0.04	409.2
1984	7804.7	3209.8	4594.9	41.1265	58.8735	0.837567	9318.303	-0.04324	390.9
1985	7852.1	3500.4	4351.7	44.57916	55.42084	0.79863	9831.964	0.055124	365.4
1986	6960.7	2595.8	4364.9	37.29223	62.70777	0.720113	9666.121	-0.01687	454.1
1987	5847.8	1711.6	4136.2	29.26913	70.73087	0.638276	9161.865	-0.05217	355
1988	6186	1570	4616	25.37989	74.62011	0.652178	9485.139	0.035285	367.1
1989	7191	2055.5	5135.5	28.58434	71.41566	0.732989	9810.517	0.034304	410.4
1990	8246.9	3243.8	5003.1	39.33357	60.66643	1.00000	8246.900	-0.15938	494.7
1991	8757.3	3104.3	5653	35.44814	64.55186	0.966426	9061.529	0.09878	601.9
1992	9233.9	2925.7	6308.2	31.68434	68.31566	1.029904	8965.788	-0.01057	565.3
1993	9137.7	2460.1	6677.6	26.92253	73.07747	0.99129	9217.993	0.02813	518.4
1994	9670.8	2892.9	6777.9	29.91376	70.08624	1.072759	9014.889	-0.02203	508.8
1995	10672.3	3380	7292.3	31.67077	68.32923	1.15324	9254.19	0.026545	510.6
1996	12327.3	3960.3	8367	32.12626	67.87374	1.272993	9683.712	0.046414	549.9
1997	13800.5	4505.8	9294.7	32.64954	67.35046	1.405623	9818.067	0.013874	509.2
1998	12610.6	2786	9824.6	22.09253	77.90747	1.312423	9608.642	-0.02133	550.9
1999	14075.2	3995.9	10079.3	28.38965	71.61035	1.445455	9737.553	0.013416	527.7
2000	17620.2	6661	10959.2	37.8032	62.1968	1.753247	10050.04	0.032091	519.8
2001	21868.5	7045.5	14823	32.21757	67.78243	1.702354	12846.04	0.278207	516.8
2002	30549.4	14384.1	16165.3	47.08472	52.91528	2.413074	12659.95	-0.01449	473.5
2003	37604	20217.9	17386.1	53.76529	46.23471	2.760024	13624.52	0.07619	560
2004	48793.4	29227.4	19566	59.90031	40.09969	3.425198	14245.42	0.045573	591.3
2005	67048.3	43946.7	23101.6	65.54484	34.45516	4.382088	15300.54	0.074067	618
2006	81223.7	55649	25574.7	68.51325	31.48675	4.895934	16590.03	0.084278	642.8

Source: 1- CBL Annual Reports and Economic Bulletin, various issues,
2- National Accounts, various issues

(a) The variables XOCGDP and XNCGDP – columns 5 and 6- are percentages.

Likewise, the oil production value followed the same downward trend which had a negative average growth rate amounting to -15.35% during the period 1980-1983.

The oil gross domestic product *OGDP* decreased from L.D 3104 million in 1991 to L.D 2926 million in 1992 and to L.D 2460 million in 1993 (as shown in Table 2.2).

However, in the late 1990s and in early 2000 the major economic variables showed a significant increase (as mentioned above) especially those linked to the external sector.

The oil gross domestic product *XOIL* jumped from L.D 2786 million in 1998 to L.D 3995.9 million in 1999 to L.D 29227.7 million in 2004, finally amounting to L.D 55649 million in 2006 and so did the gross domestic product GDP and the rest of variables that have a relationship with the oil sector (as shown in Table 2-2).

Real gross domestic product *GDPR* grew during 1970-2006 at an average rate of growth of 3.4%. The relative share of the oil sector in gross domestic product increased from 63.1%, 62.8% and 61.8%, in 1970, 1974, and 1980 respectively to 68.5% in 2006.

However, these shares were not uniform (as shown in Table 2.2). Similarly, the contribution of the non-oil gross domestic product *XNOIL* in the gross domestic product fluctuated between 78% and 31% in 1998 and 2006 respectively.

Furthermore, real gross domestic product *GDPR* achieved its highest value in 2006 amounting to L.D 15300.54 million and it achieved its lowest value in 1970 amounting to L.D 5532.6 million at 1990 constant prices (as shown in the eighth column of Table 2-2).

2.3.2 The aggregate demand components

In macroeconomic literature, aggregate demand is defined as the total demand for final goods and services in the economy at a given time and price level. On the other hand, it can be defined as the amount of goods and services in the economy that will be purchased at all possible price levels thus the aggregate demand components shows the quantity of goods and services that households CPC, firms IPC, and the government CGC want to buy at each price level.

The aggregate demand component in this study consists of the total consumption expenditure, which can be classified into the demand of private consumption CPC, and investment IPC in addition to government consumption CGC and investment IGC.

As mentioned above, regarding the stages charting the paths of macro-variables in the Libyan economy, one can find that the aggregate demand variables follow the same pattern in these stages. The private consumption expenditure CPC increased during the first stage from L.D 395.5 million in 1970 to L.D 927.1 million in 1974 and to L.D1894.7 million in 1979, while it had an unstable downward path during the 1980s, from a peak of L.D 4672.9 million in 1981. Furthermore, CPC fell to L.D 3590.6 million in 1983, to L.D 3037.5 million in 1984, to L.D 3815.6 million in 1987 and to L.D 3779.7 million in 1989 (as shown in Table 2.3). In addition, private consumption expenditure CPC during the 1990s and beyond increased from L.D 3964 million in 1990, to L.D 5993.4 million in 1994, to 8513.5 million in 1999 and up to L.D 18610.2 million at the end of study period (as shown in Table 2.3).

In addition to take into account the inflation impact on the time series of the important variables in the model, it should deal with their real values so Table 2.3 shows that real consumption expenditure CPR increased at an average annual rate of 5.65% during the period 1970-2006. In addition, although the average growth rate of real consumption expenditure CPR_G scores a positive value, it is characterised as volatile and unstable as evidenced from the Table referred to above.

Table 2.3 Aggregate demand and its components

Millions L.D

YEAR	CGC	IGC	IPC	CPC	PCP_{90}	CPR	PIT_{90}	ITOT	ITOTR	CPR_G	$ITOTR_G$
1970	220.7	122.6	120.1	395.5	0.24357	1623.7	0.22634	242.7	1072.27	0	0
1971	318.4	208.5	79.4	468.6	0.29349	1596.6	0.27272	287.9	1055.63	-0.0167	-0.0155
1972	359.1	338	98.6	543.3	0.29688	1830.0	0.27640	436.6	1579.55	0.1461	0.49630
1973	465.4	499.8	136.4	702.7	0.3640	1930.1	0.33829	636.2	1880.59	0.0547	0.19058
1974	864.8	780.4	199	927.1	0.51471	1801.1	0.47849	979.4	2046.83	-0.0668	0.0884
1975	1044.3	834.2	220.5	1193.	0.68463	1743.2	0.46660	1054.7	2260.35	-0.0321	0.10431
1976	1184.6	1029.	196.3	1336.6	0.70036	1908.4	0.49756	1225.9	2463.79	0.0947	0.09000
1977	1400.3	1171.5	196.8	1482.2	0.72292	2050.2	0.52818	1368.3	2590.56	0.0743	0.05145
1978	1691.8	1284.4	247.6	1665.2	0.75101	2217.2	0.55306	1532	2770	0.0814	0.06926
1979	2006.6	1672.6	182.7	1894.7	0.77283	2451.6	0.60168	1855.3	3083.49	0.1056	0.11317
1980	2442.3	2556.3	200.5	2795.3	0.98489	2838.5	0.68257	2756.8	4038.85	0.1577	0.30983
1981	2551.6	2872.6	27.7	4672.9	0.989562	4722.2	0.72554	2900.3	3997.41	0.6638	-0.01026
1982	2456.3	2365.9	405.6	3908.1	1.04115	3753.6	0.74292	2771.5	3730.52	-0.2051	-0.06677
1983	2380.9	2096.3	428	3590.6	0.95204	3771.5	0.75642	2524.3	3337.15	0.0047	-0.10545
1984	3158.5	1834.7	293	3037.5	0.86159	3525.4	0.76815	2127.7	2769.88	-0.0652	-0.16999
1985	2229.2	1523.3	34.8	3223.9	0.83485	3861.6	0.77634	1558.1	2006.96	0.0954	-0.27543
1986	2055	1117.1	258.8	3201.7	0.75281	4252.9	0.70022	1375.9	1964.95	0.1013	-0.02093
1987	1615.8	788.4	161.5	3815.6	0.66716	5719.1	0.62064	949.9	1530.51	0.3447	-0.2211
1988	2195.7	722.4	327.4	3597.7	0.68182	5276.6	0.63414	1049.8	1655.45	-0.0774	0.08163
1989	2520	823.4	333.4	3779.7	0.76628	4932.5	0.71280	1156.8	1622.89	-0.0652	-0.01967
1990	1997.4	702	433.3	3964	1.00000	3964	1.00000	1135.3	1135.3	-0.1963	-0.30045
1991	2375.7	723.3	311	5152.7	0.92863	5548.7	1.03090	1034.3	1003.29	0.3997	-0.11628
1992	2755.4	608.5	399.3	5136.6	1.02147	5028.6	0.97579	1007.8	1032.79	-0.0937	0.02940
1993	2132	1317.8	185.9	5988.6	1.05831	5658.6	1.06742	1503.7	1408.71	0.1253	0.36398
1994	2254	1417.8	204.6	5993.4	1.10348	5431.3	1.09225	1622.4	1485.36	-0.0401	0.05441
1995	2383	1023.9	220.7	6275.9	1.22172	5136.9	1.24749	1244.6	997.679	-0.0542	-0.32833
1996	2903	1389.8	249.9	6808.7	1.25720	5415.7	1.25478	1639.7	1306.76	0.0543	0.3098
1997	3333	1443.2	241.3	8368.1	1.46936	5695.1	1.36658	1684.5	1232.63	0.0516	-0.05673
1998	3339	1137.5	259.1	8071.6	1.35436	5959.7	1.48617	1396.6	939.731	0.0464	-0.23762
1999	3101.6	1254.9	281.1	8513.5	1.46138	5825.6	1.51479	1536	1014	-0.0225	0.07903
2000	3615.9	1912	369.2	7962.3	1.55268	5128.1	1.56135	2281.2	1461.04	-0.1197	0.44087
2001	3529.7	5702.9	985.6	10366.4	1.38852	7465.8	1.52833	6688.5	4376.35	0.4558	1.99537
2002	3922.8	7970	1737.6	11639.6	2.09892	5545.5	2.16576	9707.6	4482.31	-0.2572	0.02421
2003	3825.6	8158.7	1815.2	12990.9	1.93851	6701.4	2.18140	9973.9	4572.24	0.2084	0.02006
2004	5912.9	8749.1	1933.6	15457.1	2.11686	7301.9	2.40096	10682.7	4449.34	0.0896	-0.02688
2005	6573	11145	2186.3	16065.6	2.32769	6901.9	2.46134	13331.3	5416.27	-0.0547	0.21732
2006	7610	11946.3	2569.3	18610.2	2.44655	7606.7	2.64831	14515.6	5481.09	0.1021	0.01196
										5.65%	8.57%

Source: 1- CBL Annual Reports, and Economic Bulletin, various issues,
2- National Accounts, various issues

The real consumption expenditure *CPR* reached its highest average annual growth rate in 1981, which amounted 66.4%. This rate decreased in the following year to -20.1%, which was the second lowest obtained rate for this variable during the study period.

This is due mainly to the substantial increase in the gross domestic product *GDP* in that year which, in turn, was influenced by the massive increase in oil prices in the second oil shock in 1979-1980. The lowest obtained growth rate of this variable was -25.7% in 2002.

This, in turn, was due to the increases that occurred in the consumer price deflator that happened in accordance with the devaluation of the Libyan dinar in the end of the year 2001 as compared to the previous year (as shown in Table (2-3).

The consumer price index PCP_{90} reached 209.9% in 2002 and it was 138.8% in 2001, with an average annual growth rate of 51.2% for the study period. Thus, consumption *CPC* decreased from L.D4672.9 million in 1981, to L.D 3590.6 million in 1983, and to L.D 3037.5 million in 1984 (as shown in Table 2.3).

The reduction in oil revenue after the second oil shock in 1979-1980 came to Libya at a complicated time as the State nationalized most economic activities in 1982. ‘‘*It was the State which spent some of the oil money on development projects, imported commodities for local market needs, imported military hardware, and directly employed the majority of the labour force*’’ (Ghanem,1987; 67).

An observer of the behaviour of total private investment spending can note the decline and oscillation, which occurred during the nineteen-eighties as a result of government intervention in economic activity that followed the dominance of an uncertain environment in the economy. Therefore, this led to a disincentive to the investors in participate in economic activity.

In this regard, the same finding will be reached when reviewing the other variables of the aggregate demand component whereby *CGC*, *IGTOT*, and *IPTOT* increased in 1970s and had an unstable downward path during 1980s, while they recovered during the 1990s and beyond.

2.3.3 Public sector

Public economics' literature has many approaches in examining the public sector of an economy. These approaches are concerned with the nature (source) of government resources, the amount of these resources, how to allocate it, and the goals that a government seeks to achieve through this spending. Since Adolf Wagner, in 1883, identified "*the public economy in terms of its function and need of private resources to fulfil this function*" (Ott and Cebula, 2006; xvii), the study of public economics has focused on the identification of which function should be accomplished by the government and which should be left to the private side. Moreover, there is a need for adequate funding for this function to be implemented (Ott and Cebula, 2006). Therefore, most theoretical and empirical literature on public sector economics that has emerged since the first decade following the Second World War has concentrated on the second and the third of these approaches. This, on one hand, may be partly due to the availability of official information and the ease of its measurement and, on the other hand, can be ascribed to attempts by economists to define a comprehensive theory of the state (as mentioned above) around the notion of 'market failure' (Buchanan, 1999). Accordingly, the above mentioned approaches will be utilized in the analysis of the structure and growth of the public finance sector in Libya during the study period.

Table 2.4 Data on fiscal operations

Millions L.D

YEAR	CGC	IGC	EXTBUD	GETOT	NGOILR	GOILR	OTHREV	GYTOT	BUD	GOILR$_G$	GETOT$_G$	GYTOT$_G$
1970	220.7	122.6	52.7	396	75.6	484	10.9	570.5	174.5	0	0	0
1971	318.4	208.5	39.5	566.4	77.6	652.3	14.3	744.2	177.8	0.347727	0.430303	0.30447
1972	359.1	338	80.7	777.8	104.3	624.6	3.7	732.6	-45.2	-0.04247	0.373234	-0.01559
1973	465.4	499.8	254.7	1219.9	137	604.1	9.1	750.2	-469.7	-0.03282	0.568398	0.024024
1974	864.8	780.4	549.7	2194.9	220.8	1474.1	8.9	1703.8	-491.1	1.440159	0.799246	1.271128
1975	1044.3	834.2	1159.7	3038.2	294.1	1324	10.2	1628.3	-1409.9	-0.10182	0.384209	-0.04431
1976	1184.6	1029.6	945.5	3159.7	339.4	2077.3	44.7	2461.4	-698.3	0.568958	0.039991	0.511638
1977	1400.3	1171.5	994.2	3566	394.4	2625.9	28.8	3049.1	-516.9	0.264093	0.128588	0.238767
1978	1691.8	1284.4	1202.6	4178.8	480.7	2183.5	21.4	2685.6	-1493.2	-0.16848	0.171845	-0.11922
1979	2006.6	1672.6	1528.1	5207.3	585.1	3682.2	55.5	4322.8	-884.5	0.686375	0.246123	0.609622
1980	2442.3	2556.3	2260	7258.6	805.1	5951.1	52.3	6808.5	-450.1	0.616181	0.393928	0.575021
1981	2551.6	2872.6	2467	7891.2	1089.9	3685	317.3	5092.2	-2799	-0.38079	0.087152	-0.25208
1982	2456.3	2365.9	1511	6333.2	950.3	3230	241.7	4422	-1911.2	-0.12347	-0.19744	-0.13161
1983	2380.9	2096.3	839	5316.2	929.1	2520	268	3717.1	-1599.1	-0.21981	-0.16058	-0.15941
1984	3158.5	1834.7	1130	6123.2	1046.2	2125	273.9	3445.1	-2678.1	-0.15675	0.1518	-0.07318
1985	2229.2	1523.3	1200	4952.5	766.7	1846	399.3	3012	-1940.5	-0.13129	-0.19119	-0.12571
1986	2055	1117.1	1100	4272.1	730	1074	401.3	2205.3	-2066.8	-0.4182	-0.13739	-0.26783
1987	1615.8	788.4	1100	3504.2	665.4	1029.7	426.5	2121.6	-1382.6	-0.04125	-0.17975	-0.03795
1988	2195.7	722.4	1100	4018.1	947.5	898	503.1	2348.6	-1669.5	-0.1279	0.146653	0.106995
1989	2520	823.4	800	4143.4	1013.6	1181.5	456.7	2651.8	-1491.6	0.315702	0.031184	0.129098
1990	1997.4	702	700	3399.4	691.5	1386	363.9	2441.4	-958	0.173085	-0.17956	-0.07934
1991	2375.7	723.3	625	3724	809.5	1993	68	2870.5	-853.5	0.437951	0.095487	0.17576
1992	2755.4	608.5	452.2	3816.1	782.2	2230	600	3612.2	-203.9	0.118916	0.024731	0.258387
1993	2132	1317.8	403	3852.8	865.9	1267	620	2752.9	-1099.9	-0.43184	0.009617	-0.23789
1994	2254	1417.8	528.4	4200.2	974.7	1410	1255	3639.7	-560.5	0.112865	0.090168	0.322133
1995	2383	1023.9	1582.5	4989.4	1053.8	2284	1400	4737.8	-251.6	0.619858	0.187896	0.301701
1996	2903	1389.8	617	4909.8	1085.4	3888	1696	6669.4	1759.6	0.702277	-0.01595	0.4077
1997	3333	1443.2	737	5513.2	1117.1	3351	1686	6154.1	640.9	-0.13812	0.122897	-0.07726
1998	3339	1137.5	817	5293.5	1228.1	2551	1815	5594.1	300.6	-0.23873	-0.03985	-0.091
1999	3101.6	1254.9	796	5152.5	1284.7	3444.4	1412.6	6141.7	989.2	0.350216	-0.02664	0.097889
2000	3615.9	1912	709	6236.9	1181.4	2203	2459.2	5843.6	-393.3	-0.36041	0.210461	-0.04854
2001	3529.7	5702.9	496	9728.6	1069.3	3603	2395.8	7068.1	-2660.5	0.635497	0.559845	0.209545
2002	3922.8	7970	575	12467.8	1079.1	6551	2023.1	9653.2	-2814.6	0.818207	0.281562	0.365742
2003	3825.6	8158.7	758.5	12742.8	1275.4	3929	2984.6	8189	-4553.8	-0.40024	0.022057	-0.15168
2004	5912.9	8749.1	3792	18454	1890.2	19956	3131	24977.2	6523.2	4.079155	0.44819	2.050092
2005	6573	11145	2788	20506	1837.3	34378	2728	38943.3	18437.3	0.72269	0.111195	0.559154
2006	7610	11946.3	1285	20841.3	1972.5	43566	3523	49061.5	28220.2	0.267264	0.016351	0.259819

Source: 1- LCB Annual Reports, and Economic Bulletin, various issues,

2- National Accounts, various issues

Taking into account the special situation of Libya as a developing country dependent on oil as the main source of income, where the

fiscal policy in oil exporting countries can be profoundly affected by oil revenue uncertainty and volatility. Policy formation should factor in the exhaustibility of *the natural resources and aim at reducing oil revenue volatility passed on to the economy* (Baunsgaard, 2003; 1).

The public finance sector in Libya comprises three budgets: firstly, a development budget, which is related to the implementation of the development plans.

These plans are prepared by the Planning Board and are thoroughly evaluated by the legislature. Secondly, the administrative budget includes ordinary expenses and the revenue of the government in addition to transfers to, and from, the municipalities and public enterprises.

Finally, the foreign trade budget officially is a commodity budget. This budget was introduced in 1982 as an instrument for allocating foreign currency to priority sectors (Khader, 1987; 203).

The public sector has traditionally played a pivotal role in the Libyan economy where the overall performance of the entire economy has benefited from favourable international oil markets, bearing in mind that this commodity remains the main source of foreign currency income for the country as well as the main source of income for the national budget.

In this context, Table 2.4 shows that government oil revenue $GOILR$ increased from L.D 484 million in 1970 to L.D 43566 million in 2006. As a result, government investment expenditure IGC increased from L.D 122.6 million in 1970 to L.D 11946.3 million in 2006 and the sum of government investment during the period 1970-2006 amounted L.D 91244.7 million.

Although most of these funds were injected into the non-oil sector, the contributions of this sector $GNOILR$ to the total government revenue $GYTOT$ were only 13.25% and 4.02% in 1970 and 2006 respectively.

Accordingly, it should be noted that ''*although Libya was instrumental in forcing up oil prices in the early 1970s, it has recently become the victim of its dependence on oil revenues*'' (Khader, 1987; 202).

The Libyan economy, as mentioned before, has been deeply influenced by the recession in the oil sector during the first and second world oil shocks, where the oil exports and revenues have shrunk because of the reduction in price and production since 1981 (Khader, 1987; 202).

From a peak of L.D 5951.1 million in 1980, Libyan oil revenues fell to L.D 2520 million in 1983 and L.D 898 million in1988 (as shown in Table 2.4). Furthermore, the share of non-oil revenue in the total government revenue reached its highest rate in 1988 and its lowest rate in 2006. These rates were 40.34% and 4.02% respectively (as it can be deduced from Table 2.4).

Thus, in less than 8 years, Libyan oil revenues have dropped by more than 84.91% (as can be deduced from Table 2.4).

For instance, and in the same manner, government oil revenues $GOILR$ dropped dramatically from L.D 2230 million in 1992 to L.D 1267 million in 1993. Oil revenues had a negative annual growth rate in these two years and decreased from 12% in 1992 to - 43% in 1993, accompanied by a decrease in total government expenditure $GYTOT$ from L.D 3612.2 million in 1992 to L.D 2752.9 million in 1993 (as shown in Table 2.4). The reduction in oil revenue was, in fact, more than had been expected.

Therefore, the dependence on oil revenue is not an optimal stance for macroeconomic management. The entire financing process in Libya is dependent on the oil sector, which, in turn, depends on the oscillations of the international oil market that is fraught with risks and uncertainty.

It is worthwhile noting that the fluctuation in oil price or in the volume of its production will have an effect, in turn, on the country's ability to plan and to achieve its economic goals.

In addition, the inability of non-oil revenues *GNOILR* - which fluctuated during this period - to compensate for the decline in oil revenues *GOILR* in this period, has been reflected in the country's spending abilities, in aggravated domestic public debt and in the drastic cuts in development budgets. Consequently, the public budget has achieved a deficit over the nineteen-eighties and, to the mid-nineteen-nineties, this problem was exacerbated during this period to the extent that one economists stated that ''*it was oil that made Libya and oil is now letting it down*'' (Burgat, 1987; 213).

Therefore, this budget deficit compelled Libya to start an austerity policy, which involved cutbacks in spending on the development budget and administrative budget. The development spending *IGC* decreased from L.D 2872.6 million in 1981 to L.D 702 million in 1990 and the administrative spending *CGC* decreased from L.D 2551.6 million in the 1981 to L.D 1997.4 million in 1990.

As shown in Table (2.4), the period from the mid-nineteen-nineties to the end of the study period shows that there is a dominant expansionist trend for all (except for the extra-budget) public budget variables. For instance, the total government expenditure *GETOT* increased from L.D 4989.4 million in 1995 to L.D 12467.8 million in 2002, and jumped to L.D 20841.3 million in 2006. In addition, the total government revenues *GYTOT* increased from L.D 4737.8 million in 1995 to L.D 9653.2 million in 2002, and jumped up to L.D 49061.5 million in 2006 (as shown in Table (2.4)); meanwhile, this can be seen - with some exceptions - from the components of these two variables.

The expansionist boom that took place in the Libyan economy during this period was due to several reasons including the end of sanctions in 1999 - which were imposed on Libya by the United Nations in 1992. In addition to the oil shock that began in the global oil markets in 1994 and in ‘‘*October 2004 the oil price had hit a peak of over $ 50 per barrel, at which point the oil price had more had doubled in dollar terms since the late 1990’s*’’(Brook., Price, et al, 2004; 4). All these combined factors led to massive increases in oil prices and thus to oil income.

2.3.4 Monetary Sector

The monetary sector, in its broad definition, consists of the financial market and financial intermediaries where the financial market, in turn, includes bond and stock markets, while financial intermediaries include banks, insurance companies, pension funds, etc. Additionally, economic policy, which is related to this sector, is called monetary policy.

Looking at it another way, monetary policy can be defined as any policy relating to the supply of money, which basically, deemed the Central Bank’s responsibility (Mishkin, 2004).

Due to the domination of the monetary base, the Central Bank is able to influence monetary sector conditions and lead the short-run monetary variables that are the crux of the matter in monetary policy, which is - as mentioned - one of the most important pillars of economic policy in particular.

Therefore, monetary policy refers to actions that have been taken by the monetary authorities, represented by the central bank using certain instruments to influence the money supply and credit in the economy. Moreover, monetary policy attempts to achieve specific objectives which are maintaining price stability, addressing economic recession, increasing employment, increasing economic growth and handling the value of the domestic currency (Mishkin, 2004).

The impact of a monetary policy-transmission mechanism may not be rapid and direct but, after a period of delay, may be long or short, whereas some important variables may be not subject to the direct control of policy makers. This requires the use of indicators that clarify the impact of monetary policy on the desired goals, which is known in the economic literature as lag periods of monetary policy. From a broader perspective

the monetary policy strategy of the central bank may be conceived as being composed of two elements. The first is the macroeconomic model of the transmission mechanism the central bank has in mind, that is, how it thinks that the operational target, indicator variables, intermediate targets, and random shocks are linked to its final targets. The second element is the way the central bank, within this model, adjusts its operational target on the basis of new information and communicates it to the public in order to exert influence on its intermediate and/or final targets (Bindseil, 2004; 8).

This research does not clarify the theoretical implications that underlie these bases. The history of economic analysis illustrates that there is a theoretical debate led by two doctrines in economic literature, namely the Keynesians or Fiscalists and Monetarism or Conservatives (for further details see Snowdon, and Vane, 2003).

Keynesianism is a school of economic thought, named after John Maynard Keynes that offered a new vision that is opposed to the classical view, after the depression of the 1930s. The Keynesian School has particularly developed since the ‘General Theory of Employment, Interest, and Money’, which has explained that classical economic thought is not accurate, at least not in the short term.

The classical school of thought, which is the theoretical foundation of the monetarist thought, has insisted that natural forces, such as self-interest and competition, naturally determine prices and income. This school argued that, if the economy is perfectly competitive, this would produce a general equilibrium and this would lead, in turn, to an efficient resources' allocation.

On the other hand, Keynes argued that market forces, which are considered capable of producing the supply-demand equilibrium in the economy, could certainly do that, but with high unemployment. Therefore, Keynes recommended government intervention in the economy in order to counter the business cycle, whereby, during an inflationary gap, the government could increase taxation or cut spending, i.e. contractionary fiscal policy, and during a recession they could decrease taxation or increase spending, i.e. expansionary fiscal policy. In addition, using a government's monetary policy could increase the money supply which leads to reducing interest rates to stimulate the economy and increase production, investment, consumption and employment. Keynes also argued that even a small amount of additional government spending, or an increase in private investment, causes output to expand by an amount greater than the spending or investment because of the multiplier effect; the new money is steadily re-spent except for the proportion that people choose to save.

Monetarism is an economic school of thought. The economist Milton Friedman is its 'Founding Father'. This school of thinking emphasizes the role of money supply in the determination of nominal gross domestic product and the price level (for further details see Friedman, 2003 and Mishkin, 2010).

Unlike the Keynesians, Monetarists underline that money is neutral which means that, in the long term, changes in money supply will only change the price level and have no effect on production and employment. Therefore, the government should abandon any attempt to manage the level of demand in the economy through fiscal policy. Instead, they should try to ensure there is constant and non-inflationary growth of money supply (money supply rule)

(Friedman, 2003). In addition, Monetarists argue that recession is not caused by market failures in the long run but by errors in the speed of short run correction between businesses and workers to adjust their prices and wages when demand falls. When economic agents perceive that prices and wages have to fall, the economy will return to normal status. Since the government will not be able to recognize a coming recession more quickly than the companies that make up the economy it will be able to act at the same time as everyone else in recognizing the need to reduce prices and wages.

Nowadays, most economists agree on two things; that, in the short term, it may be possible to increase employment at the cost of slightly higher inflation, but they also believe that, in the long term, there is very little trade-off between inflation and unemployment. If one has an increase in employment that is gained because one has allowed inflation to rise, so the economy will be curbed back and then that will increase unemployment so that, in the long term, it is actually insignificant trade-off between inflation and unemployment.

Despite this convergence, there remain substantial differences between these two doctrines. The most important of these differences will be summarized as follows. Firstly, Keynesians argue that the monetary authorities should utilize discretion in the conduct of monetary policy, while Monetarists advocate a long run of the rule of monetary growth (Friedman, 2003). Secondly, Keynesians fiscal policy is still regarded as potentially significant (Blinder, 2003).

The Monetarists are less convinced of the usefulness of fiscal policy. In general, they believe that the Keynesian aggregate supply curve is more horizontal than vertical in the short term and so a stabilization policy can have major impacts on production and employment. Because Monetarists believe that the economy is inherently stable, they tend to regard the aggregate supply curve, as more vertical so discretionary stabilization policy is not as important (Mishkin, 2010).

Table 2.5 Data on Monetary Operations

Millions L.D

YEAR	MS	MBASE	NDAC	PCP	PGDP	MS_G	$MBASE_G$	$INFLRAT_{90}$	$PGDP_G$	$NDAC_G$
1970	241.0	199.4	-253	0.24357	0.232854	0	0	0	0	0
1971	364.5	314.6	-419.9	0.293492	0.280469	0.512448	0.577733	0.204961	0.204482	0.659684
1972	413.0	388.0	-382.2	0.296884	0.284157	0.133059	0.233312	0.011556	0.013151	-0.08978
1973	514.0	425.1	156.1	0.36406	0.348055	0.244552	0.095619	0.226272	0.224868	-1.40842
1974	765.0	601.3	63.9	0.514714	0.492454	0.488327	0.414491	0.413816	0.414873	-0.59065
1975	867.5	696.5	621.8	0.684633	0.460807	0.133987	0.158324	0.330123	-0.06426	8.730829
1976	1139.4	829.6	583.2	0.700367	0.486806	0.313429	0.191098	0.022981	0.05642	-0.06208
1977	1443.8	1051.5	469	0.722927	0.525246	0.267158	0.267478	0.032212	0.078965	-0.19582
1978	1687.8	1355.8	847.9	0.751015	0.501809	0.168998	0.289396	0.038853	-0.04462	0.807889
1979	2249.4	1796.0	882.4	0.772838	0.635304	0.332741	0.324679	0.029059	0.266028	0.040689
1980	2898.9	2307.2	-399.8	0.984895	0.850422	0.288744	0.284633	0.274387	0.338607	-1.45308
1981	3512.2	2166.9	1667.3	0.989562	0.921485	0.211563	-0.06081	0.004738	0.083561	-5.17034
1982	3232.3	2261.1	1999.2	1.041151	0.880457	-0.07969	0.043472	0.052133	-0.04452	0.199064
1983	2884.4	1798.9	2382.2	0.95204	0.873945	-0.10763	-0.20441	-0.08559	-0.0074	0.191577
1984	2711.4	1717.9	2936.4	0.861598	0.837567	-0.05998	-0.04503	-0.095	-0.04163	0.232642
1985	3492.3	2221.6	3044.1	0.834855	0.79863	0.288006	0.293207	-0.03104	-0.04649	0.036678
1986	3041.5	2113.1	2714.8	0.752815	0.720113	-0.12908	-0.04884	-0.09827	-0.09831	-0.10818
1987	3438.6	2250.7	3364.3	0.667161	0.638276	0.130561	0.065118	-0.11378	-0.11364	0.239244
1988	3011.6	1912.9	3619.1	0.681818	0.652178	-0.12418	-0.15009	0.02197	0.02178	0.075736
1989	3682.0	2371.1	4337.5	0.766284	0.732989	0.222606	0.239532	0.123883	0.123909	0.198502
1990	4645.4	3186.0	5893.8	1.00000	1.00000	0.261651	0.34368	0.305	0.364277	0.358801
1991	4442.7	3185.4	5701.9	0.928636	0.966426	-0.04363	-0.00019	-0.07136	-0.03357	-0.03256
1992	5168.2	4092.3	6151.6	1.021475	1.029904	0.163302	0.284705	0.099974	0.065683	0.078868
1993	5384.9	3992.7	6719.1	1.058314	0.99129	0.041929	-0.02434	0.036064	-0.03749	0.092252
1994	6057.4	4627.3	7387.6	1.10348	1.072759	0.124886	0.15894	0.042677	0.082185	0.099492
1995	6372.4	4985.7	7873.2	1.221725	1.15324	0.052003	0.077453	0.107156	0.075023	0.065732
1996	6718.0	5434.8	7626.6	1.257201	1.272993	0.054234	0.090078	0.029038	0.103841	-0.03132
1997	7021.6	5772.8	7165.9	1.469359	1.405623	0.045192	0.062192	0.168754	0.104187	-0.06041
1998	7187.7	5861.1	7335.4	1.354362	1.312423	0.023656	0.015296	-0.07826	-0.06631	0.023654
1999	7891.1	5696.8	8500	1.46138	1.445455	0.097862	-0.02803	0.079017	0.101364	0.158764
2000	7278.9	5404.8	2580.3	1.552677	1.753247	-0.07758	-0.05126	0.062473	0.212937	-0.69644
2001	8270.8	5941.9	2532.8	1.388524	1.702354	0.136271	0.099375	-0.10572	-0.02903	-0.01841
2002	8705.8	6101.0	-6118.8	2.09892	2.413074	0.052595	0.026776	0.51162	0.417492	-3.41582
2003	9029.2	6782.3	-13071.2	1.938517	2.760024	0.037148	0.11167	-0.07642	0.143779	1.136236
2004	10536.6	9920.7	-18893.4	2.11686	3.425198	0.166947	0.462734	0.092	0.241003	0.445422
2005	14028.1	14387.9	-38149.3	2.32769	4.382088	0.331369	0.450291	0.099596	0.279368	1.019187
2006	16343.0	16562.7	-58374.1	2.446557	4.895934	0.165019	0.151155	0.051067	0.11726	0.530149
				0.24357		0.13158	0.140525	7.340368	0.094805	0.056427

Source: 1- CBL Annual Reports, and Economic Bulletin, various issues,

2- National Accounts, various issues

Most of the world economies are now managed in order to keep inflation relatively low and stable because the belief is that, in the long term, this will tend to mean that unemployment will be kept relatively low.

The Libyan monetary sector is not different from monetary sectors in many other economies except that the financial market is still at a nascent stage and not able yet to fully contribute to the Libyan monetary sector or to fulfil its full requirements.

The Libyan monetary sector

has been solidly based in law... in 1963 Law No. 4 "Promulgating the Banking Law" was gazetted, and in Chap. 1, entitled "The Central Bank", the National Bank of Libya was replaced by the CBL... With an authorized capital of one million Libyan pounds it possessed, among other things, the sole right to issue currency, with the responsibility for maintaining monetary stability and the external value of the Libyan currency, as well as for regulating credit (Otman and Karlberg, 2007; 282).

In addition,

the banking sector, together with all others, changed dramatically when in November 1969 the new Libyan government required that all banks in the country should be Libyan controlled, buying out the 51 per cent control of the commercial banks that had not already converted to Libyan control... In December 1970, the government purchased outright all banks that still had some foreign minority participation and, by merging, reduced the number of commercial banks to five (Otman and Karlberg, 2007; 282).

During the last three decades of the last century, there were no clearly defined objectives for monetary policy in Libya, apart from being in support of fiscal policy.

The available tools of monetary policy at the time were not used to influence the monetary variables. Under this consideration, the monetary authority did not change the discount rate or the reserve ratio on deposits during this period. However, the Central Bank issued instructions to the commercial banks directly, assisted by its ownership of all the banks operating in Libya.

However, the situation changed at the beginning of the 21st century where the economy was in recession due to the slowdown in public spending and to the lack of clarity and stability of economic policies such as devaluation of the Libyan Dinar at the end of 2001.

This led not only to the reluctance of the private sector to participate in economic activity, but also led to a boost of this slump in the economy as a whole.

Therefore, the central bank, deliberately, took some measures to reactivate the economy such as reducing the discount rate, reducing interest rates on loans and it boosted the upper roofs of some loans granted by operating banks.

In addition, the monetary authority worked to enhance the facilities offered by banks and asked commercial banks to increase their operating capital and investment. Additionally, the Central Bank worked to consolidate and stabilize the exchange rate of the Libyan dinar.

As mentioned at the beginning of this chapter, the idiosyncrasy of Libya as a small open economy (dependent on one depleted resource as a major source in financing and managing the whole economy) should be taken into consideration.

In addition, regarding the stages that chart the paths of macro-variables in the Libyan economy, it can be found that the main monetary variables follow the same path as these stages, thus, the next section will review the main monetary variables in the Libyan economy during the study period as shown in Table 2.5.

In this Table, the consumer price index *PCP* has increased from 36.4% in 1973, to 51.4% in 1974 and to 75.1% in 1978 with a 51.2% average annual growth rate for the years 1973-1978 due to increasing the money supply *MS* from L.D 514 million in 1973 to L.D 765 million in 1974 and to L.D 1687.8 million in 1978.

In the second stage, the interested observer of the Libyan economy can note the instability and oscillation which occurred in the sector during the nineteen-eighties because of government intervention that was followed by the dominance of uncertainty in the economy. Additionally, shocks that accrued in world oil market during the nineteen-eighties led to reluctance by investors to participate in economic activity.

The money supply increased to L.D 2898.9 million and L.D 3512.2 million in the years 1980 and 1981 and then decreased to L.D 3232.3 million and L.D 2884.4 million in the years 1982 and 1983 respectively. Then the money supply returned to decline in the late nineteen-eighties. Whereas the important variables which have a relationship with the money supply such as the monetary base, net domestic assets, inflation, consumer price index and GDP deflator pursued the a similar track to the money supply which decreased initially, increased in the middle of decade and then decreased again at the end of this period.

As seen in the preceding Table, the money supply decreased in 1981 and so did the rest of the variables that have a relationship with it, taking into account that the impact of money supply on different variables (the transmission mechanism) requires a different period of time which is known in economic literature as monetary policy lags.

Furthermore, the lack of elasticity in domestic production was reflected in the depreciation of the Libyan dinar against the dollar. This led, in turn, to a decline in per capita real income stimulating the Central Bank of Libya to follow a policy of gradual reduction in the value of the Libyan dinar in order to reach the balanced price that dominated in the markets. There were three rates of the dinar; the official price, the preferential price and the black market price and this ended up unifying the exchange rate at 1.20 dinars to the dollar at the beginning of 2002. This procedure led, in the end, to a relative reduction in market prices.

The third and last stage was characterized by the dominance of an expansion trend in the Libyan economy, as mentioned formerly, (see Table 2.5) where the money supply increased to L.D 5168.2 million, to L.D 6718 million, to L.D 8705.8 million and to L.D 16343 million in the years 1992, 1996, 2002 and 2006 respectively.

In addition, the variables that have relationship with the money supply, such as monetary base, GDP deflator, and consumer price index also increased. With the exception of net domestic assets which oscillated due to their relationship with the public debts at that period, whereby the change in banking public debt lead to a change in the stock of domestic assets consisting of bonds and treasury bills.

2-3-5 Foreign Sector

International economic theory has

pointed out that there are two reasons why countries specialize and trade. First, countries differ in their resources or in their technology and specialize in the things they do relatively well; second, economies of scale (or increasing returns), make it advantageous for each country to specialize in the production of only a limited range of goods and services (Krugman, Obstfeld and Melitz, 2012; 137).

Unquestionably, the foreign trade sector has gained great importance in developed and developing countries alike. It is one of the most important tools in the exploitation of available economic resources, as well as in the supply of all operating requirements and the raw materials which are necessary for the production process. In addition, it also brings added value to national income through contributing to increasing the average per capita income.

Libya’s foreign trade sector plays a major role in economic activity by its effective influence on various economic activities and then on the entire economy through the provision of final goods and production inputs of raw materials and intermediate goods and capital. Therefore, economic policies in Libya have given a particular priority to this sector through the design and determination of appropriate trade policies that work to develop and diversify export activity in order to improve the terms of trade for the benefit of the national economy. This reduces the dominance of the oil sector in the rest of economic sectors in Libya, via encouragement of domestic products through supporting the policy of import substitution and creating a style of self-reliance in the production of many goods and services.

Herewith follows an analysis of the most important indicators in the foreign trade sector in the Libyan economy during the period 1970-2006. It must be borne in mind that the Libyan economy witnessed three fundamental stages, already referred to, which affected its macro performance as well as giving it divergent characteristics and oil had a major role in charting all of these three stages.

Throughout the first stage, the main variables of the foreign trade sector followed the same expansion path they had followed since 1970. This is because Libya is a country with a relatively small population with a growing oil income and thus it became difficult not to meet all needs, just by importing all kinds of consumer goods. on the one hand and goods that met security requirements, on the other. All these combined factors made it possible for Libya “*to follow a policy of financing gun and butter*” (Ghanem, 1987; 66).

Tables 2-6 and 2-7 summarize some important indicators of the foreign trade sector in the Libyan economy such as total imports *IMTOTC*, total exports *EXTOTC*, their prices *PIM*, *PEX* the prices' growth rates, PIM_G, PEX_G and exchange rate *EXRATE.* Additionally, there is the balance of trade *BOTGSC*, the balance of payments *BOPC* , the volume of trade, *TRADE* , its growth rate $TRADE_G$, the degree of economic openness *TRDPGDP* , the proportion of oil exports to total exports *POEXTEX* , terms of trade *TOT* and the growth rates of both real total imports $IMTOTR_G$ and real total exports $EXTOTR_G$. The Tables show that total imports *IMTOTC* follow the same prevailing path in this stage, where it increased from L.D 372.2 million in 1970 to L.D 1665.7 million in 1975 and up to L.D 2881.7 million in 1979. The financing of this increasing path of imports was covered by the inflows of oil revenue. This suggests that the stability of the economy was highly susceptible to external shocks, although the terms of trade *TOT was* not in favour of Libya in that period. The terms of trade registered a decline of 74% in 1970 to 47.9% and 46% in 1975 and 1978, respectively. However, total exports *EXTOTC* continued on the same growing track of that period, with an increase from L.D 760 million to L.D 2053.2 million and up to L.D 4801.4 million in the years 1970, 1975, and 1979 respectively. The contribution of oil exports to the total exports amounted to 91.9% and 93.7% and 92% in those same years (as shown in Table 2.7) and benefited from the significant improvement that occurred in the price of oil in 1973 and 1974.

Libyan foreign trade (exports and imports) showed a steadily increasing path during most of the 1970s as seen in the Table 2.7. This amounted to L.D 1132.2 million in 1970 and L.D 3718.9 million in 1975 and up to L.D 7623.1 million in 1979. This feature led to inherent economic openness which amounted to 87.8% in 1970, to 101.2% in 1975 and came to 100.2% in 1979. Needless to say, the negative effects that accompany the problem of economic openness to the outside world, whereby a high degree of economic openness makes the Libyan economy particularly sensitive to economic conditions in the world and dependent on a narrow range of exports (oil exports), give rise to the usual risks associated with lack of diversification.

Table 2.6 Imports, exports and their prices and growth rates, exchange rate, balance of trade and balance of payments

Millions L.D

YEARS	IMTOTC	EXTOTC	PIM	PEX	PIM_G	$PEXGS_G$	BOTGSC	BOPC	EXRATE
1970	372.2	760.0	0.209896	0.164586	0.0000	0.0000	229.700	0.000	0.35759
1971	436.0	975.1	0.252754	0.198171	0.204186	0.204058	278.100	0.000	0.33722
1972	552.4	997.8	0.255911	0.200805	0.012492	0.013292	77.800	135.600	0.33052
1973	826.5	1240.3	0.313971	0.245934	0.226876	0.224742	17.500	-315.700	0.29679
1974	1427.9	2489.8	0.443892	0.348057	0.413798	0.415245	571.300	509.800	0.29679
1975	1665.7	2053.2	0.549835	0.263611	0.238669	-0.24262	339.300	-24.300	0.29679
1976	1671.4	2881.4	0.568367	0.283396	0.033705	0.075054	632.300	252.300	0.29679
1977	1948.6	3430.8	0.591143	0.315204	0.040073	0.112242	639.198	495.598	0.29679
1978	2199.5	2978.1	0.620417	0.287757	0.049521	-0.08708	218.499	-183.770	0.29679
1979	2821.7	4801.4	0.654908	0.427858	0.055593	0.486873	1116.399	657.152	0.29679
1980	3752.1	6537.9	0.784117	0.705514	0.197293	0.648943	2431.701	1896.695	0.29679
1981	5127.7	4409.5	0.792214	0.784558	0.010326	0.112037	-1173.400	-1227.170	0.29679
1982	3920.1	4104.5	0.829805	0.704842	0.047451	-0.10161	-461.697	-595.928	0.29679
1983	3343.1	3703.3	0.761157	0.682203	-0.08273	-0.03212	-486.501	-528.879	0.29679
1984	3386.0	3350.8	0.693389	0.601743	-0.08903	-0.11794	-431.201	-509.590	0.29679
1985	2487.9	3673.2	0.719727	0.564393	0.037984	-0.06207	564.402	699.383	0.29679
1986	1895.7	2459.0	0.649093	0.508899	-0.09814	-0.09832	-48.999	66.737	0.31575
1987	2009.2	1697.3	0.575315	0.45109	-0.11366	-0.1136	-307.699	-294.450	0.29822
1988	2114.3	1652.2	0.587875	0.460916	0.021832	0.021782	-521.899	-397.870	0.28646
1989	2393.7	2212.9	0.660778	0.518024	0.124011	0.123903	-307.502	87.411	0.29558
1990	2547.3	3247.5	1.00000	1.00000	0.513367	0.930411	623.301	327.864	0.28372
1991	2763.0	3038.4	0.999338	0.810566	-0.00066	-0.18943	-61.497	71.453	0.28558
1992	2430.0	2918.5	1.046374	0.817647	0.047067	0.008736	396.201	500.640	0.29921
1993	2944.0	2635.8	1.041755	0.716694	-0.00441	-0.12347	-415.700	-522.413	0.32316
1994	2603.1	2694.6	1.106247	0.856371	0.061907	0.194891	9.200	95.434	0.36247
1995	2394.1	3116.1	1.233385	0.904237	0.114927	0.055894	699.199	711.261	0.35445
1996	2909.5	3490.2	1.248927	1.123994	0.012601	0.24303	540.598	533.180	0.36592
1997	3090.8	3790.2	1.266803	0.993187	0.014313	-0.11638	722.000	715.775	0.38868
1998	2660.7	2467.6	1.3305	0.836043	0.050281	-0.15822	-97.800	-199.221	0.45154
1999	2432.9	3374.3	1.388699	1.128051	0.043742	0.349273	990.699	319.097	0.46077
2000	2690.3	6185.6	1.32643	1.725042	-0.04484	0.529224	3211.431	2743.794	0.5434
2001	5057.6	5563.1	1.083053	1.738591	-0.18348	0.007855	2016.073	695.376	0.64409
2002	11363.0	14434.2	2.562092	2.855969	1.36562	0.642691	881.852	1454.565	1.21063
2003	11260.2	18431.8	2.44415	3.577964	-0.04603	0.252802	4398.582	6627.352	1.30187
2004	13885.3	24897.3	2.961289	4.932533	0.211582	0.378586	6023.742	7974.606	1.2444
2005	17715.1	39955.2	3.525482	6.945955	0.190523	0.408192	19553.739	18107.587	1.34864
2006	20715.0	51571.6	4.012451	8.988577	0.138128	0.294074	29121.847	25544.615	1.28178

Source: 1- CBL Annual Reports, and Economic Bulletin, various issues,
2- National Accounts, various issues

Furthermore, the heavy dependence on imports, particularly on industrial supplies, has led to the failure of the policy of import substitution which was among the top priorities of planning at that stage.

In the second stage, it can be noted that instability and oscillation occurred in the foreign trade sector during the nineteen-eighties. The instability and oscillation existed because of the government intervention that followed the dominance of the environment of uncertainty in the economy, on one hand, and on the shock of the world oil market that accrued during the nineteen-eighties on the other hand.

This led, as mentioned earlier, to the reluctance of investors to participate in economic activity.

Both total imports $IMTOTC$ and total exports $EXTOTC$ are characterized by vacillation and instability in this stage. This is shown in Table (2.6) where the total imports $IMTOTC$ increased to L.D 3752.1 million in 1980 compared to the year 1979, and increased once again to L.D 5127.7 million in 1981 and then decreased from L.D 3386 million to L.D 2487.9 million between the years 1984 and 1985.

In addition, total imports $IMTOTC$ declined again at the end of the nineteen-eighties and this amounted to L.D 2393.7 million in 1989.

Also, total exports $EXTOTC$ followed the same track, as shown in Table 2.6, and increased to L.D 6537.9 million in 1980 compared to 1979, and decreased to L.D 4409.5 million in 1981 and then increased from L.D 3350.8 million to L.D 3673.2 million in between the years 1984 and 1985.

In addition, exports $EXTOTC$ declined again at the end of the nineteen-eighties and amounted to L.D 2212.9 million in 1989.

Table 2-6 above, also, shows that the Libyan dinar exchange rate against the U.S. dollar $XRATE$ increased with the beginning of the study period from 0.35759 in 1970, until reached 0.29679 in 1973, where it has stabilized to this rate until the end of the first stage of the study. The Libyan dinar exchange rate continued stable during the second stage, then started to decline and fluctuation until the end of this stage as shown in the mentioned Table.

The final stage of the study (as shown in Table 2-6) was characterized by volatility and instability. Where the Libyan dinar at this stage reached the lowest value in the entire study period in 2005, in contrast, the highest value reached by the exchange rate during the study period was in 1990.

In addition, the average Libyan dinar exchange rate against the U.S. dollar throughout the study period was 0.465674, while the average annual growth rate of the Libyan dinar exchange rate during the study period amounted to 4.3%.
In practice, it can be said that the stability of the exchange rate of the Libyan dinar, and government intervention in the management of economic activity in most of the study period, has reduced the importance of this variable in the Libyan economy.

In addition, other important variables that have a relationship with total imports $IMTOTC$ and total exports $EXTOTC$ such as their prices, PIM, PEX the prices' growth rates, PIM_G , PEX_G the volume of trade $TRADE$ and its growth rate $TRADE_G$.

As well as, the degree of economic openness $TRDPGDP$, the proportion of oil exports to total exports $POEXTEX$, terms of trade TOT and the growth rates of both real total imports $IMTOTR_G$ and real total exports $EXTOTR_G$ have declined in the same period.

Table 2.7[(a)] Foreign trade sector indicators

Millions L.D

YEARS	*TRADE*	*$TRADE_G$*	*TRDPGDP*	*POEXTEX*	*TOT*	*$IMTOTR_G$*	*$EXTOTR_G$*
1970	1132.2	0	0.878833	0.919868	0.784131	0	0
1971	1411.1	0.246335	0.889442	0.981335	0.784047	-0.02722	0.05161
1972	1550.2	0.098576	0.884313	0.950291	0.784667	0.251343	0.009857
1973	2066.8	0.333247	0.947074	0.936628	0.783302	0.219519	0.015018
1974	3917.7	0.895539	1.032142	0.959274	0.784103	0.221989	0.41831
1975	3718.9	-0.05074	1.012138	0.937707	0.479437	-0.05823	0.088815
1976	4552.8	0.224233	0.954846	0.940931	0.498614	-0.0293	0.30535
1977	5379.4	0.181559	0.958434	0.929725	0.533211	0.12093	0.070552
1978	5177.6	-0.03751	0.94205	0.913166	0.463812	0.075499	-0.04915
1979	7623.1	0.472323	1.002644	0.920398	0.65331	0.215319	0.084313
1980	10290	0.349845	0.975004	0.992123	0.899756	0.110614	-0.17422
1981	9537.2	-0.07316	1.083921	0.958453	0.990336	0.352654	-0.3935
1982	8024.6	-0.1586	0.89837	0.944208	0.849407	-0.27014	0.036106
1983	7046.4	-0.1219	0.827849	0.964842	0.896271	-0.07028	-0.06781
1984	6736.8	-0.04394	0.863172	0.901516	0.867829	0.111821	0.0258
1985	6161.1	-0.08546	0.784644	0.866901	0.784177	-0.29213	0.168761
1986	4354.7	-0.29319	0.625612	0.877593	0.784016	-0.15512	-0.25756
1987	3706.5	-0.14885	0.633828	0.83786	0.784075	0.19579	-0.2213
1988	3766.5	0.016188	0.608875	0.926341	0.784037	0.029827	-0.04732
1989	4606.6	0.223045	0.640606	0.895431	0.783961	0.007239	0.19171
1990	5794.8	0.257934	0.702664	0.949992	1.00000	-0.29682	-0.23978
1991	5801.4	0.001139	0.662464	0.877962	0.811103	0.085396	0.154271
1992	5348.5	-0.07807	0.579224	0.808018	0.78141	-0.16005	-0.04778
1993	5579.8	0.043246	0.610635	0.715608	0.687968	0.216894	0.03035
1994	5297.7	-0.05056	0.547804	0.842945	0.774123	-0.16734	-0.14443
1995	5510.2	0.040112	0.516309	0.792786	0.733134	-0.17509	0.095209
1996	6399.7	0.161428	0.519149	0.83405	0.899968	0.200156	-0.09893
1997	6881	0.075207	0.498605	0.696507	0.784011	0.047323	0.22898
1998	5128.3	-0.25472	0.406666	0.710002	0.628368	-0.18037	-0.22658
1999	5807.2	0.132383	0.412584	0.82343	0.812308	-0.12394	0.013466
2000	8875.9	0.52843	0.503734	0.621104	1.300515	0.157711	0.198746
2001	10620.7	0.196577	0.491274	0.714008	1.605269	1.302387	-0.10765
2002	25797.2	1.428955	0.850537	0.519017	1.114702	-0.05026	0.579501
2003	29692	0.150978	0.794737	0.625886	1.463889	0.038771	0.019278
2004	38782.6	0.306163	0.806201	0.683183	1.665671	0.017785	-0.02017
2005	57670.3	0.487015	0.867865	0.758655	1.970214	0.071644	0.139617
2006	72286.6	0.253446	0.895413	0.676558	2.240171	0.027425	-0.00258

Source: Prepared by the researcher

(a) Columns 4 and 5 are percentages.

Most of these variables have pursued the same vacillation track as total imports $IMTOTC$ and total exports $EXTOTC$ which increased at the outset, then decreased mid-decade and, eventually, increased again at the end of this period.

This loss and instability in oil revenue affected the country's ability to continue following the same pattern of a ''guns and butter policy''.

Therefore, ''*priorities had to be reordered, so that income could match expenditure, because of the dependence on foreign markets and the fact that the country had developed a 'big spender' attitude*'' (Ghanem, 1987; 68). Under these conditions, it was impossible to finance such a high level of imports with such unstable oil revenues.

To solve this problem, the country resorted to a new public policy of 'maximum production and minimum consumption'; the new 'more guns less butter' policy meant that any austerity measures would be directed towards consumption (Ghanem, 1987).

This oscillation and the instability in the oil foreign markets led to an intensification in the policy of quantitative restrictions on imports which started in the year 1982, whereby it aimed to rationalize the operation of foreign currency expenditure. Thus, to implement the new policy, a number of commodities were declared unnecessary and their importation was stopped (Ghanem, 1987).

A commodity budget was prepared, limiting the country's total imports $IMTOTC$ which decreased from L.D 5128 million in 1981, to L.D 3920 million in 1982, to L.D 2211 million in 1985 (as shown in Table. 2.6).

The third stage that extends from the beginning of the nineteen-nineties until the end of the study period was an exceptional period for the foreign trade sector and was distinguished from the rest of the sectors of the economy.

It was not influenced by the expansion path that affected all the sectors in nineteen-nineties period, but in this time foreign trade variables were characterized by vacillation and instability, as seen in Tables 2.6 and 2.7. The instability had continued for a long time since starting in the early nineteen-eighties when total exports $EXTOTC$ decreased from L.D 4373 million in 1992 to L.D 2536 million in 1993, as so did total imports $IMTOTC$ later on (as shown in Table 2.6).

In addition, total exports $EXTOTC$ and total imports $IMTOTC$ followed the same path of escalation. From L.D 5057.6 million in 2001 to L.D 11260.2 million in 2003, the total imports increased up to L.D 20715.0 million in 2006. Also, total exports increased from L.D 5563.1 million in 2001 to L.D 18431.8 million in 2003 and up to L.D 51571.6 million in 2006 (as shown in Table.2-6).

2-4 Conclusions

This chapter has outlined the developments in the Libyan economy for each of the major sectors for the sample period, 1970 to 2006. One of the major conclusions from this review is that while economic growth was impressive for most of the review period, this status was hardly sustainable as it was attributable, in most cases, to the shocks of the global oil markets which had a discontinuous nature fraught with risks and uncertainty. The position was also made fragile by the prospects of future growth in the oil sector, taking into account its exhaustibility as a natural resource, which naturally faced major challenges. It is evident that while the government, through policy, has contained problems of inflation; problems of external imbalances are still at large.

This review shows that, since the freezing of the United Nations' sanctions (that lasted more than 10 years (1992-2002-03)); Libya has decided to undertake comprehensive structural reforms and accelerate its transition to a market economy. However, although "*progress has been made in recent years to liberalize the economy, it remains largely state controlled and not diversified*" (United Nations, 2006; 1). Because of all of the changes that have influenced positively on the macroeconomic performance during that period, the famous economist M. E. Porter stated that

Libya's current macroeconomic situation provides a favourable context for reform efforts, significantly better than that of the early 1990's when Libya previously sought to liberalize the economy. Libya's fiscal position is strong due to continued high oil receipts and ample foreign reserve, these provide a sound basis for management in the next few years (Porter and Yergin, 2006; 39).

This review, in turn, has highlighted the complex characteristics of the Libyan economy from its structural framework from the aspect of a historical and current policy stance. This is useful in the modelling process because it gives an indication of the relationship between certain groups of variables and targets (policy variables) of the economy. In turn, this guide can be used in the formulation of various interrelationships in the model specification.

CHAPTER THREE: THE LITERATURE REVIEW (1): THE THEORETICAL BASE FOR ECONOMETRIC MODELLING

3.1 Introduction

The purpose of this study- as mentioned in chapter one- is to construct a small macroeconometric model for the Libyan economy and estimate it over the period 1970-2006, to investigate various impacts of fiscal and monetary policies and to clarify their effectiveness as tools, which directly or indirectly determine the country's performance for economic growth. This may be utilized for economic planning in the Libyan economy. Because of the examination of the impacts of changes in policy variables, simulation experiments can give some information on the available choices to Libya for designing development strategies and "*they will also provide a framework for analyzing the macroeconomic problem in the Libyan economy*" (Abohobiel, 1983; 30). This, in turn, will give the policy-makers sufficient grounds, to make decisions that enable the achievement of economic goals easily and smoothly.

Therefore, the objective of this chapter is to review macroeconomic modelling and its applications in a developing country like Libya. This review aims to examine the roots, developments, and main features of econometric modelling from a theoretical point of view.

Accordingly, this chapter will be divided -beside the introduction and the conclusion- into three sections as follows: The background of econometric modelling will be introduced in the second section. The third section provides a summary of econometric modelling in the context of the developing countries. While the fourth section of this chapter presents the relationship between the economic policy and the econometric models in the light of studying the transmission mechanisms of both monetary and fiscal policy. In addition, this section will shed light on the fiscal and the monetary policy interaction process.

3.2 The background of econometric modelling

It is necessary at the outset to explain the meaning of the econometric model in order to interpret the connotation of this term to avoid misunderstandings that might occur in the context. This, in turn, requires elucidation of the concept of the model in general and the econometric model in particular (For more details see: Howrey et al, 1981 and Frain, 1995).

Klein and Young mentioned that ‘‘*we might regard any attempt to reduce the description of phenomena to a set of stylized relationships which approximate the observed facts as a modelling effort*’’ (Klein and Young, 1980; 1). Consequently, the model[2] in its widest conception is ‘‘*a simplification of a real system, facilitating understanding, prediction, and perhaps control of the real system*’’ (Whelan; 2006; 1)

On the other hand, an economic model is a mathematical representation of the quantitative relationships between economic variables (Soludo, 2002). More specifically, the econometric model term could be defined as a

set of behavioural equations, as well as institutional and definitional relationships, representing the structure and operations of an economy, in principle, based upon the behaviour of economic agents (Valadkhani, A.2005; 1).

Moreover, ‘‘*such models will be systems of inter-linked equations estimated from time-series data using statistical or econometric techniques*’’ (Bardsen, et al, 2005; 17).

[2] For more detail see: Edmonds; 1999

Furthermore, Klein observes that,

the model by nature is only an approximation of reality. Therefore, we shall never have the definitive system. With much more data, more thinking about the functioning of the economy, and improved statistical methods we should be able to come close to reality (Jayawickrama, 2007 ;80).

In other words, because the reality is often complex, human mentality or its human behaviour is unable to expect and comprehend it in its entirety (Gourieroux and Monfort, 1995), therefore, the econometric model represents a compromise between reality and manageability (Jadhav; 2011).

In the same manner, Hazzel and Norton remarked that the econometric models ‘‘*by virtue of their logically consistent framework ... could provide the analyst and policymaker with a valuable economic representation of the sectors and a laboratory for testing ideas and policy proposals*’’ (Hazzel and Norton, 1986; 2).

Consequently, the major concern of econometric modelling has been to introduce a typification of the real economy and to interpret its empirical behaviour. The main problem in the modelling process arises as soon as one wants to describe and analyze a real phenomenon (Klein et al., 1999).

Nevertheless, the robustness of the econometric model is ultimately not in accurately reflecting the reality in all its complexity but in highlighting the most important influences that seem related to the object of model and that are of sufficient significance in determining the state of the system (Gourieroux and Monfort, 1995, and; Whelan, S. 2006).

Econometric modelling is –as a process- motivated by two main goals: forecasting and the more importantly, policy analysis (Klein et al, 1999). In pursuit of both of these goals, every model should adequately achieve four criteria: Firstly, the model must be built based on a distinct theoretical framework. Secondly, the model should be consistent with its theoretical framework where ‘‘*the actual specification of the model must reflect a clear understanding of the contextual framework within which policies are formulated and executed along with an envisaged process of adjustment*’’ (Pandit, 2000 ; 1). Thirdly, it is fundamental that the model is designed on an affluent and firm database and, finally, the estimated model must utilise the sophistication and discipline of econometric methodology. However, it is unfortunately, hard to coordinate this long list of competing criteria, and the creativity of the model builder depends on his ability to achieve the optimal compromise, so one can say that econometric modelling is multidimensional and both an art and a science (Valadkhani, 2005).

In the practical front, Valadkhani and others 2004 have classified the macroeconomic models into two main groups: macroeconometric models and computable general equilibrium models. Furthermore a useful taxonomy suggested by Challen and Hagger in 1983 (Khayum, 1991), where

according to Challen and Hagger there are five varieties of macroeconometric models in literature[3]: Keynes-Klein model, Philips-Bergstrom model, Walras-Johansen model, Walras -Leontief model, and finally Muth - Sargent model (Valadkhani, 2005; 1).

In each of these groups of model names, the first name belongs to the economist who provided the theoretical vision framework and the second to the econometrician who used this vision to build the econometric model (Challen and Hagger, 1983).

The first model listed by Challen and Hagger is the Keynes-Klein (KK) model. The main aim of this model is to elucidate the Keynesian demand-oriented

3 For more detail about these models see: (Mehari, 1998. especially chapter four), and see too: (Soludo, 2002)

model of macroeconomic fluctuations, where according to conventional Keynesian theoretical views; the real (goods) market constantly clears the whole economy with the dominant role being played by the aggregate demand sector in determining aggregate output sector. This model mainly uses stabilisation policies to deal with the short-run instability problems of output and employment.

It is important in this context, too, to make clear that ‘‘*the basic Keynesian model has been criticised as it does not consider the supply side and the incorporation of production relations*’’ (Valadkhani, 2004; 266). In addition, this model does not pay enough attention to the role of money market expectations and relative prices. Therefore, the monetarist economists Anderson and Carlson constructed in 1970, the St. Louis model in order to highlight the monetary impacts on the real variables in the economy.

Moreover, to remedy this deficiency, the contemporary versions of the Keynes–Klein (KK) model have increased their emphasis on the aggregate supply sector, and including additional sectors determining prices and monetary variables. ‘‘*Consequently, modern (KK) models feature endogenous money supply and wages with explicit treatment of the open economy and the supply side of the Macroeconomy*’’ (Mehari; 1998; 64).

The second type of macroeconometric model category, the Phillips–Bergstrom (PB), emerged when Phillips used both Keynesian and neoclassical theories within a dynamic and continuous time model to interpret stabilisation policy. Broadly speaking, the Phillips–Bergstrom model is also a demand-oriented model, but the main distinguishing criterion of this model being utilizes difference or differential equations to estimate the structural equations of the model, which is considered a difficult method to apply in particular for large-scale models (Valadkhani, 2004).

The third macroeconometric model type, the Walras–Johansen (WJ) model, is mainly a multi-sector model (for more details see: Bodkin, et al, 1991). According to Walras theory (general equilibrium hypothesis), the economy consists of many of inter-dependent markets that based on microeconomic theory. These inter-dependent markets attempt to reach an equilibrium state by maximising the profit behaviour of producers and maximising utility function of consumers in all competitive markets with the overall result being optimal allocation and full employment of resources in the sense of Pareto-optimality. The economy sectors in the Walras-Johansen (WJ) model are linked together via an exchange process (purchases and sales) in all markets and to each other. The Walras-Johansen (WJ) model is non-linear and its structural equations are built in logarithmic differentiation form (Valadkhani, 2004).

Johansen has utilized the essential ideas of the Walrasian general equilibrium theory that was based on microeconomic theory concerning macroeconomic planning and forecasting by building a Multi-Sectoral Growth Model (see Brems, 1990) of the Norwegian economy in 1960. Later versions of the model have been used to summarize future growth patterns over a long period to clarify issues of economic structure and income distribution, and, to coordinate the development and policy issues of different sectors of the economy (Mehari; 1998).

The fourth type of macroeconometric model is the Walras–Leontief (WL) model, which considered as a pattern of a general equilibrium system. This type of modelling combines the Walrasian general equilibrium model with an input–output Leontief system. Where the ‘‘*using an input–output system, given the values of the sectoral or aggregate, final demand components, the sectoral output (or value added) can be obtained*’’ (Valadkhani, 2004; 267). The Walras–Leontief (WL) model provides a helpful path to track the goods and services flow between the different sectors of the economy, and provided the technical coefficients are regularly adjusted, it can be used to plan and forecast future development patterns of an economy. Besides, the Walras–Leontief (WL) model is the most adequate macroeconometric model for developing countries (Challen and Hagger, 1983).

The last model in the of Challen and Hagger list is the Muth–Sargent (MS) model, which tends to advocate the neo-classical equilibrium theory and highlights the supply side of the economy. Equilibrium models in this type postulate that the prices system in the economy is set therefore, markets clear permanently. Moreover, this model assuming the differences between the prices from their equilibrium values as a temporary phenomenon. Although this approach provides coherent theoretical foundations for prices system determination, the assumption of the continuous-market-clearing prices may be considered as an extreme hypothesis.

In the same manner, the constructed model of this type is based on the development of the rational expectations theory, which triggered as a revolution in macroeconomic modelling in the early 1970s a decade after the publication of the seminal study of Muth that proposed rational expectations hypothesis in 1961.

The notion of the rational expectations introduced an important development on macroeconomic modelling because it enables agents to adjust relevant information in the macroeconomic environment in an optimal manner. This cyclical adjustment has seriously weakened interventionist policy that was presented by the adaptive expectation hypothesis, ‘‘*because with the complete integration of expectations into agents behaviour, the latter is affected by all available information and the implications of such information for future periods*’’ (Mehari; 1998; 65). However, it should be clear that one of the distinct characteristics of the Muth–Sargent model pertains to the formation of expectations. Where, the formation of expectations in the Muth–Sargent model is no longer by using of the lagged values of the dependent variables, but can be estimated through the process of complete model solving.

The New Classical School, by emphasizing -as mentioned- the role of the expectations and the supply side in this model, seeks to explain the inefficiency of demand management policies. In this respect, Sargent (1976) tried to explicate the stagflation phenomenon in 1970’s by inventing a forward-looking macroeconometric model, where different copies of this model indicate that there is no trade-off between unemployment and inflation in the short run, which is in contrast to the Keynesian modelling perspective.

Finally, the Muth–Sargent model is similar to the Keynes–Klein model in terms of being dynamic, nonlinear and stochastic and incorporating the use of discrete time.

The second category of macroeconomic model is the Computable General Equilibrium model (CGE) that has been formulated originally based on the empirical research activities of Johansen’s model (1960), which optimising the behaviour of economic agents and conducting the policy analysis on international trade resource economics, income distribution and efficient sectoral production (Valadkhani, 2004). Also the Computable general equilibrium model (CGE) has had a significant development as a result of its uses for ‘‘*developing countries which is originated from the Adelman-Robinson model of income distribution in Korea to be succeeded by the World Bank for the analysis of development planning and policies*’’(Ezaki, 2006 ; 2).

Furthermore, it is also has advanced as a result of the subsequent developments that occurred in both Walras–Johansen (WJ) and Walras–Leontief (WL) models (Valadkhani, 2004). In fact, applied effort on this model began because of Scarf’s works (1969 and 1984) on the computation of equilibria and with ‘‘*the* *early models of Shoven and Whalley in 1982 (Ezaki, 2006) were linked to the study of fiscal reform and international exchanges*'' (Capros and et al, 1990; 558).

There were some distinctions between macroeconometric and (CGE) models at the early stages, nowadays these differences are slightly vague. So ''*some Computable general equilibrium models are now being linked to macroeconometric models, thus producing a complementary, rather than a substitutable, relationship between them*'' (Valadkhani, 2004; 268). Economic models builders have recognized the urgent need for reconciliation of (CGE) and macroeconometric models (Capros and et al, 1990).

One of the most controversial issues in the practical side of macroeconomic modelling is the model size (for more details see: Maddala, 1981, and Bardsen et al, 2005), which is measured by the number of stochastic equations that can be included in a model (Taylor, 1981). The advocates of small scale modelling argued that the diagnosis of the economy problems would be more difficult when the model has numerous equations. ''*They argue that one needs to Keep It Sophisticatedly Simple (KISS)*[4]'' (Valadkhani, 2005; 14). The opponents argue that small models cannot absorb the reality in all its complicated nature, and this may lead to misleading policy conclusions. In brief, Bodkin, Klein, and Marwah (1991) stated that,

a complete model often encompasses three sub components, viz. national income, input output, and flow of funds. Thus a macroeconometric model becomes larger in size if the aim is to have a full model'' (Valadkhani, 2004; 15).

However,

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4 There is another explanation for this term, for full details see: (Edmonds, B. and, S. Moss, 2004).

the most obvious candidate for explaining this observed variation in model size is the model-builder's purpose of model construction...for some purpose large models are necessary, but for other purpose small models are necessary, or at least sufficient (Taylor, 1981; 181).

In spite of the origin of macroeconometric models based on the Keynesian economic theory, Keynes made the first critique on this type of model in his commenting on the Tinbergen's model for the U.S. economy in 1939 (for more details, see: Pesaran and Smith; 2009). Where Keynes ''*believed that Tinbergen's attempts to verify the structural parameters of economic decision rules as a system would lead to misleading outcomes*'' (Jayawickrama, 2007; 84). Because of this Tinbergen's model was not accurate due to his inability to specify the important linkages that underlie the real economic system and due to the measurement errors in relevant variables. Keynes, consequently, commented that Tinbergen's work was greatly wasting time or practicing statistical alchemy (see Bodkin, et al, 1991; Jayawickrama, 2007). Later on ''*this was followed by scepticism on the part of policy makers and heavy criticism by authorities and academics alike*'' (Matlanyane, 2005; 32).

Early macroeconometric models were heavily criticised for presenting a static and abstract form of the economy. These criticisms can be summarized into the following issues: structural instability (Lucas critique), theoretical contrasts with rational expectations theory, forecasting inadequacy, the division of the model between endogenous-exogenous variables (identification problem), and finally the existence of the problem of unit roots (spurious regressions) and ignorance of the time-series properties.

Moreover, with the time when the macroeconometric models became unable to provide adequate explanations for policy-makers, their popularity declined. Where, models failed to predict the simultaneous presence of high inflation and unemployment -stagflation problem- in the early 1970s. This contradicts the trade-off between inflation and unemployment that embedded in the Keynesian theory, because of the model structure lacks important macroeconomic determinants such as supply-side shocks (Cooley and Le Roy, 1985).

Additionally, Lucas (1976) made –as mentioned above- the most influential criticism in the application of econometric models for policy analysis, which known as a (Lucas critique). Lucas concluded that,

the structure of an econometric model consists of optimal decision rules of economic agents, and that optimal decision rules vary systematically with changes in the structure of series relevant to the decision maker, it follows that any change in policy will systematically alter the structure of econometric models (Lucas, 1976; 41).

Accordingly, it is most likely that coefficients, which estimated in the econometric models, will change because of agents expecting and perceiving the policy measures. Responding to this criticism, Eckstein, McNees and Zarnowitz have investigated the reliable forecasting performance of econometric models subsequently; they stated that,

the track record of continuing econometric modellers is not so bad... Compared to their alternative (naive models, time series analysis of single series, or judgmental forecasts) the econometric models do reasonable well, particularly as the forecasting horizon lengthens (Valadkhani, 2005; 13).

In spite of the theoretical contrasts between econometric models and the theory of rational expectations being considered as an important criticism, Bodkin and Marwah drew attention to the irrational assumption of the rational expectations' theory, which relates the ability of the economic agent to the complete access to raw data and to the true model of the economy. This assumption is obviously unrealistic and cannot be acknowledged (Valadkhani, 2005). Additionally, Fair (Fair, 2004) had already tested the rational expectations' thesis and in most cases he rejected it.

Furthermore, an important criticism has levelled to identification problems. Because identification required a complex system of simultaneous equations, its process would depend to a vast extent on presence of dynamics in the model. Moreover, the interaction between policy experiments and the magnitude of the role of expectations made the process of identification a difficult one.

These criticisms and their dependent debates supported interest in the development of other modelling techniques and led to intensive research to develop a new technique that can overcome the weaknesses in econometric modelling. So, with the initial work of Davidson and Hall (1991) and others, came more powerful modelling strategies, in particular, the techniques provided ways to estimate and test the structural relationships and over-identifying restrictions.

Therefore, according to these and other developments, econometric modelling has regained its status in the policymaking sphere and is still used today to tackle policymaking in challenging situations (Matlanyane, 2005). In this regard, Valadkhani stated that,

macroeconometric modelling can still be a unique tool, especially for policy formulations provided that a wide variety of investigations, particularly in relation to model selection, diagnostic tests, and time series properties of the data, are undertaken. With the advancement of econometric "know-how", the disparity of opinions between advocates and critics of macro-econometric modelling appears to be narrowing (Valadkhani, 2005, P.18).

Accordingly, the econometric modelling will be turned into the basis for the sketching of macroeconomic policy and forecasting.

In the same context, one can say that econometric modelling has undergone -and still- major developments in terms of theoretical foundations and improving the estimation techniques, that have made it usable, practical for policy analysis, and forecasting.

3.3 Econometric modelling in developing countries

The modelling of econometric has relatively long history in the developing countries, spanning the last five decades[5], to the extent that these models are no longer a matter of esoteric in these countries (for details see, Behrman, and Hanson, 1979). Where Soludo (2002) said that the econometric models '*have grown from the arcane contrivances of a coterie of academics to become major tools of policy analysis and decision making by both the public and private sectors*' (Soludo, 2002; 4).

The history of economic thought has shown that most countries in the world, especially the developing ones have been engaged -more or less- in the process of economic planning, after Keynes published his seminal study that entitled 'The General Theory of Employment, Interest and Money' in 1936. Where, the importance of government intervention to play an active role in the leadership of the economy became obvious. In addition, it has been concluded that government intervention can influence the course of economic activity to improve the macroeconomic performance.

Given their limited resources, developing countries sought to find the best way to allocate their scarce resources, especially the capital factor, which has encouraged many of these countries to adopt economic planning as an

[5] In fact, the history of econometric modelling in the developing countries started in India with Narasimham model in 1956.

instrument to manage their economies. Making such choices can be undertaken by the use of econometric models which present the best utilization of resources in order to achieve certain goals.

Moreover, the existence of numerous of economic problems in the developing countries, such as the internal and external deficits, stagflation, and immense debt burdens -internal and external- led a significant number of these countries to use the econometric models. This is ‘‘*not only to help policy formulation but also to uncover the structure of such economies and to build the appropriate theoretical framework*’’ (Pandit, 2000; 4).

Nonetheless, one can say that the first virtual model for the developing countries[6], specifically for the Indian economy, has emerged by Narasimham under the supervision of Tinbergen in 1956. This model was mainly a small version of the Keynes–Klein *(KK)* model and focused on the demand side of the economy. Furthermore, the Economic Commission for Asia and the Far East (ECAFE) in 1968, and the United Nations Conference on Trade and Development (UNCTAD) in 1973 constructed many of econometric models for about 40 developing countries to help them in forecasting the foreign capital needs of the member countries (see: Shourie (1972); Sastry; (1975) and Bodkin, et al 1991).

The econometric model relationships for any economy depend on the specific structure for the economy under consideration, where every country has a special aspect that makes the economy in question somewhat different from others.

On the other hand, it is obvious that the developing countries have specific characteristics that require discussing and identifying accurately, where ‘‘*a brief listing and discussion of these distinctive traits seem a natural way to start*’’

6 For more details about developing countries models, see: (Mehari; 1998).

(Del Rio and Klein; 1974; 162). Nevertheless, developing countries, as a whole, cannot be characterised as a unique and uniform group of countries because their economies are at different stages of development and the differences between developing and developed countries can be attributed to their relative position in the development race. Some are considered to be developing, but are privileged because of a specific factor that differentiates them from other developing countries. For example, in OPEC countries oil revenues have eliminated the financial constraint to economic development. Although, the OPEC countries itself cannot be identified as a uniform group of countries (Abohobiel, 1983).

However, this does not mean that the specification and structure of the econometric models in the developing countries are completely different from those in the developed countries, where as Del Rio and Klein stated that

after all, the anatomy and physiology of all economies are essentially the same. The difference seems to be in size, complexity, refinement of market mechanism, and speed with which the macroeconomic organs function, using as the standard of comparison those of the advanced economies (Del Rio and Klein; 1974; 161).

In general, the developing countries features can be summarized as follow: low per-capita income, low levels of human capital in addition to existence of unfavourable structural change indicators such as the high levels of poverty, and population growth rates. In addition, it can be said, that the existence of these features that characterize developing countries is due mainly to the imperfection of their economic sectors -real and financial; consequently, the structural change of the economy is considered the main cause that influences the optimum decision-making process.
The malfunction in: fiscal, monetary, and foreign sectors are the most important ingredients that must be considered in the econometric modelling in developing countries.

Some of fiscal problems need a special consideration, such as the implications of fiscal rigidities, and ‘‘*high tax rates levied on a narrow tax base and heavy reliance on revenues from financial repression and multiple currency practices, on the inflation tax, and on excessive debt financing*’’ (Khan, H. 2005; 13). In addition, the effect of fiscal deficits on a various macroeconomic variables needs special handling.

Furthermore, the foreign sector needs a particular attention as well. Most of the developing countries are price takers in the international markets for their exports and imports of goods and services as well as in financial assets. This consideration clarifies when required to identify a specific relationship between trade and financial liberalization and macroeconomic performance during the economic reform process. The difficulties of short-run control of macroeconomic during the reform and liberalization process also need little attention; as such, the dynamic aspects are often handled in a simple way.

In the same manner one area that needs to be highlighted in the modelling process is the dynamic macroeconomics which are associated with monetary and exchange rate policy which occur in a context where international mobility is imperfect. In addition,

the association of quasi-fixed exchange rates with currency and financial crises makes this issue especially significant. Contractionary effects of devaluation may also destabilize the economy, and could be included as a theoretical possibility that may sometimes become a practical problem (Khan, H. 2005; 13).

In the end, most of these features can be outlined in two crucial elements, external and internal, that are faced by developing countries, such as capital and technological imports, exports of primary goods, and balance of payments’ problems as examples of external problems. Additionally, maldistribution of income, rural-urban labour migration, the large economic role undertaken by the government, the existence of overcapacity in the modern productive sectors, and in some cases, even inflation, can be traced to them as internal problems.

Accordingly, one can say that the inclusion of these possible features relevant to the modelling of econometric will lead to improve the outcomes of these models. Therefore, the focus will be on these traits when dealing with characteristics of developing countries.

In context of econometric modelling in the developing countries, there is an important question which many econometricians have tried to answer (Nugent, 1975). The question is what kind of macroeconomic model should be employed for developing countries? The answer to this question that asked by Klein (Klein, 1965) is still an open matter (Abohobiel, 1983). The difficulty in answering this question is that an econometric model of any country should reflect -as mentioned above- the actual economic structure of the economy under consideration. So,

the common procedure for constructing a macroeconometric model for any country is to specify the main features and economic peculiarities -and particularities- of the country in question, formulate these features into a set of working hypotheses, and then test these hypotheses by translating these features into econometrics (Abohobiel, 1983; 9).

According to Abohobiel 1983, existing macroeconometric models for developing countries can be classified into two basic groups, and he alluded to that most of the macroeconomic models built for developing countries reflect either one or a hybrid of these views on reforming the economies.

First of these groups, the Keynesian or the stabilisation models which are demand-oriented models and concentrate on short-run fluctuations in income and employment and are based on assumptions which are thought to be realistic for developed countries (Abohobiel, 1983, and c.f., Aljerayed, 1993). The first of these assumptions is that there are no supply constraints on the determination of output (Elabbassi, 1988). The second assumption is the existence of an efficient fiscal system that has power to levy and collect taxes. The other Keynesian assumption that fits developed countries is the existence of well-developed capital and financial markets (Abohobiel, 1983).

The stabilisation models appear to work well in explaining short-run behaviour in many developing countries. However, the earliest macroeconometric models for developing countries were based on the Keynesian approach with little adjustment for special conditions in the developing countries (Valadkhani, 2005). This has led to many misspecifications of such models, such as, a deficiency in aggregate supply, a shortage or surplus of labour, duality in the economy, the lack of a financial market and ignoring the possibility of integrating the short and long- run properties.

The second group of existing macroeconometric models for developing countries is based on the classical and neoclassical models of growth. This group of models is supply oriented, focusing on the supply aspects of the long-term growth process including the effect of population growth, technological changes, and changes in the industrial structure. Therefore, these models are focusing on long-term changes in production, distribution, and growth. This type of models also, has utilized as a framework for macroeconometric models in developing countries (Abohobiel, 1983). Most the long-run models of economic growth are extensions of the Harrod – Domar theory of growth, which is based on Keynes's idea about demand for total output.

Most of the macroeconometric models in developing countries rely on a Keynesian framework that only emphasises the demand sector constraint. However, it should be kept in mind that in many developing countries supply side problems are also important, where in a supply-constrained economy, such as most of developing countries, increasing effective demand through increased government spending will escalate inflation instead of increasing output and employment. On the other hand, the Keynesian theory shows that any economic policy that is able to stimulate effective demand is in fact also capable of stimulating the economic growth process.

As a result, recent macroeconometric modelling processes have attempted to incorporate the supply side of the economy and this is, in most cases, undertaken by specifying an aggregate production function, whereby the macroeconometric modelling process -and this study is not an exception- represents much realism by capturing both the demand and supply constraints on the macroeconomic relationships, which so-called neoclassical synthesis (for further details about this expression, see: Goodfriend, 1997).

As a confirmation for the above result, Abohobiel in 1983 had stated that

any comprehensive model for developing countries should include both demand and supply sides of the economy by combining the elements of stabilization and growth. That is both the pressures of capacity expansion and the demand determination should be described adequately (Abohobiel, 1983; 19).

3.4 Economic policy and econometric models

As a social science, economics is interested in determining, or in fact predicting of changes in economic variables, because of impacts of the economic policy on the behaviours of human beings. Practical experience proves that it is not appropriate to rely on intangible and abstract intuition to manage the economy during the process of policymaking. This is because of reality and its complexity, as mentioned previously, such as human behaviour (that cannot be expected properly in many cases), requires a more prudent thinking. Yet, it is not easy to use economic thinking to extract the impact of a change (Mishkin, 2012). This is due to any misunderstanding of the implications including even insignificant effects of alternative behaviours, will make it hard to choose intelligently. In this connection, Klein declares that

social systems are enormously complicated, so much so that we can never grasp the complete explanation of all aspects of society at once. We break the problem into parts, but even that is not sufficient for complete human comprehension; therefore, modelling is an important step (Klein, Welfe, and Welfe, 1999; 1).

As the concept of an econometric model has been previously defined, it should now be possible to clarify what is economic policy and, specifically, what are monetary policy and fiscal policy?

Economic policy, in its broad sense, is the actions which taken by the competent authority (such as the Treasury or the Central Bank) of economic policy under consideration, to influence the economy. This concept can be defined, precisely, as the use of specific economic instruments, to achieve particular economic goals, during a specified period, with the other remaining factors staying constant.

Fiscal and monetary policies are two distinct economic instruments used by governments and central banks, respectively, as part of a nation's overall economic strategy to influence the performance of the economy as whole. Fiscal policy pertains to the government's budget measures; government revenue is collected through taxes and other resources, and spends through public spending. As well as, monetary policy pertains to the Central Bank measures that aim to control the supply of money in the economy.

Fiscal policy can be precisely defined as a tool that makes the government able to produce effects in the economy to achieve specific economic goals through decisions on taxing and spending, as fiscal instruments, over a defined period. In the same manner, monetary policy is the tool whereby the Central Bank can control the supply of money and the cost of borrowing through interest rate changes, as a monetary instrument, to achieve specific economic goal over a defined period.

In this context, beside the traditional instruments of monetary policy, which are: the discount rate, open market operations, and reserve requirements, the Federal Reserve Bank of the USA has developed new monetary policy instruments, during the recent financial crisis, these instruments, specifically, are: interest on reserve balances and a term deposit facility (for further details see, Hubbard and O'Brien, 2012).

In other context, there are several goals which economic policy makers are sought to achieve. These goals are economic growth, stability in price level, fair distribution of income, reasonable favourable balance in the balance of payments.

The distinguishing criterion in this regard, is that these economic goals should be achieved according to a hierarchy system, based on the level of development in the economy. For instance, the developed economies seek to achieve full employment, proper distribution of income, price stability, etc, mainly the developing economies, on the other hand, aim at achieving agreeable distribution of income, fighting inflation, and finding the appropriate solution to handling the problem of unemployment respectively. Therefore, each economy must have a system of priority for its goals (for more details see, Von Mises, 2006).

Several economists in both developed and developing countries have agreed that economic policy-making is a complex process that because it is designed to achieve the long list of objectives, as mentioned above. So, ''*in order to achieve these objectives, policy makers engage in the tasking process of processing* *information, articulating goals/targets, and choosing and quantitatively manipulating the instruments at their disposal''*(Soludo, 2002; 4-5).

In this context, there are many approaches have been proposed by the econometricians and, the economists for economic policy evaluation, as will be mentioned in detail in chapter six, (For more details see, Naylor, 1971; Intriligator et al, 1996; Pindyck and Rubinfeld, 1998; and Wieland, 2011). Some of these approaches using econometric models to assess the effects of alternative economic policies on the behaviour of an economic system, or econometric models approaches, while other approaches can be considered as special cases of the econometric approaches, and can be called the naive approaches.

The three of the naive approaches which are famous respectively are: expert opinion approach, the Delphi approach and disjointed incrementalism approach (Intriligator et al, 1996).

In respect of econometric model based approach, similarly, three of which are famous, and these approaches can be arranged as follows: firstly, the Tinbergen approach, secondly the Theil approach, and finally the policy simulation approach (Intriligator et al, 1996).

Furthermore, there are three important steps for making an economic policy: first, is a clear list of goals sought to be achieved, second is effects of alternative policies that should be examined and third evaluate these alternative policies and improve any drawback when found at any stage.

To implement all these steps, the best alternative in this situation is to build econometric models, which offer a logical simplification for complex chains of causes and effects among numerous variables that interact in the real economy (Howrey et al, 1981).

Moreover, it should be noted that the relationship between economic policy and econometric models is a close relationship, because the most important purpose of the econometric modelling among its main three purposes is to analyze the various economic policies impacts (Pindyck and Rubinfeld, 1998). This conclusion, made Soludo raises a very important question about the nature of the relationship between economic policy-making and the econometric models, whether this relation is Siamese twins or intellectual acrobatics (Soludo, 2002).

In this respect, Lang (1983) noted that ‘‘*the possibility that an econometric model misrepresents reality- because of specification or identification problems or because of the Lucas critique- does pose risks to economic policy-making*’’(Lang, 1983; 10). Nevertheless, he later expressed that ‘‘*when these problems are better resolved by the economics profession, economic forecasting and the formulation of economic policies will be able to be more a science, and less an art*’’ (Lang, 1983; 10). This is what exactly happened in the past decades, especially for policy formulations, where a wide variety of investigations particularly in relation to model selection, diagnostic tests, and time series properties of the data, are undertaken. In addition to the advancement that occurred in econometric "know-how" during the same period (Valadkhani, 2005 and Papanikos, 1991). Consequently, several economists and policy-makers have not been affected by these criticisms which directed the use of the econometric models in the analysis of economic policies. Moreover, they have relied on these models to forecast economic activity and to evaluate the potential effects of policy options, based on their knowledge of the usefulness of using the econometric models as a tool for policy analysis (Klein, 1947).

3.4.1 Economic policy transmission mechanism

When Ragnar Frisch highlighted the dynamic analysis of economics in 1933, he distinguished between two types of fluctuations, namely impulses and propagation processes. Impulses occur irregularly, but when they do occur, propagation process effects spread throughout the economic system (Meltzer, 1995). Later on, the economists replaced the phrase impulse with 'shock' and propagation with 'transmission'. Accordingly, we could say that ''*the transmission process describes how the economy responds to an impulse*'' (Meltzer, 1995; 49).

One must clarify the meaning of the transmission mechanism of an economic policy. This term can be defined as a channel that can be pursued by an economic policy instrument to influence real economic activity and inflation or, more accurately, as the way that one can track the impact of a change in an economic policy instrument on real economic activity and inflation.

The following section provides information from the economic literature for the two renowned types of transmission mechanisms of economic policy, namely the transmission mechanism of monetary policy (for more details see, Laidler, 1978). In addition to, this section briefly summarizes the transmission mechanism of fiscal policy in line with the relative importance given to the debate among economists about the transmission mechanisms of economic policy. These two types of transmission mechanisms will be employed when analysing the economic policy in Libya, later on in chapter six of this study.

Monetary authorities in any country are seeking through monetary policy to attain all economic targets assigned to it. Consequently, monetary policy is utilized as a tool to manage or influence monetary aggregates such as money supply, interest rates, and hence bank credit, including the exchange rate. In this regard therefore, the Central Bank in the pursuit of these goals sets intermediate objectives for monetary policy. In other words, these intermediate goals are regarded as channels through which monetary policy is transmitted to the whole economy with the aim of affecting all objectives (for more details see: Adao, Correia, and Teles, 2003).

Monetary policy, as mentioned previously especially in the short and medium term, is a significant tool, yet in some cases, it has unexpected and undesirable consequences (Kocherlakota, 2005). And also the monetary policy is a complicated topic, where ‘‘*different views of the monetary transmission mechanism are readily apparent in the many different models that monetary economists use to evaluate monetary policy*’’ (Taylor, 2002; 21). Therefore, the central banks must have a precise evaluation of their policy effects, and more specifically, ‘monetary policymakers must have an accurate assessment of the timing and effect of their policies on the economy’ (Boivin, Kiley, and Mishkin, 2010).

In his seminal work ‘the monetary transmission mechanism: an empirical framework’ John B. Taylor (1995) has an excellent survey of the research on monetary policy transmission mechanism especially on the interest rate channels. Taylor in this study defined the monetary policy transmission mechanism as “*the process through which monetary policy decisions are transmitted into changes in real GDP and inflation*” (Taylor, 1995; 11). This requires a deep understanding of the mechanism of monetary policy action in the economy, to eschew any unwanted effects in conducting and implementing the monetary policy (Mishkin, 1995). This implies that to carry this assessment out, monetary policymakers need to perceive the mechanisms through which monetary policy influences real economic activity and inflation (Boivin, Kiley, and Mishkin, 2010).

The conference of Financial Innovation and Monetary Transmission, which held in the Federal Reserve Bank of New York in 2001 concluded that *the process begins with the transmission of open market operations to market interest rates, either through the reserves market or through the supply and demand for money more broadly. From there, transmission may proceed through any of several channels* (Kuttner and Mosser, 2002; 16).

In this context, one can mention that although the main transmission channels of monetary policy theoretically and empirically were identified many decades ago, some features of these channels are still incomplete task; also, the differentiation between the influences of these channels on economic activity is very difficult due to the close relationship and interaction between them (Juks, 2004). Therefore, it should be taken into account that these channels are still subject to ongoing development in the economic research.

The next sections will introduce a compact overview of the major monetary transmission channels, which has received a lot of research attention in the economic literature. The section starts with the traditional interest rate channels, and then handles the channels induced by a view of other assets' prices that including foreign exchange rate channel and equity price channel which involve the effects of wealth on consumption and Tobin's q theory of investment. Finally, this section discusses the credit channel, which consists of the bank-lending channel and the balance-sheet channel.

The interest rate channel is the first mechanism at work in standard macroeconomic models. According to this transmission channel an increase in nominal interest rates, leads to increase in the real rate of interest and the user cost of capital, which in turn translates to a delay in consumption or a reduction in investment spending or both (Kuttner, and Mosser, 2002) and thereby lowering the aggregate demand and output. The fundamental assumptions behind this proposition are based on the belief that monetary policy, such as a change in the short-term of official interest rate, has an impact on short and long term, nominal as well as real interest rates that in turn affect consumer and investment spending, aggregate demand, and output (Mishkin 1996). In the same manner, this means that the interest rate channel is reliable only if firstly, the Central Bank has influence over the short and long-term real interest rate, which in turn requires the presence of nominal rigidities (i.e. sticky prices) in the economy under consideration (Juks, 2004). Secondly, it is reliable only if the aggregate demand components are sensitive to the interest rate changes.

Many economists including Bernanke and Gertler (1995) argue that, the availability of the interest rate channel assumptions lies in the fact that the economic response to the policy resulting from interest rate changes is frequently larger than implied by the common estimates of the interest rate elasticities of consumption and investment (Bernanke and Gertler, 1995). This implies that ‘‘*mechanisms other than the narrow interest rate channel may also be at work in the transmission of monetary policy*’’ (Kuttner, and Mosser, 2002; 16).

Furthermore, Bernanke and Gertler (1995) concluded that ‘‘*empirical studies have had great difficulty in identifying significant effects of interest rates through the cost of capital*’’ (Mishkin, 1996; 4), and that the empirical failure of transmission mechanisms of interest rate channel have encouraged the motivation to find another channels of monetary policy transmission mechanisms, especially the credit channel(Mishkin, 1996).

In addition to bonds which have earned the most attention in the Keynesian economic model, there are two influential assets which also have obtained great attention in the transmission mechanism literature, namely equities and foreign exchange. Transmission mechanism of equity prices in turn includes two important channels, which are the effects of wealth on consumption and Tobin's ‘q’ theory of investment.

The effects of wealth is regarded as one of the oldest transmission channels of monetary policy, where, its roots back to the earliest literature that advocated Keynes' General Theory. In addition, Pigou and other economists earlier perceived that variations in consumer spending which induced by changes in the real value of the money stock could help to bring an automatic stabilization to an economy exposed to fluctuations of inflationary and deflationary forces (Ludvigson, Steindel, and Lettau, 2002). According to this transmission channel, an expansionary monetary policy reduces the interest rates, which make bonds less attractive compared with stocks and result in increased demand for stocks, which heighten stock prices. In the same manner, interest rate cuts make it (stocks) cheaper to finance housing that in turn leads to increasing of the real estate prices.

Subsequent works, notably by Modigliani (1963, 1944) and Patinkin (1965) elucidated that the real balance effects could stabilize the economy at full employment. In addition to, Modigliani and Brumberg (1954, 1980), and Ando and Modigliani (1963) expanded this theoretical debate on the real balance effect into a thoughtful analysis of the influence of changes in wealth propelled by monetary policy, where in the life-cycle model, Modigliani emphasized the crucial role of household wealth in determining spending on nondurable goods and services. Life-cycle theory states that consumption is determined by the consumer's life-cycle resources that consist originally of financial assets, primarily stock, and real estate. Interest rate reductions entail an increase in stock and real estate prices and accordingly boost household wealth. In the meantime, consumer's lifetime resources expand, in turn raising consumer spending and aggregate demand (Ludvigson, Steindel, and Lettau, 2002).

It is worthwhile noting that the extent of the effect of wealth is still disputable as Mishkin (2001) argues that fluctuations in the values of financial assets also change the liquidity of households. This change in turn affects the readiness of households to possess non-liquid assets and hence influences expenditure on durable goods. Therefore, the change in financial prices changes wealth and thereby consumption; but there is also a second round of expenditure change due to the liquidity effect (Mishkin, 2001).

In fact, wealth channel is one of two different types of transmission mechanisms involving equity prices, where, the second channel as mentioned previously is the investment effects. Tobin's 'q' theory has explained investment effects, which defined as the market value of firms divided by the replacement cost of capital. According to this theory, if 'q' is high that means new plant and equipment capital is cheap relative to the market value of firms. This in turn means that investment spending will rise because firms can buy a relatively large amount of new investment goods with only a small issue of equity. An interest rate cut entailing a rise in equity prices will therefore reduce companies' capital costs and consequently enhance investment expenditure. The source of strength in Tobin's 'q' theory lays in its consistency and compatibility with the economic analysis of both of the Keynesian and monetarist theories on how monetary policy affects the equity prices (Mishkin, 1995).

The foreign exchange rate, besides equity, is regarded as an important asset that has obtained a great deal of attention in the economic literature on the monetary policy transmission mechanism. It is an important factor in standard open-economy macroeconomic models, although it is often neglected in the closed-economy models (Kuttner, and Mosser, 2002). According to the chain of transmission of this channel, interest rates run to the exchange rate ''*via the uncovered interest rate parity condition relating interest rate differentials to expected exchange rate movements*'' (Kuttner, and Mosser, 2002; 17). Therefore, an increase in domestic real interest rates on the domestic currency, make the deposits of domestic currency more competitive compared with foreign currency deposits. This will lead to improvement in domestic currency exchange rate and increases the domestic price levels, thereby lowering the net exports and hence the overall level of aggregate demand and output (Kuttner, and Mosser, 2002, and cf, Mishkin, 1995).

The information problems in financial markets can be ascribed to the frictions that occur in the costly enforcement and verification of financial contracts these problems can be ascribed to asymmetric information. These problems have led to arising and analysis of new channels of monetary policy transmission mechanism based on the credit market failure. In this regard, there are two channels of transmission mechanism which have appeared because of asymmetric information in credit markets, namely: the bank-lending channel and the balance-sheet channel.

Bank-lending channel is the first channel built, based on the assumption of banking system's ability to solve the problem of asymmetric information in the credit market. This channel roots back to Roosa in 1951, and was revived again in the seminal paper of Bernanke and Blinder in 1988 (Kuttner, and Mosser, 2002, and cf, Handa, 2009).

It is understood that commercial banks play an important role as the best financial intermediary between savers (lenders) and investors (borrowers). Since there is no perfect substitution for commercial banks' deposits with other funding sources, the bank-lending channel of monetary transmission is transmitted as follows: increases in bank reserves and bank deposits, through the expansionary monetary policy, increases the available quantity of bank loans, which will increase investment spending and probably increase consumer-spending (Bernanke and Blinder 1988, and cf, Mishkin, 1995).

The most important result according to this theory is that the role of commercial banks in economic activity will be enhanced. Where, based on transmission mechanism of this channel, a significant number of small firms will depend mainly on commercial banks in financing their activities, compared with big companies that can directly depend on the stock market to finance their projects.

Finally, balance sheet channel provides an additional theory concerned with asymmetric information in the credit market. According to this theory, monetary policy influences the firms in three different ways. Each of which depends mainly on minimizing the serious consequences of adverse selection and moral hazard, that arises as a result of frictions in the credit market due to asymmetric information (Mishkin, 1995).

Based on the mechanism of the first way, equity prices drop, due to money supply decreasing (as a contractionary monetary policy), leading to reducing the net worth of business firms, which in turn forces firms' collateral down and their ability to lend, and hence decreases the investment expenditure and aggregate demand. While, as the second way, contractionary monetary policy affects (enhance) the nominal interest rate, and shrinks cash flow of firms, which worsen their balance sheet. This by the same manner will lower the collateral for lending, and reduce investment expenditure and hence, decrease aggregate spending and demand (Mishkin, 1995; and cf, Kuttner, and Mosser, 2002).

Third channel of balance sheet transmits into the economy through the impact of monetary policy on price levels. Where expansionary monetary policy will increase general price levels, thus easing the onus of debt, Since debt repayment agreement implies that all debt instalments be paid in fixed nominal terms, this will boost the net worth of firms, which increases investment spending, and higher aggregate demand (Mishkin, 1995). In this regard, it should be noted that this theory deals with the nominal interest rate instead of the real interest rate, which has been discussed in previous theories. Where, the nominal interest rate in the short term has a prominent role in this theory because the interest rate in the short term has an important influence on the cash flows of the firms.

Despite the importance that is given to the role of the monetary policy in developing countries, nonetheless the transmission mechanism of this policy has not been given the same amount of attention, and has thus became vague and indefinite (Montiel, 1991).

Unquestionably, the transmission mechanism of the monetary policy in the developing countries has different considerations, where the nature of developing countries imposed chancy outcomes about how monetary policy influences the economies of these countries. As well, it has highlighted the transmission mechanism of the monetary policy as a whole, how is it different, or compatible with the existing mechanisms in developed countries.

The effectiveness of the channels of transmission of economic policy, is determined mainly, by the status and degree of evolution of the financial systems and the market's components in these economies (Neményi; 2005). For further clarification, it could be argued that,

the relative importance of each channel may differ from one economy to another depending on a number of factors including the underlying structural characteristics, the state of development of financial markets, the instruments available to monetary policy, the fiscal stance and the degree of openness (Mohan, 2008; 295).

The structural changes and the limits of the financial market are considered to be the most prominent features in developing countries putting a heavy burden upon the process of the transmission mechanism. Where the structural changes lead to the creation of a state continued volatility of the inside lag period of the economic policy, namely the lag of recognition period and the lag of implementation period. Additionally, these changes significantly affect the elasticity of these policies (Neményi; 2005). Consequently, this makes the relationships between the monetary policy measures and the rest of the macro variables in the economy, in such a financially curbed economy not clear.

Needless to say that, the financial market is like any other market in the economy. It reflects the relationship between prices such as interest rate, the price of stocks and bonds in addition the exchange rate, and the quantities such as money supply, quantities of stocks and bonds on the market in addition the foreign currency and assets available at the Central Bank. Additionally, the Central Bank is the main player in this market, which, through open market operations, could manage an important part of monetary policy.

This market as explained previously is the principal means where most of the transmission channels of monetary policy in the economy are active through. Therefore, the absence of such a market, or being inefficient is an obstacle in the way of these channels. To describe this situation accurately, Peter J. Montiel (1991) stated that,

in developing countries, the structure of financial markets makes the operation of such a mechanism much more problematic. In the first place, the menu of assets available to private agents is limited. Organized securities markets in which the Central Bank can conduct open market operations simply do not exist in many developing countries (Montiel, 1991; 84).

This certainly does not mean that monetary policy has no importance in developing countries, but it works within specific considerations, as mentioned previously.

In the past, there was a consensus on two approaches about how the transmission mechanisms of monetary policy work in the developing economies environment, namely the McKinnon-Shaw approach and the neo-structuralists approach (Montiel, 1991). These two approaches emphasized the importance of the interest rate channel as a main instrument through which the monetary policy transmitted into the economy, despite it is not fully sensitive to interest rates.

The choice of this channel due to the assumption that was mentioned earlier when deals with channels of transmission of monetary policy in detail, which emphasizes the ability of the Central Bank to control interest rate, which is exactly what is happening in the case of developing countries. Central Bank in most of these countries controls the bulk of monetary variables that are available.

Although the consensus is that the interest rate is the main channel that transmits the impacts of monetary policy, these two approaches differ in the manner of the transmission mechanism and in its outcomes (Montiel, 1991).

McKinnon-Shaw's supporters acknowledged that the interest rate would affect the economy through savings (bank deposits). because in the rationing system, the stimulus of savings by increasing the interest rate on deposits, leads to raise the supply of credit, which facilitates in turn the financing of private investment or working capital, or both. It is worthwhile noting that any increase in deposits interest rate will not be a contractionary monetary policy, as referred in the conventional economic theory, but it will be an expansionary policy (Fry, 1989).

In contrast, the adherents of new structuralists approach emphasize the importance of the role of informal credit markets in developing economies; especially those that impose a legal ceiling on the interest rate cannot be exceeded. The analysts in this approach showed, that the increase in interest rate, in such a situation, will draw the funds away from the informal credit markets, and this limits their ability to grant the credit because of the increase in the marginal cost of loanable funds. This reflected in the end, the creation of a state of contraction (Montiel, 1991). In addition to the theoretical framework of these two approaches, which have been clarified previously, there are several other mechanisms for the transmission of monetary policy in developing countries. These include the wealth effect channel that figured through variations in these economies, due to the changes in financial curb degrees as well as the impact that works through the premium in the free exchange markets, which in turn arise because of expectations about inflation, and because of changes in the available foreign assets in the economy.

Compared with the abundance of economic literature which addresses the monetary policy issues, in contrast, one would find a fraction of this literature concerned with the fiscal policy issues. Specifically, the transmission mechanism of the fiscal policy (for more details about this mechanism see: Perotti, 2008), this in spite of its momentousness, especially in the past few years after the growing interest in the so-called new consensus of macroeconomics (Fontana; 2009), where the visions correspond with the neo-classical school and the new Keynesian school tenets.

Based upon this, the following sections will address the fiscal policy transmission mechanism in briefly.

When one deals with the fiscal policy transmission mechanism, the contemporary economic literature has a several streams of thought (Kutspeli, 2005; and see Baldacci, Arye and Kojo 2003). The first stream is the neo-classical theory that alleges the expansionary fiscal policy will have a contractionary impact on the economy in the end where the effects of this policy are transmitted into the economy through interest rate mechanisms (Kutspeli, 2005). The mechanism of this channel could be described as follows: when government, intends to adopt an expansionary fiscal policy, government spending will increase. Therefore, according to the neo-classical theory, interest rates rise to maintain the equilibrium in the capital market, and this increases the market interest rates which affects all the interest-sensitive components of the aggregate demand, especially private investment expenditure and eventually decreases output and inflation (Kutspeli, 2005). In fact, this, because of the main pillar of the classical schools, is hypothesized that the economy is operating on full employment level (all available of production resources are employed). Therefore, the ultimate impact is to increase prices of the production resources, due to the competition between different sectors, to ensure that these resources will remain in a particular economic activity. Accordingly, this theory conceives that the government expenditure will crowd out the private sector investment.

In a concise manner,

government expenditure crowds out private investment. Higher government expenditure, whether financed with taxes or debt, increases the demand for goods and services, raising interest rates, making capital more expensive and, as such, reducing private investment (Ahmed, and Miller, 1999; 4).

The second stream of thought about the fiscal policy transmission mechanism is the new Keynesian school, which could be applicable in developed and developing countries alike (Ahmed and Miller1999), compared with the first stream of thought, which is fully consistent with the economies of developed countries. This theory assumes the absence of full employment in the economy; in addition, it believes that investment is not very sensitive to interest rate. Therefore, based on this school of thought the increase in government spending will raise the aggregate demand. This theory confirms that the expansionary fiscal policy will increase the interest rate by a small amount, which cannot affect in investment spending, but will increase production and income significantly.

The advocates of this theory assume that the increase in public spending will lead to an increase in private investment, because of the positive impact of public spending on investors' expectations, due to the investors believe that the expenditure will be reflected either, in increase income and thus increase demand, or to improve the infrastructure to stimulate investment. In contrast, the neo-classical theory, the New Keynesian School supposes that the expansionary fiscal policy will crowd in rather than crowd out the private investment **(**Bahmani, 1999).

Third, there is another stream of thought that believes the fiscal policy has a neutral influence on the economic activity, in particular when it is financed by issuing new public debt. The theoretical framework underlying this idea is the so-called Ricardian equivalence proposition[7]. In fact, many economists believe that this proposal represents a third stream of thought pertain to the fiscal policy transmission mechanism.

David Ricardo (1820) was the first to propose the idea that concerned with the effects of public spending finance, and the economist Robert Barro revived it again in 1989 (Barro; 1989).

The basic idea underpinning this mechanism is that the process of financing government spending through public debt will increase the expectations of the public about the possibility of raising taxes in the future. Moreover, this leads to increase labour supply, based on the workers' desire to increase their income, to meet the expected increase in future taxes, which in turn, reduced real wages, consumption and along the entire economic activity (Fontana; 2009).

The finances of public spending by issuance public debt or through tax increases would have eventually the same effect, because the public debt must be repaid in the future, which means that the government will increase the taxes. Therefore, this makes the only available option to the government, either taxes now or taxes later. Worthwhile noting that, Ricardo himself, due its insignificance in practice,

7 There are some criticisms directed to Ricardian equivalence theorem, for more details, see, (O'Driscoll, 1977).

criticised this idea, because he distrusted some of the theorem's assumptions (Barro; 1989).

It is worthwhile to mention finally, that there are argumentative perspective debates on the subject that fiscal policy is dominant factor in economic activity, not monetary policy. This perspective is called fiscal theory of price level but it must be borne in mind the extent of the criticism that is directed to its theoretical foundation (for derails see, Buiter, 2001, and 2005). According to this theory, the amount of public debt is the main factor in determining the level of prices, since the primary function of fiscal policy in this case is ‘‘*it equates present value of its outstanding debt and future fiscal surpluses*’’ (Basic, 2007; 4).

3.4.2 The interaction between fiscal and monetary policy

The most important aspect in the context of the economic policy achievement is how the monetary and fiscal policy accomplish their assigned objectives in an optimal way. The famous Sargent and Wallace study titled “some unpleasant Monetarist arithmetic” is considered the cornerstone of the revolving debate about economic policies implementation; the authors, in this study explained that monetary policy does not have any influence on inflation, both in the long or short term, in the absence of favourable fiscal policy measures (Sargent and Wallace, 1981). This explicitly led to an emphasis on the importance of interaction (coordination) between fiscal and monetary policies.

Traditionally, these two policies have pursued to achieve different targets in different directions. While monetary policy seeks to achieve the goal of reducing inflation, and works to stabilize the economy of production and price shocks, in contrast, the fiscal policy directs towards increasing growth and employment, even at the expense of increasing the rates of inflation (Raj, Khundrakpam, and Das, 2011).

Furthermore, as it is already mentioned above, that these policies are implemented through different agencies namely: the Central Bank and the Treasury. This, in turn, will affect the independency of these two policies; this means that neither the Central Bank nor the Treasury has full control over its instruments of economic policy or over the ultimate impact of these instruments (Lambertini, 2006). Accordingly, a change in one will influence the effectiveness of other policy, and because of that, the final influences of the policy, as mentioned, will deviate from the range of expectation (Hilbers, 2004). Consequently, ‘‘*that is why it is crucial to pursue a consistent monetary-fiscal policy mix and coordinate these (and other) policies as much as possible to avoid tensions or inconsistencies*’’ (Hilbers, 2004; 3). To achieve an optimum mix of macroeconomic targets, such as increased growth while maintaining price stability, it is necessary that, these two policies to have a complementary relationship, or at least they could coordinate their measures (Raj, Khundrakpam, and Das, 2011). It should be noted here, that the degree of complementarities or coordination between the policies depends on the development of the financial institutions in the economy under consideration (Hilbers, 2004).

In accordance with this, Chari, Christiano, and Kehoe (1991) argue that fiscal and monetary policy in order to be optimal must show certain characteristics, concerned with the extent of their interaction (complementary not substitutive policies) in the model under consideration (Chari, Christiano, and Kehoe 1991; Chari and Kehoe, 1999).

There are two groups of research which have appeared in the economic literature concerned with the revolving debate about economic policies interaction. The first of these is so-called fiscal theory of inflation, and it has developed thereafter to the fiscal theory of the price level. This group is mainly interested in how the interaction of fiscal and monetary policies influence on public debt as mentioned previously (Merzlyakov; 2011).

The second group is concerned with the optimal strategic interaction of the two policies. The advocates of this stream questioned the assumption that the coordination between fiscal and monetary policies is always effective. They argue that may be ineffective due to ‘‘*the wide range of instruments available by which fiscal and monetary authorities may achieve the major goals of stabilization policies*’’ (Merzlyakov; 2011; 1).

This approach has two criticisms. The first states that fiscal policy while achieving its goals attains, at the same time, traditional monetary goals. This mechanism highlights the government funds an expansionary fiscal policy by borrowing from the Central Bank this process influences the monetary base and thus affects the money supply. According to this criticism, fiscal and monetary policy interaction affects the regularity of inflation and, more importantly, influences the stability of public debt (Merzlyakov; 2011).

The second criticism clarifies that there is a compromise between the goals of the fiscal and monetary policies, where the critics noted that the independence of monetary and fiscal authorities might not automatically guarantee to achieve the desired goals optimally. The critics of this approach believe that,

efficient interaction between the government and the Central Bank is possible if both have identical goals (output approaches social optimum and prices are stable) or if their goals are strictly separate (the Central Bank is concerned only with the price level, and the government is concerned only with optimal output) (Merzlyakov; 2011; 2).

3.5 Conclusion

This chapter provided a general theoretical framework, which is considered a necessary prelude for the next chapter. By addressing a partial framework for specification of the model of this study, unquestionably, this chapter presented the theoretical ground for econometric models construction, and focused on some characteristics of the economic modelling process in general, as well as it also briefly deal with economic modelling in developing countries in particular. The second part of this chapter focused on one of the most important uses of econometric models, namely, the analysis of economic policies. Where it explained, briefly, the nature of interrelationship between economic policy and econometric models, in order to do so, it has focused on the remaining part of this chapter on the fiscal and monetary policies transmission mechanism, as it, shed light at the end, on the mutual interaction between these policies.

CHAPTER FOUR: LITERATURE REVIEW (2): THE MODEL SPECIFICATION

4.1 Introduction

The previous chapter dealt with the broad lines that underpin the process of econometric models' building. This has been achieved by clarifying the solid bases, which might affect this process in the developed and developing countries alike. Moreover, chapter three paved the way for the current chapter by providing some details on various economic policies.

This chapter plays an important complementary role in the process of building econometric models, as it explains the theoretical basis that is relied upon in identifying the various relationships in the model, whether between the different models' blocks, or between the equations comprising these blocks. It has been customary in this kind of empirical study to provide theoretical support for various economic relations in the model; this gives justification for an explanation of general framework of these relations. It is not possible, in such studies, to take into account any variable without having a theoretical basis.

This chapter aims, as noted above, to provide a theoretical specification of all the relationships contained in the econometric model for this study. To achieve this goal, this chapter has been divided into four main sections. The first part provides a prelude to the theme of the chapter via this introduction, and the second part provides that which will be considered the backbone of this chapter, the specification of the model, through the study of the economic relationships between the multiple variables and the equations that are contained in the six blocks of this model. Portraying the model in its final form, to facilitate the comparison of its various parts, will be expounded in the third part. Moreover, the last part will summarize, briefly, what has been presented in this chapter.

4.2 Specification of the Study Model

Having specified the main structure of the Libyan economy in chapter two and completed the preliminary theoretical background for the current model in the previous chapter. The following sections present the relationship between the variables involved in an equation, and identifies the relationship between the equations of the model as a whole; this information falling mainly under the so-called specification of the study model. Therefore, these sections will provide an overview of the literature relating to the macro-econometric modelling that concerns the present empirical model of the Libyan economy.

The present model is a small and highly aggregated macro model. It can be divided into six blocks: aggregate demand, balance of payments, aggregate supply, prices, public finance, and money supply. There are 38 endogenous variables, 16 behavioural (stochastic) equations, and the rest are identities. The full model consists of 64 variables in total, and there 24 are exogenous variables with the exception of the lagged variables.

The behavioural single equations have been estimated, as will be seen later when estimating the single equations of the model in the next chapter, using PcGets (Autometrics) in PcGive software; (see Doornik and Hendry 2007; see also, Doornik, 2009). A brief specification of the equations in each block of the model is given in the following subsections below.

4.2.1 Aggregate demand block

The aggregate demand component in this study consists of the total consumption expenditure that can be classified into the demand of real private consumption CPR and government consumption CGC; in addition, investment is represented by one stochastic equation, which is the non-oil private investment expenditure $IPNOILC$, and one identity for the real capital stock in the non-oil sector

KNOILR. Finally, the imports and exports are represented by three behavioural equations viz. real imports of consumer goods *IMCONR*, real imports of capital goods *IMCAPR* and oil exports, in millions of barrels *EXOILMB*, and one identity, which is the oil export in millions of Libyan dinars *EXOILC.*

4.2.1.1 Consumption expenditure

As mentioned above, there are two consumption equations in this block, the first is the real private consumption, and the other one is current government expenditure on goods and services. A discussion of these two equations will be undertaken in the following two subsections of the model.

4.2.1.1.1 Private consumption spending *(CPR)*

Consumer spending is one of the most salient elements of expenditure on GDP at the macroeconomic level, in developed and developing countries alike, in line with the objective of consumption maximizing, which is considered the axis of economic activity, whereby improving the standard of living is one of the most important goals pursued by all the world economies. This importance has been clarified through the controversy that accompanied the explanation of the consumption phenomenon, whereby many authors and economists contributed in the interpreting of this phenomenon in an attempt to explain the factors that affect consumer behaviour (for more details see Ferber, 1973). Unquestionably, the debate concerning the explanation for consumption expenditure behaviour dates back to 1930s and four fundamental hypothesises have emerged since that time.

These attempts clearly started when Keynes proposed in his book (‘The General Theory of Employment, Interest Rate and Money’ that was issued in 1936) his theory of consumption, which was called the theory of absolute income (AIH). This theory has shown that disposable income is the main interpreter of consumer behaviour through the interaction of some psychological factors for consumers. Keynes noticed that consumer spending depends on income level, where ‘‘*men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income*’’ (Ferber, 1973; 1304). This proposition was developed through casual observations whereby Keynes concluded that there is a marginal propensity to consume less than the average propensity, which became the basis of his general theory later on.

The absolute income theory (AIH) has played a major role in determining the levels of employment and income; Keynes has made this theory as one of the main parts of the theory of macroeconomics through the relationship between consumption and saving and also through the impact of saving on investment (Glahe, 1973). This theory has had the greatest impact on the emergence of many theories and applied studies, which deal with the phenomenon of consumption. Contributions made by other authors’ studies were initiated in order to test the hypotheses that were created by Keynes, on the one hand, and to develop and test new hypotheses that could fit the practical reality on the other.

Furthermore, it could be argued that the essential point in the explanation of the phenomenon of consumption in all the theories and empirical studies that have emerged since the theory of Keynes have, up until now, revolved around defining the concept of income, as well as clarifying the relationship of this concept with social and psychological factors in order to explain an individual’s consumer behaviour.

At the outset, the first of these contributions was that which were put forward by Duesenberry and Modigliani independently in 1949 (Ferber, 1973) which advanced the relative income hypothesis (RIH). Duesenberry and Modigliani assumed that consumption by any person is related to relative income. They separately concluded that income is relative when compared with the highest prior value of the income, taking the perspective of time series' analysis into account. This means that consumer spending depends on the highest income in the past. Moreover, this income is relative to the position of the person in the distribution of income for his surrounding reference group which deals with cross section analysis. In fact, the first proposal for the cross section formula was by

''*Dorothy Brady and Rose Friedman who suggested that the saving rate of an individual depends not on the level of his income but rather on his relative position on the income scale relative to the income of a reference group*'' (Ferber, 1973; 1305).

In other words, therefore, low income does not lead to lower consumption in the short term significantly, although it increases appropriately with increasing income in the same period.

Based on the previous presentation of this theory, one can say that consumer behaviour follows the pattern of relative consumption function in the long term and the pattern of proportional consumption function in the short term.

In addition to the theory of relative income, Brown's theory of permanent income (Brown, 1952), later demonstrated by Friedman (1957), showed that customs and traditions have control on consumers' thinking to the extent that they affect their behaviour and then become affected by inertia. Friedman explained that absolute income (current) is not the determinant factor of consumer spending but it is determined by permanent or fixed income (Y_P). In this regard, Friedman stated that ''*the consumer plans his expenditures not on the basis of the income received during the current period but rather on the basis of his long-run or lifetime income expectation*''(Ferber, 1973; 1306).

It is noted that permanent income can be increased or decreased regardless of the amount of measured income, which is obtained by individuals during any period. This can be happen by increasing or decreasing the temporary or transitory income *(Y_T)* which results from non-periodic and inconstant circumstances. In addition, Friedman divided, in contrast to, the above theories, consumer spending into: permanent consumer spending *(C_P)* and transitory consumer spending *(C_T).* Furthermore, he assumed that there is no correlation between *(YP)* and (Y_T), between *(C_P)* and *(C_T)*, or between *(Y_T)* and *(C_T).*

Lastly, Friedman in 1957 asserted that consumption is proportional to permanent income, i.e. consumption is a fixed percentage of the permanent income whereby

the key relationship is that permanent consumption (C_P) *is a linear multiple (K), of permanent income* (Y_P) *. To Friedman, the multiple depends on the interest rate, on the ratio of non-human to total wealth and on a catchall variable, which includes age and tastes as major components* (Ferber, 1973; 1306).

Finally, the theory of life cycle for Modigliani and his associates (Modigliani and Brumberg, 1954, and Ando and Modigliani, 1963) is one of the prominent contributions in explaining the behaviour of consumption. This theory takes into account the income during a lifetime in determining the consumption during the same period. According to the LCH,

people distribute their consumption over their life cycle in order to maximize utility during their lifetime. That means dissaving when they are just starting out, saving during peak earning years, and then dissaving again during their retirement years (Evans, 2004; 129).

When the consumers know the level of their income during the lifetime, accordingly, they will be able to calculate the optimal consumption at any given time by maximizing their utility function, which consists of both the current and postponed consumption (in the future).

This analysis clarifies that the wealth of consumer plays an important role in the interpretation of their behaviour. Therefore, wealth is considered as one of the influential independent variables in the consumption function (for more detail see Spiro, 1962, and Evans, 1967) and its impact should be taken into account.

There are two new revisions for the theory of consumption have emerged in economic literature after the theory of life cycle, namely the theory of random walk (Hall, 1978), and the implementation of behavioural economics (Mishkin, 2012).

There are two new revisions for the theory of consumption have emerged in economic literature after the emergence of the theory of life cycle, namely the theory of random walk (Hall, 1978), and the implementation of behavioural economics (Mishkin, 2012).

In the theory of random walk, Hall argued that consumer spending is not predictable; therefore, it follows the random walk pattern. There are four logical steps, which underlie the random walk hypothesis: firstly, most consumption theories, especially the permanent income and life cycle hypotheses, built their assumptions that consumers' behaviour is based on future income using this expectation to determine their lifetime resources. This hypothesis states that lifetime resources are quantified by expectations of the future income (Evans, 2004). Secondly, depending on the first assumption, the expectation about lifetime resources will vary only if future income expectation changes. Thirdly, according to these above assumptions, consumption will change only if these expectations changes. Finally, this hypothesis depends on the rational expectations' pattern, where all the assumptions are derived from the available information; therefore, any unanticipated variations in this information will lead to changes in consumption. The main implication of this hypothesis is that it is very difficult to control consumer spending through certain economic policies (Mishkin, 2012).

Behavioural economics is, also, a new stream in economic research and it borrows its concepts from other social sciences, especially from sociology and psychology. Some economists have utilized social and psychological concepts to explain consumer spending behaviour. The basic idea behind the theory of behavioural economics is the doubt of its advocates in the ability of consumers to describe their desires and behaviour accurately, and thus the failure to represent their optimal behaviour in the right manner and to achieve their goals easily.

According to previously mentioned theories, variables such as disposable income, disposable income in the previous period, consumer spending in the previous period and the wealth of individuals, are important variables in explaining consumer behaviour. One can find these variables in most of the practical studies concerned with the explanation of consumer behaviour at the macro levels.

However, in addition to these variables, there are other variables which have been included in some studies including demographic factors such as population, age, life expectation and family distribution (Evans, 2004). In addition, the division of disposable personal income into employment income and property income has had an effect on the interpretation of the behaviour of consumption. Some studies have also indicated the importance of the pattern of distribution of income in determining consumption levels (Evans, 1969) as well as the importance of some of qualitative factors relating to consumer tastes which have a role in explaining consumption behaviour (White, 1978).

In addition, the general prices level (Klein, 1979), the interest rate (Weber, 1970) the availability of credit and future income play an important role in determining consumption (Evans, 2004). Some economists have confirmed that pent-up demand, which results in certain circumstances such as wars and economic crises, leads to an increase in the consumption of goods that have been affected by such circumstances. This factor is affected by the availability of durable goods and the role of expectation in influencing the behaviour of consumption.

The consumption equation in this study depends on disposable income, lagged disposable income (i.e. disposable income in the last period); consumer spending in the lagged period and liquid assets (expressed in the money supply as a proxy for real private wealth). All the variables are expressed in real values (the base year is 1990) to explain the behaviour of consumption during the study period.

$$LCPR = F\,(LCPR\_1,\ LYPDR,\ LMSR)$$

Where:

$LCPR$ = private consumption expenditure on goods and services, in real and natural logarithms,

$LCPR\_1$ = lagged real private consumption expenditure on goods and services, in natural logarithms,

$LYPDR$ = Real personal disposable income, in natural logarithms, and

$LMSR$ = Real money supply, in natural logarithms.

This study assumes that consumption is positively related to lagged real private consumption expenditure, real personal disposable income, and real money supply; therefore, it expected that these variables' parameters would be greater than zero.

4.2.1.1.2 Government consumption spending *(CGC)*

The state in developing countries, such as Libya, plays a key role in the economy as a consumer and a producer alike. Additionally, it, directly and indirectly, drives the economy through its policies and profoundly influences economic activity in the country as a whole. This is due mainly to the fact that the private sector in most developing countries (and Libya is not exception) is still in an embryonic stage and does not have the ability to fulfil a vital role in the country's economy.

It is worthwhile noting that a balanced government budget was one of the main goals that was sought to be achieved by the makers of economic policies in most countries of the world. However, the budget now is employed as the main tool for economic policy, where it is intentionally utilized to achieve a surplus or deficit to reach certain goals. This intentionality in handling the budget is what is so-called, in economics, a fiscal policy.

In a similar manner, public spending is considered the most fundamental tool of the public budget and fiscal policy, whereby the government seeks (in addition to taxes and public debt) to achieve certain economic goals, such as increasing income, production and employment.

According to the theory of public finance, many categories can be taken into account when studying the behaviour of public spending. However, taxonomically, public spending can be divided into two major categories. Firstly, public consumer spending on goods and services, and secondly, public investment' spending on goods and services. These categories of spending constitute the government demand for the available real resources of the economy, which consists of public employees' compensations, and government purchases of consumer and investment goods.

In this respect, it could be argued that the use of public spending as a tool in economic policy is not a new precept. As it originated from the contributions of Keynes during the Great Depression, whereby the prevailing view in that period was that the government could not spend more than its revenue because a budget deficit leads to increased public debt and then to inflation, unquestionably both of which are undesirable outcomes. In addition, changes in public spending are not free of adverse effects, as assumed by some studies (Heijdra, Ligthart and Ploeg, 1998), where it has been shown that public consumer spending is included in the private utility function through the direct crowding-out effect of public consumption spending.

More accurately, some studies attribute the problem of inflation, the accumulation of public debt, the disappointing investment performance, then the slowing down of the process of economic growth to the distorted intervention of the government in the conduct of the economy, which results in an imbalance in the government sector (Easterly and Schmidt-Hebbel, 1994).

However, Keynes explained that spending creates demand. This demand in turn, will lead to increased production because an increase in both public consumer spending and public investment spending will lead to an increase in personal incomes and, in turn, to an increase in private consumption. This will be through the initial increase in the multiplier of spending without having any adverse impact on the marginal efficiency to invest in the private sector. In other words, according to Keynes, the net influence of government spending is to increase the national income. Moreover, other studies conducted by Hall (Hall, 1980) and Barro (Barro, 1981, 1997) have also concluded that an increase in government consumption leads to increases in output and employment alike.

In fact, public spending is treated, especially in the Keynesian theory, as a stimulant to activate the private sector, which means that initial public spending is directed in order to spur economic activity. This is accomplished through encouraging the increase in private investment by injecting a purchasing power or establishing new infrastructure, which works through ‘external economies’ to increase (crowd in), not replace, private investment. On the other hand, public spending might be treated as a compensatory spending to replace (crowd out) private investment spending when the latter is unable to play its role.

Therefore, it should be noted that the source, which is relied upon to finance spending has a great impact on the results that could be predicted from this spending. The impact on income and prices can differ depending on the source of the funding, for instance, the impact of funding through a tax levy differs when compared to financing through the sale of bonds (borrowing from public) or by issuing money.

Departing from this basis, the monetarism school shows that the financing of budget deficit through domestic borrowing, especially borrowing from the Central Bank, or by issuing money, will cause inflationary pressures as well as leading to increased interest rates. Also, the financing of expenditure (budget deficit) by external borrowing in turn leads to an imbalance in the balance of payments and may cause, in the end, a negative impact on the exchange rate (Matlanyane, 2005).

With respect to the variables that explain the behaviour of public expenditure, some of the famous models (see, for example, Rasche and Shapiro, 1968; Steindi, 1971; Aghevli and Khan, 1980) have linked the desired level of government spending with the desire and the ability of society to pay. This is represented in tax rates as a source of financing for public expenditure (Rasche and Shapiro, 1968), in addition to government borrowing as an important determinant of public spending.

In addition, one of the prominent factors that affect the level of public consumer spending is the population growth (Ando, 1974) which is represented in the increase in demand for services that are provided by the government (Chu, 1988). Furthermore, some models indicate that nominal government spending adjusts proportionally to the difference between government spending that is targeted by the government and the actual level of such spending in the last period (Khan and Knight, 1981). Moreover, it is logical to assume that a government, in the long term, decides to increase their spending in parallel with the growth in nominal income.

Furthermore, some studies (Ando, 1974) show that real consumer spending and the level of real income are considered as important variables in explaining the behaviour of consumer public spending. Moreover, public consumer spending in the previous period and the general price level (Aghevli and Khan, 1980) are also valuable variables in explaining the variation in consumer public spending.

As regards developing countries, some sources have indicated the possibility of linking government spending to the value of exports (Khan, 1974a), where government spending increases alongside exports increasing. This situation seems to be the case in the oil-exporting economies where oil revenue depends for contribution to public revenue on expenditure policy and on the related allocation of resources, whether on expenditure items, or on the various economic sectors, as well as relying on the value of oil exports.

The rise of the oil revenues in the mid-nineteen-seventies and early nineteen-eighties encouraged the Libyan government to increase both consumer and investment spending in the Libyan economy, where it has been thought to continue the oil revenues as a source of public revenue. This has enabled the decision-makers, on one hand to direct the largest share of the revenue to public consumption spending within the framework of the expansion of the state in delivering public services as part of the social welfare policy.

Moreover, on the other hand the increase government consumption spending is due to the weak of the absorptive capacity of the economy to absorb the huge investment' possibilities, supplied by the oil boom during that period.

In fact, public revenues in the Libyan economy include both oil and non-oil revenues, where the oil revenue is based on the size and value of exports of crude oil. The non-oil revenue includes direct and indirect taxes, as well as other income, which means it primarily depends on economic activity outside the oil sector.

In spite of the small rise in the relative importance of non-oil revenue in the recent period, it still constitutes a limited part of the total public revenue. Whereas the absolute increase of non-oil revenue, is expressed in the fact that, this increase did not occur due to the developments in the non-oil sector, or due to the tax policies systems, or because of improvement in the performance of public sector. It occurred, however, because of decreasing oil revenues and their volatility, especially during the period of this study.

With regard to the variables in the consumer public spending function, it can be expressed in both of real and nominal forms. Some writers such as Aghevli and Khan have expressed these variables in their nominal and real form (Aghevli and Khan, 1980) despite the importance of the expression of variables in the public sector in nominal form, where it is obvious that a government does not suffer from the money illusion. Moreover, the expression for the function in a semi-logarithmic, logarithmic, or normal form is a matter relating to how to manage the research and how to achieve its goals.

From this point, the public consumption expenditure of the Libyan economy can be seen as a function of non-oil revenues, such as total direct tax, total indirect tax, and the function of the oil revenues, thus it could be said that consumer public spending is explained by its funding sources. Therefore, in accordance with this description, this equation will adopt as the following functional form:

$$CGC = F\ (TAXDIRC,\ TAXINDC,\ OILREV)$$

Where:

$$CGC \ \ = \textit{the consumer public spending, nominal,}$$

$$TAXDIRC = \textit{Income tax (total direct taxes),}$$

$$TAXINDC = \ \ \textit{Total non-direct tax, and}$$

$$OILREV = \ \ \textit{the Treasury's share of oil revenues}$$

Similarly, as expected in private consumption, consumer public spending positively depends on total direct taxes, total non-direct taxes, and the treasury's share of oil revenues, respectively, thus it is expected that the coefficients of these variables will be greater than zero.

4.2.1.2 Investment expenditure

Investment is one of the components of aggregate demand and a significant factor for economic growth, and it can be regarded as a key element in being responsible for economic instability.

In general, investment comprises three sub-groups as follows: firstly, business fixed investments, which includes businesses spending on structures and equipment that are used in the production process. Secondly, inventory investment, which includes businesses spending to acquire additional raw materials and parts for use in the production process (this investment also contains final goods) and, finally, residential investment which comprises businesses spending on constructing new houses, whether to live in or rent out (Mishkin, 2012). In other words, the total fixed investment can be defined as the expenditure on purchasing of new machinery, equipment, buildings, and the new means of production, including the additions to the inventory. Where, the additions to the inventory are an important element in the composition of the investment, in terms of being part of the current production of consumption and the investment goods that have not been consumed.

4.2.1.2.1 Real non-oil private gross fixed investment *(IPNOILR)*

Economic literature has not discovered up until now a critical theory with regard to the determination of investment demand explanatory variables, although this literature has many models, each of which have tried to summarize the most important variable that could interpret investment function behaviour (for details about these models see Jorgenson, 1971).

In contrast to the behaviour of consumer spending, investment spending is apparently not a stable function that can be explained by specific elements. There are many theories, as mentioned before, that have tried to explain the behaviour of the investment function by assuming different explanatory variables. Some of these theories have stressed the importance of the cost of capital, where the rate of interest is compared with the marginal efficiency of capital (Al-Jebory, 1991). Additionally, some theories have tried to highlight the role of profits, sales, and changes in production as determinant factors for capital spending; also, some studies have emphasised the role of the availability of external and internal finance in the investment process (Evans, 2004).

Based on his interest in macroeconomic issues, Keynes believed that fluctuations in employment and production are highly dependent on investment. The volume of investment depends, as mentioned, on the marginal efficiency of capital and the interest rate, which is defined as the discount rate that equates the discounted present value of the future income stream from the capital asset to the price of this asset (Keynes, 1936); therefore, when profit expectations are increasingly high, investment, will be increased. In addition, the interest rate, which is the other determinant of investment, depends on the quantity of money and the liquidity preference (Mishkin, 2012).

The Keynesian theory, which is based on the under full employment equilibrium, made savings a function of income and income is a function of investment, which is contrary to the classical view where investment is explained by changes in savings.

The modern growth models that depend on capital, have revitalized the idea that is based on the assumption that saving is a constraint on investment, or is one of two restraints on investment (as in the two-gap model). Whereby the rate of investment determines the growth rate of income, regardless of the level of additional savings, while the marginal propensity to save, which is supposed to be affected by economic policy measures, represents one of the determinants or at least a restriction on the rate of increase in investment and thus on the rate of economic growth.

Candidly, economists have not agreed on one variable that determines investment spending, as is the case for the level of income, which is dominated by theories of consumption as a determinant of consumer spending. Some studies, whether theoretical and practical, have found that profit is the main determinant of investment, while others point to the accelerator principle, and others have focused on the degree of capacity utilization as an influence on investment spending. In addition, some economists have seen that the integration of the accelerator principle and profit is an influential variable when analysing investment spending (among other factors, which are summarized such as the interest rate, and other financial factors (Edgmand, 1983)).

It is possible to understand the different models of investment with application to a specific individual firm and then to generalize the results on the macro level of the economy. Additionally, the results can be compared to these models on these three aspects which could explain the behaviour of investment. These aspects are determinants of the desired capital and the time structure of the investment process, in addition to the treatment of the replacement investment. Therefore, the models of investment behaviour differ, substantially, in every part of these three aspects.

In the same context, the determinants of the desired level of capital can be divided into three main groups. The first is the use of capacity utilization represented by the ratio of production to capacity (the difference between production and capacity, the change in output, and sales minus the highest previous sales). The second is domestic financing represented by the flow of domestic capital, the balance of liquid assets, credit and ability, and accumulation in tax liabilities, and the third is the external financing represented by interest rates, rate of return, stock prices and market value of the firm.

Tinbergen, in 1938 and 1939, suggested a theory where investment depends on the level of profits; Klein updated this assumption in 1951 (Jorgenson, 1971). Under this theory of profits, or the so-called theory of internal funds for investment, the desired capital stock, and then investment, depends on the level of profits whereby private companies are seeking to maximize profits, so the expectation of attaining profits serves as a fundamental motivation behind the investment. Therefore, investment will increase due to a growth in expectation for obtaining more profits in the future (Edgmand, 1983).

The essence of this theory relies on the assumption that the level of current profits and the lagged profits are significant indicators for determining the level of expected profits whereby the increase in the level of the attained profits during any period will lead to an increase in the expectations of future profits. This is also related to boom and bust forecasts which mean shifting the curve of the marginal efficiency of capital to the right and to the left, depending on whether the expectations are optimistic or pessimistic which, eventually, leads to changes in the desired capital (Edgmand, 1983).

However, there are some reservations about the use of the level of current and lagged profits as indicators of the stream of profits in the forthcoming period, where an increase in profits resulting from increased sales may be a major factor, but only when the anticipated increase in demand is ceaseless or sustainable, not affected by temporary or unexpected change. In addition, the demand trend is a leading indicator of a firm for its future assessment. Notwithstanding, this increase in demand may not lead to an expansion in the purchase of production resources if the firm operates at a level less than the maximum of production capacity. Moreover, it can be said, that the incentive of profit maximization is not a basic factor in investment decisions in the public sector, except in the minimum limits as the social return plays a key role in most public projects that are aimed at satisfying the basic needs of citizens, such as investments in health, education, welfare and so on. In most cases, a comparison between different projects, according to the priorities that are governed by non-economic considerations, play a primary role in determining the different aspects and levels of the public investment expenditure. Hence, as long as profit is the main determinant of investment, according to the profits or the internal funds' theory, investment is determined by production, pursuant to the accelerator principle (Jorgenson, 1971).

The relationship between the change in the level of production and the size of investment spending is what is known as the accelerator principle. According to Clark, this situation does not substantially differ in the flexible accelerator model by Chenery in 1952 and Koyck in 1954; the only differences are in terms of time dimension. Whereby this model focuses on the period of the investment process from the perspective that the desired level of capital is determined in accordance with long-term considerations, so that the time structure of the investment process is represented by the geometrically distributed lagged function, which was developed later by Chenery, deeming that capital is proportionate to the lagged desired output.

The main idea of the accelerator principle is that expectations are mostly related to changes of income and the expectation of profits is considered the most influential factor in investment in the short term. Furthermore, investment that results from a firm's desire to meet increases in demand for its products is called the stimulant investment which is linked to current income changes or, more accurately, to the rate of change of income. In the context of this idea, the accelerator principle assumes the stability of capital to production ratio and a lack of excess capacity, which causes the firm to continue to increase investment in plants and new machinery in a response to an increase in aggregate demand. Furthermore, the stability of capital to production ratio and a lack of excess capacity are expected to continue or it is expected that the increase is sustainable (Edgmand, 1983).

In fact, there are several studies and models (for further details about these studies see Jorgenson, 1971; Evans, 1969 and 2004) that have tried to explain the behaviour of investment spending through the addition of new explanatory variables to the production level and to the change in the production level, according to what is supposed to be the accelerator principle. These variables are represented in the capacity utilization (for more details about the capacity utilization and its measures see Klein and Long, 1973, and Christiano, 1981), in the profits, sales, cash flow and the relative change in the prices of securities, and in the price of capital goods, the ability of credit and in the interest rate (Jorgenson, 1971). Apparently, capacity utilization was specified as the variable that obtained the highest degree of fit in these studies, noting that the level of potential output can be regarded as a measure of the capacity utilization within the relationship and includes capital stock (Jorgenson, 1971).

However, studies have demonstrated that the most influential variable in investment is the level of income or production in an economy. Nevertheless, technological changes, or changes in the prices of raw materials and production inputs have in turn, influenced investment. Additionally, investment often depends on lagged variables, for a year or more, to express the conditions during investment decision-making (Evans, 1969). This means the use of some of the lag structure that the investment responds to, which changes in output over time.

Some economists have added other factors that have played a direct role in influencing investment expenditure, such as uncertainty about the economy at the macro level which leads to reducing the rate of investment whereby investments will decline in periods of high uncertainty, and vice versa, whereas an increase in government spending, or a decrease in tax rates on personal income will stimulate investment through its impact on aggregate demand and thus on production.

The investment theories that have been reviewed above could possibly apply in developed countries, but the attempts to undertake these theories are accompanied by a number of uncertain outcomes, which are primarily related to some theoretical and practical considerations that make, certainly, a straight application of the conventional investment theory unreasonable. These considerations are related to the degree of government intervention in the economy, which could be reflected in the massive role of government in capital formation, especially in oil-exporting countries such as Libya. In addition, also, there is an absence of the influential role of the financial market in such countries as Libya, because it is still nascent, and there is the negative impact of restrictions imposed on the exchange rate in these countries. Furthermore, there are constraints on some variable data, such as capital stock and interest rates, which make the application of these theories, as mentioned, rather unrealistic (Luintel, 1993).

Moreover, in the context of developing countries, the results from some studies of Latin American countries (Chenery and Ekstein, 1970) have shown the existence of a strong relationship between exports and savings which, in turn, reveals the strong positive relationship between the growth rate of exports (or imports) and the rate of growth in GDP. This means that investment is expected to be dependent on the imports of capital goods, which in turn depends on export earnings (Mikesell and Zinser, 1973). Other studies have confirmed the possibility that investment in developing countries function in terms of trade which is treated as an exogenous variable in the investment function (Fielding, 1997).

In oil-producing countries where oil revenues are the main source of income creation and of financing economic activity, this revenue is the primary determinant of investment and plays the fundamental role in closing the gap of internal and external resources through contributing to the financing of public expenditure in general, and to public investment spending in particular.

It is possible to look at oil revenues from the standpoint of them being government savings, which could contribute to the formation of domestic savings. Oil revenue is handled as an ingredient in total revenues as though it is a tax imposed on foreign companies operating in the oil sector. This revenue plays a fundamental role in the formation of savings in a yield economy that lacks a sufficient saving channel as well as in an economy that has a lack of awareness of the importance of savings. From this angle, oil revenues can be regarded as a key determinant of investment in oil economies, such as the Libyan economy, in terms of its role in the financing of public investment spending which serves as the backbone of the gross fixed capital formation in the economy.

Fluctuations can occur in oil revenues because of the volatility and instability in crude oil prices in the international market. Consequently, foreign reserves play an important role in determining investment spending that accounts for an additional source of funding of domestic investment. Whenever the government resorts to this expedient there is a shortfall in other sources funding.

Thus, according to these considerations, this study has assumed that the total investment expenditure is to be represented through private investment in the non-oil sector as a stochastic function. The function of private investment in the non-oil sector has been selected as the change in real capital stock in the non-oil sector and government investment spending in the non-oil sector that has been delayed for one year, these being the explanatory variables for the behaviour of private investment in the non-oil sector.

This study also assumed that the real private non-oil sector, lagged for one year as an explanatory variable (Lagged dependent variable) in this function, in turn, reflects the impact of lagged investment spending in the last period on the investment in the current period.

The variable (DUM_{8185}) is a dummy variable reflecting the beginning of the full control of the state in Libya and its hegemony over all sectors of the economy. It also reflects the period where oil revenues receded coinciding with the second oil shock in 1980 and it will be equal to one during the period 1980 to 1985 and equal to zero otherwise, as follows:

$$IPNOILR = F\,(IPNOILR\_1,\ DKNOILR,\ IGNOILR\_1,\ DUM_{8185})$$

Where:

$IPNOILR$ = Real non-oil private gross fixed investment,

$DKNOILR$ = Changes in capital stock in non-oil sector,

$IPNOILR\_1 =$ *Lagged real non-oil private gross fixed investment,*

$IGNOILR\_1 =$ *Lagged government investment expenditure in the non-oil sector, and*

$DUM8185$ = Dummy variable which is equal to one (1981-1985) or equal to zero otherwise.

The relationship between real non-oil private gross fixed investment and its explanatory variables is expected to be positive, with the exception of the dummy variable, where it is negative. The parameters of changes in capital stock in the non-oil sector, lagged real non-oil private gross fixed investment, and lagged government investment expenditure in the non-oil sector are expected to be greater than zero, while the coefficient of the dummy variable will be less than zero.

4.2.1.2.2 Real capital stock in the non-oil sector *(KNOILR)*

This study has assumed that the total investment expenditure is represented by the real capital stock in the non-oil sector (as an identity). This identity is made up of real capital formation in the previous period, private investment in the real non-oil sector, real public investment in the government sector and the net of depreciation, as can be seen from the following identity:

$$KNOILR = KNOILR\_1 + IPNOILR + IGNOILC\,/PIT - DEPNOILC\,/PIT$$

Where:

$KNOILR$ = Real capital stock in the non-oil sector,

$DEPNOILC$ = the current depreciation of capital stock in the non-oil sector, and

PIT = investment price deflation.

The rest of the variables are as defined above.

4.2.1.3 Imports and Exports

The foreign sector is considered as a key driver of economic activity in all the countries of the world in general, and in developing countries in particular as this sector can meet all the desired needs, whether for consumption or for investment through the imports' channel. Furthermore, it can sell all tradable goods as well as all excess production through export channels. Additionally, the foreign sector is reliable as a major source of income in developing countries.

The economic theory of international trade since the seminal works of Smith (1776), Torrens (1808) and Ricardo (1828) has assumed that, through absolute advantages' and then comparative advantages' hypothesises, countries, which participate in the international trade, will attain economies of scale in production. This will be realized if each of the countries' supply the goods that it produces relatively well, and thus this specialization will increase, at first, skills, and efficiency and subsequently will increase production and then welfare (Krugman, Obstfeld and Melitz, 2012).

In general, economic literature has assumed that nonmarket forces determine the demand for imports in developing countries and for the world's demand for exports from these countries. Thus, the imports and exports will be insensitive to changes in prices. In most cases, many developing countries export raw materials, therefore these countries are just price takers in the global markets which is evidenced by the models of the trading behaviour of developing countries, which were built by Maizels in 1968, and by Chenery and Strout in1969 (Khan, 1974b).

In the following sub-section, it will be clear that total imports are divided into two stochastic functions. The real imports of consumer goods *IMCAPR*, and the real imports of capital goods *IMCAPR,* whereas total exports consist of one stochastic equation, which is the oil export in millions of barrels *EXOILMB*, and there is one identity for oil exports in millions of Libyan dinars, *EXOILC.*

4.2.1.3.1 Imports functions

Imports are one of the most important reliable sources in meeting the needs of domestic demand, especially in developing countries, where domestic production cannot, in most of these countries meet the needs of the domestic demand and, therefore, these countries resort to covering the excess demand by imports. Additionally, it could be said that the demand for imports is closely related to economic activity, as it increases in boom periods and decreases in recessions.

Unquestionably, the best evidence on the importance of imports demand is the quantity of the studies that have investigated and discussed the variables that govern the behaviour of imports, and have demonstrated the selection of the imports' function as the main endogenous variable in most econometric models (Khan, 1975).

In the same manner, total imports demand, in its simplest description, has microeconomics' foundations, as according to the general utility function, relative prices and the aggregate domestic real income are the main explanatory variables in such a function (Khan and Ross, 1977). In other words, it is the application of the simplest form of the imports function, where it is a function of relative prices and real income. This, in turn, implies that the price of imports relative to the level of domestic prices is an exogenous variable for the importing country, and is determined in practice in global markets with quantities of imports that are domestically adjusted (Khan, 1975).

Moreover, it can be said, that the imports of previous period (lagged import) has a great role in the interpretation of the demand for imports, as the sign and the magnitude of the parameter play an influential role in this context. The positive sign, therefore, describes the dominance of the past factors on the imports' demand and reflects the accumulated habits, which are surrounded by the consumer's inertia, and then the actual imports need more than one period to adjust in order to reach the desired imports (Klein and Goldberger, 1969). However, if the sign of the lagged imports parameter is negative, this indicates the so-called Houthakker-Taylor inventory effect, which shows that the inventory, which was built from previous imports, diminishes the demand of current imports (Behrman, 1977).

In addition to all the variables mentioned above, there are many other variables which have a significant impact on the demand for imports, but the use of any of these variables, in the end, requires a full knowledge of the goals of the study under consideration. For instance, the credit to finance import is one of the important additional explanatory variables for the behaviour of imports; this importance is reflected by having a direct and influential link between an internal monetary policy and international economic flows (Behrman, 1977).

Additionally, adding a time trend[8] is an effective variable, which includes several factors such as demand growth and the absorptive capacity of the economy as a whole. A time trend also contains two contrasting factors, namely

8 There are some criticisms about using time trend in economics; for further details see Phillips, 2010

the ability for, and possibility of the substitution of domestic products by imports, on the one hand, and the consumer preference for these imports, on the other hand (Behrman, 1977).

Generally, the imports function has been divided, in many econometric models, into several sub-functions; this divide stems from the importance of providing information on the behaviour of different types of imported goods (i.e. consumption or capital, etc.). This divide stems, also, from the importance of the information on the nature and the extent of bias that is included in the estimates of elasticities, which is, in turn, dependent on the total imports behaviour (Khan, 1975). Many variables have been taken into account in many econometrics studies when studying the demand of consumers and producers on imports. It was found that the most significant of these variables is personal disposable income.

4.2.1.3.1.1 Imports of consumer goods *(IMCONR)*

Mostly, the demand for imports of consumer goods is treated in the econometric models as a function of several variables depending on the purpose of the study. These variables are namely the real disposable income and the relative prices of imports, as mentioned above; also, the degree of absorptive capacity, foreign reserves, and dummy variables related to unusual or seasonal changes, and in some cases, lagged dependent and independent variables. Additionally, the imports of consumer goods function includes the components of real spending, specifically in developing countries, where real private consumption spending is considered as the most influential explanatory variable in the function of imports of consumer goods.

Policy makers, in the developing countries, used to impose restrictions on imports' flow, especially on the imports of consumer goods. These restrictions are enforced for several reasons, such as a shortage in foreign reserves, protecting the domestic industry and, in some cases are imposed on the imports of some consumer goods which are regarded as undesirable (Abohobiel, 1983). In this context, it should be noted that the imposing of such restrictions affects the degree of the measurement bias of the imports function (McCallum, 1972, and Khan, 1974b).

These quantitative restrictions appear as explanatory variables in the imports function, such as the level of international reserves, the amount of foreign assets, and export receipts, which mainly reflect a country's import capacity; therefore, policy makers must change one of these variables to become a constraint in the imports function (Khan, 1975).

With respect to the choice of an appropriate functional form for the imports, function, there is no decisive standard to be relied on (for more details see Khan and Ross, 1977; Boylan, Cuddy, and O'muircheartaigh, 1980; Gandolfo and Petit, 1983). It is mainly an empirical matter and subject to the considerations of the researcher and related to the objectives of the study. For instance, if forecasting is the essential aim of the study, the linear form is the appropriate functional form of the import demand equation (Khan and Ross, 1977). However, most researchers would tend to prefer a log-linear relationship. In this regard, Khan stated that

there are two reasons why the equation is specified in logarithms: (1) it allows imports to react in proportion to a rise and fall in the explanatory variables; and (2) on the assumption of constant elasticities, it avoids the problem of drastic falls in the elasticity as imports rise (Khan, 1974b; 680).

In the practical studies, it is allowed to divide the imports function into several sub-functions, more or less as assumed by the requirements of the study. Furthermore, it is possible, as mentioned above, to divide the function of total imports in this study into a function of imports of consumer goods and a function of imports of capital goods.

The imports of consumer goods, in this study, are specified as a function of the real private consumption expenditure, whereby the shortage of import substitution goods has made this type of spending, this focuses primarily on the demand for imports of consumer goods. In addition to, the imports of consumer goods is function of relative prices of imported consumption goods. Additionally, the imports of consumer goods is a function of the nominal exchange rate, measured as a unit US dollars per amount of Libyan currency, and lagged imports of consumer goods, as is shown in the following function:

$$LIMCONR = F\,(LIMCONR\_1,\ LCPR,\ LEXCHRATE,\ PPRICE,\ PPRICE\_1)$$

Where:

$LIMCONR$ = the logarithm of imports of consumer goods,

$LIMCONR\_1$ = lagged of logarithm of the imports of consumer goods,

$LCPR$ = logarithm of real private consumption expenditure,

$LEXCHRATE$ = logarithm of the exchange rate (Libyan dinar exchange rate against the US dollar),

$PPRICE$ = the relative prices $(PIMC/PGDP)$, and

$PPRICE\_1$= lagged one period of the relative prices.

4.2.1.3.1.2 The imports of capital goods *(IMCAPR)*

In the same regard, the explanatory variables that include the function of imports of capital goods in most of econometric models, consists of industrial output, change in real inventory, and the degree of absorptive capacity. As well as consists of the relative prices of imports, and lagged imports of capital goods, foreign exchange reserves, and the dummy variable of the seasonal or unusual changes.

With regard to the imports of capital goods in this study, it has been specified as a function of the non-oil real government investment expenditure and the change in non-oil real capital stock in addition to the lagged imports of capital goods and the relative prices of imported capital goods as is shown in the following function:

$$LIMCAPR = F\,(LIMCAPR\_1,\ LIGNOILR,\ LDKNOILR,\ LPIMPIT)$$

Where:

$LIMCAPR$ = logarithm of real imports of capital goods,

$LIMCAPR\_1$ = lagged logarithm of real imports of capital goods,

$LIGNOILR$ = logarithm of non-oil real government investment expenditure,

$LDKNOILR$ = logarithm of the change in non-oil real capital stock, and

$LPIMPIT$ = the relative prices of the imports of capital goods.

4.2.1.3.2 Exports' functions

The world demand for any country's aggregate exports depends mainly on world price level, real world income and the unit value of exports of that country (Khan, 1974b). However, this situation is slightly different in the case of exporters of raw materials, especially in the case of oil-exporting countries, as the international oil market determines the quantities demanded and supplied within a specified period according to the pre-determined prices. Hence, an oil-exporting country is described, in the oil market, as a price taker country. Therefore, all production will be sold at those prices and, consequently, the most important explanatory variables in the oil exports function is the amount of oil produced during a certain time.

4.2.1.3.2.1 Oil exports in millions of barrels *(EXOILMB)*

The export sector in this study consists of two endogenous equations; one of which is stochastic which represents the oil exports in millions of barrels

(EXOILMB), and the other identity reflects the value of oil exports in millions of Libyan dinars *(EXOIL)*, as follows:

$$EXOILMB = F\,(EXOILMB\_1, XOILMB)$$

Where:

$EXOILMB$ = the oil exports in millions of barrels,

$EXOILMB\_1$ = the lagged oil exports in millions of barrels, and

$XOILMB$ = millions of barrels of oil production

4.2.1.3.2.2 The value of oil exports in millions of Libyan dinars *(EXOILC)*

The second endogenous equation in the exports' sector is an identity, which reflects the value of oil exports in millions of Libyan dinars. This identity is specified as multiplying the oil exports in millions of barrels by the average price of a barrel of oil in the global market, in Libyan dinars, as follows:

$$EXOILC = EXOILMB * PEXOILLD$$

Where:

$EXOILC$ = the value of oil exports in millions of Libyan dinars,

$EXOILMB$ = the oil exports in millions of barrels, and

$PEXOILLD$ = the average price of a barrel of oil in the global market, in Libyan dinars.

4.2.2 Balance of payments block

The foreign sector is one of the most important sectors of any economy in the world as a whole. Unquestionably, that the Libyan economy is deeply dependent on the foreign sector, as has been mentioned previously, for the import of products required to keep up the development course of the economy. Additionally, this sector provides money resources to purchase those imports and fund development projects. This enables the State to follow these transactions with the rest of the world termed, in economics, the balance of payments.

The balance of payments consists of three major accounts, which are the current account, the financial account, and the capital account, whereby, as is mentioned above ‘‘*a country’s balance of payments accounts keep track of both its payments to and its receipts from foreigners*’’ (Krugman, Obstfeld, and Melitz, 2012; 306). Each of these transactions must be recorded as a credit or a debit. A transaction is considered a credit if it results in a receipt of a payment from the rest of the world, while it is considered a debt if it leads to a payment to the rest of the world (Carbaugh, 2011).

It is worthwhile noting that, although the balance of payments theory dates back to the works of David Hume (1752), when he severely criticized the theoretical foundation of the mercantilists’ theory of international trade (Johnson, 1972), nevertheless, the real interest in analysing the effects of different economic policies on the balance of payments has been enhanced since the nineteen-thirties. Several approaches have emerged consecutively since that date, each of which attempt to explain and analyse the different positions of the balance of payments and, therefore, the influences of these varied conditions that result from the impact of various economic policies on the economy as a whole. In fact, one of the substantial objectives of these approaches mainly concentrates on the influence of devaluation on the status of the balance of payments (Johnson, 1977a). These theories can be arranged into the following subsections:

- Firstly, the elasticities’ approach that proposed by Robinson in 1937 and Machlup in 1955.
- Secondly, the absorption approach which developed by Alexander in 1952.

- Thirdly, the Mundell-Fleming approach that invented by Fleming in 1962 and Mundell in 1962 and continued in 1963.
- Fourthly, the monetary approach to the balance of payments developed by Dornbusch in 1973 and Whitman in 1975 and later on by Frenkel and Johnson in 1976, and
- Lastly, the portfolio balance approach which appeared for the first time in works of Oates in 1966, McKinnon in 1969 and later on in the work of Branson in 1974 (Johnson, 1977a,b; Matlanyane, 2005).

The first approach is the elasticities' approach that arises from the early work of Robinson and Machlup in 1937 and 1955 respectively. This approach analyses the current account of the balance of payments from the perspective of the Marshall-Lerner condition, whereby it explores the influence of devaluation on the position of the current account.

According to the elasticities' approach, the position of the current account will improve according to the following assumptions: the first is related to the simple model that assumes perfect elasticity of supplies with the initially balanced trade so that the sum of the elasticities of both exports and imports is greater than unity. The second is regarded a complex case, where it is ''*assuming independent elasticities of demands for imports and supplies of exports that a fearfully complex algebraic expression should satisfy but challenging to derive and explore*'' (Johnson, 1972; 1557).

With increase proposed in the inability of the elasticities' approach should explain the different effects of devaluation on the current account, this approach was designed under the stimulus of the crisis of the Great Depression in the last century and it is no longer valid to interpret the current account imbalances in an environment beset by inflation. The absorption approach became a halfway house where depends on the analysis of elasticities and is incorporated within the Keynesian multiplier theory, taking into account the circumstances of inflation (Johnson, 1977a).

This second approach confirms that the current account imbalance is caused by the difference between domestic absorption and domestic output and is based upon the current account deficit that occurs by an increase in absorption over the domestic output, and vice versa in the case of surplus (Matlanyane, 2005).

According to this method, the effect of devaluation on the current account is dependent on the degree of use of economic resources (employment) in the economy under consideration. Hence devaluation will increase domestic output compared to domestic absorption levels and it will then improve the current account position in the case of unemployed resources, and will assume that the conditions of the elasticities are favourable provided there is the marginal propensity to absorb less than one (Johnson, 1977a). In the case of the employment of resources, devaluation will increase domestic absorption over domestic production, which result in the deterioration of the current account position, on the one hand, and an outbreak of inflation in the economy, on the other. To recapitulate, the ultimate impact of devaluation on the current account depends on employment, and on the effect of changing the terms of trade, because of the devaluation effect on income (Matlanyane, 2005).

The third approach was developed independently as a product of the works of Marcus Fleming and Robert Mundell in the early nineteen-sixties (Boughton, 2003). In reality, this model has incorporated not only the effects of the interest rate on output (as in the analysis of an economy under autarky in the conventional IS-LM model), but also accounts for the effects of the exchange rate. Moreover, it has merged both the capital account of the balance of payments and the monetary sector in the analysis (Boughton, 2003; Matlanyane, 2005). The analysis of this approach is conducted under various exchange rate regimes (e.g. fixed or flexible) with several monetary and fiscal policy scenarios such as changes in the money supply, government expenditure, or global interest rate, and exploring the results in each of these cases.

Economic policy makers, in the open economies, will be confronted by three critical challenges when they attempt to sketch an appropriate economic policy. In fact, the problem resides in how to attain irreconcilable goals at the same time, in effect , how to conduct an independent monetary policy directed to achieve domestic objectives and join in free global capital mobility, meanwhile stabilizing the exchange rates (Obstfeld, Shambaugh and Taylor, 2005) which is the so-called ‘Trilemma’ or ‘unholy trinity’ in economic literature. This ‘Trilemma’ is the theoretical background of the Mundell-Fleming model which considered one of the Keynesian approaches to modelling the balance of payments, which is also known as the IS-LM-BP model.

The fourth approach is the monetary approach to the balance of payments that developed in early nineteen-seventies, as mentioned above, by Dornbusch (1973), Whitman, and Frenkel and Johnson in 1975 and 1976 respectively.

In fact, the monetary approach relies on the ‘Walras's Law’ which is one of general equilibrium theories. According to Walras's Law, all excess market demands (and conversely, excess market supplies) must be equal to zero. In this regard, Johnson emphasized that,

the essence of the 'monetary approach' is most easily understood by reference to Walras's Law as used in contemporary theory, according to which the sum of the excess demands for goods, securities, and money is identically zero (Johnson, 1977b; 259).

The essential consideration of this approach is analysing the balance of payments under a fixed exchange rates’ regime. The main assumptions of this approach are, firstly, the real variables such as output and employment are balanced at their long-run equilibrium values. Secondly, the demand for money is a stable function, and lastly, ‘‘*monetary inflows or outflows associated with surpluses or deficits are not sterilized -or cannot be, within a period relevant to policy analysis- but instead influence the domestic money supply*’’ (Johnson, 1972; 1560).

Furthermore, there are three theoretical foundations underlying the monetary approach to the balance of payments. The first is that the balance of payments is a monetary phenomenon and, therefore, it must be analysed according to monetary theory tools, not by tools of the international trade theory. Secondly, as long as that money is stock, so the appropriate theory on the balance of payments must take into account both stocks and flows. Thirdly, alongside the domestic credit as a source for the money supply, the international reserve flows are considered as an additional source for the money supply, thus, the different policy implications are considered pivotal when requiring an analysis of the balance of payments (Johnson, 1977b).

The economic policy implications of this approach are different in the case of an open economy compared with that of a closed economy. However, attention is focused primarily on an open economy that could be recapitulated in what follows, considering the influence of an expansionist monetary policy. An increase in money supply will lead to an increase in the domestic expenditure, which, in turn, will transfer to the deficit in the balance of payments by increasing the demand for imports. The balance of payments’ deficit leads to a reduction in the money supply and that will decrease the excess holdings of money by the private sector, and this will eventually translate into reducing the domestic expenditure.

There are some criticisms of the monetary approach, two of which are directed at its theoretical assumptions. The first criticism negates the putative stability of demand for money, while the second denies the automatic response of the money supply to the needs of trade (Johnson, 1977a). There is another criticism concerned with the policy implications of this approach, where ‘‘*the monetary approach is the impotence of monetary policy in its effects on domestic variables, while it becomes fully potent in its effects on the balance of payments*’’ (Matlanyane, 2005; 55).

The last approach is the portfolio balance approach, which refers to a series of models that appeared in the late 1960s and early 1970s. This approach was a result of the contribution of many economists inter alia, as previously mentioned, Oates, McKinnon, and Branson, in 1966, 1969 and 1974, respectively.

The portfolio balance approach stems mainly from the monetary approach to the balance of payments, and developed, on the one hand, by taking into consideration liquid assets and relying on the model of international portfolio diversification and, on the other hand, by combining the role of the effect of wealth and the capital account stock theory (Matlanyane, 2005). This approach in its origins is an attempt to introduce a clear exposition for the relationship between the changes in the exchange rate and the current account of the balance of payments (Isaac, 2012). Furthermore, the model works in the light of the interaction between banking systems and private sectors at home and abroad (Taylor, 2004). Unlike the monetary approach to the balance of payments, the portfolio balance approach not only focuses on the movements in the demand for, and supply of, money but also takes account of the demand and supply relationships between other financial assets (Cross, 1998).

This approach assumes that there is no perfect substitution between the foreign and domestic bonds; furthermore, it assumes that all markets are automatically cleared. Additionally, it assumes that the market participants are able to choose the appropriate combination of portfolio. The choice is based on some preferences and constraints such as wealth, tastes, the level of domestic and foreign interest rates and on expectations of the inflation and interest rates. The portfolio balance approach depends on the effects of changing both interest rates and wealth. Finally, the portfolio balance approach assumes that the market participants are able to adjust their financial assets when any change occurs in the market conditions upon which the portfolio has been built (Cross, 1998).

The policy implication of the portfolio balance approach is concentrated on analysing the adjustment process of the portfolio that results from monetary disequilibria. Therefore, the portfolio policy implications can be depicted in what follows.

From the portfolio policy prospective, an expansionist monetary policy decreases the domestic interest rate and activates the effect wealth. This will increase the demand for foreign financial assets according to the degree of the financial assets' substitution and the magnitude of the portfolio multiplier (Matlanyane, 2005). In terms of the balance of payments, this would lead to the deterioration of the current account and hence to depreciation in the domestic currency. Accordingly, this devaluation in the domestic currency increases exports and reduces imports, which will eventually lead to an improvement in the current account. Therefore, any disequilibria that occur in the current account would be adjusted because of the contradiction between the domestic currency depreciation and the effect of wealth (Cross, 1998).

There are several criticisms are directed against this approach but the most important one is the rejection of the assumption, which concerns the automatic clearance of financial markets; this is not applicable in developing countries due to the immaturity of the financial markets in these countries. The second most important criticism is the neglect of the real sector in this approach.

The review of the balance of payments relationships in this study consists of two behavioural stochastic equations and six identities, as follows:

4.2.2.1 Net financial income from abroad

The first behavioural equation is the net financial income from abroad *(NFIFBC)* and is described by the following function, where the explanatory variables are:

$$NFIFBC = F\ (NFIFBC\_1,\ FINACC)$$

Where:

NFIFBC = Net financial income from abroad,

NFIFBC_1 = Lagged net financial income from abroad, and

FINACC = Financial account balance in the balance of payments

4.2.2.2 Net compensation of employees from abroad

The second equation is the net compensation of employees from abroad *(WAGEFBC)* which is explained by

$$WAGEFBC = F\ (WAGEFBC\_1,\ FLABOR)$$

Where:

WAGEFBC = Net compensation of employees from abroad,

WAGEFBC_1 = Lagged net compensation of employees from abroad, and

FLABOR = Foreign labour force (thousands).

4.2.2.3 Total Exports

$$EXTOTC = EXOILC + EXOTHERC$$

Where:

$EXTOTC$ = Total Exports,

$EXOILC$ = Oil exports in millions of dinars, and

$EXOTHERC$ = Exports of other goods.

4.2.2.4 Total imports

$$IMTOTC = IMCONR/PIMC + IMCAPR\,/\,PIM + IMOTHERC$$

Where:

$IMTOTC$ = Total imports

$IMCONR$ = Real imports of consumer goods

$PIMC$ = Imports' price index of consumer goods

$IMCAPR$ = Real imports of capital goods

PIM = Total imports' price index

$IMOTHERC$ = Other imports

4.2.2.5 Net income from abroad

$$NETYFBC = WAGEFBC + NFIFBC$$

Where:

$NETYFBC$ = Net income from abroad,

$WAGEFBC$ = Net compensation of employees from abroad, and

$NFIFBC$ = Net financial income from abroad.

4.2.2.6 Balance of trade, current (goods and services)

$$BOTGSC = EXTOTC - IMTOTC$$

Where:

$BOTGSC$ = Balance of trade, current (goods and services),

$EXTOTC$ = Total exports, and

$IMTOTC$ = Total imports.

4.2.2.7 Balance of payments, current

$$BOPC = BOTGSC - NETYFBC + FINACC + BOPOTHC$$

Where:

$BOPC$ = Balance of payments, current,

$BOTGSC$ = Balance of trade, current (goods and services),

$NETYFBC$ = Net income from abroad,

$FINACC$ = Financial account balance in the balance of payments, and

$BOPOTHC$ = Other balance of payments' items.

4.2.2.8 The balance of foreign assets (reserves)

$$IRC = IRC\_1 + BOPC$$

Where:

IRC = Balance of foreign assets (reserves),

IRC_1 = Stock of the balance of foreign assets (reserves), and

$BOPC$ = Balance of payments, current.

4.2.3 Aggregate supply block

To achieve the aim of this study easily, the aggregate supply, the *GDP* component, will be divided into the production from the oil sector *(XOIL)*, and the production from the nonoil sector *(XNOIL)*. The aggregate supply block consists of one behavioural stochastic equation, which is the real non-oil gross domestic product, *(XNOILR)*, and one identity, which is the real gross domestic product *(GDPR)*.

Challen and Hagger (1983), as previously noted, have shed light on econometric modelling by exploring varying types of econometric models and the review of these models has clarified that there are two dominant approaches representing the theoretical foundation of the modelling process. First, there is the aggregate demand, which is based mainly on Keynesian economics as a theoretical ground; the Keynesian view, in this regard, stresses that the increase in aggregate demand will eventually lead to an increase in income and employment (Matlanyane, 2005). The second approach is to aggregate supply and this depends on the theoretical foundation of the classical and neoclassical economic theory, as well as on the so-called supply-side economics[9], which are defined in their simplest mode as ''*the application of price theory -so-called microeconomics- in the analysis of problems concerning economic aggregates -so-called macroeconomics*'' (Ture, 1982; 11).

In fact, the supply-side economics' view originally stems from the classical and neoclassical economic theory (Raboy, 1982; Ture, 1982). However, it differs from those theories in being reliant on the role of public economic policies and it attaches great importance in stimulating the available economic potential (Ture, 1982) whereby the fundamental argument acknowledges that ''*fiscal policy affects incentives to invest, economic efficiency and economic growth by way of changing relative prices*'' (Matlanyane, 2005; 38).

This school of thought emerged in the economic literature after the conventional Keynesian theory doctrines failed to introduce an agreeable exegesis to the contradiction in the stagflation phenomenon[10]. This stream of thought advocates that a government should reduce the barriers that confront the private sector by

9 For more details about supply side economics, see these excellent articles: Ture (1982), Raboy (1982), Lucas (1990) and Phelps (1991).

10 Actually not only Keynesian theory which failed to explain the phenomenon of stagflation, but also the monetarist school failed, in turn, to provide an appropriate interpretation for this phenomenon: see in this regard, (Tsoulfidis, 2010; 325-326), but there is a new exposition for this phenomenon by the Keynesian economists for more details see , (Zhang, and Clovis, 2010).

creating a favourable environment for investment and production and making it more flexible by reducing regulations which will enable the private sector to play its ascribed role. According to the supply side economists, the barriers are represented in the tax component of a fiscal policy, which is imposed by a government on income and capital (Raboy, 1982).

It is worthwhile noting that the policy implication of this school ‘‘*focus on the view that increased saving is necessary for increasing capital formation that can raise productivity and hence economic growth*’’ (Matlanyane, 2005; 38).

With regard to the practical side of supply-side economics, there are two approaches: the production function approach and the cost structure approach. The first approach focuses on the relationships between the outputs and inputs. In contrast, the main concern is directed, on the one hand, on analysing the demand and supply of economic resources and, on the other, as to how to incorporate the technology factor to the function; the second approach is concerned with the harmony between the factor costs and the prices. In this regard, it should be noted that there is no specific difference between the two approaches and, in reality, they are treated as identical to each other. However, the process of selecting either of these approaches depends on a number of factors; the most important are the goal of the study and the method that is used in the analysis growth (Matlanyane, 2005).

The measurement of the GDP could be reached in the economy as a whole from the supply side by using the production method or from the demand side by using the expenditure method. Likewise, the analysis of the sectoral supply sector could be achieved by using variables from each of them, or by the mixing of the two sides’ variables (Abohobiel, 1983).

4.2.3.1 Real non-oil gross domestic product *(XNOILR)*

The aggregate supply block in this study is divided into two separate sectors namely the production from the oil sector *(XOIL)* and the production from the nonoil sector *(XNOIL)*. The production from the nonoil sector can be represented by a behavioural equation; the explanatory variables are selected from the two sectors mentioned above and can be described as follows:

$$XNOILR = F\,(KNOILR,\ KNOILR\_1,\ IMCAPR,\ IMCAPR\_1,\ CRNOILR)$$

Where:

XNOILR = Real non-oil gross domestic product,
KNOILR = Non-oil real capital stock,
KNOILR_1 = Lagged non-oil real capital stock,
IMCAPR = Real imports of capital goods,
IMCAPR_1 = Lagged real imports of capital goods, and
CRNOILR = Bank credit to non oil sector

4.2.3.2 Real gross domestic product *(GDPR)*

The real gross domestic product is treated as an identity in this model as follows:

$$GDPR = XNOILR + XOILR$$

Where:

GDPR = Real gross domestic product,
XNOILR = Real non-oil gross domestic product, and,
XOILR = Gross domestic product (production) of the oil sector.

4.2.4 Prices block

The increasing attention that has been given to inflation in recent decades is driven by the acceleration of this problem. Moreover, solving the inflation problem by reducing the general prices' level can also cause problems that can hit the economy. Whereas the effects of inflation are transmitted directly onto consumers, deflation has an impact on producers' revenues and therefore profits and then, eventually, affects entrepreneurship. Therefore, this problem is caused by factors that consolidate the instability in the general prices' level.

Because the problem of inflation is the most influential issue in recent times, it is worthy to give it a maximum attention. In this regard, the growing interest in studying the prices system at the macro level is virtually motivated by determining the actual causes of inflation, on the one hand, and in finding out the variables that play a key role in influencing it, on the other (Green, 1987). In fact, from the analytical perspective, there are three sectors that have a significant role in the creating and sustainability of inflation in open economies, namely: the external sector, the monetary sector, and the real sector.

In terms of the theoretical perspective, two streams of thought have dominated the economic literature for decades. The first believes in the role the quantity of money influences in the real sector through its effect on the general level of prices. This stream of thought is represented by the classical and the neoclassical schools and, later on, by the monetarist school. The second emphasizes the role of excess demand on price instability, which is represented by the Keynesian school (Matlanyane, 2005).

Laidler and Parkin stated that ''*inflation is a process of continuously rising prices, or equivalently, of a continuously falling value of money*'' (Laidler and Parkin, 1975; 741). Thereby inflation derives its significant status from the large role played by money in the modern economy (Laidler and Parkin, 1975). On this basis, inflation has been regarded as a monetary phenomenon in the intellectual heritage of economic theory where, still, the arguments are brought forward on this matter up to the current time.

The above statement by Laidler and Parkin is not accurate in the case of developing countries, where the increase in money supply is not the main cause of inflation in these countries. There are other factors relating to fiscal imbalances, such as the high growth of money that results from the system of budget deficit financing, as well as exchange rate devaluation because of the crises that occur in the balance of payments (Sargent and Wallace, 1981; Montiel, 1989; Totonchi, 2011).

The first thing that strikes the researcher in looking at the heritage of the classical theory of inflation is the quantity theory of money, which was formulated by a number of classical economists such Ricardo, Mill and Marshall, and then it was further developed and was further publicised by the works of Fisher. This theory tries to answer the question that is caused by the reasons that increase the general price level under a certain amount of money and by the specific velocity of its circulation, as well as a known number of transactions (the exchange) that arise between people at a given volume of output. Through a series of classical theory assumptions, the theory finds that the decrease in the value of money (inflation) is due to the perceived increase in its supply, where the excess of money supply is directed towards spending and thus increases the demand for goods and services.

Therefore, it can be concluded that the rise in price level is a result of increasing the quantity of money, which, in turn, causes an increase in aggregate demand and then it can said that inflation is a function of the quantity of money, on the one hand, and of excess demand on the other. The second vision of the classical theories of inflation is the Cambridge equation, which was formulated by many

British economists, led by Marshall and Pigou. This theory is distinguished from its predecessor that made the demand for money determinant could explain the changes in the general level of prices by which it can be concluded that inflation is merely a function of excess demand for goods and services which occurs as a result of the decline that may occur in the demand of money.

In spite of the variety of the doctrines and theories that dealt with inflation after the formation of these two theories, the role played by the quantity of money in influencing the general level of prices has won approval in all these theories even though they spring from different ancestry. The argument remained confined to only two considerations; the first relates to the notion of direction of causality between money and prices, which is much debated among economists when determining the feedback between money and the general level of prices (Sims, 1972).

The second consideration relates to the mechanism of the effect of money supply in the general price level and in the way by which this effect is achieved, in terms of being direct or indirect. Where the increase in money supply may be accompanied by an increase in the tendency of individuals to save or to hoard and not by an increase in the demanded quantity, hence the Keynes explanation of inflation differs from the interpretation of these theories.

Keynes pointed out that the mechanism of the effect of money supply on the general level of prices is subject to employment in an economy, as the immediate impact of an increase in the quantity of money is the decreasing of the interest rate, whereby the increase in money supply is more than the money demanded for speculation and with the assumption is that the constant of marginal efficiency of investment will lead to an increased demand for investments. If the resources are unemployed, the effect will be reflected in the form of increasing the level of employment and income and prices do not increase, or if they do so, they rise slightly. Whereas if resources are close to full employment or if there are some bottlenecks because the supply of production factors are not elastic, or because of heterogeneity among them, the effect would be a proportionate increase in the price level. This, therefore, proves that the quantity theory of money is true in the case of full employment and, in such a case, there will be a direct effect of the quantity of money on the general price level.

The Keynes interpretation of inflation is that prices rise because of a rise in production costs which, in turn, rises due to a lack of homogeneity and because the production factors are not elastic in the short term. This theory became known as the theory of the cost-push inflation (Gordon, 1976). In addition, it is noticed from the Keynes analysis that inflation, which is caused by a demand-pull, is semi-inflation and does not cause any problem under the circumstances of expanded unemployment. This made him propose the policy of fiat money as a means of handling it, which means that this policy controls demand inflation by conducting fiscal and monetary policies, which seems to be an inappropriate policy in order to control supply inflation (or so-called cost-push inflation). Where the deflationary fiscal and monetary policies impact on the levels of aggregate demand while cost inflation does not occur as a result of imbalances between aggregate supply and aggregate demand, but rather occurs as a result of the situation of a monopoly in the production factors’ market or in the commodities market. Therefore, it is difficult to control supply inflation compared to controlling demand inflation, as it requires no increase in wage rates if it is not accompanied by an increase in productivity. Therefore, a deflationary economic policy could control the inflation of cost-push if both the demand and total production could be reduced to the extent that sufficient joblessness is achieved in order to prevent wage increases exceeding labour productivity.

It can be perceived from the previous explanation that a reduction in prices to a certain level requires the acceptance of a specific rate of unemployment, which leads to admitting the inverse relationship between inflation and unemployment; this is named in the economic literature as the Phillips curve (Gordon, 1972; Laidler and Parkin, 1975). The Phillips curve notion was criticized in the early nineteen-seventies when a new phenomenon emerged that bound inflation and unemployment in a positive relationship, which was later called stagflation (Humphrey, 1978). This situation, of the simultaneous coexistence of inflation and unemployment, has led to the emergence of many streams of thought trying to advance an adequate explanation to this puzzle (Tsoulfidis, 2010). One of these streams has adopted interpretations of development and expansion of the old Phillips curve by adding new variables to it, while other explanations have attributed inflation to the presence of institutional, social, and political forces, but this stream in the end, has developed ideas relating to inflation costs.

The most influential stream of thought in the explanation of the problem of the price instability debate was built on the revival of the classical theory of inflation. Milton Friedman and his supporters of the Chicago School, who are known as monetarists, have been led that direction.

Unquestionably, the monetarists are one of the most important branches of the neoclassical school (Modigliani, 2003; Laidler, 2003). In fact, this movement started in the light of the works of both Henry Simon and Jacob Viner of the Chicago School in 1930s (Phelps, 1991). Later on, Friedman and his fellows walked the same path as their colleagues, and they adopted the demand for money as a strategic variable of economic activity. This is due to their belief that the money supply is an institutional datum determined outside the model and to their belief that the Central Bank can completely control it (Friedman and Heller, 1969; Friedman, 1971). In addition, the results of some of Friedman’s studies emphasized the importance of money as determining the economic activity level. In this regard, the monetarists believe that money not only matters, but also that it is all that matters (Friedman, 1970). Furthermore, they affirm that the quantity of money per unit of output is a key variable to understanding the nature of price fluctuations. This necessarily requires a full knowledge of the changes that occur to the volume of production, on the one hand, and the quantity of money that individuals want to hold, on the other (Friedman, 1969). This made Friedman assert that the modern quantum theory is a theory of demand for money, not a theory of monetary income, production, or pricing.

All of these combined factors have made Friedman; firstly, believe that inflation is always and everywhere a monetary phenomenon (Hillier, 1986). Secondly, he believed that inflation reflects the imbalance between the money supply and demand, as the individuals who have more money than they want to hold relative to their income will direct this surplus to increased spending on goods, services and to bonds, this means an increase in aggregate demand, which leads to an increase in prices.

Based on the above explanations, it is clear that the core of neoclassical theory is the belief that money matters. Therefore, any study that tries to explain the fluctuations that occur in economic activity and ignores the role of monetary changes is, in fact, not an accurate study. Harry G. Johnson is convinced that inflation is merely due to the implementation of expansionary monetary policies and any attempt to involve any other elements in the analysis is just a desperate attempt (Hillier, 1986).

Complementary to what has been mentioned above, two approaches can be explored concerned with the interpretation of inflation (Patinkin, 1972). The first is the method of the classical and neoclassical quantity theory of money, while the other approach is the method of the excess demand, which originated with

Keynes, Wicksell, and Bent Hansen. Excess demand implies that aggregate demand for goods and services, as described by a certain quantity of money, exceeds the aggregate supply at the prevailing level of prices and it seeks to rise thereafter.

However, there is no significant difference in the assumptions underlying the methods of inflation analysis where it can be seen that the analysis, which depends on the excess demand method, leads to an increase of the money supply and then to an increase in prices, and then causes inflation. Moreover, it could be argued that the method of quantity theory of money describes the situation as it is, and only refers to the origin of the problem, while the excess demand method shows the mechanism by which the factors that cause inflation interact.

At the practical level, as mentioned above, there are three sectors that have affected the prices system of any economy, which are, namely the monetary, real, and external sectors. With regard to the monetary sector, many econometric studies derive the inflation function using the demand for money function (Cagan, 1956; Dutton, 1971; Khan, 1980; Aghevli and Khan, 1980). Furthermore, the most dominant economic theory in recent decades acknowledges the role of the variations in money supply as an important determinant of price in an economy. In terms of the real sector, it is noted that the production factors cost, especially the wage rates and the inventory variations, are utilized in many of the econometric models to estimate the function of inflation (Eckstein and Fromm, 1968; Gordon, 1972). Finally, the external sector variables; in particular, the imports' prices and the exports prices (export oil prices in the case of Libya) have played the same role as the money supply and the production factors cost in determining the prices system levels (Abohobiel, 1983).

The prices block in this study consists of nine endogenous variables, five of which are stochastic equations, while the rest are identities. The next subsections will briefly clarify these mentioned variables.

4.2.4.1 GDP implicit price deflator *(PGDP)*

PGDP is used to represent the GDP implicit price deflator, and the behaviour of this variable is specified in the following equation:

$$PGDP = F\ (PGDP\_1,\ EXCHRATE,\ PIM,\ DMS)$$

Where:

PGDP = GDP implicit price deflator

PGDP_1 = Lagged *GDP* implicit price deflator

EXCHRATE = Libyan dinar exchange rate against the *USA* dollar

PIM = Total imports' price index

DMS = Changes in the money supply

4.2.4.2 Inflation rate *(INFGDP)*

INFGDP represents the definition function of the inflation rate of the implicit *GDP* deflator and expresses the relationship between the value of the implicit *GDP* deflator in the current period *PGDP* and in the last period *PGDP_1*, as clarified in the following function:

$$INFGDP=F\ (PGDP,\ PGDP\_1)$$

Where:

INFGDP= Inflation rate of the implicit GDP deflator,

PGDP= Implicit GDP deflator, and

PGDP_1= Lagged GDP implicit price deflator.

4.2.4.3 Non-oil *GDP* implicit price deflator *PGDP (PGDPNOIL)*

The following function reflects an important variable, especially in oil-exporting countries, which is the non-oil GDP implicit price deflator. As can be seen from the following relationship the behaviour of this variable can be explained- in the Libyan economy - by the variables that are described in the following function:

$$PGDPNOIL = F\,(PGDPNOIL\_1, PGDP, TREND, CUGDP)$$

Where:

PGDPNOIL= Non-oil GDP implicit price deflator,

PGDPNOIL_1 = Lagged non-oil GDP implicit price deflator,

PGDP = Implicit GDP deflator,

TREND = Trend, and

CUGDP = Absorptive capacity of GDP.

4.2.4.4 Inflation rate of non-oil GDP *(INFGDPNOIL)*

Similar to the examples above, *INFGDPNOIL* is expressed through the following definition function, the behaviour of the inflation rate of the implicit non-oil sector deflator.

$$INFGDPNOIL = F\,(PGDPNOIL\_1, PGDPNOIL)$$

Where:

INFGDPNOIL = inflation rate in non-oil GDP,

PGDPNOIL_1 = lagged non-oil GDP implicit price deflator, and

PGDPNOIL = non-oil GDP implicit price deflator.

4.2.4.5 The average price of a barrel of oil in the global market in Libyan dinars *(PWOILLD)*

The price of a barrel of oil in the global market as presented in Libyan dinars appears in the next identity where it equals the price of a barrel of oil in the global market as presented in USA dollars multiplied by the Libyan dinar exchange rate against the USA dollar:

$$PWOILLD = PWOILUS\$ * EXCHRATE$$

Where:

PWOILLD = The average price of a barrel of oil in the global market, in Libyan dinars,

PWOILUS$ = Average price of a barrel of Libyan oil in the world market in USA dollars, and

EXCHRATE = Libyan dinar exchange rate against the USA dollar.

4.2.4.6 Exports' implicit price deflator *(PEXOILLD)*

The equation below introduces the exports' implicit price deflator *PEXOILLD* where it is modelled as a function of the lagged exports' implicit price deflator for one period *PEXOILLD_1.* Additionally, it shows the functions of the lagged average price of a barrel of oil in the global market, in Libyan dinars, for one period *PWOILLD_1* and the lagged average price of a barrel of oil in the global market, in Libyan dinars, for two periods *PWOILLD_2* respectively:

$$PEXOILLD = F\,(PEXOILLD\_1,\ PWOILLD\_1,\ PWOILLD\_2)$$

4.2.4.7 Consumer implicit price deflators *(PCP)*

Consumer implicit price deflators *PCP* can be modelled as a behavioural equation and it is shown as a function of lagged consumer implicit price deflators for one period *PCP_1* , the *GDP* implicit price deflator *PGDP*, and lagged GDP implicit price deflator for one period *PGDP_1*, and two periods *PGDP_2*, respectively, as shown in the following equation:

$$PCP = F\,(PCP\_1,\, PGDP,\, PGDP\_1,\, PGDP\_2)$$

4.2.4.8 Investment implicit price deflators *(PIT)*

The following equation introduces the investment implicit price deflators *PIT* as a behavioural equation where, in the same manner as appears in the consumer implicit price deflators above, it is a function of the lagged investment implicit price deflator for one period. In addition, it is a function of both the lagged *GDP* implicit price deflator for one period *PGDP_1*, and for two periods *PGDP_2*, respectively, as shown in the following equation:

$$PIT = F\,(PIT\_1,\, PGDP,\, PGDP\_1,\, PGDP\_2)$$

4.2.4.9 Gross domestic product at current factor price *(GDPCfc)*

The gross domestic product at current factor price *GDPCfc* is introduced as a definition identity, where it equals the sum of the nominal non-oil gross domestic product and the nominal gross domestic product in the oil sector. The nominal values of these two variables are deduced by dividing the real values of these variables by their implicit price deflators as shown in the following identity:

$$GDPCfc = XNOILR \,/\, PGDPNOIL + XOILR \,/\, PGDPOIL$$

Where:

GDPCfc = Gross domestic product at current factor price,

$XNOILR$ = Non-oil gross domestic product, real,

$PGDPNOIL$ = Non-oil GDP implicit price deflator,

$XOILR$ = Gross domestic product in the oil sector, real, and

$PGDPOIL$ = Implicit deflator of oil GDP.

4.2.5 Public finance block

The debate about the impact of a government's role in the economy is a controversy as old as the economic theory itself. The debate appeared with the beginnings of mercantilism and has extended up until the present day through the thinking of the classical and Keynesian economists.

Sometimes, modelling the public sector has not been given the importance that it deserves. It should be given the same amount of importance that is given to the monetary sector. This is because the behaviour of the public sector significantly affects the key macro variables in an economy (Matlanyane, 2005).

When the state plays its assigned role, it needs to spend and this requires a certain amount of revenues; this action is called -in the economic literature- public finance (Hyman, 2011) and this explains how government behaviour can affect the economy as a whole, which has been previously elucidated in the fiscal policy transmission mechanism. In this context, the theoretical framework that deals with the impact of a certain fiscal policy (whether, as mentioned, it is driven by classical or Keynesian theory) places an emphasis, ultimately, on the impact of this policy regardless the nature of this influence (Tanner, 1979; Feldstein, 1982). In this regard, two types of these effects on the economy can be identified, namely: effects on monetary variables and effects on real variables.

It is worthwhile noting, in this context, that the final effect on the macro variables in an economy depends on how public spending is financed, and how the deficit would be financed that would arise because of this process (Easterly and Schmidt-Hebbel, 1994). The recurring question in economic literature is the manner by which a government will finance the budget deficit.

Regarding the impact of government actions on monetary variables, it comes through the funding of the deficit via domestic bank borrowing. The financing of the budget deficit by this channel, in particular from the Central Bank, - as in the Libyan case - leads to the emergence of inflationary pressures. Accordingly, the monetary base will increase due to a growth in domestic assets, and this will increase the money supply, which heightens the general level of prices.

The impact on the real variables comes from the decline in both economic growth and investment because of the negative growth of the profit rates that arise from the changes that have occurred in consumption and investment due to the public budget imbalances, in response to changes in tax rates (Altig, 1988). It is worthwhile saying in this context that the rationale for this approach lies in the so-called Ricardian equivalence, which implies that any increase in current government spending, financed by domestic borrowing, will be offset by an increase in future taxes (Plosser, 1987; Yotsuzuka, 1987 and Becker,1997). This theorem clarifies that all the taxable sectors will be affected by a surcharge in the future to repay this debt (Barro, 1989).

The approach that has explained the impact of government behaviour on macro variables has been previously mentioned. This approach is related to the controversy that is concerned with crowding effects which explains the relationship between the public and the private sector and highlights the extent of substitutability and complementarity between these two sectors.

The purpose of modelling the government sector in this study is to elucidate how important is the role played by the state in economies in general and in developing economies, such as the Libyan economy, in particular. The study focused in this part of the model on the revenue side, where expenditure variables have been classified in the aggregate demand section.

The public finance block in this study consists of ten behaviour, identity, and bridge equations, which will be briefly explained in the following sub-sections.

4.2.5.1 Income tax *(TAXDIRC)*

Taxes are one of the most important instruments of a fiscal policy that can be relied upon to achieve the various objectives of the policy, such as the redistribution of income or the guidance of production and spending on a particular sector. Tax is also a natural source of financing public spending compared to other sources such as the issuing of new money, or the issuing of bonds, which are sold to the public.

There are many perspectives on the classification of taxes in the empirical studies, which focus on the measurement of tax functions, according to the various objectives of each study. Some studies have measured a very large number of functions of taxes, while the number in some studies has ranged between eleven and fourteen functions, and other studies have confined it to one or two functions.

Taxes are divided in the economic literature into several types, the most important of which is the division of taxes into direct taxes and indirect taxes. Direct taxes are imposed on income and wealth, such as income tax and profits' tax. This type of tax implies that the sectors, which bear this tax burden, will not be able to transfer it to other sectors. Moreover, direct taxes and indirect taxes can be divided into many other types of tax, such as the relative tax, lump-sum taxes, or progressive taxes.

There are many variables involved in the interpretation of the tax function, such as real income and the general level of prices. Some studies rely on disposable personal income and the lagged disposable personal income, to estimate income tax (Brunner and Meltzer, 1972, b). Furthermore, some studies depend on consumer spending and private consumption expenditure in the previous period to explain the behaviour of spending tax.

Income tax or direct tax in this study is modelled as a stochastic equation, a function of the gross domestic product at the current factor price, trend, and lagged on period of income tax, as in the following equation:

$$TAXDIRC = F\ (TAXDIRC\_1,\ GDPCfc\_1,\ TREND)$$

Where:

$TAXDIRC$ = Income tax,

$TAXDIRC\_1$ = Lagged on period of income tax,

$TREND$ = Time trend, and

$GDPCfc$ = Gross domestic products at the current factor price.

4.2.5.2 Non-direct, current taxes *(TAXINDC)*

Non-direct taxes are those imposed on the components of spending. In this case the sector that bears the tax burden can transfer the burden in full, or part thereof, in the form of increased prices. The salient examples of indirect taxes are customs' duties, sales' tax and value added taxes.

Non-direct tax in this study is an identity as presented in the following equation:

$$TAXINDC = TARIFFC + TAXNTARC$$

Where:

$TAXINDC$ = Non-direct taxes,

$TARIFFC$ = Current taxes on imports, and

$TAXNTARC$ = Indirect taxes, non-customs revenue.

4.2.5.3 Total government income $(GTYC)$

Total government income $(GTYC)$ in this model is an identity as clarified by the next equation:

$$GTYC = TAXDIRC + TAXINDC + OILREV + TAXOTHC$$

Where:

$GTYC$ = Total government income,

$TAXDIRC$ = Income tax,

$TAXINDC$ = Non-direct taxes,

$OILREV$ = Treasury's share of oil revenues, and

$TAXOTHC$ = Taxes and other income of the public Treasury.

4.2.5.4 Personal disposable income, at current prices $(YPDC)$

Disposable personal income at current prices can be defined as that part of an income, which is left entirely to individuals to take action with, whether to spend on consumer goods, or to save, after deducting all personal income taxes. Disposable income is an economically important variable because it is the most significant variable that explains the behaviour of private consumption expenditure and saving.

In this study, disposable personal income is modelled and determined endogenously by an identity as a difference between the gross domestic products at market price, subsidies for economic units, and income from abroad, on the one hand, and total government income, on the other, as shown in the following identity:

$$YPDC = GDPCmp + SUBSIDIESC + NETYFBC - GTYC$$

Where:

$YPDC$ = Disposable personal income at current prices,

$GDPCmp$= Gross domestic products at market price,

$SUBSIDIES$ = Subsidies for economic units,

$NETYFBC$ = Income from abroad, and

$GTYC$ = Total government income.

4.2.5.5 Personal disposable income, real *(YPDR)*

Disposable personal income at current prices is used in this model in its real form, so the linkage of nominal (current) disposable personal income to other equations in the model is then made functional by transforming the current disposable personal income to real values by the following identity:

$$YPDR = YPDC / PGDP$$

Where:

$YPDR$ = Real disposable personal income,

$YPDC$ = Nominal (current) disposable personal income, and

$PGDP$ = Implicit gross domestic products deflator.

4.2.5.6 Total government spending *(GTEC)*

Total government expenditure in this study is determined endogenously as a sum of government consumption expenditure on goods and services, government gross fixed investment in the non-oil sector, and other expenses of the government sector, as clarified in the next identity:

$$GTE = CGC + IGNOILC + OTHGEC$$

Where:

GTE = Total government expenditure,

CGC = Government consumption expenditure on goods and services,

$IGNOILC =$ Government gross fixed investment in non-oil sector, and

$OTHGEC$ = Other expenses of the government sector.

4.2.5.7 The government budget balance $(BUDGET)$

Budget deficit is one of the most debatable issues among economists, whether discussing the reasons for the deficit, on the one hand, or exploring the appropriate way to finance this deficit on the other (see, for example, Tanner, 1979; Feldstein, 1982; and Kormendi, 1983).

Financing government budget deficit is the basis, which accounts for the bulk of attention of interested economist studying this topic. The subsequent effects of the process of deficit financing are different according to different sources of funding and, therefore, each process must be identified in order to avoid the negative effects, which might be caused by a given funding process.

To illustrate this issue, it can be argued that the deficits' measures have developed and deviated from a conventional context, which identifies the budget deficit as the difference between the income and expenditure of the Public Treasury. This measure has encountered many criticisms because it is not accurate and because it has confined deficit to the central government. Therefore, emphasis has been placed on a new framework, which takes all government entities (such as municipal authorities) into account. Consequently, the deficit, in this case, will be equal to the difference between government and public sector revenue, on the one hand, and all expenditure by these entities, on the other. In this case, this measure is called the unified deficit of the public sector.

There is another concept of budget deficit, which is called primary deficit, in which the public debt interest payments are eliminated from government spending, because they are expenses resulting from a former deficit, not from current activities.

In addition to the above, there is a concept called operational deficit, which measures the deficit under conditions of inflation. In the light of this concept, the deficit is represented by the requirements of both government and public sector borrowing, minus the interest payment in order to inflation-correct, through the monetary correction parameter, which includes the interest rate that is paid to creditors to compensate them for the losses of their assets (debt) because of inflation.

Finally, there is a concept of budget deficit, which is named structural deficit. This measure eliminates the impact of emergency or temporary factors, which can affect the government budget, such as the deviation of domestic income or interest rates from their value in the long term, as well as the imbalance that can occur in prices' levels. This measure also excludes the sales of government assets because those represent an extraordinary resource.

Needless to say, that the plausibility of financing the budget via deficit has no longer become an admissible idea because of the serious consequences that have been caused by it, whether by funding from internal or external sources. According to the bulk of these effects, the way in which public budget deficit is handled has become one of the essential matters in maintaining economic stability.

In a concise manner, the current debate about the budget deficit in developing countries has settled into two points of view; the International Monetary Fund and Monetarism represent the first. This view stems from the fact that deficit, ultimately, is excess demand whereby public spending contributes a high proportion in the aggregate demand (Aschauer, 1985). Thus, treatment via this approach has focused on curbing the growth of public spending by reducing the role of the state in economic activity, and reducing taxes[11] on high incomes and capital in order to encourage the private sector.

The second point of view represents proponents of independent development as an alternative to first view; firstly, as it tries to provide a remedy to the problem of budget deficit by supporting capability of tax by the government, on the one hand, and the rationalization of public spending, on the other.

Below is given the identity that represents the budget deficit in this study, where it has been assumed that the budget balance is equal to the difference between total government income and total government expenditure, as evidenced by the following equation:

$$BUDGET = GTYC - GTEC$$

Where:

$BUDGET$ = Government budget balance,
$GTYC =$ Total government income, and
$GTEC$ = Total government expenditure.

4.2.5.8 Changes in domestic assets *(NDAC)*

The following equation reflects the changes in domestic assets of the Central Bank, which is equal, in this model, to the sum of the bank credit granted to the non-banking sector, and the changes in the rest of the domestic assets of the Central Bank.

$$NDAC = CRNOILC + OTHDASC$$

Where:

11 It seems at first glance that the treatment of a budget deficit by reducing tax rates is rather a strange matter but it has theoretical support via the so-called Laffer curve, for more details on this issue see: Raboy, 1982; Malcomson, 1986 and Trabandt and Uhlig, 2010.

$NDAC$ = Changes in domestic assets,

$CRNOILC$ = Bank credit to non-oil sector, and

$OTHDASC$ = Changes in other domestic assets.

4.2.5.9 GDP at market price, current *(GDPmp)*

The Gross Domestic Product is considered one of the best-recognised measures of economic activities in the economic litterature.

Furthermore, Gross Domestic Products *(GDP)* at market prices is an economic term referring to the final products of economic activity in a particular country. According to Mishkin (2012), the meaning of '*GDP* at market prices' is ''*the total value of goods and services produced in an economy*'' (Mishkin, 2012; 19).

There are various alternative ways for measuring *GDP*. In this context, it has been chosen to mention, specifically, three of them: value added (production), expenditure, and income approaches. Each of these approaches measure the Gross Domestic Product from a specific prospective. From the production approach, *GDP* could be defined as ''*the current market value of all final goods and services newly produced in the economy during a fixed period of time*'' (Mishkin, 2012; 19).

According to the expenditure approach, *GDP* could be defined as ''*the total spending on currently produced final goods and services in the economy*'' (Mishkin, 2012; 23) where the total spending is divided into private consumption expenditure, private investment expenditure, government spending (on consumption and investment goods) and net exports.

Finally, with income approach, *GDP* involves adding up all the incomes received by households and firms in the economy, including profits and tax revenue to the government (Mishkin, 2012).

The following identity represents the Gross Domestic Product at market prices, where it is the sum of the Gross Domestic Product at factor prices and non-direct taxes, less subsidies for the economic units.

$$GDPmp = GDPCfc + TAXINDC - SUBSIDIESC$$

Where:

$GDPmp$= Gross Domestic Product at market prices,

$GDPCfc$ = Gross Domestic Product at factor prices,

$TAXINDC$ = Non-direct taxes, and

$SUBSIDIES$ = Subsidies for the economic units.

4.2.5.10 Growth rate of real GDP ($GDPR_G$)

The growth rate of the real Gross Domestic Products is specified in the equation below:

$$GDPR_G = ((GDPR - GDPR\_1)/GDPR\_1)*100$$

Where:

$GDPR_G =$ The growth rate of real Gross Domestic Products,

$GDPR$ = Real Gross Domestic Products, and

$GDPR\_1$= Lagged real Gross Domestic Products.

4.2.6 Money supply block

The money supply is regarded as one of the most controversial economic variables, at both theoretical and practical levels (Laidler, 1969). This controversy can be verified by a lack of agreement on the unified and explicit definition of the concept of money; this in spite of the consensus on its importance which is established through its widespread use in all societies (Kaufman, 1969). The money supply is considered one of the important tools of civilization and advancement which can lubricate the exchange process as well as having strong influence on real economic variables (Shostak, 2000).

It should be noted that there is general agreement among economists concerning the functions of money, although some economists try to emphasize the importance of a particular function, irrespective of the two other functions it possesses. Therefore, the author will seek, firstly, to clarify these functions and then, secondly, define which of these assets undertake such functions and, therefore, may be called money.

The function of the standard of values is the first function that has emerged to describe money, where it is regarded as a basis for a comparison between goods when determining their rates of exchange. There is no doubt that the presence of a single measure facilitates this process significantly. Furthermore, it should be noted that the function of the standard of values is, essentially, an accounting function and refers to an abstract unit of money, i.e the barter of goods could only occur by the evaluation of each commodity through monetary units and the money may not be, virtually, in the exchange process; this, really, is a difficult and complex mechanism. Then the function of the medium of exchange came after growth in the needs and the increase in the number and breadth of economic transactions alongside the development of societies which led to the complexity of the process, as mentioned earlier, of the exchange and flow of goods in the markets. Time is regarded as a critical factor in the completion of the process of exchange because economic transactions are, in fact, an extended process over time and there is no guarantee of the continuity of the synchronization in the exchange process that leads, in turn, to the appearance of a new function of money, which is its role as a store of value.

In the same context, the description of an asset as a medium of exchange and a standard of values satisfies all the necessary and sufficient conditions which are required to describe it as money. Whereas describing an asset as a store of value without the inclusion of the other two functions means that it cannot be described as money.

This does not mean that the function of the store of value is insignificant but, on the contrary, this function has been researched greatly in the monetary economics field and there is increasing severity in the disputes around it. It is worthwhile noting that there are other assets which are characterized by being steady in value and are used with money as a store of value, but are not regarded as money. Money is demanded as an asset, often, because of its own characteristics, which results in disagreements about the specific terms used to describe the money concept, which has led to an arising need to accurately define this term; specifically when establishing what is meant by the supply of money.

It can be said, in general, that the differentiation between the functions of money is disputed by two points of view. The first considers that the most important function of money is in its role as a medium of exchange, which is the prevailing view of the monetarists, led by Milton Friedman, Whereas the second point of view attaches importance to the function of the store of values, where money is demanded for its own characteristics. According to this point of view, the narrow money supply concept, which is limited to the currency in circulation and the demand deposits in commercial banks, is not the right foundation which must be adopted by a monetary policy; it must be directed to a wider interest which is concerned with the overall liquidity in an economy; this is urged by the report issued by the Radcliffe committee during its examination of the monetary system in England in 1959.

The concept of liquidity is ambiguous and uncertain and it is difficult to give a precise and comprehensive definition of the idea of liquidity. Analytically, one looks at liquidity on the basis of the degree to which it can be the asset marketed and the possibility of converting it into money in a short time and in its full value. Therefore, when determining the degree of liquidity, the outcome is the extent to which the asset can quickly be converted into a means of payment, and the degree by which it maintains its value during the conversion process. Based on this criterion, any mixture of financial assets may reflect different degrees of liquidity depending on the components that are represented in the financial assets' mixture.

It should be noted here that assets that accustomed by individuals are actually considered more liquid than others, as the most commonly used assets in a society can be marketed easily at a price close to their purchase price. Consequently, liquid assets, without the function of a medium of exchange, are a perfect alternative to money and the total of these assets can be summed up by individuals' spending decisions. Thus, the idea of liquidity is considered as a vital basis that a monetary policy can rely upon.

This perspective has developed in monetary policy substantially as a result of the individual contributions of Gurley and Shaw which focused on the possibility of increasing the efficiency of a monetary policy when it has been studied within the financial assets as a whole (Gurly and Shaw, 1970).

Moreover, this debate takes a deeper dimension when one refers to the ability of the Central Bank to control the money supply, which led to an attempt to determine the amount of this control which entails knowing whether the money supply is endogenously determined or not. In such a scenario, monetarists treat the quantity of money and its rate of growth as constant variables determined outside (exogenous variable) the model. This is incompatible with the view of non-monetarists who consider that the money supply is determined inside (endogenous variable) the model by the level of economic activity and the preferences of different individuals, through substitution between money and other financial assets (Humphrey, 1975).

In general, the treatment of the money supply as an endogenous variable has proved its importance in many practical studies (Marothia and Phillips, 1982). And, away from the Keynesian radical point of view which is expressed by Nicholas Kaldor, ‘that money doesn’t matter’, it can be said that the view of the post-Keynesians, led by James Tobin, is more reasonable. Many authors have termed this view as an eclectic view (Glahe, 1973) because it comprises the best arguments of both the Keynesians and the monetarists and, therefore, it can be considered that the money supply is an endogenous variable, and that it is then determined inside the model (Brunner and Meltzer, 1972 a).

With regard to the explanatory variables that describe the behaviour of the supply of money, this can be clarified through the actions of the three economic units that affect the money supply. The nominal money stock in a particular time is as a result of the portfolio decisions of the Central Bank, the commercial banks and the public, including non-bank financial intermediaries.

Therefore, these variables should be reflected somehow in the behaviour of these economic units. In this context, many economists have adopted the monetary base and the money supply in the previous period as significant explanatory variables in describing the behaviour of the money supply (Khan, 1974).

In addition, some economists take into account the impact of the interest rate on the money supply (Fand, 1970) as well as the important role of the currency in circulation and the demand and the time deposits, the currency deposits ratio, the currency money supply ratio, and the time deposits money supply ratio. Moreover, these writers also take into consideration some of the monetary policy tools that are represented in the discount rate, in the required reserves, and in the maximum allowable interest rate on time deposits, as crucial explanatory variables.

Also, some studies took into account the excess reserve and the expanded monetary base which includes the monetary base as well as the changes in the amount of liberated reserves that resulted from the changes in the legal reserve, in addition to the transfers that occur in the deposits between the differing levels of commercial banks. Additionally, these liberated reserves can be realized due to the transfers in deposits between member banks in the Federal Reserve's system (Central Bank) and non-member banks. Additionally, these transfers also occur between time deposits and demand deposits (Andersen, 1967).

The equation for the money supply in this study depends on the stock of the money supply and on the components of the monetary base which are represented by both the stock of foreign assets and net domestic assets in the current period and the previous period. Additionally, the money supply function in this model function the dummy variable expresses the period which covers the lifting of the embargo on Libya and the start of the transition in the Libyan economy. Accordingly, the function will be as follows:

$$MS = F\,(MS\_1,\ IRC, NDAC, NDAC\_1, D_{0206})$$

Where:

MS = Money supply,

MS_1= Lagged one period of the money supply,

IRC = Balance of foreign assets (reserves),

$NDAC$= Net domestic assets,

$NDAC\_1$= Lagged one period of net domestic assets, and

D_{0206} = Dummy variable (1 in 2002 – 2006, 0 elsewhere).

4.3 The complete model

This section will present the model equations that will be estimated in the next chapter as a handy reference in order to facilitate the comparison between the model blocks and equations in order to clarify the interrelationships in the model as a whole.

$$LCPR = \alpha_{1,1} * LCPR\_1 + \alpha_{1,2} * LYPDR + \alpha_{1,3} * LMSR - \alpha_{1,4} * LMSR\_1 + \alpha_{15} * TREND \text{ -------- } (4.1)$$

$$CGC = \alpha_{2,1} + \alpha_{2,2} * TAXDIRC + \alpha_{2,3} * TAXDIRC(-1) + \alpha_{2,4} * TAXINDC + \alpha_{2,5} * OILREV \text{ -------- } (4.2)$$

$$IPNOILR = \alpha_{3,1} * IPNOILR\_1 + \alpha_{3,2} * DKNOILR + \alpha_{3,3} * IGNOILR\_1 - \alpha_{3,4} * DUM_{8185} \text{ -------- } (4.3)$$

$$KNOILR = KNOILR\_1 + IPNOILR + IGNOILR - DEPNOILR \text{ -------- } (4.4)$$

$$LIMCONR = \alpha_{4,1} * LIMCONR\_1 + \alpha_{4,2} * LCPR - \alpha_{4,3} * LEXCHRATE\_1 - \alpha_{4,4} * PPRICE + \alpha_{4,5} * PPRICE\_1 \text{ -------- } (4.5)$$

$$LIMCAPR = \alpha_{5,1} * LIMCAPR\_1 + \alpha_{5,2} * LIGNOILR + \alpha_{5,3} * LDKNOILR - \alpha_{5,4} * LPIMPIT \text{ -------- } (4.6)$$

$$EXOILMB = \alpha_{6,1} * EXOILMB\_1 + \alpha_{6,2} * XOILMB - \alpha_{6,3} * XOILMB\_1 \text{ ------ } (4.7)$$

$$WAGEFBC = \alpha_{7,1} * WAGEFBC\_1 - \alpha\ \alpha_{7,2} + \alpha_{7,3} * FLABOR - \alpha_{7,4} * FLABOR\_1 \text{ ------ } (4.8)$$

$$EXOILOC = EXOILMB * PEXOILLD \text{ ------ } (4.9)$$

$$NFIFBC = \alpha_{8,1} * NFIFBC\_1 + \alpha_{8,2} * FINACC \text{ ------ } (4.10)$$

$$EXTOTC = EXOILOC + EXOTHC \text{ ------ } (4.11)$$

$$IMTOTC = IMCONR * PIMC + IMCAPR * PIM + IMOTHC \text{ ------ } (4.12)$$

$$NETYFBC = WAGEFBC + NFIFBC \text{ ------ } (4.13)$$

$$BOTGSC = EXTOTC - IMTOTC + BOTGSDISCREP \text{ ------ } (4.14)$$

$$BOPC = BOTGSC - NETYFBC + FINACC + BOPOTHC \text{ ------ } (4.15)$$

$$IRC = IRC\_1 + BOPC \text{ ------ } (4.16)$$

$$XNOILR = \alpha_{9,1} + \alpha_{9,2} * KNOILR - \alpha_{9,3} * KNOILR(-1) + \alpha_{9,4} * IMCAPR + \alpha_{9,5} * IMCAPR\_1 + \alpha_{9,6} * CRNOILR \text{ ------ } (4.17)$$

$$GDPR = XNOILR + XOILR + GDPRDISCREP \text{ ------ } (4.18)$$

$$PGDP = -\alpha 10, 1 + \alpha_{10,2} * PGDP\_1 + \alpha_{10,3} * EXCHRATE + \alpha_{10,4} * PIM + \alpha_{10,5} * DMS \text{ ------ } (4.19)$$

$$INFGDP = (DPGDP / PGDP\_1) * 100 \text{ ------ } (4.20)$$

$$PGDPNOIL = \alpha_{11,1} * PGDPNOIL\_1 + \alpha_{11,2} * TREND + \alpha_{11,3} * PGDP + \alpha_{11,4} * CUGDP \text{ ------ } (4.21)$$

$$INFLGDPNOIL = (DPGDPNOIL / PGDPNOL\_1) * 100 \text{ ------ } (4.22)$$

$$PWOILLD = PWOILUS\$ * EXCHRATE \text{ --------------------------------------- } (4.23)$$

$$PEXOILLD = \alpha_{12,1} * PEXOILLD(-1) + \alpha_{12,2} * PWOILLD - \alpha_{12,3} * PWOILLD(-1) + \alpha_{12,4} * PWOILLD(-2) \text{ ------------------------------ } (4.24)$$

$$PCP = \alpha_{13,1} + \alpha_{13,2} * PCP\_1 + \alpha_{13,3} * PGDP - \alpha_{13,4} * PGDP\_1 + \alpha_{13,5} * PGDP\_2 \text{ -- } (4.25)$$

$$PIT = \alpha_{14,1} + \alpha_{14,2} * PIT\_1 + \alpha_{14,3} * PGDP - \alpha_{14,4} * PGDP\_1 + \alpha_{14,5} * PGDP\_2 \text{ -- } (4.26)$$

$$GDPCfc = (XNOILR * PGDPNOIL) + (XOILR * PGDPOIL) \text{ -------------- } (4.27)$$

$$TAXDIRC = \alpha_{15,1} * TAXDIRC\_1 + \alpha_{15,2} * GDPCFC\_1 + \alpha_{15,3} * TREND \text{ -- } (4.28)$$

$$TAXINDC = TARIFFC + TAXNTARC \text{ -- } (4.29)$$

$$GTYC = TAXDIRC + TAXINDC + OILREV + TAXOTHSC \text{ ---------------- } (4.30)$$

$$YPDC = GDPmp + SUBSIDIES + NETYFBC - GTYC \text{ --------------------- } (4.31)$$

$$YPDR = YPDC / PGDP \text{ --- } (4.32)$$

$$GTEC = CGC + IGNOILC + OTHGEC \text{ -- } (4.33)$$

$$BUDGET = GTYC - GTEC \text{ -- } (4.34)$$

$$NDAC = CRNOILC + OTHDASC \text{ --- } (4.35)$$

$$GDPmp = GDPCfc + TAXINDC - SUBSIDIES + GDMPDISCREP \text{ -------- } (4.36)$$

$$GDPRG = (DGDPR / GDPR\_1) * 100 \text{ -- } (4.37)$$

$$MS = \alpha_{16,1} * MS\_1 + \alpha_{16,2} * IRC + \alpha_{16,3} * NDAC \text{ ----------------------------- } (4.38)$$

4.4 Conclusion

This chapter has described the theoretical background of the model by reviewing all the theories that related to the equations of the model in order to justifying the variable in each equation, and shed light on the debate about these theories.

It is known that the Libyan economy is a small open one, reflecting most of the characteristics of developing economies and it depends on the production and export of one commodity as the main source of income. Additionally, it imports much of its needs from other economies. The private sector in Libya is unable to undertake the role that has been assigned to it.

These characteristics are the dominant feature of the Libyan economy, accordingly, this model has been constructed to reflect, clearly, these characteristics, with an attempt to explain the variables contained in the model equations.

Accordingly, this chapter has focused on the important variables in aggregate demand and supply, and has highlighted the role of the government and external sectors, in a developing economy such as the Libyan economy.

CHAPTER FIVE: ESTIMATION OF THE MODEL

5.1 Introduction

Using econometric models in economic research is one of the most important approaches that have helped to advance economics during the past three decades because of the importance of practical applications in strengthening the theoretical aspects, and then consolidating the beliefs around them (Frisch, 1971).

In fact, economic studies that use econometric models seek to achieve all or some of the goals that such models aspire to attain. Structural analysis of the study model is considered the first of these goals (Intriligator, Bodkin, and Hsiao, 1996, (see in particular chapter14)). This goal will be achieved in this chapter by estimating the single equations of the model in order to clarify its underpinning theory (through the magnitude and the sign of the different parameters in the model equations) as an economic evaluation, in addition to emphasize goodness of fit for these equations, as a statistical evaluation. The other two goals that are sought to be achieved in econometric models are forecasting and the evaluation of economic policies (Intriligator, Bodkin, and Hsiao, 1996, (specifically in chapters, 15 and 16, respectively)). This subject will be addressed in the next chapter where it will utilize a simulation technique to achieve these two goals simultaneously by using the results of the simulation process to apply forecasting inside the sample period. Additionally, the aim was to accomplish a policy analysis by evaluating different available scenarios using the control solution of the model, which was obtained from the aforementioned simulation process.

CHAPTER FIVE: ESTIMATION OF THE MODEL

The Dutch economist Jan Tinbergen has summarized econometric models research in three steps: firstly, one must prepare a list of variables that must be taken into account. Secondly, there is the preparation of a scheme of equations or the relationship between the variables involved in the study, and finally the validity of these equations should be tested by estimating their parameters (Tinbergen, 1971).

The estimation of the parameters in the single equations, and testing their goodness of fit, is the basis upon which to build the entire econometric model and thus its ability to predict; this then can be used in the model analysis of different policies. This is despite the fact that the goodness of fit in the single equations' estimation is not sufficient in some cases to guarantee the goodness of its performance in the model as a whole, as will be seen later in the next chapter (Pindyck and Rubinfeld, 1998; cf. Pagan, 1999).

The two previous chapters (chapters three and four) have introduced the required theoretical framework of the model of the study and paved the way to this chapter that will deal, as mentioned above, with the estimation of the single equations of the model.

To achieve the mentioned task, this chapter will be divided into four sections in addition to the introduction and the conclusion, which will be shown in sections one and six respectively. The second section will review estimation techniques with a focus on a methodology used by the London School of Economics (LSE) which is considered the philosophical foundation of the estimation method that will be used for the single equations in this study.

The estimation process of the single equations (that forms the six blocks in this model) will be addressed in section three, while section four will present the estimated model in its final form. Finally, section five will provide a list of all the variables in the model of the study.

5.2 The estimation technique

Hoover, in his excellent article on econometric methodology, acknowledged that ''*the methodology of econometrics is not the study of particular econometric techniques, but a meta-study of how econometrics contributes to economic science. As such, it is part of the philosophy of science*'' (Hoover, 2005; 1).

In this regard, many economists, in particular most econometricians, believe that economics is, to some extent, a pure science[12] (Chao, 2007, Gilbert, and Qin, 2007), although it may seem in reality to be a social science because interpretation of economic phenomena improves when one utilizes the latest software and econometrics' techniques (Rao, 2006).

In this respect, the developments that occur in research into econometrics must be taken into account, especially developments within the time-series techniques, on one hand, and developments that take place in the field of econometric software in response to the developments in the time-series techniques, on the other (Hoover, 2005).

In this regard, as was mentioned in the first chapter, there are many econometrics methodologies. These methodologies include among others: the Cowles Commission, or structural modelling, the atheoretical Vector Autoregression (VAR), Calibration, Extreme-bounds analysis and the London School of Economics' (LSE) approach (for details see among others: Ingram

12 This topic can be found, specifically, in the debate between Davis and Chao, for more details see: Davis, 2005; Chao, 2005 and Chao, 2007. In fact, this stream of thought began with the works of Schumpeter in 1933, see Gilbert, and Qin, 2007.

1995; Canova 1995; Mizon 1995; Kydland and Prescott 1995; Hoover, 2005; Leamer 1983; Chao, 2002).

In addition, several of these methodologies are targeted by continuous developments. However, the attention has been focusing on the two most dominant streams in the field of econometric research which are, firstly, the Cowles Commission or structural modelling, which has evolved recently and is subsidiary in the literature to the real business cycle theory (RBC) (Ingram, 1995), secondly, the methodology of the London School of Economics (LSE) and its general-to-specific approach.

In general, the crucial step in econometric research is how the model that is assigned to solve the phenomena of interest will be accurately selected. Unquestionably, this step provides the main source of difference between the competing methodologies.

The main problem that arises and results from the selection process and then leads to the differences between these methodologies is how to bridge the theory-data gap. Where there a contradiction between economic theory (which has an equilibrium nature-static) and the data used to prove the validity of this theory in order to interpret and uncover true economic relationships that are collected from the real world and are characterized by their disequilibrium nature (Hoover, 2005, and Campos, Ericsson and Hendry, 2005). Additionally, these theories do not offer any suggestions about the dynamic nature of this reality (Rao, 2006).

With regard to the theory-data relationship, there are three dominant approaches (Pu, 2002). Firstly, there is Cowles Commission approach which represents the theory conducted approach where, *the econometric analysis within the Cowles Commission tradition begins from the idea that the structural form of the process generating the data is known qualitatively, reduced form are then derived from such structures* (Favero, 1999; 148).

Secondly, the atheoretical VAR approach represents the data conducted approach which ''*removes the pretence of applying theoretical structure to the data and, instead, uses unrestricted systems of reduced form equations (or vector autoregressions or* VARs*) to model the responses of variables to shocks''* (Hoover, 2005; 24). Thirdly, there is the London School of Economics' methodology (LSE) that combines the two previous approaches and is described as the data-and-theory approach (Pu, 2002).

To avoid these empiric procedures that focus on how to combine theory and data, the Cowles Commission's methodology[13], as the oldest prevalent econometric methodology, proceeded (as mentioned in chapter one) to experiment with different combinations of explanatory variables by processing the data that are of observational nature and which will be used in the estimation.

The Cowles Commission econometricians have resorted to treating economic relationships through given ad hoc dynamic specifications such as Almon lags and the partial adjustment process (Gilbert, 1986; Rao, 2006). Furthermore, econometricians using the Cowles Commission's methodology try to change the length of the sample periods and to test various functional forms as well as testing different estimation methods ''*in order to find a regression that suited a theoretical preconception, had 'significant' coefficients, maximized goodness-of-fit, or some other criterion or set of criteria*''(Hoover, and Perez,

13 For an excellent review of the Cowles Commission methodology refer to Malinvaud, 1988; Christ, 1994; Hoover, 2005 and for an influential criticism of this methodology see Gilbert, 1986; Mizon, 1995, and Favero, 1999.

2000; 196). These empiric procedures, in fact, lead to fabricating spurious regressions where the resultant statistical goodness of fit properties, eventually, have no economic sense (Pierse, n.d).

This procedure which is considered, largely, reprehensible, is the so-called data mining, which in the literature is referred to as

a broad class of activities that have in common, a search over different ways to process or package data statistically or econometrically with the purpose of making the final presentation meet certain design criteria (Hoover and Perez, 2000; 195).

Economists' opinions have significantly differed about this concept. According to Hoover and Perez, there are three views of this disputed issue. The first attitude considers that data mining is unacceptable but if a researcher is embroiled in such procedure, he/she should adapt the statistical inferences, and take the data mining into account. The second attitude is based on Leamer's extreme-bounds analysis which deems data mining unavoidable, subsequently ''*the only results of any interest are those that transcend the variety of alternative data mined specifications*'' (Hoover and Perez, 2000; 196). The third attitude reflects the opinion of the London School of Economics' methodology which is utilized in general-to-specific searches and considers that data mining is a necessary approach and that ''*the only hope we have of using econometrics to uncover true economic relationships is to be found in the intelligent mining of data*'' (Hoover and Perez, 2000; 195).

In spite of the divergence of these views on the concept of data mining, it could be argued that the prevailing opinion among them asserts the importance of this empirical procedure.

From this point, it can, specifically, be said that ‘‘*the lack of sufficient interest for the statistical model is at the root of the failure of the Cowles Commission approach to provide an acceptable answer to an interesting question*’’ (Favero, 1999; 148). Unquestionably, this controversy has, intrinsically, paved the way for the emergence of an alternative methodology. This methodology is represented by the London School of Economics’ methodology[14] led by Hendry and his collaborators (Chao, 2002).

The merit[15], which makes this approach different from others, is in its dependence on the semantic approach that distinguishes between the theoretical model and the empirical model. In theory, LSE econometricians have provided an integrated approach to econometrics through a stream of research that has been published in the past three decades which have clarified that ‘‘*the theory of reduction explains how econometric models are intrinsically a kind of empirical model, derived from the DGP*’’ (Chao, 2002; 2). Furthermore, in practice, they have built full empirical models based on this methodology (Chao, 2002). The LSE methodology also resembles the structural approach in the philosophy of science, which deems the model, as mentioned previously, as a structural depiction of reality (Chao, 2002).

The main tenet of this methodology, as mentioned above, is the general-to-specific approach which is regarded as the practical embodiment of the theory of reduction (Hoover and Perez, 1999; Krolzig and Hendry, 2001; Chao, 2002, and Campos, Ericsson and Hendry, 2005).

14 For more details on this methodology, refer to the wonderful articles on LSE methodology in Gilbert, 1986; Mizon, 1995; Chao, 2002 and Campos, Ericsson and Hendry, 2005.

15 One of the main reasons for the use of this methodology, in this study, is in its ability to select a useful model for the policy analysis scenarios of the study, when analysing the different economic policies, where ‘‘*Gets modelling results in a parsimonious model that is particularly useful for scenario analysis (conditional forecasting, policy analysis, counterfactual analysis, etc.)*’’(Sucarrat, 2009; 6)

More specifically, in fact, London School of Economics' methodology relies on two main pillars, namely, firstly, the theory of reduction[16], which clarifies that the econometric model, actually, is a derivation of an empirical model of the data-generating process (DGP). Furthermore, it should be noted that the LSE ''*methodology is closely related to a wider range of work on integrated and cointegrated systems*'' (Hoover, 2005; 26). As stated previously, the pivotal point of this methodology is Hendry's theory of data reduction which originated from ''*the analysis of "Exogeneity"[17] in the seminal article of Engle, Hendry and Richard in 1983*'' (Hoover, 2005; 27) on the one hand and it is also related to the theory of encompassing[18] on the other (Hoover and Perez, 1999).

The second pillar is the general-to-specific approach which considers the practical framework of the theory of reduction that leads econometricians to accomplish the desired econometric model (Chao, 2002). Based on these facts,

the LSE approach is an empiricist methodology in which econometric models are said to match the phenomena in all measurable respects. This concept is known as congruence[19]. Thus, diagnostic tests in econometrics are construed as congruence tests (Chao, 2002; 1).

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16 The detailed explanation for the theory of reduction can found in Campos, Ericsson, and Hendry, 2005, specifically in section two, p. 5.

17 In fact, the exogeneity analysis was the origin of the theory of reduction which became one of the main pillars of the London School of Economics' methodology. See Engle, Hendry and Richard (1983) and Hoover (2005).

18 The encompassing concept can be defined as,

a basis for constructing tests of a given model against an alternative specification, whether those models are nested or non-nested. In general-to-specific modelling, one common application of encompassing arises when comparing congruent models obtained from alternative simplification paths (Campos, Ericsson and Hendry, 2005; 57).

For more details on encompassing and congruence concepts see Bontemps and Mizon, 2001; Chao, 2002.

19 It should be noted that ''the idea of congruence was first known as the 'tentatively adequate conditional data characterization'' (Chao, 2002; 8)

In practice the theory of general-to-specific attempts to explain ‘‘*how data can be characterized in a way that is partial or simpler than the true (DGP) data-generating process*’’ (Hoover, 2005; 27) without a loss of information pertain to the question of interest.

The notion of general-to-specific is not a new idea because its dates back to Sargan’s works, particularly to his seminal article in 1964 (Pagan, 1987; for further details c.f. Phillips, 2003 and Campos, Ericsson and Hendry, 2005) where he was mostly motivated by the empirical issues of dynamic specification.

According to the general-to-specific, empirical modelling should commence with a hypothetical probabilistic structure of the data which must be equivalent to the data generating process (DGP). However, this hypothesised probabilistic structure per se is undetermined, so this process must be applied repeatedly. This will provide an estimation of the data generation process (DGP) and, additionally, will clarify its consistent probability theory which is used for the modelling of empirical evidence and will also modify the starting point if the outcome is not adapted consistently (Campos, Ericsson and Hendry, 2005). To confirm this approach Campos, Ericsson and Hendry stated that

general-to-specific modelling, empirical analysis starts with a general statistical model that captures the essential characteristics of the underlying data set, i.e., that general model is congruent. Then, that general model is reduced in complexity by eliminating statistically insignificant variables, checking the validity of the reductions at every stage to ensure congruence of the finally selected model (Campos, Ericsson and Hendry, 2005; 3).

Eventually, as stated in chapter one, this approach involves starting with as broad a general specification as possible and then it tries to explain how econometric models are derived from the data-generating process (DGP).

In this respect, an important question arises: how does the researcher know what the final simplified model should be? Hendry and Richard answered this question and suggested that the simplified model should,

(1) be data admissible; (2) be consistent with the theory; (3) use regressors that are not correlated with regression disturbance factor; (4) exhibit parameter constancy; (5) exhibit purely random data (white noise); and (6) be encompassing (include all possible rival models) (Asteriou, 2006; 190).

These criteria can be illustrated as follows: firstly, data admissible means that consistency must be available between the data and the model forecast. Secondly, the model should provide an economic meaning. Thirdly, there is no exogeneity in the model where the correlation between the model regressors and the error term is zero. Fourthly, the parameters in the estimated model must be stable. Fifthly, there must be randomness where the residuals that are caused by the estimation process must be purely random and, finally, encompassing means that the estimated model must be able to interpret all the results of the competing models (c.f. Pierse, n.d. and Campos, Ericsson and Hendry, 2005).

The application of this methodology which is represented in the general-to-specific (Gets) model selection procedures, in fact, could not exist without the immense advances in computer automation and computational power (for further details see Krolzig, and Hendry, 2001; Doornik and Hendry, 2007; Doornik, 2009). The existence of such kinds of automation, which have greatly saved wasting time, is the cornerstone behind the creation of such types of selection procedures (Hoover and Perez, 1997). According to Campos, Ericsson and Hendry ‘‘*the difficulties of empirical modelling are well reflected in the slowness of empirical progress, providing plenty of ammunition for critics*’’ (Campos, Ericsson and Hendry, 2005; 1). Accordingly, the crux of any process in the model-selection depends on the costs of inference and the costs of search (Hendry, 2005; Campos, Ericsson and Hendry, 2005).

When Hendry and his associates at the London School of Economics developed the general-to-specific approach, a package of diagnostic tests[20] emerged which paved the way for the accurate selection of econometric models. Nonetheless, many econometricians have encountered difficulties in the application of this approach. At the forefront of these difficulties, is how to deal with the data mining. Some econometricians, as mentioned earlier, consider that data mining has become pejorative terminology (Doornik, 2009). However, after the leading work by Hoover and Perez[21] (1999), most of these difficulties have been eased, as

to analyse the general-to-specific approach systematically, Hoover and Perez mechanised the decisions in general-to-specific modelling by coding them in a computer algorithm, in doing so, Hoover and Perez also made important advances in practical modelling (Campos, Ericsson and Hendry, 2005; 3).

The main aspects of the automated Gets algorithms can be described by three phases of development (Hendry and Krolzig, 2005; Doornik, 2009 and Sucarrat, 2009). The first of them is the algorithm that was developed by

[20] For some details on most of the model selection tests see Chapter 15 in Davidson and Mackinnon, 1999.
[21] The article of Hoover and Perez in 1999 is not the starting point in the automation process of general-to-specific modelling. Where the beginning of this effort is rooted back in the leading work of Lovell in 1983, when he aiming to select a small relation - about five regressors- from a large database – about 40 variables. There are many of economists have contributed in this topic, see inter alia, Mayo (1981), White (1990), and Hendry (1995), for more details see, Krolzig and Hendry, (2001).

Hoover and Perez, which consists of five stages, as, will be elucidated in the following subsections:

- **General unrestricted model** (GUM)[22]: the first step in the search towards an accurate econometric model is the most important one. It should include all the relevant variables of the model under consideration based on subject-matter theory, the availability of the data, and it should ascertain that it encompasses all previous evidence and measurement information (Hendry and Krolzig, 2005). In fact, such a model should provide ‘‘*sufficient information on the process that is modelled, and statistically well behaved*’’ (Doornik, 2009; 89). In this regard, the econometricians have been accustomed to express the general unrestricted model (GUM) in the form of an autoregressive distributed lag model (ARDL)[23] which refers to a model that is compounded of two different models, autoregressive (AR), and distributed lag (DL), so that it contains the lags of both dependent (AR*)*, and independent (DL), variables. Therefore the simplest form of the (ARDL) (p*,* q)[24] model is (1,1), and it can be modelled as in the following equation:

  $$Y_t = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_{t-1} + \alpha_3 Y_{t-1} + u_t$$

  The lag length[25] in the model is dependent on the nature of the data, whether it is quarterly data, annual data etc. In the case of quarterly data the suitable lag length should be, at least, five quarters, depending on the sample size whereas for annual data it should be at least two

[22] This terminology was coined by Hendry-Krolzig; in contrast, they coined SUM to refer to specific unrestricted model see: Doornik, 2009.
[23] For more details about the ARDL model, see Pesaran and Shin, 1997.
[24] The lag length for the autoregressive model (AR) is denoted by (p), while the lag length for the distributed lag model (DL) is denoted by (q).
[25] In fact, there are tests for the selection of the lag length but the experience has proved the facts mentioned above.

years depending on the sample size (Doornik and Hendry, 2006; Rao, 2006).

- **Multiple path search**[26]: This stage involves the testing-down process, that aims by using different routes to delete all insignificant variables (which have the lowest t-value) in the initial GUM. Every eliminated variable in the GUM represents a separate path in the reduction process, which starts, by a path that has the most insignificant variable and stops when all the remaining variables are statistically significant. According to the algorithm that was developed by Hoover and Perez, the maximum number of paths is only ten (Doornik, 2009).
- **Encompassing test:** provides the necessary means for comparing alternative models regarding whether one of the models is nested in the other model and therefore can replace it, or whether it is non-nested. The nested models' concept can be explained by the following two models:

  Model (A): $Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + u_i$
  Model (B): $Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + u_i$

  It should be noted that model (B) is nested in model (A) because it is a special case. If one estimates the model (A) and tests the hypothesis that says ($\beta_4 = \beta_5 = 0$) through regular tests such as (t, F), and the result is not to reject this hypothesis, it can be said that model (A) should be encompassed to model (B).

[26] The number of the search paths is usually determined by the following formula: (2^k), where *(k)* is number of regressors in the model. For more details, see Doornik and Hendry, 2006.

- **Diagnostic testing**: the Hoover-Perez algorithm has utilized a package of diagnostic tests for every estimated model, such as autocorrelation, residual ARCH, and normality tests. In addition, there is an in-sample Chow test and an out-of-sample Chow test; however, the algorithm needs to retain some of data. The mechanism that is adopted in such cases is that when any of these tests fail the current reduction process will be rejected and will draw attention to the next process (Doornik, 2009).
- **Tiebreaker**: despite the complexity of the computation process of this algorithm, it is possible that all the reduction paths can reach the same terminal model. However, there is a required final model that should be achieved despite these redundant computations. In most cases, multiple terminal models could be achieved as valid reductions of the GUM regardless of the economic or aesthetic considerations that are desired by the user, but the selection process must be undertaken according to a fully automated procedure (Doornik, 2009). For instance ‘‘*Hoover and Perez (1999) adopt the best fitting terminal model, while Hoover and Perez (2004) use the minimum Schwarz Criterion*’’ (Doornik, 2009; 90).

Hendry and Krolzig in 1999 have undertaken the second phase of development in the automated Gets algorithm in 2001. They refined the Hoover and Perez algorithm in three principal directions:

- **Presearch**: to save computation time, the cost of inference, and in order to reduce the maximum size of the empirical work five types of presearches have been added. These presearch types are ‘‘*two on lags, one on variables (that is, the same variable at different lag lengths)* *and two more on groups of insignificant coefficients*'' (Doornik, 2009; 90).

- **Multiple-path search**: as mentioned previously, according to the algorithm that was developed by Hoover and Perez, the maximum number of paths is only ten. Consequently, Hendry - Krolzig have originated additional search paths to pursue blocks of regressors, aiming to eliminate all of the individual insignificance variables that are increased to a specific level. This certain level is determined, according to Hendry-Krolzig, by two invented strategies, which are the liberal strategy that is bounded by *5%* and the conservative strategy that is bounded by 1%. It should be noted that Hendry-Krolzig added six search paths for the first (liberal) strategy and five search paths for the second (conservative) strategy (Hendry-Krolzig, 2005; Doornik, 2009).
- **Iteration**: there is one iteration for multiple-path searches in the Hoover-Perez algorithm. Accordingly, Hendry and Krolzig suggest an alternative process for the selection procedure, which consists of a multiple-iteration search. The encompassing test in the first path tests the group of terminal candidate models and eliminates the model that constitutes an invalid reduction. From this group the encompassing test is run again to delete all the unwanted models. This process will be repeated until convergence (the new GUM is not different to the previous GUM) where no further models are eliminated. The group of the retained models constructs a new GUM or, according to Hendry and Krolzig, a new SUM (specific unrestricted model) and then the tiebreaker selects the final model (Doornik, 2009).

After this development[27], Hendry and Krolzig adapted the following three aspects:

- **Tiebreaker**: Hendry and Krolzig added the AIC and Hannan-Quinn criteria as an option, together with the Schwarz criterion that was considered as a default tiebreaker.
- **Out-of-sample testing**: to overcome the problems that can occur as a result of the trade-off between retained data for out-of-sample testing and the large sample of data which is used for model estimation, Hendry and Krolzig (2004) proposed that,
  this trade-off can be controlled directly through the significance levels that are chosen. Then, split sample methods provide a less transparent mechanism, which tend to cost more than they gain (Doornik, 2009; 91).
- **Invalid GUM**: The Hoover-Perez algorithm excludes all the invalid GUM that could not pass at least two diagnostic tests. Thus, in order to improve this step, Hendry-Krolzig modified the level of the significance of the diagnostic tests where,
  if the GUM *fails one or more tests at p-value p_d (with a default of p_d = 0.01), then each failed test is made less strict by raising its p-value to a point where the test passes, the new level is then maintained throughout* (Doornik, 2009; 91)

Several changes have been implemented and accumulated to constitute the third phase of development in the automated 'Gets' algorithms (which are called the Autometrics algorithm aims) in order to improve the basic Hoover-

[27] The Autometrics can be deemed as the third and the most recent generation of the automated model selection procedure *'Gets'*.

Perez and Hendry-Krolzig algorithms' performance. The Autometrics algorithm can be summarized by the following four stages:

- **Presearch:** Hendry-Krolzig have added extra presearch options to the basic Hoover-Perez and Hendry-Krolzig algorithms (Gets), wherein ‘‘*the candidate sets for the presearches are constructed in simplistic ways and once a variable is removed, it cannot reappear*’’ (Doornik, 2009; 91). It is worthwhile noting that some incapability might occur to lag-length reduction; however, the algorithm is working effectively if the DGP has few significant or orthogonal variables (Doornik, 2009).
- **Search paths**: Hoover and Perez have preferred the multiple-path search despite its unfavourable aspects because it is considered as an unorganized means for the model search. However, they wanted to minimize the importance of the mechanical nature of the selection. The computer has advantages in this respect thus ‘‘*Autometrics considers the whole search space from the outset, but may discard parts in a systematic way*’’ (Doornik, 2009; 92).
- **Scope**: the scope of this algorithm cannot be used in regression models where ‘‘*Autometrics is implemented entirely within the likelihood framework* (*of which regression is a special case*)’’ (Doornik, 2009; 92).
- **Efficiency**: Hendry and Krolzig emphasised the vitality of this property, as this algorithm was designed to increase computational efficiency and to avoid drawbacks that may occur in such cases, which show a delay in diagnostic tests, estimate the same model repeatedly, and, finally, recognize the terminals between the iterations (Doornik, 2009).

5.3 Estimation results of the single equations

The estimation of the single equations in this study is undertaken using PcGive12 econometric package (Doornik and Hendry, 2006) which uses the automatic model selection (Autometrics) as a leading estimation technique[28]. In this regard, Autometrics, which has been extensively covered above, provides the necessary tools to estimate the single equations of the model and consolidates the effective selection of the study model, which then paves the way to test the model's predictive ability, in addition to facilitating the simulation of the various policies that are to be proposed. The Autometrics algorithm provides short estimation for the individual equations; in addition, it introduces the error correction mechanism (ECM) for the individual equations of the model, through the long run estimation for the individual equations.

5.3.1 The estimation tests

As mentioned above, the first step in the search for an accurate econometric model is to build a general unrestricted model (GUM) which should include all the relevant variables of the model under consideration based on the subject-matter theory, the availability of the data and ascertaining that it encompasses all previous evidence and measurement information. The (GUM) equation is mainly an (ARDL) model with a different order. This leads to the existence of a large number of variables in the model. The increase in the explanatory variables in the model, in turn, leads to a decrease in the residual sum of squares (RSS) and then, as a result, it leads to an increase (R^2) as well as to a decrease in the degrees of freedom. This, in turn, requires a comparison between several competing models in order to select the most appropriate and

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[28] It should be noted that this estimation technique ''*can have wider use than regression models only, therefore Autometrics is implemented entirely within the likelihood framework (of which regression is a special case)*'' Doornik, 2009; 92).

satisfactory model. This, eventually involves using a package of diagnostic tests that help in the selection process.

The software used in the estimation process of the individual equations of the model of the study uses an integrated set of necessary tests to implement a selection among competing models. Some of these tests, as mentioned in chapter one, pertain to the statistical evaluation such as conventional (F and t) tests while others are linked to the econometric evaluation including autocorrelation, heteroscedasticity, autoregressive conditional heteroscedasticity (ARCH), misspecification of the functional form and the normality of the distribution of the residuals. Finally, the magnitude and sign of the parameters gives the necessary economic evaluation to determine the extent of compatibility between the estimated equation and its underpinning economic theory. In accordance with this context, econometric models can be classified, as shown above, into two main types, namely nested and non-nested models; accordingly, the selection criteria are specified to distinguish between these two classifications.

Generally, the null and alternative hypotheses when comparing between the models are:

H_0: $y = X\beta + u_1;$ and

H_1: $y = Z\gamma + u_2:$

These tests will be described succinctly in following subsections:

- **General criteria for model selection:** there are four criteria, usually, used in the models' selection evaluation which are respectively: the Akaike information criterion (AIC), the Schwarz information criterion (SIC), the Hannan-Quinn information criterion (HQ), and the Finite prediction error (FPE). These criteria are calculated, in the software, according to specific formulas and the model that achieves the lowest value of these criteria will be selected. It is worthwhile noting that the Akaike information criterion (AIC) has great importance as the models that will be selected based upon this criterion will be consistent with the models that are used for prediction whether inside or outside the sample period, whereas the model that will be selected based upon other criteria will be valid only for one of these two purposes. In addition, this criterion has an additional important merit, which is that it is used in determining optimal lag length in the autoregressive (AR) models. In this regard, it should be noted that the Schwarz information criterion (SIC), (the default test in Autometrics) has the same features as well.

- **Error autocorrelation (AR) test**, also, known as Breusch-Godfrey test, or Lagrange multiplier (LM) test. The (LM or AR) test follows the (χ^2) distribution; Harvey also presented this test in the F-form in 1981 and 1990 (Doornik and Hendry, 2006). Lagrange multiplier test has many uses in the econometrics, where it is used, mainly, in detecting of the serial correlation or the autocorrelation, as it has the ability to avoid the several drawbacks of the Durbin-Watson test. Furthermore, it is utilized in the selection of the models, where it clarifies to what extent is the benefit of adding or deleting an explanatory variable of the model. In addition, it is also used in examining of presence of the heteroscedasticity, and, it is, finally, applied in detection of extent accuracy of some non-linear formulas in the non-linear models (nonlinearity).

- **A Wald test** is utilized in multiple regressions when it is necessary to impose some restrictions on the parameters that will be estimated. The next step is comparing the restricted model with the unrestricted one; the null hypothesis (H_0) in this case is a test of whether the restriction is valid or not. This test follows the (F) distribution with degrees of freedom *(K_U - K_R)* and *(n-K_R).* If the Wald statistic is greater than the (F) critical value, then the null hypothesis was not accepted.
- **Likelihood ratio:** the researcher has, sometimes, to add or delete one or more variables from the model under discussion and this, in turn, requires examining the accuracy of this procedure. The test follows the *(χ^2)* distribution with degrees of freedom equal to the number of restrictions (the added or deleted variables).
- **Autoregressive Conditional Heteroskedasticity test (ARCH):** the instability of the variance of forecast errors may reveal the existence of autocorrelation in this variance. Engle in 1982 proposed the autoregressive conditional heteroscedasticity model (ARCH) that paved the way to test this problem later on. The notion behind this test is the variance of the regression disturbance (error term) in the current time (u_t) is related to the squared error term in the previous time (u_{t-1}^2). This entails imposing a condition on the variance of the error term at the time (t) as:

$$u_t \sim N[0, (\alpha_0 + \alpha_1 u_{t-1}^2)]$$

This assumes that the error term is normally distributed with a zero mean and variance of ($\alpha_0 + \alpha_1 u_{t-1}^2$). The null hypothesis in this test is

$$H_0: \alpha_0 = \alpha_1 = \cdots = \alpha_{t-p} = 0$$

This hypothesis can be tested based on the (χ^2) distribution, with the degree of freedom being equal to the autoregressive terms (p). The PcGive 12 also presents F- form for this test as a default test[29].

- **Heteroscedastic-consistent standard errors (HCSE):**
  In some cases, the error term is infected by heteroscedastic in an unknown way. This leads to difficulty in obtaining consistent estimates of the regression parameters' standard errors. Accordingly, this criterion is used to produce consistent estimates of standard errors of the estimated parameters even with the existence of the unknown source of heteroscedasticity. This criterion is calculated in the software in two ways, one of which is based on White (1980), called (HCSE), while the second is the Jackknife[30] estimator labelled (JHCSE) introduced by MacKinnon and White (1985). (HCSE) is deemed a useful measure of the standard error, as it calculates and tests in the PcGive programme as a criterion for standard error using the conventional (t) test labelled as (tHCSE) and (tJHCSE). Heteroscedasticity and the autocorrelation consistent standard errors (HACSE) is also another criterion that is provided in the software to reflect the problems of heteroscedasticity and autocorrelation. The criterion is treated in the same way as the former criteria, using the conventional (t) test and is labelled (tHACSE).
- **Log-likelihood criterion:** the likelihood function is commonly used in the selection of models, which are estimated by the same

[29] This is due to the fact that, '*F-forms have more appropriate significance levels and that chi square* (x^2) *versions reject acceptable models too often*' (Doornik and Hendry, 2006; 216), therefore PcGive tends to report F-form when possible.
[30] Jackknifing and Bootstrapping are similar methods, utilised in the resampling of statistical data to achieve accurate sample statistics (criteria) (medians, variances, and so on). For more details on the Jackknife estimator, see Lee, Babu, and Rao, 2012.

data set. The process of selection requires, as mentioned above, a comparison between the competing models and then eliminating the less significant model. To implement this procedure, the likelihood function consolidates imposing conditions on the observed data and uses the logarithmic form to facilitate the complex steps in the selection process. This criterion is calculated from the log-likelihood function, with and without a constant and it chooses the model that achieves the lowest value of this criterion.

Finally, before providing some details on the results of the estimate of the individual equations of the model, there are some general and important remarks that should be mentioned first, which can be summarized as follows:

1. The estimated results are the most satisfactory (accepted) forms that have been obtained using the Autometrics algorithm. This has been verified by all conventional statistical and econometric tests which were utilized as diagnostic tests in the Autometrics, so, any concern should be mainly, directed to the economic exposition.
2. All the general criteria for the model selection (HQ, SIC, AIC, and FPE) are calculated, whether with or without the constant (intercept), for the logarithmic likelihood function and, in both cases, it selects the model that achieves the best results.
3. Each of the estimated equations indicates that it does not suffer from the spurious regression[31] problem as all equations of the model have achieved a Durbin-Watson statistic greater than one.

[31] It worthwhile noting that Granger and Newbold in 1974 proposed, as rule of thumb, that if the coefficient of determination (R^2) is greater than the Durbin-Watson statistic (in other words, if the Durbin-Watson statistic is less than 1); this means that the estimated regression is spurious (Gujarati, 1995; 724).

4. The Autometrics algorithm enables one to obtain both short-run and the long-run solution of the model equations by estimating the error correction mechanism ECM[32] in the equations. Furthermore, it should be clarified that the main source of the ECM is the ARDL model which derives, at the same time, from the basis of the Autometrics GUM model. The point to make concerning ECM is,
   the ease with which they can fit into the general-to-specific approach to econometric modelling, which is in fact a search for the most parsimonious ECM model that best fits the given data sets (Asteriou 2006; 331).
   Additionally, it should be mentioned that the error correction mechanism ECM has many advantages. According to Asteriou (2006) the ''*most important feature of the ECM comes from the fact that the disequilibrium error term is a stationary variable*[33] *(by definition of cointegration)*'' (Asteriou 2006; 331). Furthermore, ''*ECMs are formulated in terms of first differences, which typically eliminate trends from the variables involved, they resolve the problem of spurious regressions*'' (Asteriou 2006; 331).
5. Some functions have been estimated in a logarithmic form (namely: real private consumer spending, real imports of goods and services and real imports of capital goods). The preliminary results of the estimation of these functions show that such linear forms were not accepted. As a result, this status gives the impression that these functions are non-linear functions, which was confirmed later by the

[32] ECM can be defined as the mechanism that directly estimates the rate that leads the dependent variable to approach the equilibrium due to the changes in the independent variable.
[33] In fact, this reinforces the argument for the absence of the Stationarity problem in the models that are addressed by the London School of Economics' methodology (LSE) that rely on the (GUM) model, which depends, in turn, on the (ARDL) model. Thus, there is no need to apply unit roots tests to determine the degree of cointegration between the different variables in the model. For more details on this methodological digression, see Hendry, Pagan and Sargan, 1984; Hendry, 1987; Smith, 1999; Rao and Singh, 2006 and Hassler and Wolters, 2006

decisive statistical acceptance for these functions in their logarithmic form. The estimated parameters of these equations reflect the elasticity concept, which is also named, as will be mentioned below, the instantaneous growth rate or the marginal effect of a change in the dependent variables because of the change in independent variables.

6. Finally, with respect to the Libyan data sources that will be utilized in the estimation of the model equations are annual data for the period 1970-2006, and available from following sources:
    - The publications of the Secretariat of Planning: national accounts and socio-economic indicators and,
    - The publications of the Libyan Central Bank (LCB): economic bulletins and annual reports.

This model consists of six blocks containing sixteen behavioural equations, as has been previously described in chapter four. The following sections show the estimate of these variables.

5.3.2 Estimation results of the aggregate demand block

The aggregate demand block consists of six behavioural equations that represent the consumption expenditure, the investment expenditure and imports and exports, as will be shown in the next subsections.

5.3.2.1 Real private consumption expenditure on goods and services *(LCPR)* in logarithmic form

The estimated results of this equation (and all the estimated equations of the model, as will be clarified in the following subsections) reveal that it has achieved acceptance in all of the statistical criteria, whether by the econometric (autocorrelation, heteroscedasticity, functional form, etc.) or by the conventional statistical test (*F* and *t*). Therefore, the remainder of interest should be directed towards the economic interpretation of this equation.

The private consumption function in this study is a combination of the Keynes and Friedman consumption functions. This appeared by estimating results which declared the important role of both disposable income and the lagged consumption. The coefficient of disposable income in this function does not represent the marginal propensity to consume, but it does demonstrate sensitivity to changes in private consumer spending due to changes in disposable income, which reflects the elasticity concept. It is also named the instantaneous growth rate or the marginal effect of a change in the *LCPR* because of the change in *LYPDR.*

In addition, it should be noted that the elasticity of change in *LCPR* due to the change in *LYPDR* is a small percentage, but this can be accepted, as it is consistent with the hypothesis inertia of private consumption in Libya during the study period on the one hand. In addition, on the other hand, in most of the period study individual income was stable at low levels. This income was directed mainly on spending on basic needs, which, in turn, were subsidized during the study period years. Support for these commodities was abolished in the early part of the first decade of this millennium.

The variable *LCPR_1* gives an impression of the extent of inertia in the behaviour of private consumption in Libya. The size of this variable and its statistical acceptance show the importance of this rooted behaviour among consumers in Libya.

The effect of wealth has a significant role in explaining the behaviour of consumption in Libya, as expressed by the variable *LRMS.* In spite of the negative impact of variable *LRMS_1*, the outcome of the effect of wealth in the interpretation of the behaviour of private consumption in Libya has remained positive.

Finally, the coefficient of *TREND* is reflected in the amount by which the function moves in each period. Furthermore, this coefficient is considered as the compound growth rate in *LCPR* where its small size indicates the stability of the consumption function in the short run.

While the private consumption function, which was estimated at the outset, indicated the behaviour of private consumption in Libya in the short term, the function, when estimated later explained the path of this behaviour in the long term by pursuing the model variables to reach equilibrium. The importance of the error correction mechanism is derived, mainly, from the relationship between the variables of the function in the long term, where it provides, in the disequilibrium, information about the speed of the adjustment of this relationship while attempting to reach the desired equilibrium (Asteriou, 2006).

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
LCPR_1	0.59117	4.5345	4.5544	5.6775	5.2169
LYPDR	0.21806	2.1635	2.0545	2.4637	2.2418
LMSR	0.57999	2.9425	3.2084	3.1287	2.8035
LMSR_1	-0.42406	-2.0802	-2.4102	-2.5488	-2.3026
TREND	0.012111	2.9607	3.2329	3.5866	3.2235

Sigma 0.136235 *RSS* 0.55679929

Log-likelihood 23.9615 *DW* 2.02

No. of observations 36 No. of parameters 5

AR 1-2 test: $F(2, 29) = 0.082787$ [0.9208]

ARCH 1-1 test: $F(1, 29) = 0.037987$ [0.8468]

When the log-likelihood constant is not included:

AIC	-3.83574	*SC*	-3.57182
HQ	-3.74362	*FPE*	0.0216533

When the log-likelihood constant is included:

AIC	-0.997859	*SC*	-0.733939
HQ	-0.905744	*FPE*	0.369827

The solved static long-run equation for *LCPR*

Long-run sigma = 0.328846

$$ECM = LCPR - \underset{(3.08)}{0.533369} * LYPDR - \underset{(2.01)}{0.381382} * LMSR - \underset{(4.23)}{0.0296232} * TREND;$$

(t-value)

WALD test: χ^2 (3) = 19651.9 [0.0000] **

5.3.2.2 Government consumption expenditure on goods and services *(CGC)*

As has been mentioned in chapter four, the consumer public spending function can be expressed in both real and nominal forms; some economists such as Aghevli and Khan have indeed expressed these variables in nominal and in real form (Aghevli and Khan, 1980).

The consumer public spending in this study, as it appears in the estimated equation, utilizes the nominal form, as it is obvious that a government (the Treasury) does not suffer from ‘money illusion’.

The consumer public spending (administrative expenditures) in Libya depends on the domestic resources of the Treasury such as direct and indirect taxes.

The Treasury also has access to the Treasury's share of the oil revenues in order to cover the deficit that may arise in the budget.

The estimated consumer public spending function has achieved, as shown, all the statistical criteria that requires econometric and statistical acceptance. Moreover, from the economic standpoint, one finds, firstly, that all the coefficients' signs are consistent with economic theory. Secondly, the size of each coefficient in the function reflects how important the variable under consideration is, in explaining the behaviour of consumer public spending in Libya.

It has been found, as shown in chapter four, that the current or the lagged direct taxes have a relatively large coefficient when compared with the indirect taxes and the Treasury's share of oil revenues, respectively. The latter scored a lower value, which indicates the secondary role of the oil revenues in funding the administrative expenditures in Libya.

	Coefficient	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
Constant	328.61	3.0902	2.7559	3.6926	3.5296
TAXDIRC	2.2061	3.3555	5.4784	3.5156	2.9966
TAXDIRC_1	1.1783	1.6897	2.0798	1.6450	1.4014
TAXINDC	1.4315	5.0938	5.1379	5.2567	4.8789
GOILR	0.05118	7.2805	9.5727	10.252	8.3466

Sigma	247.409	*RSS*	1897552.01
R^2	0.977949	$F(4, 31) = 343.7$ [0.000] **	
Log-likelihood	(-246.788)	*DW*	1.56
No. of observations	36	No. of parameters	5

AR 1-2 test: $F(2, 29) = 1.3038$ [0.2869]

ARCH 1-1 test: $F(1, 29) = 0.24242\ [0.6262]$

When the log-likelihood constant is not included:

AIC	11.1503	*SC*	11.3703
HQ	11.2271	*FPE*	69712.9

When the log-likelihood constant is included:

AIC	13.9882	*SC*	14.2081
HQ	14.0650	*FPE*	1.19066e+6

The solved static long-run equation for *CGC*

Long-run sigma = 247.409

$ECM = CGC - 340.864 - 3.36871 * TAXDIRC - 1.42204 * TAXINDC -$

(t-value) (3.09) (12.3) (5.09)

$0.0515589 * GOILR;$

(7.28)

WALD test: $\chi^2(3) = 1077.29\ [0.0000]$ **

5.3.2.3 Non-oil real private investment expenditure *(IPNOILR)*

The relationship between real non-oil private investment and its explanatory variables is expected to be positive, as mentioned in the previous chapter, with the exception of the dummy variable DUM_{8185} which represented the era that coincided with the beginning of governmental control over the economy in Libya. So, this variable is expected to be negative.

In practice, it turned out that all explanatory variables for the function were statistically accepted.

The estimated parameters of this function showed that the amount of non-oil real private investment expenditure has a significant effect on the behaviour of the estimated function. The government investment expenditure in the non-oil sector (as expected), did not crowd out non-oil real private investment expenditure but, it just crowded it in until the early nineteen-eighties, even if this role, is only relevance to the lagged of government investment spending.

The last positive role in this relationship concerns a change in the stock of real capital, which located third place in importance with regard to desired funding.

In the early nineteen-eighties some of the government policies, which were represented in the imposition of state control over the entire economic activity, had a negative impact on the economy. Moreover, the Libyan economy's dependence on oil in order to finance public spending made it vulnerable to further negative influences during the same period, which witnessed the second oil crisis.

The negative influence of these combined factors has been represented in a dummy variable *(DUM_{8185})* which explains the nature of this complex relationship.

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
IPNOILR_1	0.38937	2.5175	3.2841	2.1636	1.5041
DKNOILR	0.074741	2.1324	2.1802	2.2869	2.0448
IGNOILR_1	0.098444	3.4574	3.0326	2.8706	2.1280
DUM_{8185}	-200.43	-2.5103	-2.9179	-2.0341	-1.6478

Sigma 141.76 *RSS* 602879.655

Log-likelihood (-214.557) *DW* 1.72

No. of observations 34 No. of parameters 4

AR 1-2 test: $F(2, 28) =$ 2.1830 [0.1315]

ARCH 1-1 test: F (1, 28) = 0.65985 [0.4235]

When the log-likelihood constant is not included:

AIC	10.0184	*SC*	10.1980
HQ	10.0796	*FPE*	22460.2

When the log-likelihood constant is included:

AIC	12.8563	*SC*	13.0359
HQ	12.9175	*FPE*	383609

The solved static long-run equation for *IPNOILR*

Long-run sigma = 228.392

$ECM = IPNOILR$ - 0.122401 *$DKNOILR$ - 0.161217 *$IGNOILR$ +

(*t-value*) (2.70) (3.93)

328.233*DUM_{8185}

(-2.33)

WALD test: (χ^2) (3) = 121.457 [0.0000] **

5.3.2.4 Real imports of consumer goods in logarithmic form *(IMCONR)*

The explanatory variables in the real imports of consumer goods function show the degree of statistical acceptance that is achieved by these variables. Additionally, these variables do not suffer from conventional measurement problems. In the economic context, the signs of these explanatory variables are consistent with economic theory, which recognizes that there is a negative relationship between the demand for imports, on the one hand, and between both the exchange rate and relative prices, on the other hand. Moreover, the estimated function shows that there is a positive relationship between the real imports of consumer goods and the lagged imports of consumer goods and real private consumption expenditure. In the same manner, the parameters of these two variables clarify the inertia in the behaviour of imports of goods because of increasing dependence on imports to satisfy domestic consumer demand; a coefficient that has illustrated real private consumer spending in this function.

The choice of an appropriate functional form for the imports function, as mentioned in chapter four, is, basically, an empirical matter and subject to the considerations of the researcher where there is no decisive standard to be relied on. In this context, the imports of consumer goods function in this study is shaped as a log-linear relationship, where the linear form is deemed the appropriate functional form of the import, especially with those functions that seek to test the model's ability to predict (which is assumed to be one of the most important objectives of this study).

	Coefficients	*t-SE*	*t-HCSE*	*t-HACSE*	*t-JHCSE*
LIMCONR_1	0.53386	3.1470	3.7869	2.6674	2.2511
LCPR	0.40402	2.7408	3.2673	2.3015	1.9297
LEXCHRATE_1	-0.32555	-2.4737	-3.5374	-2.2371	-1.8905
PPRICE	-1.5647	-3.9876	-4.7011	-3.3910	-2.9459
PPRICE_1	0.59572	1.6928	1.5866	1.7506	1.4889

Sigma 0.20887 *RSS* 1.30879623

Log-likelihood 7.84636 *DW* 2

No. of observations 35 No. of parameters 5

AR 1-2 test : $F(2,28)$ = 0.053072 [0.9484]

ARCH 1-1 test : $F(1,28)$ =1.3364e-007 [0.9997]

When the log-likelihood constant is not included:

AIC -3.00053 *SC* -2.77833

HQ -2.92383 *FPE* 0.0498589

When the log-likelihood constant is included:

AIC	-0.162649	*SC*	0.0595437
HQ	-0.0859481	*FPE*	0.851564

The solved static long-run equation for *LIMCONR*

Long-run sigma = 0.440798

*ECM=LIMCONR -0.866722*LCPR+0.698387*LEXCHRATE+*

(*t-value*) (24.5) (-4.10)

*2.07867*PPRICE*

(-7.69)

WALD test: χ^2 (3) = 6587.23 [0.0000] **

5.3.2.5 Real imports of capital goods in logarithmic form *(IMCAPR)*

The estimated coefficients of the following equation have a satisfactory statistical acceptance; moreover, there are no econometric problems.

Economically, these coefficients clarify the relative importance of lagged real imports of capital goods and real non-oil government investment expending respectively, and to a lesser extent; the change in the stock of the capital has realized its importance in the interpretation of the behaviour of this demand function.

Finally, the relative prices of imported capital goods exhibit an inelastic demand and this is consistent with the fact that imports of capital goods are important and, therefore, it is expected that the demand will be inelastic.

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
LIMCAPR_1	0.51029	5.6267	8.2162	7.2038	6.6891
LIGNOILR	0.30085	5.9327	11.461	7.7983	7.3224
LDKNOILR	0.14658	2.6918	2.6589	2.9094	2.7402

LPIMPIT	-0.54840	-2.8214	-3.8870	-3.3412	-2.8653

Sigma	0.154242	*RSS*	0.737510606
Log-likelihood	17.8841	*DW*	2.07
No. of observations	35	No. of parameters	4

AR 1-2 test: $F(2, 29) = 0.26181$ [0.7715]

ARCH 1-1 test: $F(1, 29) = 0.25350$ [0.6184]

When the log-likelihood constant is not included:

AIC	-3.63125	*SC*	-3.45350
HQ	-3.56989	*FPE*	0.0265096

When the log-likelihood constant is included:

AIC	-0.793374	*SC*	-0.615620
HQ	-0.732014	*FPE*	0.452770

The solved static long-run equation for *LIMCAPR*

Long-run sigma = 0.314964

$$ECM = LIMCAPR - \underset{(8.15)}{0.614342}*LIGNOILR - \underset{(3.98)}{0.299309}*LDKNOILR + \underset{(-2.40)}{1.11984}*LPIMPIT$$

(*t-value*) (8.15) (3.98) (-2.40)

WALD test: $\chi^2(3) = 14811.8$ [0.0000] **

5.3.2.6 Oil exports in millions of barrels *(EXOILMB)*

The barrels of the oil exports are assumed to be dependent on the quantity of oil produced and the number of barrels of oil exports in the previous period. This relationship is expected to be positive, as appears in the following estimated equation.

The estimated results are consistent with the suppositional relationship between the variables and achieve the desired statistical acceptance.

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
EXOILMB_1	0.80411	9.7104	10.206	10.889	10.312
XOILMB	0.82682	14.598	11.575	13.882	12.677
XOILMB_1	-0.66468	-6.3939	-5.1486	-6.0911	-5.6787

Sigma	28.2717	*RSS*	25577.2072
Log-likelihood	(-165.06)	*DW*	2.47

No. of observations 35 No. of parameters 3

AR 1-2 test: $F(2, 30)$ = 1.5123 [0.2367]

ARCH 1-1 test: $F(1, 30)$ = 1.5834 [0.2180]

When the *log-likelihood* constant is not included:

AIC	6.76554	*SC*	6.89885
HQ	6.81156	*FPE*	867.798

When the log-likelihood constant is included:

AIC	9.60341	*SC*	9.73673
HQ	9.64943	*FPE*	14821.5

The solved static long-run equation for *EXOILMB*

Long-run sigma = 142.152

ECM = EXOILMB - 0.827709 **XOILMB*

(t-value) (17.4)

WALD test: χ^2 *(1)* = 301.941 [0.0000] **

5.3.3 The balance of payments block

The balance of payments in this study represents the prominent parts of the foreign sector, which are the net financial income from abroad *(NFIFBC)*, and the net compensation of employees from abroad *(WAGEFBC)*. These two variables reflect a vital aspect in dealing with the rest of the world's economies, which is considered an influential factor in a developing economy such as the Libyan economy. These variables are modelled in the system as behavioural equations, as will be shown in the next subsections.

5.3.3.1 Net financial income from abroad *(NFIFBC)*

Alongside the financial account balance in the balance of payments, the lagged net financial income from abroad remains an important variable in explaining the behaviour of the net financial income from abroad. This is because the fluctuations of the contribution of net financial income from abroad, within the components of the financial account of the balance of payments, can be demonstrated through the small size of the coefficient of the financial account balance in the balance of payments. The equation has achieved the acceptance of both the economic and statistical criteria.

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
NFIFBC_1	0.46986	2.9875	2.3968	1.7453	1.4913
FINACC	0.099148	2.8563	6.6379	4.6407	3.2120

Sigma	*213.967*	*RSS*	1510797.85
Log-likelihood	(-236.437)	*DW*	1.6

No. of observations 35 No. of parameters 2

AR 1-2 test : $F(2,31)$ = 13.985 [0.0000] **

ARCH 1-1 test : $F(1,31)$ = 41.592 [0.0000] **

When the *log-likelihood* constant is not included:

AIC	10.7871	*SC*	10.8760
HQ	10.8178	*FPE*	48397.9

When the *log-likelihood* constant is included:

AIC	13.6250	*SC*	13.7138
HQ	13.6556	*FPE*	826610

The solved static long-run equation for *NFIFB*

Long-run sigma = 403.606

ECM = NFIFB - 0.187023 **FINACC*

(t-value) (2.55)

WALD test: χ^2 *(1)* = 6.48944 [0.0109] *

5.3.3.2 Net compensation of employees from abroad *(WAGEFBC)*

The remittances of earnings by people are considered one of the main ingredients of the international flow of financial resources. This is particularly true for developed countries and for the wealthy countries of the third world (which, primarily, are the oil exporting countries) and also especially true for those that have small populations such as Libya (Todaro and Smith, 2012).

As shown in chapter four, a foreign labour force is an influential explanatory variable in this study; this has been proved by the estimated results from the following equation, which demonstrates that all the coefficients obtain satisfactory economic and statistical acceptance. The importance of foreign labour in small-populated country, such as Libya, is a significant matter and this was verified by the variable results. Additionally, the sign and the size of the lagged net compensation of employees from abroad and the intercept of the function have shown the influence of the other factors that affect this relationship.

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
WAGEFBC_1	0.67949	6.0600	6.9621	6.1713	5.3845
Constant	-38.41400	-2.0405	-2.5840	-2.1493	-1.7242
FLABOR	0.82663	6.0229	7.5367	5.7974	3.6497
FLABOR_1	-0.37670	-2.0226	-4.0875	-2.1851	-1.4990

Sigma	47.5527	*RSS*	70099.0562
R^2	0.886694	$F(3, 31)$	80.86 [0.000] **
Log-likelihood	(-182.703)	*DW*	1.79
No. of observations	35	No. of parameters	4

AR 1-2 test: $F(2, 29) = 0.097557$ [0.9073]

ARCH 1-1 test: $F(1, 29) = 0.0053593$ [0.9421]

When the *log-likelihood* constant is not included:

AIC	7.83089	*SC*	8.00864
HQ	7.89225	*FPE*	2519.69

When the *log-likelihood* constant is included:

AIC	10.6688	*SC*	10.8465
HQ	10.7301	*FPE*	43035.0

The solved static long-run equation for *WAGEFBC*

Long-run sigma = 146.694

$ECM = WAGEFBC + 119.852 - 1.4038 * FLABOR;$

WALD test: $\chi^2(1) = 25.9029$ [0.0000] **

5.3.4 The aggregate supply block

The aggregate supply, the *GDP* component, will be divided into the production by the oil sector *XOIL* and the production by the non-oil sector *XNOIL*. However, the aggregate supply block in this study consists of one behavioural stochastic equation which is the real non-oil gross domestic product *XNOILR*, while the other variable, which is the real gross domestic product *GDPR* , will be regarded as the identity, as shown by next paragraph.

5.3.4.1 Non-oil gross domestic products, real *(XNOILR)*

The gross domestic products' GDP is represented in this study by the aggregate supply component, which shows the quantity of goods and services produced by the oil *XOIL* and non-oil *XNOIL* sectors in the economy.

The significant role of the state in Libya means that it is a major player in the domestic economy, especially in the non-oil domestic products' sector, and thus, in essence, is the owner of the real capital in this sector. However, the oil crises, especially in the nineteen-eighties overshadowed the public sector and led to the decline in oil revenues, which is deemed the main source of funding for the public sector. Consequently, this led to a gradual decline in this sector's role, which, in turn, brought about the neglect of major production projects. This then deteriorated significantly to the point where the state has been forced to privatize many of these projects.

On the other hand, following the decline of the private sector at the end of the nineteen-seventies and the early nineteen-eighties, the role of this sector began to recover again, in the mid-nineteen-nineties and into the early years of the millennium.

These facts can be easily manifested through an analysis of the estimated results of this equation, which reflect the role of the negative factors that have been mentioned above, through the size and the sign of the estimated intercept of the function.

In addition, the dual role played by real capital formation in the non-oil sector, which is reflected in the coefficient of this variable in both current and past periods, is evidence of the negative impact that is caused by a decrease in oil revenues. However, the obviously positive role played by the imports of capital goods, as evidenced by its estimated parameters, is the reason for the continuity of some of these projects (especially for the strategic ones, on the one hand, and it also paves the way for the private sector to participate in efforts to develop Libya on the other).

Finally, the coefficient of bank credit to the non-oil sector shows the importance of this variable, which provides an indication of the beginning of the natural role of the banking system in the Libyan economy.

Technically, all the estimated parameters in the function have gained both economic and statistical acceptance.

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
Constant	-1526.5	-3.7136	-3.5342	-2.9440	-2.4993
KNOILR	1.2971	5.0508	3.7908	4.4315	3.6751
KNOILR_1	-1.2464	-4.7036	-3.5163	-4.1269	-3.4335
IMCAPR	2.5902	4.1645	4.7169	3.9235	3.2628
IMCAPR_1	1.4009	2.3211	2.6844	2.2849	1.9206
CRNOILR	0.41739	2.7530	2.5876	2.2276	1.9257

Sigma	635.856	*RSS*	11725060.9
R^2	0.926187	$F(5, 29)$ =	72.78 [0.000] **

Log-likelihood (-272.296) *DW* 1.59

No. of observations 35 No. of parameters 6

AR 1-2 test: $F(2, 27) = 2.5843$ [0.0940]

ARCH 1-1 test: $F(1, 27) = 0.59900$ [0.4457]

When the *log-likelihood* constant is not included:

AIC	13.0647	*SC*	13.3314
HQ	13.1568	*FPE*	473623

When the *log-likelihood* constant is included:

AIC	15.9026	*SC*	16.1693
HQ	15.9947	*FPE*	8.08923e+006

The solved static long-run equation for *XNOILR*

Long-run sigma = 596.161

$$\underset{(t\text{-}value)}{ECM} = XNOILR + \underset{(-3.71)}{1526.53} - \underset{(3.92)}{0.0506105}*KNOILR - \underset{(9.14)}{3.99114}*IMCAPR - \underset{(2.75)}{0.417394}*CRNOILR$$

WALD test: $\chi^2(3) = 191.176$ [0.0000] **

5.3.5 The prices' block

The prices' block in this study consists of nine endogenous variables, five of which are stochastic equations, namely, the *GDP* implicit price deflator *PGDP,* the non-oil *GDP* implicit price deflator *PGDPNOIL*, the exports implicit price deflator *PEXOILLD* , the consumer implicit price deflators *PCP* and the private investment implicit price deflators *PIT,* while the rest are identities.

In this connection, practical experience has shown that the prices' block variables, with the exception of the exports implicit price deflator, depend primarily on the GDP implicit price deflator as a key variable to explain their behaviour. All of these variables, virtually, have stemmed from the same theoretical and practical perspective.

The next subsections will clarify, briefly, the estimates of the behavioural equations of the mentioned five variables.

5.3.5.1 GDP implicit price deflator *(PGDP)*

In the previous chapter, the main factors that affect the stability of the price system in an economy were clarified, whereby the role of the key sectors that create instability in an economy and consolidate its sustainability were noted. Unquestionably, it became clear that the external sector, the monetary sector, and the real sector play, respectively, a significant role in this context.

In addition, as was discussed in the previous chapter and based on the theoretical framework of this equation, it has specified the explanatory variables for this equation, which represents both the external and monetary sectors. These variables were the total imports' price index and the Libyan dinar exchange rate against the USA dollar and the changes in the money supply, as well as the lagged *GDP* implicit price deflator, and the intercept of the function.

The estimated results of this function describe the significant role of both the Libyan dinar exchange rate against the USA dollar and the total imports price index in the interpretation of the behaviour of this variable. Additionally, the lagged *GDP* implicit price deflator and intercept of the function have a salient role in determining this relationship. In spite of the small size of the coefficient of the changes in the money supply, however, its statistical acceptance has played a significant role in this relationship, even if this role is of less importance compared with the other explanatory variables. Additionally, it has a long-term role, as evidenced by the results below.

In practice, the function is economically and statistically acceptable and does not suffer from the conventional problems of econometrics.

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
PGDP_1	0.63552	9.5495	16.475	12.410	8.9083
Constant	-0.12361	-4.8299	-6.0336	-5.8398	-4.5697
EXCHRATE	0.35301	2.9813	2.9929	3.3021	2.3127
PIM	0.40072	4.7561	8.3396	7.5240	5.1616
DMS	8.9524e-005	3.2300	1.9059	1.8472	1.3979

Sigma	0.087304	*RSS*	0.228659498
R^2	0.994205	$F(4, 31)$ = 1287 [0.000] **	
Log-likelihood	38.3774	*DW*	2.03

No. of observations 35   No. of parameters 5

AR 1-2 test: $F(2, 29)$ = 2.1695 [0.1324]

ARCH 1-1 test: $F(1, 29)$ = 0.35470 [0.5561]

When the *log-likelihood* constant is not included:

AIC	-4.74516	*SC*	-4.52296
HQ	-4.66845	*FPE*	0.00871084

When the *log-likelihood* constant is included:

AIC	-1.90728	*SC*	-1.68509
HQ	*-1.83058*	*FPE*	*0.148776*

The solved static long-run equation for *PGDP*

Long-run sigma = 0.235993

ECM = *PGDP* + 0.339124 - 0.968532 **EXCHRATE* - 1.09941 **PIM* –
(*t-value*) (-3.47) (2.52) (7.99)

0.000245618 **DMS*
(2.88)

WALD test: χ^2 (3) = 197.072 [0.0000] **

5.3.5.2 Non-oil GDP implicit price deflator *(PGDPNOIL)*

As mentioned above, the implicit deflator of *GDP* is a key variable in explaining the behaviour of all price equations in this study. It can be seen that it contributes additionally to the lagged non-oil *GDP* implicit price deflator, and to the temporal trend, in the interpretation of most of the changes that occur to the non-oil *GDP* implicit price deflator.

Despite a lack of crucial statistical acceptance for the absorptive capacity of GDP, it remains an influential variable, where it could provide a further assistance when analysing the different economic policies in the next chapter. The non-acceptance of this variable, particularly, did not decisively affect the estimated equation as a whole. In addition, it remains influential, even in the long run estimation of this function, as evidenced by the results below.

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
PGDPNOIL_1	0.46522	3.0070	2.1748	2.6339	1.5016
TREND	0.01802	2.7098	2.6594	2.3467	1.3902
PGDP	0.10637	2.2917	2.1871	2.5966	1.7974
CUGDP	0.001192	1.8403	1.1795	1.2871	1.2609

Sigma 0.157203 *RSS* 0.766096553

Log-likelihood 17.2186 *DW* 2

No. of observations 35 No. of parameters 4

AR 1-2 test: $F(2, 29) = 0.55511$ [0.5800]

ARCH 1-1 test: $F(1, 29) = 0.031123$ [0.8612]

When the *log-likelihood* constant is not included:

AIC	-3.59322	*SC*	-3.41547
HQ	-3.53186	*FPE*	0.0275371

When the *log-likelihood* constant is included:

AIC	-0.755347	*SC*	-0.577593
HQ	-0.693986	*FPE*	0.470319

The solved static long-run equation for *PGDPNOIL*

Long-run sigma = 0.289903

ECM = PGDPNOIL - 0.033698 **TREND* - 0.198906 **PGDP* –

(t-value) (4.48) (2.64)

0.00209293 **CUGDP;*

(1.97)

WALD test: $\chi^2(3) = 462.614$ [0.0000] **

5.3.5.3 Exports implicit price deflator *(PEXOILLD)*

The main reason for choosing this variable is to express the total exports implicit price deflator that not only to express the price of oil exports, where oil exports, represent a very large proportion of total exports[34].

[34] In fact, oil exports did not fall below 51% of the total exports throughout the study period, moreover it in some years, reached the roof of 98% of total exports, as shown in Table (2-7) in chapter two of this study.

As has already been stated in chapter four, the external sector is one of three sectors, which affect the price system in Libya. In this context, the exports implicit price deflator is one of the channels through which the external sector affects the economy[35].

In addition, this variable, as it was explained in the previous chapter, is not affected by the changes in the price system in Libya, where it is determined by its value in the last period, in addition to the average price of a barrel of oil in the world market during the current period and the previous two periods.

The estimated results, below, elucidate that the lagged exports implicit price deflator is the main explanatory variable and the average price of a barrel of oil in the world market comes in as the second position as an explanatory variable for the behaviour of this function. In spite of this, the long run estimation assures that the role of the average price of a barrel of oil in the world market explains the dependent variable behaviour.

In addition, the results show that the whole equation has a satisfactory economic and statistical acceptance.

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
PEXOILLD_1	0.66767	4.8028	5.8170	5.4396	3.4206
PWOILLD	0.89397	11.742	7.0499	6.8510	4.0791
PWOILLD_1	-0.77231	-4.5522	-3.5917	-3.4791	-2.1759
PWOILLD_2	0.21767	2.0929	2.0861	1.9650	1.2694

Sigma	1.30972	*RSS*	53.1764982
Log-likelihood	-56.9825	*DW*	1.75
No. of observations 35		No. of parameters 4	

[35] Indeed this occurs in Libya through an indirect channel, by the amount of the oil revenue, which, in turn, influences the entire economy.

AR 1-2 test: $F(2, 29)$ = 0.60625 [0.5522]

ARCH 1-1 test: $F(1, 29)$ = 0.055086 [0.8161]

When the *log-likelihood* constant is not included:

AIC	0.646840	*SC*	0.824594
HQ	0.708201	*FPE*	1.91141

When the *log-likelihood* constant is included:

AIC	3.48472	*SC*	3.66247
HQ	3.54608	*FPE*	32.6459

The solved static long-run equation for *APEXOIL*

Long-run sigma = 4.13732

ECM = PEXOILD - 1.02108 **PWOILLD*

(t-value) (9.20)

WALD test: χ^2 (1) = 84.5759 [0.0000]**

5.3.5.4 Consumer implicit price deflator *(PCP)*

The estimated results from this equation show how deeply the consumer implicit price deflator relies on the implicit *GDP* deflator in the interpretation of its behaviour. As it is dependent on its value in the current period in addition to its value during the two previous periods, this is confirmed by the results of the function in the long run estimation.

However, this result also shows that the strongest effect is reliant on the variable value, in the previous period.

The estimated results are consistent with economic theory and with the statistical criteria.

Coefficients *t-SE* *t-HACSE* *t-HCSE* *t-JHCSE*

PCP_1	0.83850	8.4737	9.4142	9.3414	3.7432
Constant	0.11721	2.2962	2.9676	2.5994	1.9684
PGDP	0.64899	6.4392	4.1390	4.2249	2.4807
PGDP_1	-0.92681	-5.9310	-3.4458	-3.4071	-1.8352
PGDP_2	0.33841	2.4644	1.7378	2.0888	1.4452

Sigma 0.0945249 *RSS* 0.268048881

R^2 0.972527 $F(4, 30)$ = 265.5 [0.000] **

Log-likelihood 35.596 *DW* 1.92

No. of observations 35 No. of parameters 5

AR 1-2 test: $F(2, 28)$ = 0.012261 [0.9878]

ARCH 1-1 test: $F(1, 28)$ = 0.41486 [0.5248]

When the *log-likelihood* constant is not included:

AIC -4.58622 *SC* -4.36403

HQ -4.50952 *FPE* 0.0102114

When the *log-likelihood* constant is included:

AIC -1.74834 *SC* -1.52615

HQ -1.67164 *FPE* 0.174405

The solved static long-run equation for *PCP*

Long-run sigma = 0.585298

ECM = PCP - 0.725749 - 0.375173 **PGDP;*

(t-value) (2.43) (1.21)

WALD test: $\chi^2(1)$ = 1.46645 [0.2259]

5.3.5.5 Investment implicit price deflator *(PIT)*

The estimated result for the function of the investment implicit price deflator shows that it, also, is influenced by the *GDP* implicit price deflator, whether in the current period or in the previous two periods, although the outcome of this effect is not categorical. However, the reason behind keeping this variable is that it is the only variable which explains the behaviour of the function in the long run.

The lagged investment implicit price deflator over one period remains the most influential explanatory variable in this function as most of the positive changes that occur in the function can be attributed to this variable.

The estimated result for this function also shows that it has been accepted by both the statistical or economic criteria.

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
PIT_1	0.99813	11.973	16.204	15.037	4.6092
PGDP	0.38036	3.8551	2.1139	1.9816	1.2703
PGDP_1	-0.61947	-3.9730	-2.1818	-2.0380	-1.1778
PGDP_2	0.27849	1.9528	1.5114	1.6812	1.1401

Sigma	0.0995677	*RSS*	0.307325594
Log-likelihood	33.2031	*DW*	2.07

No. of observations 35 No. of parameters 4

AR 1-2 test: $F(2, 29)$ = 0.86710 [0.4308]

ARCH 1-1 test: $F(1, 29)$ = 0.34938 [0.5590]

When the *log-likelihood* constant is not included:

AIC	-4.50662	*SC*	-4.32887
HQ	-4.44526	*FPE*	0.0110467

When the *log-likelihood* constant is included:

AIC	-1.66875	*SC*	-1.49099
HQ	-1.60739	*FPE*	0.188672

The solved static long-run equation for *PIT*

Long-run sigma = 53.3716

ECM = PIT - 21.1046 **PGDP*

(t-value) (0.0235)

WALD test: χ^2 (1) = 0.000550203 [0.9813]

5.3.6 Public finance block

As shown in the previous chapter, the public finance block represents the influential sector in the economy, which is the government sector. Moreover, as mentioned in chapter four, the public finance block in this model has one behavioural equation that constitutes direct or income tax and the following subsection introduces an estimation of this equation.

5.3.6.1 Income tax *(TAXDIRC)*

Income tax is one of the important domestic sources in financing government spending, especially in Libya where it has been heavily relied upon for financing consumer spending (administrative budget).

As has been mentioned in the previous chapter, the function of income tax in this study depends on the lagged gross domestic products at the factors' price and on the lagged income tax, in addition to the time trend, as explanatory variables, and the results for the function estimation affirm that.

The estimated results show the crucial statistical acceptance of this function, in addition to the consistency of these results with economic theory, as well as the absence of any of the traditional econometric problems in this function.

Finally, the results from the estimation function in the long run shows they have become dependent on the variable which was eliminated when estimating this function in the short run, which is the gross domestic product at factor cost in the current period *GDPCfc*, which could explain the behaviour of this relationship in the long run.

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
TAXDIRC_1	0.51571	3.7591	3.5207	3.5983	3.1738
GDPCfc_1	0.0072181	4.6687	5.2479	4.9498	4.2880
TREND	6.7300	3.2173	3.0113	3.1190	2.7714

Sigma	54.1671	*RSS*	93890.4568
Log-likelihood	(-187.817)	*DW*	2.1

No. of observations 35 No. of parameters 3

AR 1-2 test: $F(2, 30) = 0.14241$ [0.8678]

ARCH 1-1 test: $F(1, 30) = 0.65267$ [0.4255]

When the *log-likelihood* constant is not included:

AIC	8.06596	*SC*	8.19928
HQ	8.11199	*FPE*	3185.57

When the *log-likelihood* constant is included:

AIC	10.9038	*SC*	11.0372
HQ	10.9499	*FPE*	54407.8

The solved static long-run equation for *TAXDIR*

Long-run sigma = 110.34

$ECM = TAXDIR - 0.0149044*GDPCfc - 13.8967*TREND$

(t-value) (5.88) (8.77)

WALD test: $\chi^2(2) = 332.681$ [0.0000] **

5.3.7 Money supply block

Money supply is deemed one of the most influential economic variables, at both theoretical and practical levels (Laidler, 1969). One rarely finds an economic study based on econometric methodology that does not take into account the monetary sector as one of the key sectors in its model. The monetary sector is represented, in this study, by one behavioural equation, as will be clarified in the next subsection.

5.3.7.1 Money Supply *(MS)*

In the econometric modelling which has been adopted in this study, explaining the behaviour of the money supply is undertaken, traditionally, by relying on the monetary base variables (such as the balance of foreign assets and net domestic assets) in addition to the lagged supply of money. In addition, this study relies on the changes in the lagged domestic assets. As well as, on the dummy variable reflecting the period 2002-2006 when major changes occurred in the Libyan economy (such as the end of the United Nation embargo on Libya, the dramatic changes in prices, and then in oil revenues and, finally, changing the exchange rate of the Libyan dinar against the U.S. dollar).

The estimated results of this function show the following:

- The lagged supply of money has a significant impact on the changes that can occur for this variable.
- The foreign assets' balance has acquired the second importance in this relationship, in spite of the growing price rate in the oil prices and their impact on oil revenue, which is an essential source of foreign assets.
- The net domestic assets have played a less prominent role compared to their role in the nineteen-eighties and nineteen-

nineties[36]. In these decades, the domestic public banking debt (which is deemed one of the most important components of domestic assets in Libya) increased significantly. This started because the Treasury borrowed from the Central Bank, in addition to starting to make re-payments for these accumulated debts.

- The tremendous influence of the dummy variable because it includes many factors that significantly affect the behaviour of the supply of money in Libya.
- This function depends on the foreign assets' balance and on net domestic assets, in addition to the dummy variable, as explanatory variables for the estimation of the long run function.
- Finally, the estimated function shows the statistical acceptance of the explanatory variables and clarifies that the variables do not suffer from conventional econometric problems.
- Additionally, there is the consistency of these variables with economic theory, and that is with the exception of the lagged net domestic assets (which is surrounded by some deficiencies, which may be due to what has been discussed above).

	Coefficients	*t-SE*	*t-HACSE*	*t-HCSE*	*t-JHCSE*
MS_1	0.44257	2.7331	2.6280	2.1454	1.6002
IRC	0.41544	4.0666	4.6212	3.4942	2.3087
NDAC	0.28605	3.4298	3.7925	3.0338	1.8068
NDAC_1	0.089047	1.5020	0.71939	0.81066	0.48036
D_{0206}	3311.6	3.5111	3.4385	2.9363	2.0289

[36] In fact, the net domestic assets played a prominent role in the Libyan economy during these two decades due to the domestic banking debt crisis, which, in turn, was the main reason for the exacerbation of the problem of inflation during that period. For more details, see Ruhaet, 1998.

Sigma	452.73	*RSS*	6148938.2
Log-likelihood	(-261.001)	*DW*	2.51
No. of observations 35		No. of parameters 5	

AR 1-2 test: $F(2, 28) = 3.4821$ [0.0446]*

ARCH 1-1 test: $F(1, 28) = 1.7764$ [0.1933]

When the log-likelihood constant is not included:

AIC	12.3622	*SC*	12.5843
HQ	12.4389	*FPE*	234245

When the log-likelihood constant is included:

AIC	15.2000	*SC*	15.4222
HQ	15.2767	*FPE*	4.00078e+006

The solved static long-run equation for MS

$Long\text{-}run\ sigma = 800.683$

$$ECM = MS - 0.745275 * IRC - 0.672915 * NDAC - 5940.93 * D_{0206}$$

(t-value) (16.7) (24.3) (7.95)

WALD test: $\chi^2(3) = 647.482$ [0.0000] **

5.4 The complete estimated equations of the model

The econometric model of this study has been constructed out of six blocks containing 38 equations, 16 of which are behavioural while the rest are identities, definitions, and bridge equations. The next section will show the complete versions of the estimated equations of the model of the study.

$$LCPR = 0.5912 * LCPR\_1 + 0.2181 * LYPDR + 0.58 * LMSR - 0.4241 * LMSR\_1 + .01211 * TREND$$

$$CGC = 328.6 + 2.206 * TAXDIRC + 1.178 * TAXDIRC\_1 + 1.432 * TAXINDC + 0.05118 * OILREV$$

$IPNOILR = 0.3894 * IPNOILR\_1 + 0.07474 * DKNOILR + 0.09844 * IGNOILR\_1 - 200.4 * DUM8185$

$KNOILR = KNOILR\_1 + IPNOILR + IGNOILR - DEPNOILR$

$LIMCONR = 0.5339 * LIMCONR\_1 + 0.404 * LCPR - 0.3255 * LEXCHRATE\_1 - 1.565 * PPRICE + 0.5957 * PPRICE\_1$

$LIMCAPR = 0.5103 * LIMCAPR\_1 + 0.3009 * LIGNOILR + 0.1466 * LDKNOILR - 0.5484 * LPIMPIT$

$EXOILMB = 0.8041 * EXOILMB\_1 + 0.8268 * XOILMB - 0.6647 * XOILMB\_1$

$WAGEFBC = 0.6795 * WAGEFBC\_1 - 38.41 + 0.8266 * FLABOR - 0.3767 * FLABOR\_1$

$EXOILOC = EXOILMB * PEXOILLD$

$NFIFBC = 0.4699 * NFIFBC\_1 + 0.09915 * FINACC$

$EXTOTC = EXOILOC + EXOTHC$

$IMTOTC = IMCONR * PIMC + IMCAPR * PIM + IMOTHC$

$NETYFBC = WAGEFBC + NFIFBC$

$BOTGSC = EXTOTC - IMTOTC + BOTGSDISCREP$

$BOPC = BOTGSC - NETYFBC + FINACC + BOPOTHC$

$IRC = IRC\_1 + BOPC$

$XNOILR = -1527 + 1.297 * KNOILR - 1.246 * KNOILR\_1 + 2.59 * IMCAPR + 1.401 * IMCAPR\_1 + 0.4174 * CRNOILR$

$GDPR = XNOILR + XOILR + GDPRDISCREP$

$PGDP = 0.6355 * PGDP\_1 - 0.1236 + 0.353 * EXCHRATE + 0.4007 * PIM + 8.952e\text{-}005 * DMS$

$INFGDP = (DPGDP / PGDP\_1) * 100$

$PGDPNOIL = 0.4652 * PGDPNOIL\_1 + 0.01802 * TREND + 0.1064 * PGDP + 0.001119 * CUGDP$

$INFLGDPNOIL = (DPGDPNOIL / PGDPNOL\_1) * 100$

$PWOILLD = PWOILUS\$ * EXCHRATE$

$PEXOILLD = 0.6677 * PEXOILLD\_1 + 0.894 * PWOILLD - 0.7723 * PWOILLD\_1 + 0.2177 * PWOILLD\_2$

$PCP = 0.8385 * PCP\_1 + 0.1172 + 0.649 * PGDP - 0.9268 * PGDP\_1 + 0.3384 * PGDP\_2$

$PIT = 0.9981 * PIT\_1 + 0.3804 * PGDP - 0.6195 * PGDP\_1 + 0.2785 * PGDP\_2$

$GDPCfc = (XNOILR * PGDPNOIL) + (XOILR * PGDPOIL)$

$TAXDIRC = 0.5157 * TAXDIRC\_1 + 0.007218 * GDPCFC\_1 + 6.73 * TREND$

$TAXINDC = TARIFFC + TAXNTARC$

$GTYC = TAXDIRC + TAXINDC + OILREV + TAXOTHSC$

$YPDC = GDPmp + SUBSIDIES + NETYFBC - GTYC$

$YPDR = YPDC / PGDP$

$GTEC = CGC + IGNOILC + OTHGEC$

$$BUDGET = GTYC - GTEC$$

$$NDAC = CRNOILC + OTHDASC$$

$$GDPmp = GDPCfc + TAXINDC - SUBSIDIES + GDMPDISCREP$$

$$GDPRG = (DGDPR / GDPR\_1) * 100$$

$$MS = 0.1884 * MS\_1 + 0.5839 * IRC + 0.5645 * NDAC$$

5.5 The variables of the model

Generally, there are two kinds of variables in econometric models: the endogenous variables consist of identities, which are symbolised, in this model, by the letter *(I)*, the behavioural or stochastic equations, which are symbolised by the letter *(B)*, and the exogenous variables, which are symbolised as *(EXO)*.

The exogenous variables include predetermined variables from outside the model such as the policy variables and the lagged variables. The lagged variables that delayed one period have a suffix (_1) at the end of the variable name. The suffix (_2) will be added if there are two periods of delay, and so on. The last kind of exogenous variables is the dummy variable and it should be noted, finally, that some of endogenous variables are linked to the model as bridge variables.

When the letter (C) ends the variable name, this means that the value of that variable is at the current prices of any nominal value. If the name ends with the letter (R), it means that the variable is expressed in real terms or at fixed prices at a given base year (1990).

Adding the letter (L) at the beginning of the variable's name refers to the use of the logarithmic formula when estimating the equation, such as *LCPR, LIMCONR*, and *LIMCAPR*.

*, and ** asterisks next to P-value of the statistic refer to five and one percent statistical significance level respectively.

Variable number	Nomenclature	Description of the variable	Variable type
1	*CPR*	Private consumption expenditure on goods and services, Real	*B*
2	*CGC*	Government consumption expenditure on goods and services	*B*
3	*IPNOILR*	Non-oil real private investment expenditure	*B*
4	*KNOILR*	Non-oil real capital stock	*I*
5	*IMCONR*	Real imports of consumer goods	*B*
6	*IMCAPR*	Real imports of capital goods	*B*

7	*EXOILMB*	Oil exports, in millions of barrels	*B*
8	*EXOILC*	Oil exports in millions of dinars	*I*
9	*NFIFBC*	Net financial income from abroad	*B*
10	*WAGEFBC*	Net compensation of employees from abroad	*B*
11	*EXTOTC*	Total exports	*I*
12	*IMTOTC*	Total imports	*I*
13	*NETYFBC*	Net income from abroad	*I*
14	*BOTGSC*	Balance of trade (current goods and services)	*I*
15	*BOPC*	Balance of payments, current	*I*
16	*IRC*	The balance of foreign assets (reserves)	*I*
17	*XNOILR*	Non-oil gross domestic product, Real	*B*
18	*GDPR*	gross domestic product, Real	*I*

19	*PGDP*	*GDP* implicit price deflator	*B*
20	*INFGDP*	Inflation rate *GDP*	*I*
21	*PGDPNOIL*	Non-oil *GDP* implicit price deflator	*B*
22	*INFGDPNOIL*	Inflation rate in non-oil *GDP*	*I*
23	*PWOILLD*	The average price of a barrel of oil in the global market in Libyan dinars	*I*
24	*PEXOILLD*	Exports' implicit price deflator	*B*
25	*PCP*	Consumer implicit price deflators	*B*
26	*PIT*	Private investment implicit price deflators	*B*
27	*GDPCfc*	*GDP* at factor prices	*I*
28	*TAXDIRC*	Income tax (total of direct taxes)	*B*
29	*TAXINDC*	Non-direct tax, current	*I*
30	*GTYC*	Total government income	*I*

31	*YPDC*	Personal disposable income	*I*
32	*YPDR*	Personal disposable income, Real	*I*
33	*GETOT*	Total government spending	*I*
34	*BUDGET*	Deficit or surplus in the government budget	*I*
35	*NDAC*	Net domestic assets	*I*
36	*GDPRG*	*GDP* growth rates	*I*
37	*GDPmp*	*GDP* at market price, current	*I*
38	*MS*	Money supply	*B*
39	*BOPOTHC*	Other balance of payment items	*EXO*
40	*CRNOILC*	Bank credit to non oil sector	*EXO*
41	*CUGDP*	Absorptive capacity of *GDP*	*EXO*
42	DUM_{0206}	Dummy variable (1 in 2002 – 2006 , 0 elsewhere)	*EXO*
43	*DEPNOILC*	Capital depreciation in non-oil sector	*EXO*

44	D_{8185}	Dummy variable (1 in 1981 – 1985, 0 elsewhere)	*EXO*
45	*EXCHRATE*	Libyan dinar exchange rate against the USA dollar	*EXO*
46	*EXOTHC*	Exports of other goods	*EXO*
47	*FINACC*	Financial account balance in the balance of payments	*EXO*
48	*FLABOR*	Foreign labour force	*EXO*
49	*IGNOILC*	Government gross fixed investment in non-oil sector	*EXO*
50	*IMOTHC*	Other imports	*EXO*
51	*TAXNTARC*	Indirect taxes non-customs revenue	*EXO*
52	*OILREV*	Treasury's share of oil revenues	*EXO*
53	*OTHDASC*	Change in other domestic assets	*EXO*
54	*PIM*	Total imports price index	*EXO*

55	*PIMC*	Imports price index of consumer goods	*EXO*
56	*PWOILUS$*	Price of a barrel of Libyan oil in the world market in U.S. dollars	*EXO*
57	*SUBSIDIESC*	Subsidies for the economic units	*EXO*
58	*TARIFF*	Taxes on imports	*EXO*
59	*TAXOTHC*	Taxes and other income of the public treasury	*EXO*
60	*TREND*	The trend	*EXO*
61	*XOILR*	Real *GDP* in the oil sector	*EXO*
62	*XOILMB*	Millions of barrels of oil production	*EXO*
63	*OTHGEC*	Other expenses of the government sector	*EXO*
64	*PGDPOIL*	The implicit deflator of oil *GDP*	*EXO*

5.6 Conclusion

This chapter has presented the estimated and test results of the behavioural equations of the model. These results have depended, to a large extent, on three levels of assessments, that are referred to in chapter one, which are the theoretical, the statistical, and the econometric evaluation that required an examination of the signs and magnitudes of the estimated parameters.

With regard to the statistical properties' inspection, this entailed testing the significance of the parameters of each explanatory variable in the equation of the model. It also involved testing the overall statistical acceptance of each equation.

As for the evaluation of econometrics, it meant checking the existence of conventional econometric problems such as autocorrelation, multicollinearity, and heteroscedasticity, which could require rectification of these problems.

It is worthwhile noting that most of the equations performed well. The estimated results, above, have reflected the many factors that have had a role in influencing the Libyan economy during the study period.

The satisfactory formulas that have been obtained from the estimates of these equations are expected, with thanks to the use of the Autometrics algorithm, which played an important role in the formulation of the model and provide solutions in order to analyse the various economic policies in the next chapter.

Finally, it is noteworthy that these results indicate that they are considered to be fairly parsimonious specifications, and that they adequately suit the particular features of the Libyan economy, as a small developing country.

CHAPTER SIX: THE MODEL EVALUATION

6.1 Introduction

By specifying and estimating the model in this study (which has been accomplished in the two preceding chapters (chapters four and five)) the first objective has been achieved. This is the objective which most models aspire to attain, and, as mentioned previously, is the structural analysis of the model. Wherein one of the most essential aspects of ‘‘*structural analysis is the estimation of the parameters of the structural form ... in order to measure the extent of influence of each of the included variables in any equation of the model*’’ (Intriligator, 1983; 208).

The estimated model, such as the model in the previous chapter, is not considered to be ready for utilization in any practical work before testing its validity by using validation simulations. This means as Klein stated ‘‘*show, in a sense, how good, or how reliable, the model is and whether it is suitable for use*’’ (Klein, Welfe, and Welfe, 1999; 193).

However, the ultimate aim of this study will not be completed, without also completing the other two objectives[37] as “*the test of any model is not only how will it perform for individual equations but also how it functions as a complete system in prediction, simulation, and policy evaluation*” (Abohobiel, 1983; 140). Consequently, this chapter will go further in carrying out the rest of the objectives, namely the forecasting and policy analysis, which is deemed the task of this chapter.

[37] For more details about this issue see, Moustafa, 1978, and c.f. Pindyck and Rubinfeld, 1998

Accordingly, to fulfil this task in a clear manner, the current chapter will be divided into six parts. The first part of this chapter is an introduction for the topic while explanations of the two remaining objectives that constitute the backbone of the theme of this chapter will be introduced in part four and part five respectively. The third part will introduce the solution of the model as a system of equations simultaneously which is considered as the basis of testing the reliability of the model in depicting the economy under consideration (Ghartey and Rao 1990). These latter three sections will be preceded, in section two, by an overview of the general framework of the policy evaluation approaches. Finally, the sixth part will summarize all that was covered in this chapter.

6.2 The policy evaluation approaches

There are many approaches that have been proposed by econometricians and economists for economic policy evaluation (For further discussions on these approaches see Naylor, 1971; Intriligator, Bodkin and Hsiao, 1996 and Wieland, 2011). Some of these approaches use econometric models to assess the effects of alternative economic policies on the behaviour of an economic system, while other approaches can be deemed as special cases of this econometric model based approach, wherein three of which are famous. These three approaches are, respectively, expert opinion approach, the Delphi approach and the disjointed incrementalism approach (Intriligator, Bodkin, and Hsiao, 1996; c.f. Holden, Peel, and Thompson, 1990).

In respect of econometric model based approach, each of them assumes that it begins with a specific econometric model of the economy under consideration. Similarly, in this area, there are three familiar approaches and these approaches can be listed as follows: firstly, the Tinbergen approach, secondly the Theil approach and, finally, the policy simulation approach (Intriligator, Bodkin and Hsiao, 1996).

The first econometric model based approach for policy evaluation is the instruments-targets approach, developed by Tinbergen. This approach depends on two important hypotheses: the first is that the policy maker can specify a fixed value for each of the endogenous variables as a target of policy. The other assumption is that there are a number of policy variables called 'instruments' must be greater than, or at least equal to, the number of endogenous or target variables. The difference between the targets and instruments variables is called the policy degree of freedom (Intriligator, Bodkin and Hsiao, 1996).

The Tinbergen approach has some serious defects; the first of which, that pertains the ability of policymakers to define certain target choices, is highly questionable. The second is that the Tinbergen approach assumes there is no trade-off among the targets as well as determining the fixed value for each. The third defect is a common one relating to a shortage of independent instruments (for details see Intriligator, Bodkin and Hsiao, 1996).

A second econometric model based approach for policy evaluation is the social-welfare function or the Theil approach which assumes that one can know the social welfare function of the policy maker and that it may be expressed as a function of the target variables and the policy instruments (Intriligator, Bodkin and Hsiao, 1996) . This approach, in turn, suffers from many serious problems. One of the shortcomings is that in the real world one simply does not know the parameters or even the functional form of the social welfare function for governmental policy makers. ''*In summary, the Theil approach to the evaluation of economic policies with macroeconometric models is little more than an* *interesting exercise which offers only a limited promise as a policymaking tool''*(Naylor, 1971; 264).

The third approach to the problem of evaluating alternative economic policies, which use an estimated econometric model, is known in economic literature as the simulation approach (For a detailed review of this approach see Pindyck and Rubinfeld, 1998, particularly chapters 13 and 14).

The simulation concept has many definitions, which vary according to the purpose of the concept's uses. Practically, there are three definitions, which can be used in the field of econometrics, as will be elucidated below. Firstly, there is the historical simulation method, which uses the estimated model and the historical values of exogenous variables to calculate the values of endogenous variables. A second form of simulation is a projection which refers to the ''*forecasts values of endogenous variables beyond the sample*'' (Intriligator, Bodkin and Hsiao, 1996; 556). The third type of simulation is policy simulation that utilizes the estimated form of the model to determine all the different combinations of policy variables and endogenous variables for a given set of possible policies (Intriligator, Bodkin and Hsiao, 1996).

Linguistically, the concept of simulation generally ''*refers to the determination of behaviour of a system via the calculation of values from an estimated model of the system*'' (Intriligator, Bodkin and Hsiao, 1996; 555). Alternatively, according to Klein's definition,

simulation will be understood to mean solution of an equation system representing a model, in the language of differential equations, a simulation will be an integral of the system from fixed initial conditions (Klein, Welfe and Welfe, 1999; 153).

In fact, as stated above, in each of the simulation methods the exogenous variables and the policy instruments along with estimated parameters and the disturbance terms of the model are exploited together to figure out the values of the endogenous variables of the model equations (Intriligator, Bodkin and Hsiao, 1996). In this context, this study will utilize the first and the third types of this simulation while the second simulation type is beyond the interest of this study.

In addition, the simulation approach contains the interaction process between the policymakers and the model builders whereby the policymaker would provide the model builder with alternative desired policies and the model builder would provide the decision-makers, in turn, with their likely consequences for the endogenous variables. Therefore, the policymaker would then choose a desired policy and its outcome from among the alternative policies available. Evidently,

simulation, based in part on communication between policymaker and model builder, represents a valuable approach to policy evaluation that could be used in any policy area in which there exists a relevant estimated econometric model (Intriligator, 1983; 214) .

The main advantage of this approach is that it does not assume prior knowledge of either the targets of the policy maker or the social welfare function (Naylor, 1971), ''*rather, it requires that the policymaker formulate an explicit set of policy alternatives and that an estimated econometric model incorporating the appropriate policy variables be available*'' (Intriligator, 1983; 214). There is another advantage in the simulation approach, which it eases the use of a combination of subjective judgmental factors on the part of economic policy makers and objective analysis using an econometric model whereby the subjective considerations are nested in most of the simulation approach steps. Firstly, the competing set of desired policies is chosen on a subjective basis.

Secondly, the simulation process, by its nature, comprises added factors because the expert opinion and judgment is a crucial part of this process. Finally, the choice of a particular policy, which is based on the alternative simulated results, has subjective judgments, pertaining to the objectives of the policy (Intriligator, Bodkin and Hsiao, 1996).

The simulation approach does not provide a solution for all the problems of model users. This approach, like the others, suffers from some difficulties. Two of these difficulties, in particular, are the most influential. The first is direct difficulty, which is related to the nature of the simulation technique. Intriligator and his associates mentioned that,

no matter how many simulations the model specialist runs for the decision maker, there is no guarantee that the crucial simulation, yielding a much higher level of satisfaction for the decision maker, might not have been achieved on a simulation that the model specialist failed to run (Intriligator, Bodkin and Hsiao, 1996; 558).

Nevertheless, it should be noted that this difficulty, in the words of Intriligator, is ‘‘*inherent in the use of a framework in which optimization is not carried out explicitly*’’ (Intriligator, Bodkin and Hsiao, 1996; 558).

The second difficulty is indirect difficulty, which is related to the nature of the econometric modelling technique. Whereby, particular problems exist with the estimated econometric models such as data errors, estimation errors, misspecification of the model and the problems that pertain to the possible structural change that might occur as result of the difference between the period of uses and the period of estimations (Intriligator, Bodkin and Hsiao, 1996).

6.3 The solution of the model

In fact, solving the model of the study, as a whole, simultaneously using the simulation technique is a necessary step to completing the remaining goals that should to be achieved in econometric studies. In this context, the historical simulation will be utilized to solve the model equations where this enables the achievement, as mentioned, of forecasting within the sample period and policy evaluations[38].

This process uses one of the nonlinear models solution methods (the Gauss-Seidel method is used in this study) by applying dynamic simulation. The historical simulation uses the parameters of the equations, which were estimated in chapter five by using single equation estimated methods and the historical values of exogenous variables to compute the estimated values of endogenous variables for the actual sample observations. The comparison between the simulated and the actual values determines the accuracy of the model. If the model fails to track the historical period, it should be re-specified.

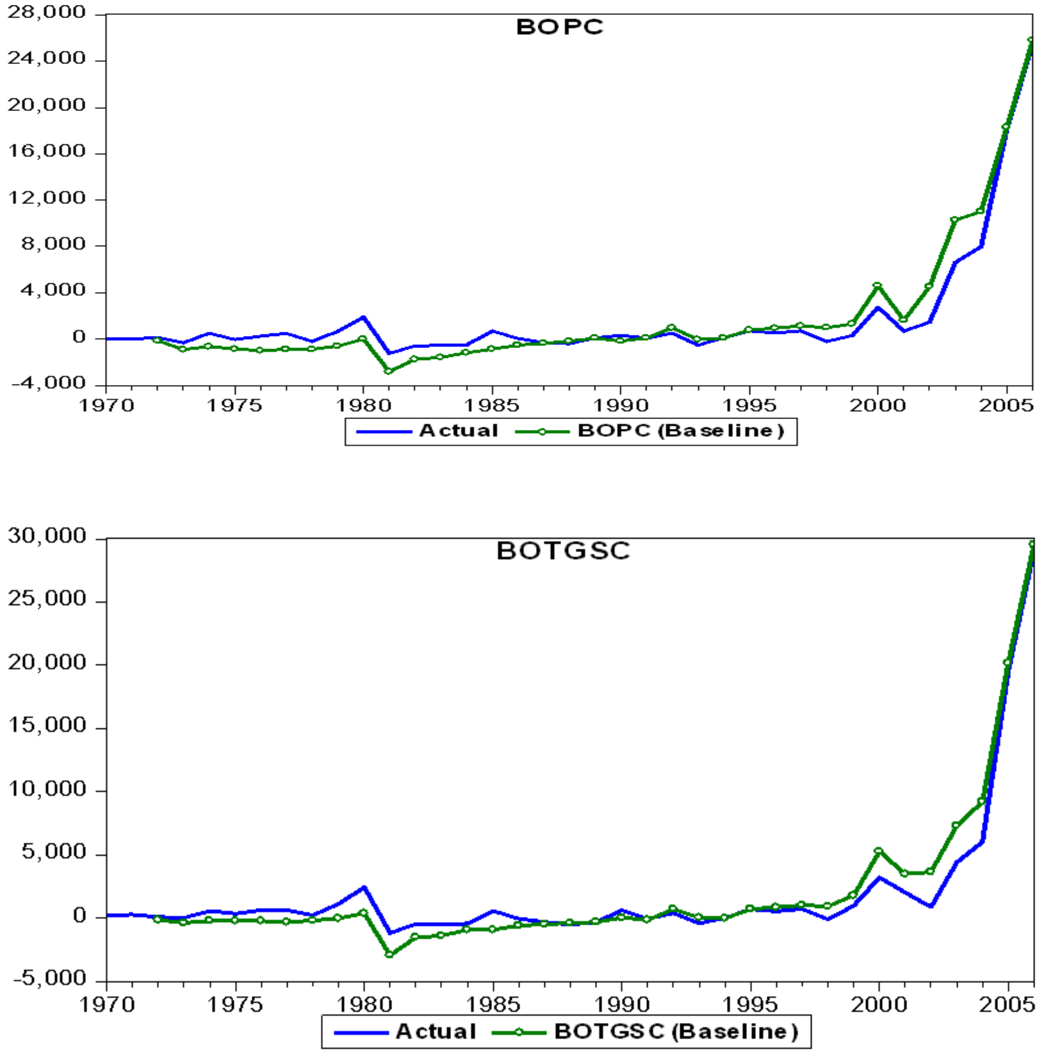
In this context, however, it could be argued that the final decisive criterion in the evaluation of the model, as a whole, is mainly based on the acceptance of its most important equations, in addition to investigating the reason behind the non-acceptance of the other equations with an attempt to justify the reason of this rejection.

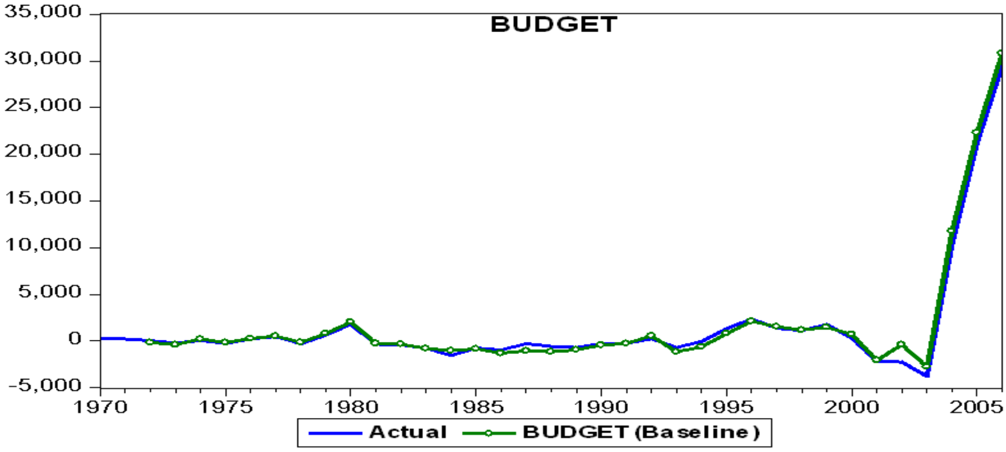
The model as a system has been solved for the period 1973-2006 because of the presence of lagged variables up to the second order in the estimated single equations in assessing its performance in terms of how well it tracks the behaviour of the endogenous variables.

[38] This study uses EViews 7.2 software to solve the model as a system of equations as well as in order to evaluate several of the policy scenarios.

The solution of the model will be illustrated, graphically, below in Figure 6.1, where the historical value is coded ‘actual’ while the dynamic solution (control solution) is coded ‘baseline’ for 38 endogenous variables, which constitute the system of the model of the Libyan economy.

Figure 6.1 the Dynamic simulation of the model




BUDGET
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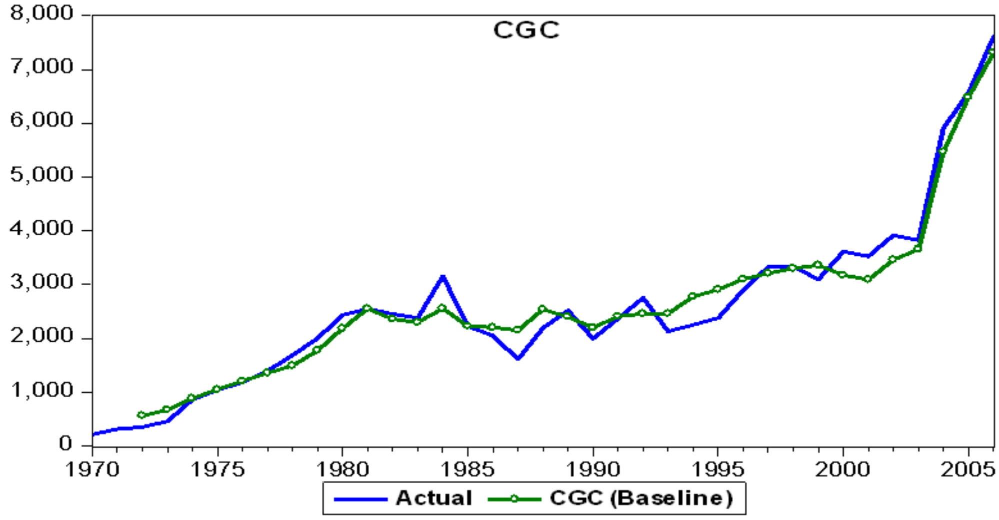
30,000
25,000
20,000
15,000
10,000
5,000
0
-5,000
1970
1975
1980
1985
1990
1995
2000
2005
Actual
BUDGET (Baseline)


CGC
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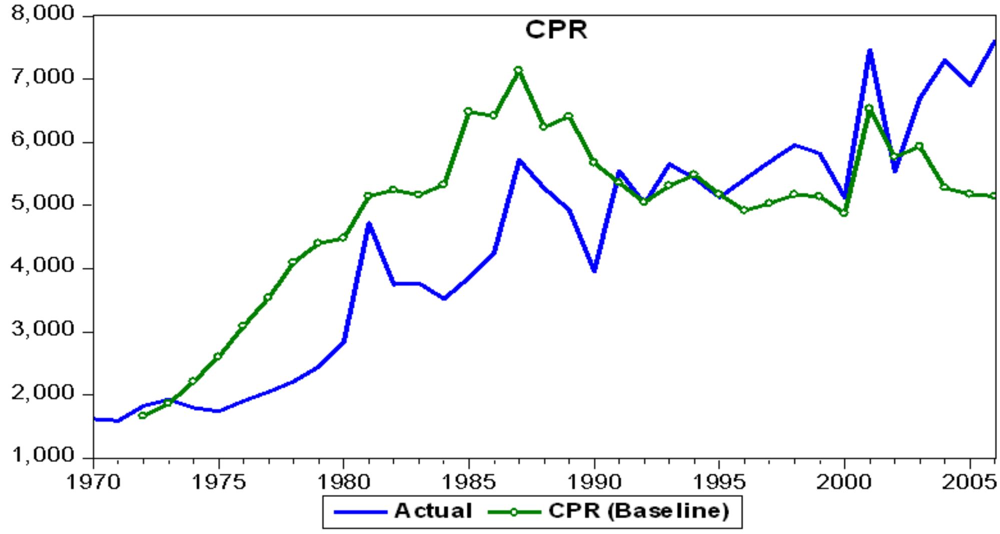
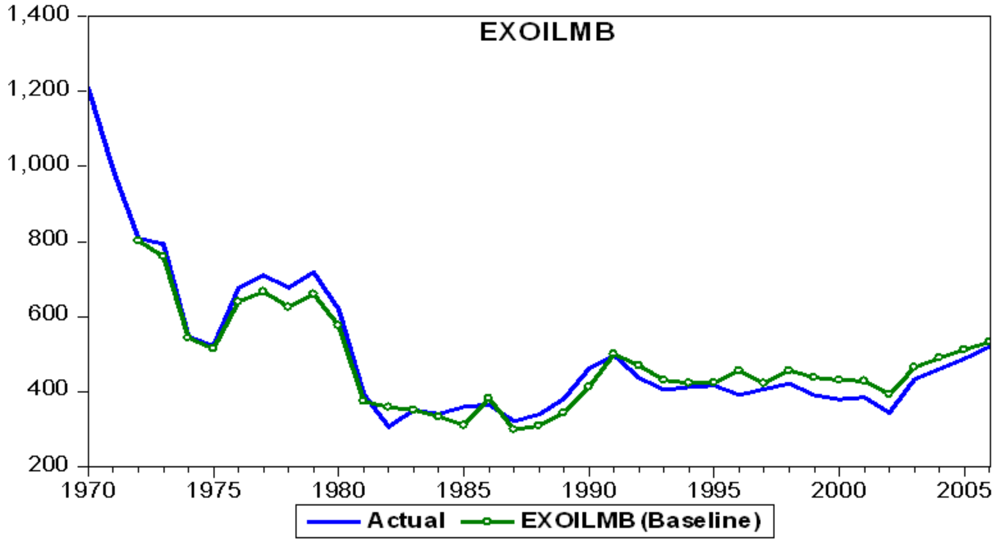
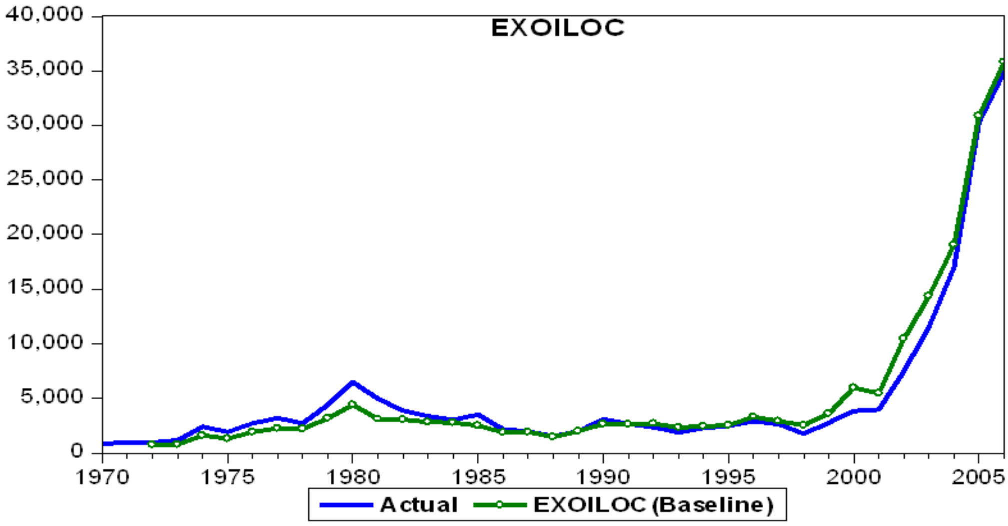
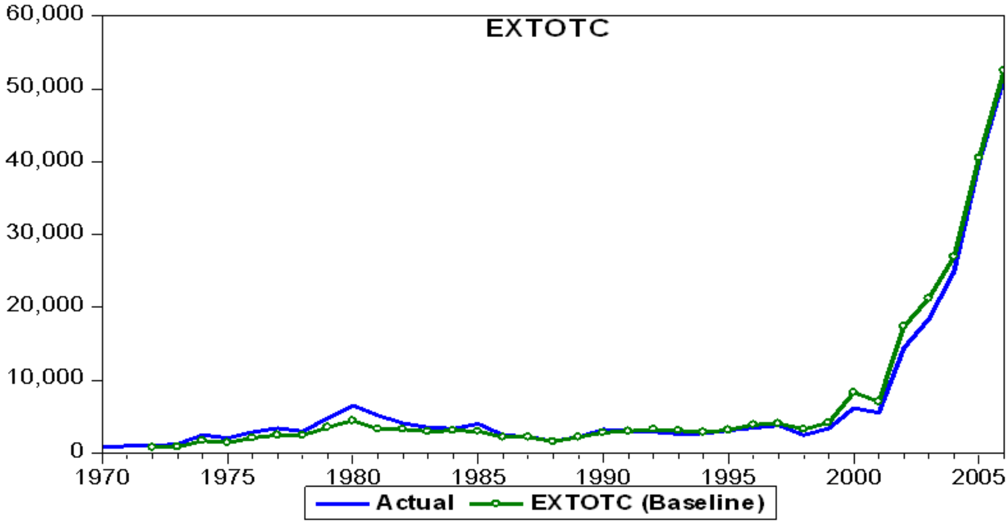
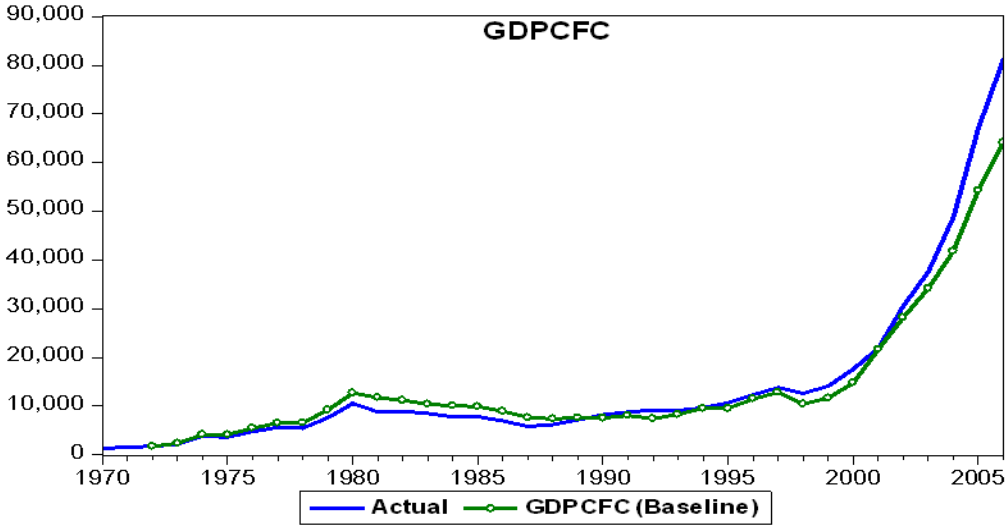
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
CGC (Baseline)

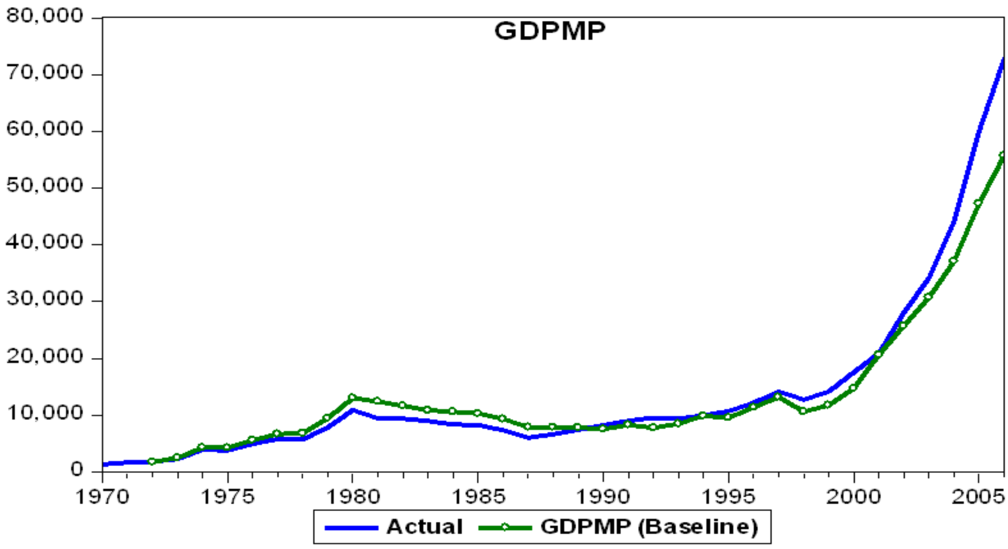

CPR
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1970
1975
1980
1985
1990
1995
2000
2005
Actual
CPR (Baseline)

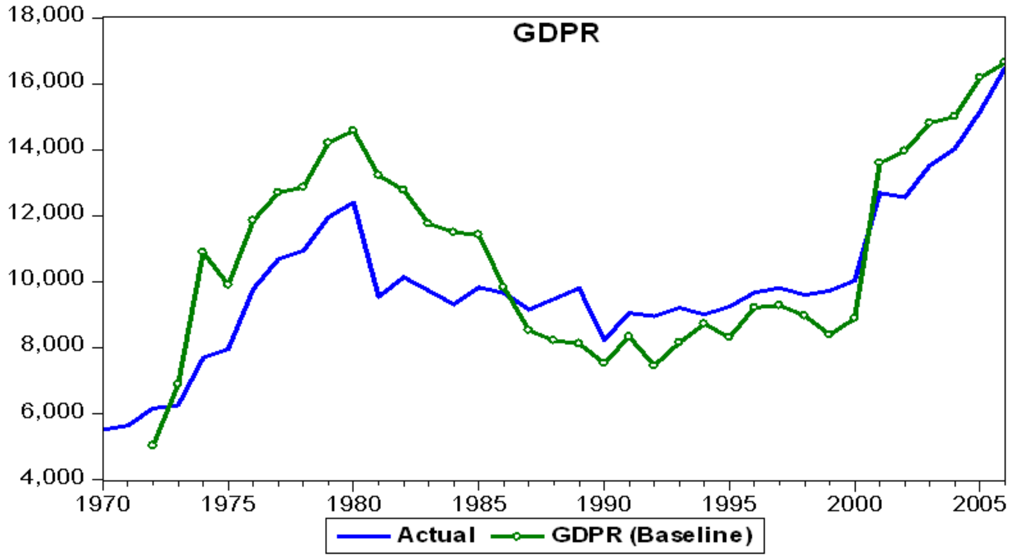

EXOILMB
1,400
1,200
1,000
800
600
400
200
1970
1975
1980
1985
1990
1995
2000
2005
Actual
EXOILMB (Baseline)

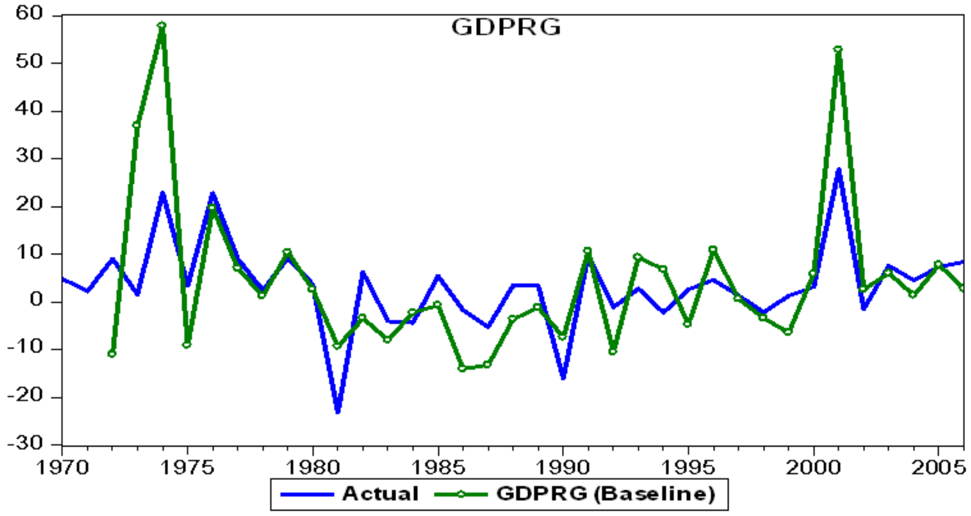

EXOILOC
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
EXOILOC (Baseline)

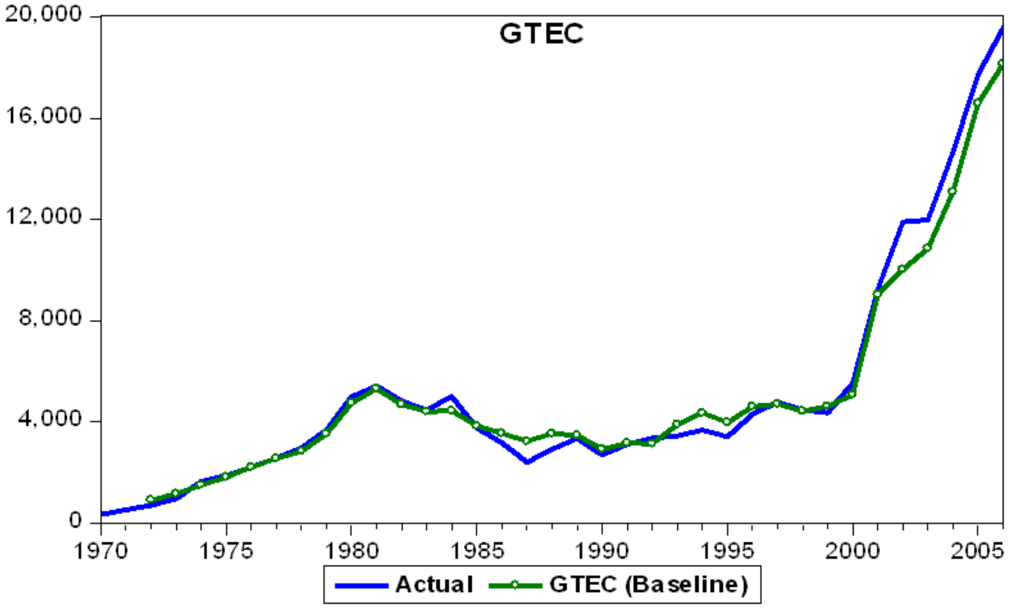

EXTOTC
60,000
50,000
40,000
30,000
20,000
10,000
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
EXTOTC (Baseline)

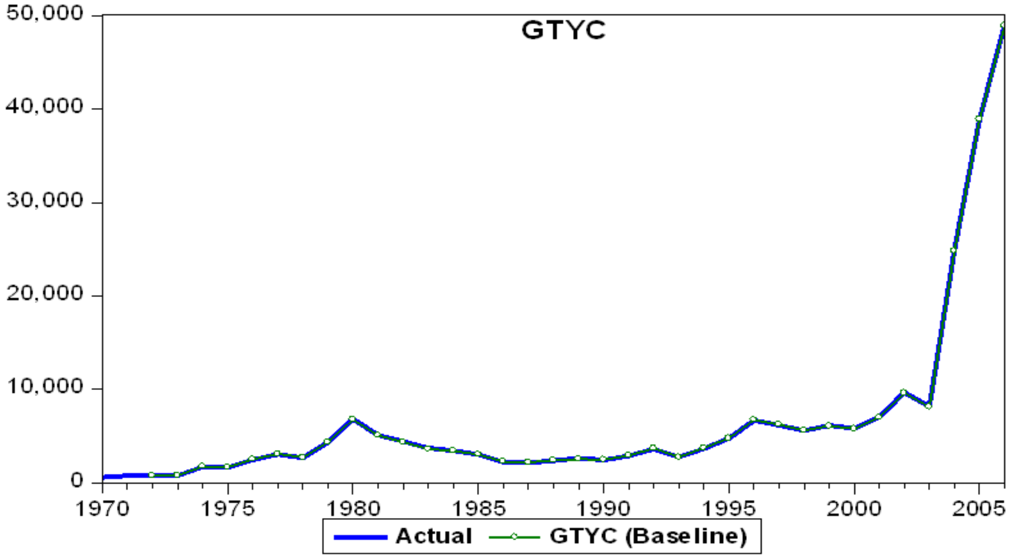

GDPCFC
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
GDPCFC (Baseline)

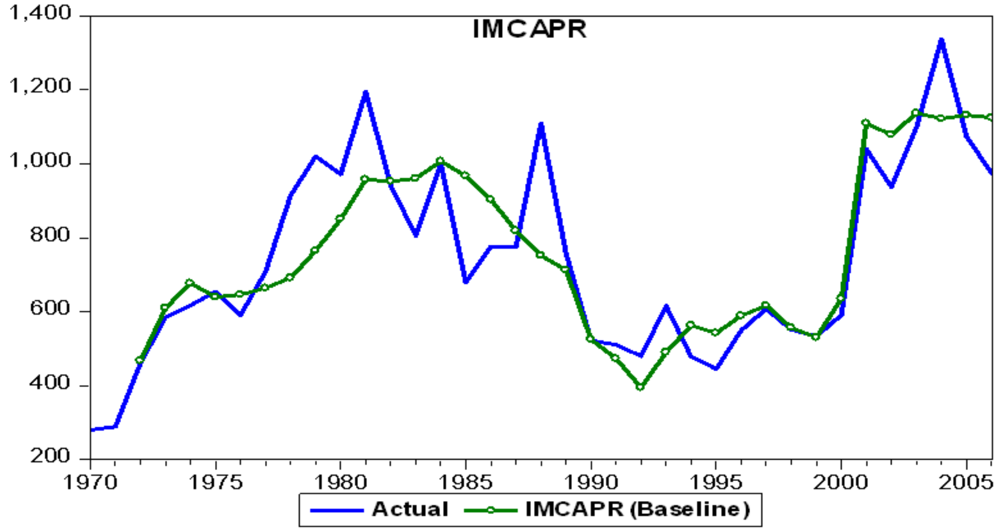

GDPMP
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
GDPMP (Baseline)

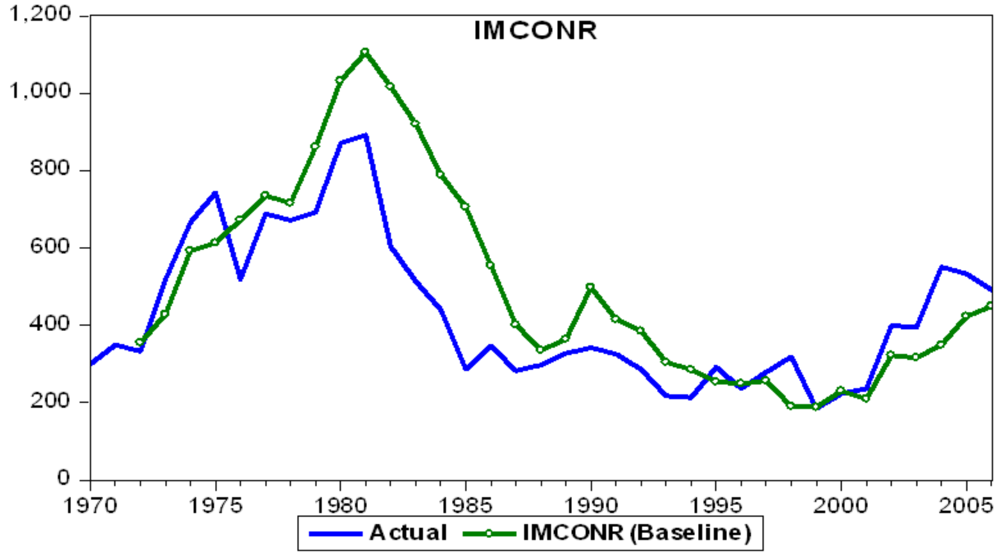

GDPR
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
1970
1975
1980
1985
1990
1995
2000
2005
Actual
GDPR (Baseline)

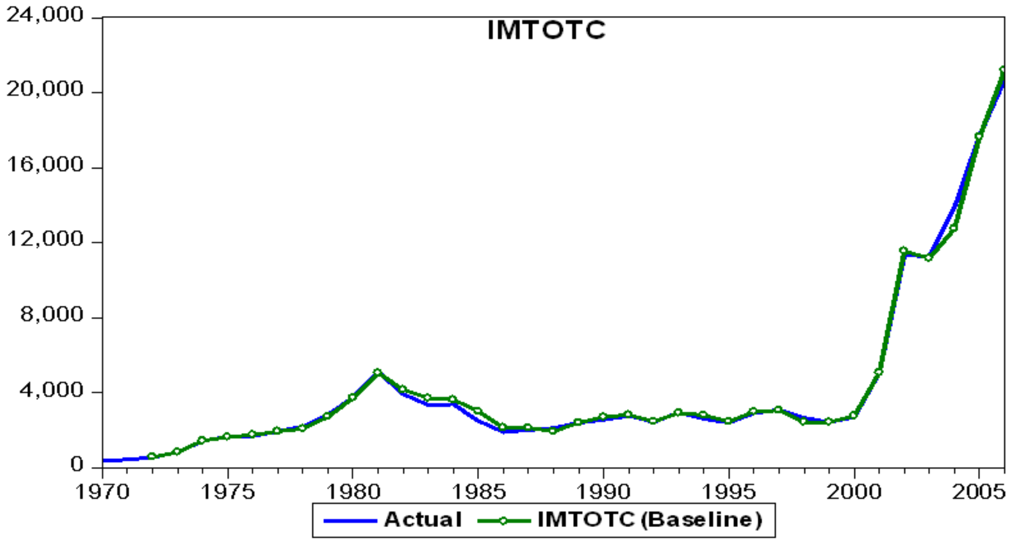

GDPRG
60
50
40
30
20
10
0
-10
-20
-30
1970
1975
1980
1985
1990
1995
2000
2005
Actual
GDPRG (Baseline)

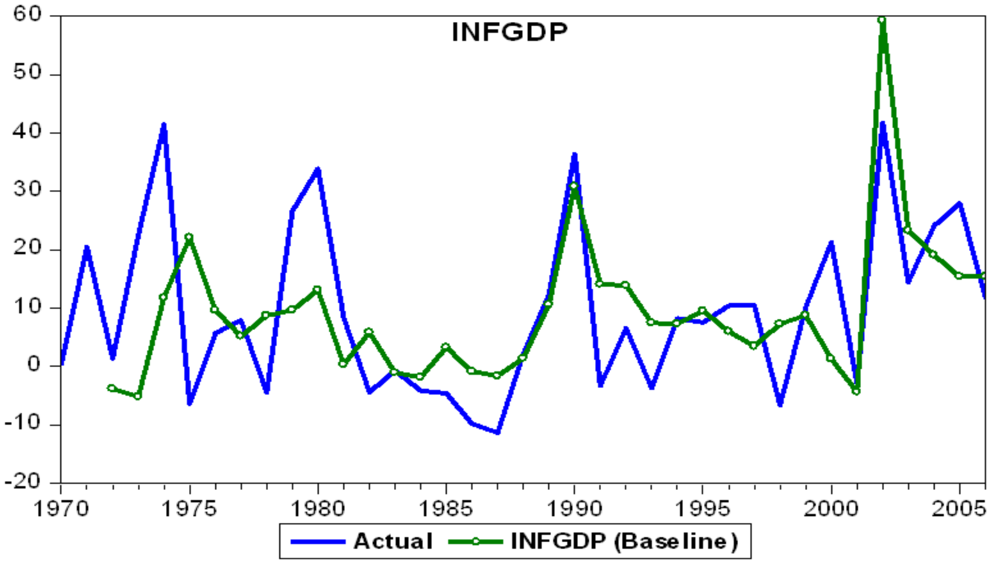

GTEC
20,000
16,000
12,000
8,000
4,000
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
GTEC (Baseline)

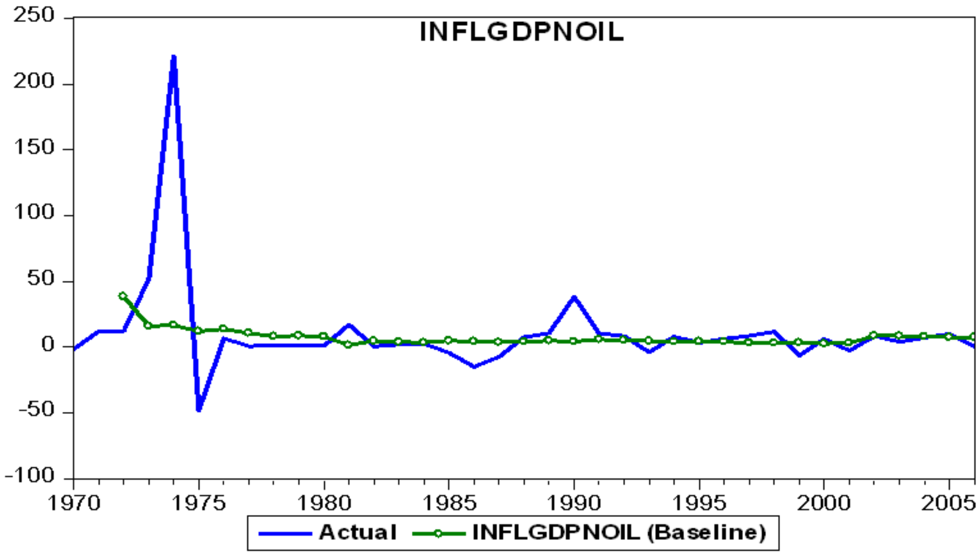

GTYC
50,000
40,000
30,000
20,000
10,000
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
GTYC (Baseline)

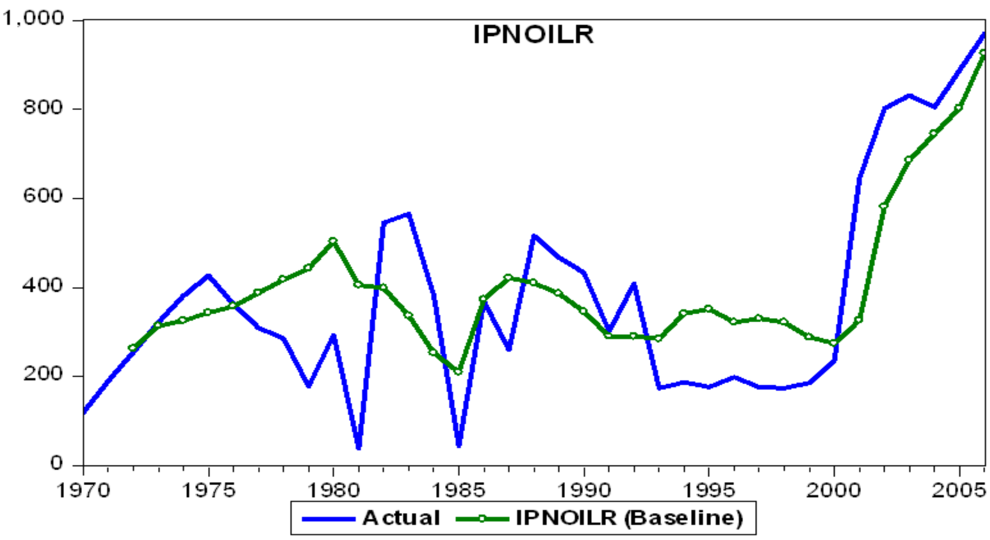

IMCAPR
1,400
1,200
1,000
800
600
400
200
1970
1975
1980
1985
1990
1995
2000
2005
Actual
IMCAPR (Baseline)

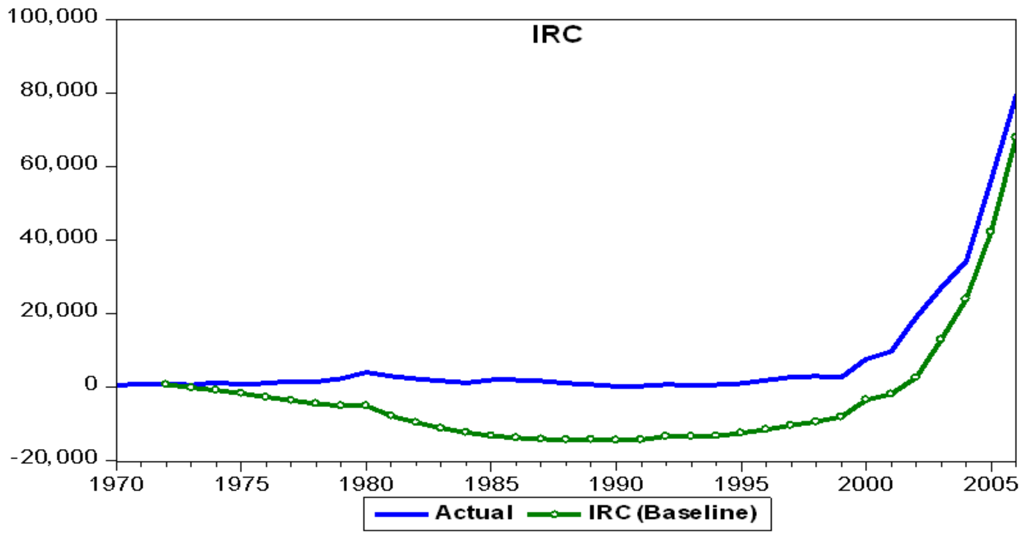

IMCONR
1,200
1,000
800
600
400
200
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
IMCONR (Baseline)


IMTOTC
24,000
20,000
16,000
12,000
8,000
4,000
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
IMTOTC (Baseline)


INFGDP
60
50
40
30
20
10
0
-10
-20
1970
1975
1980
1985
1990
1995
2000
2005
Actual
INFGDP (Baseline)


INFLGDPNOIL
250
200
150
100
50
0
-50
-100
1970
1975
1980
1985
1990
1995
2000
2005
Actual
INFLGDPNOIL (Baseline)


IPNOILR
1,000
800
600
400
200
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
IPNOILR (Baseline)


IRC
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80,000
60,000
40,000
20,000
0
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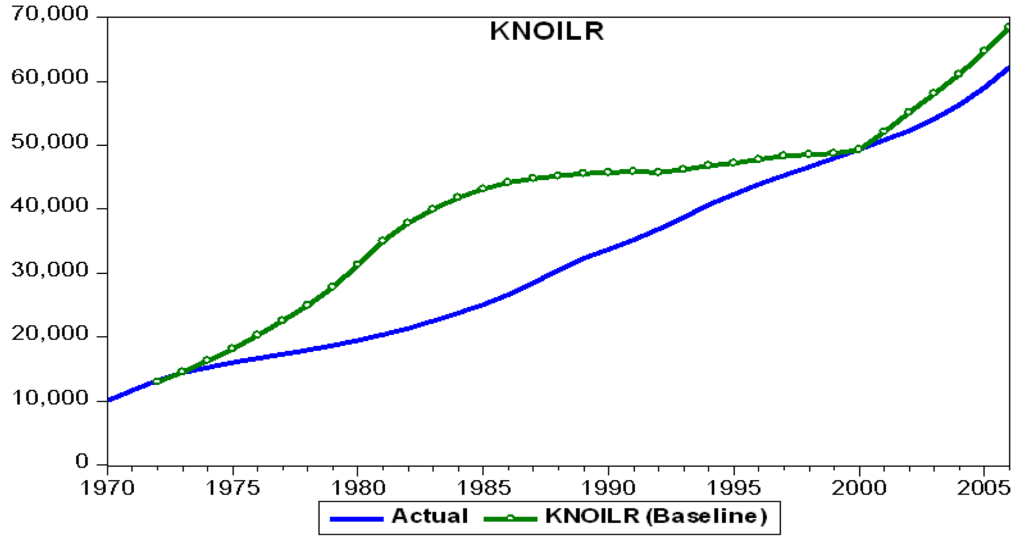
1970
1975
1980
1985
1990
1995
2000
2005
Actual
IRC (Baseline)


KNOILR
70,000
60,000
50,000
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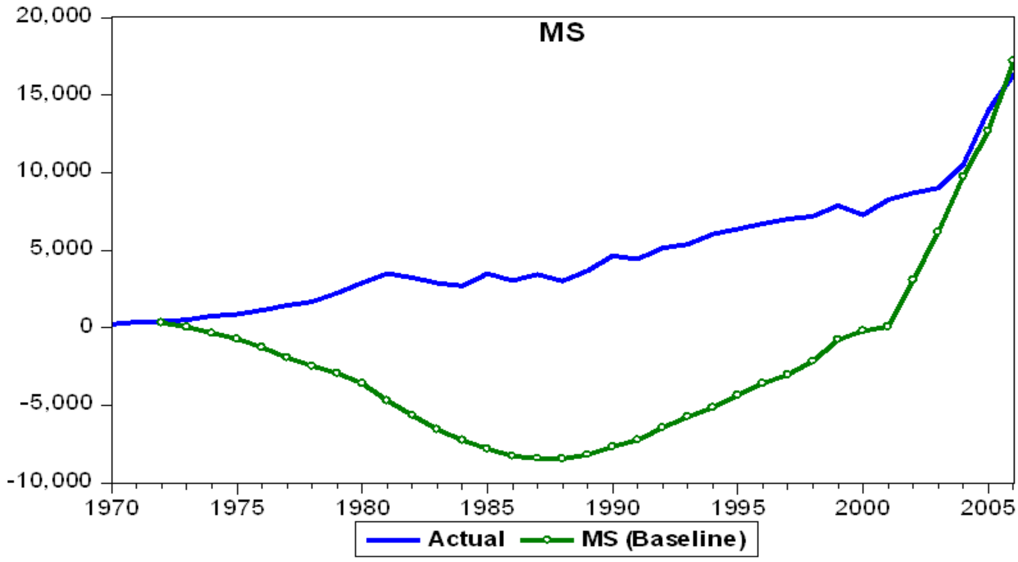
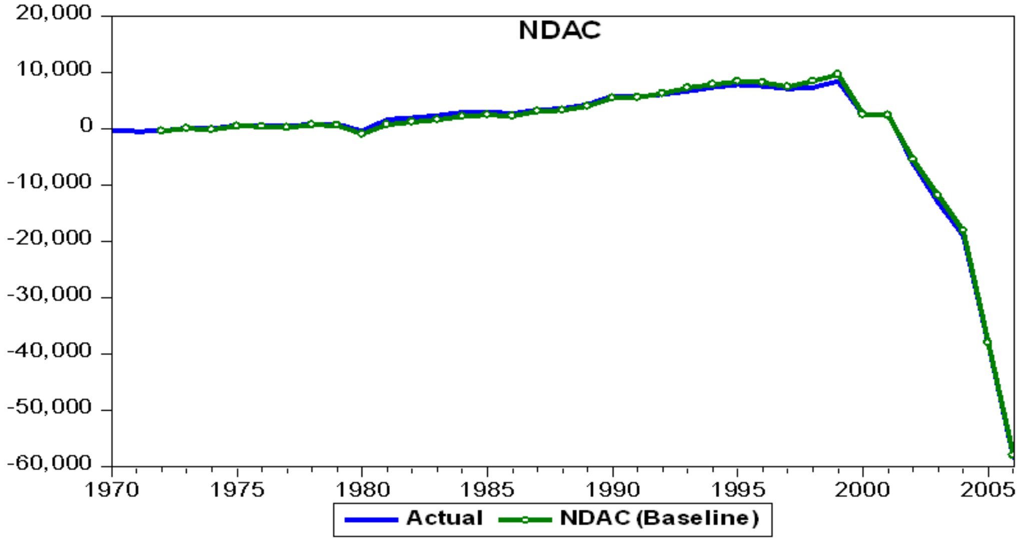
30,000
20,000
10,000
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
KNOILR (Baseline)


MS
20,000
15,000
10,000
5,000
0
-5,000
-10,000
1970
1975
1980
1985
1990
1995
2000
2005
Actual
MS (Baseline)


NDAC
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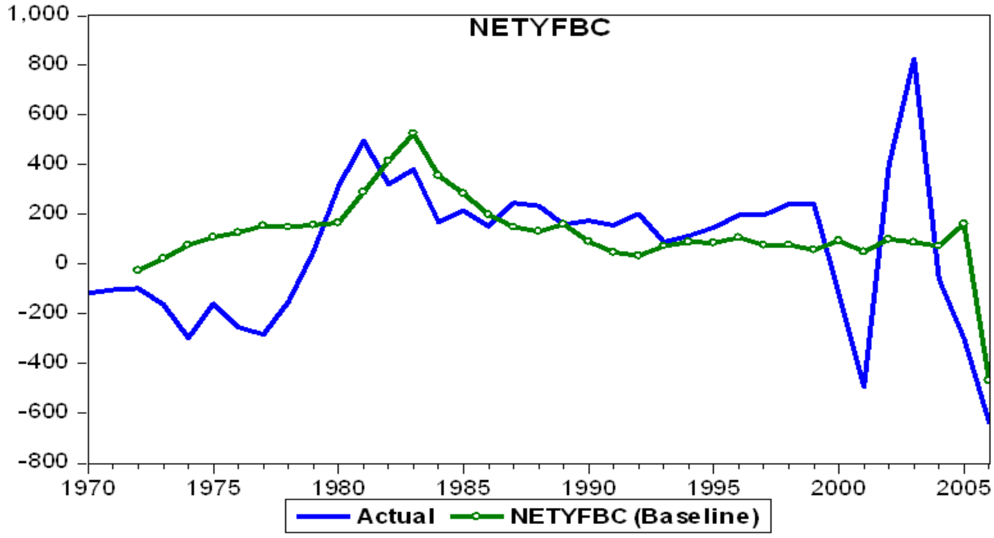
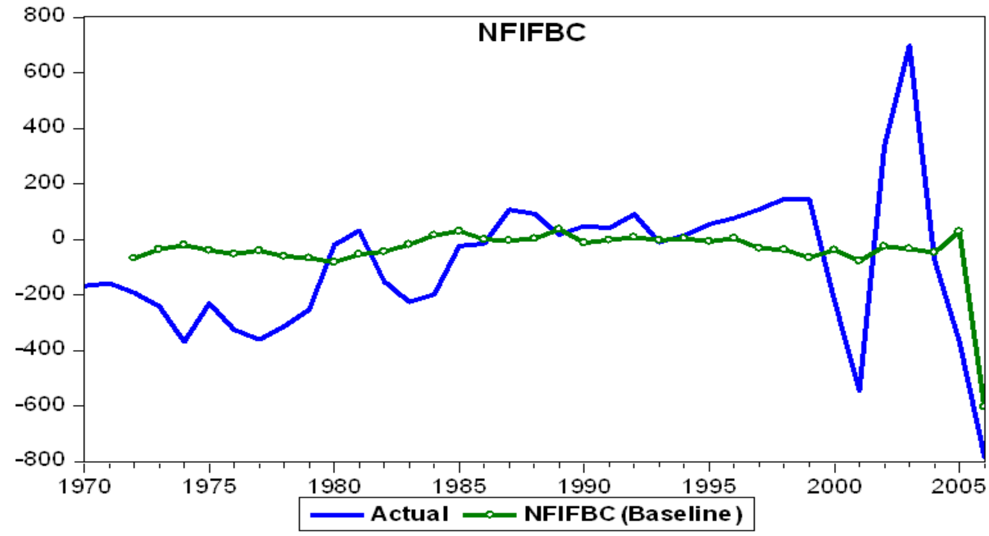
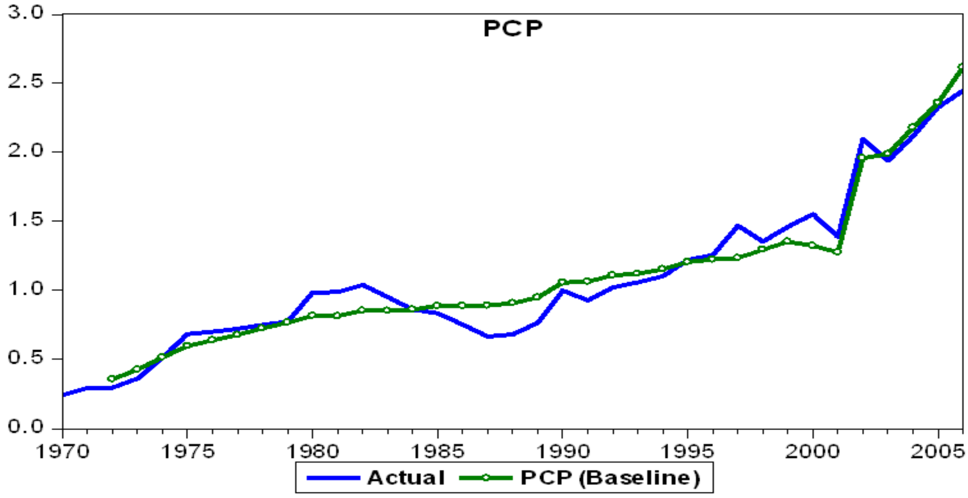
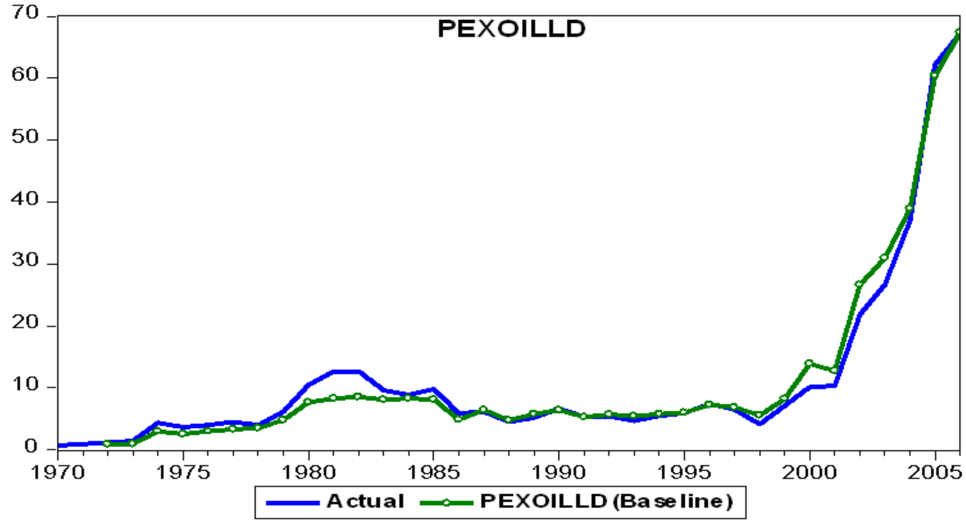
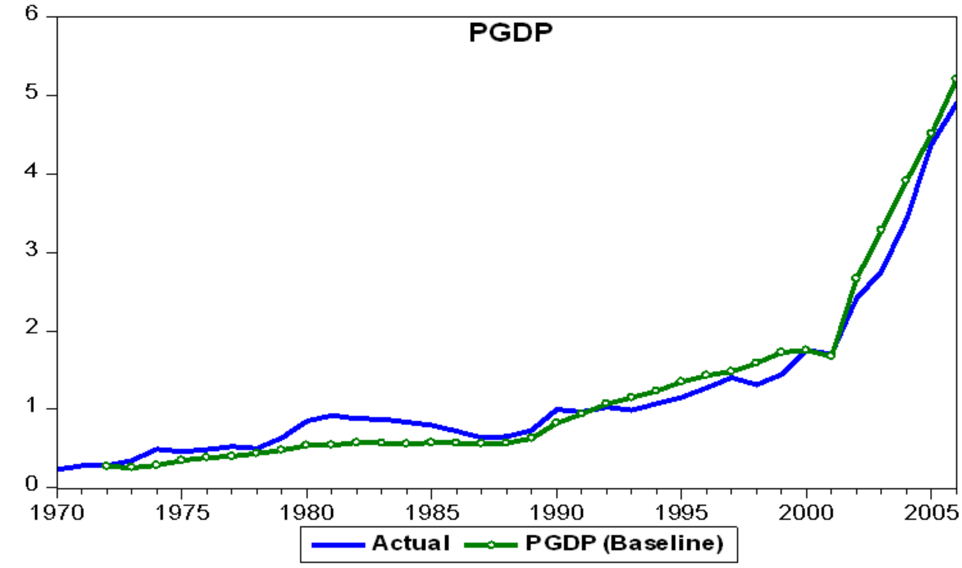
10,000
0
-10,000
-20,000
-30,000
-40,000
-50,000
-60,000
1970
1975
1980
1985
1990
1995
2000
2005
Actual
NDAC (Baseline)

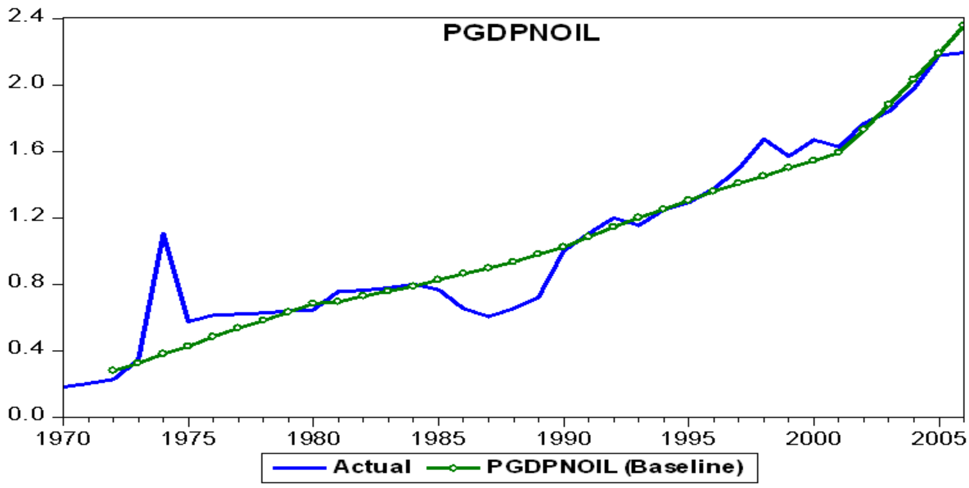

NETYFBC
1,000
800
600
400
200
0
-200
-400
-600
-800
1970
1975
1980
1985
1990
1995
2000
2005
Actual
NETYFBC (Baseline)


NFIFBC
800
600
400
200
0
-200
-400
-600
-800
1970
1975
1980
1985
1990
1995
2000
2005
Actual
NFIFBC (Baseline)


PCP
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
PCP (Baseline)


PEXOILLD
70
60
50
40
30
20
10
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
PEXOILLD (Baseline)


PGDP
6
5
4
3
2
1
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
PGDP (Baseline)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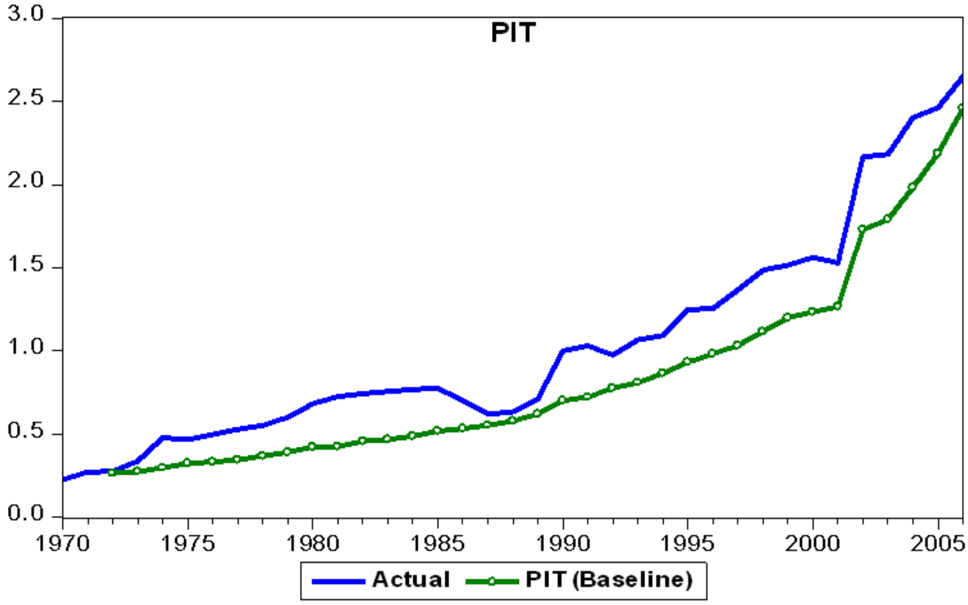
1.2
0.8
0.4
0.0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
PGDPNOIL (Baseline)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1.0
0.5
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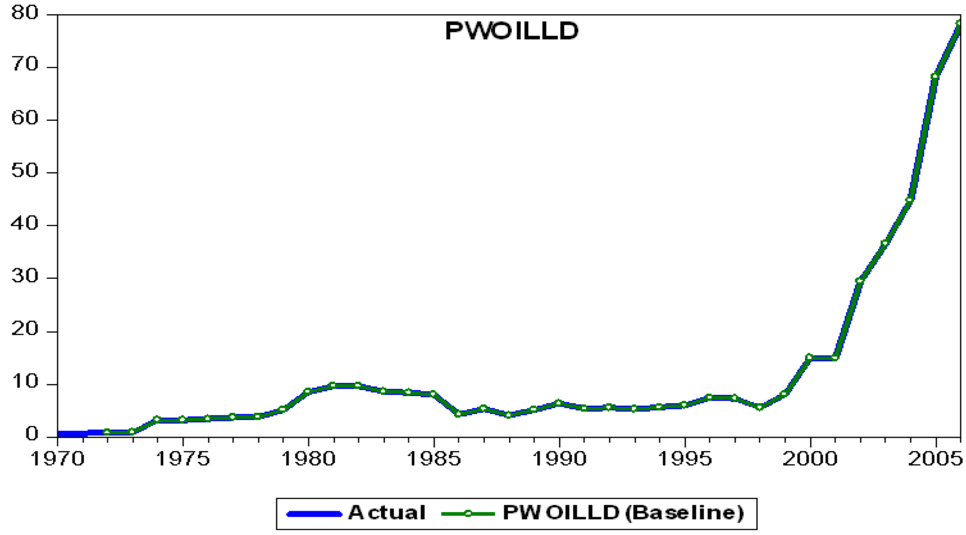
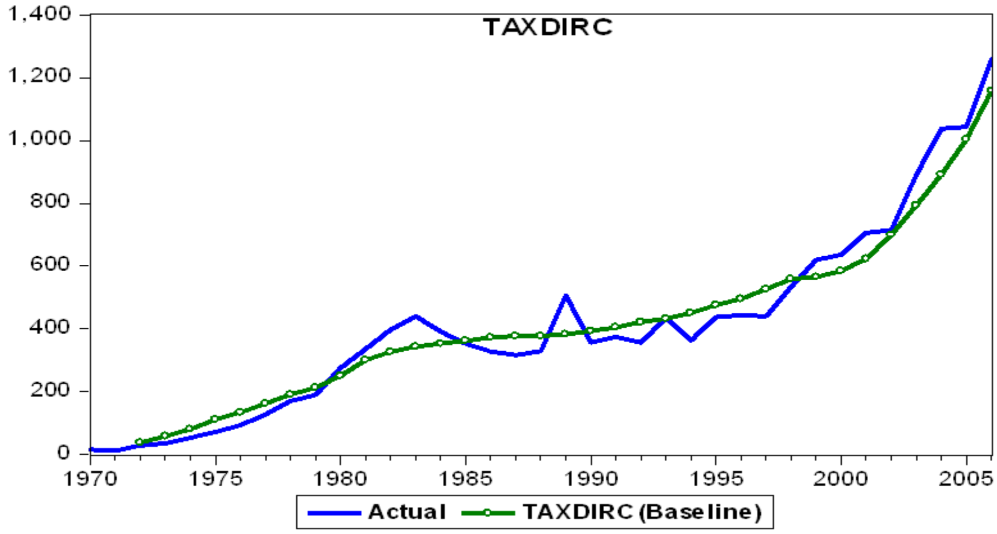
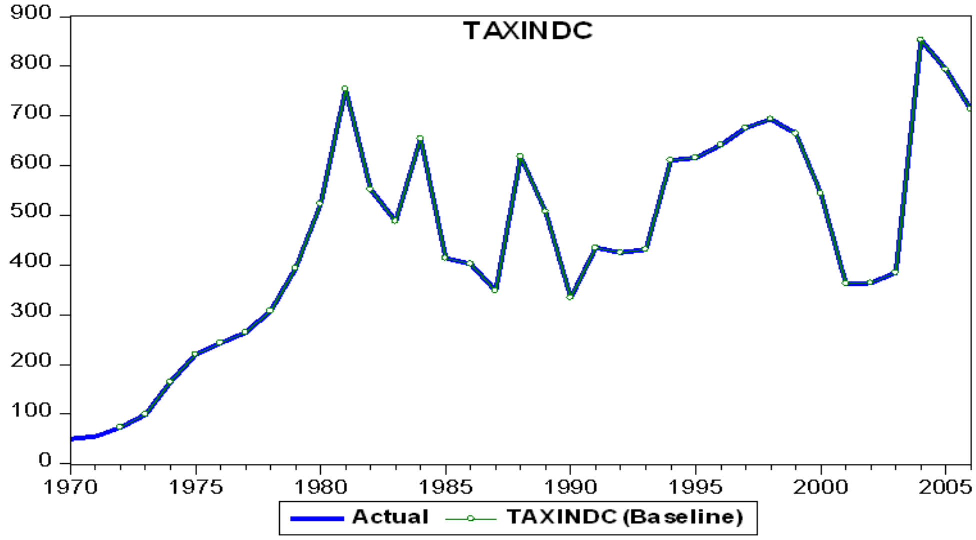
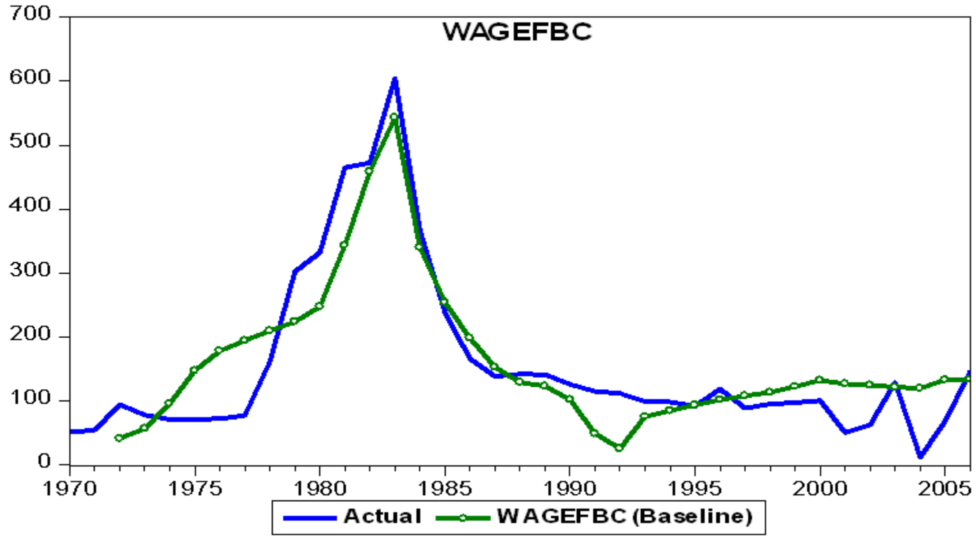
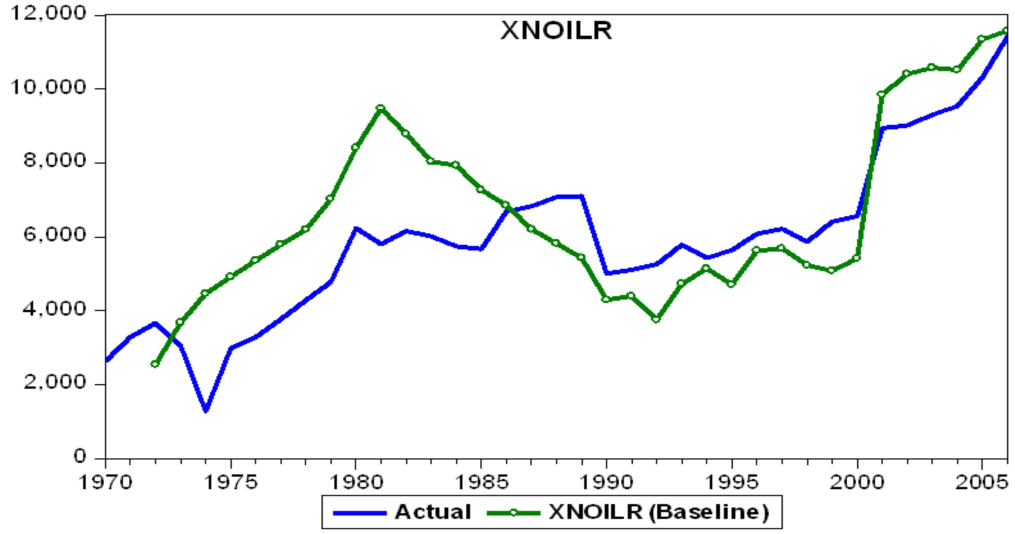
1970
1975
1980
1985
1990
1995
2000
2005
Actual
PIT (Baseline)


PWOILLD
80
70
60
50
40
30
20
10
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
PWOILLD (Baseline)

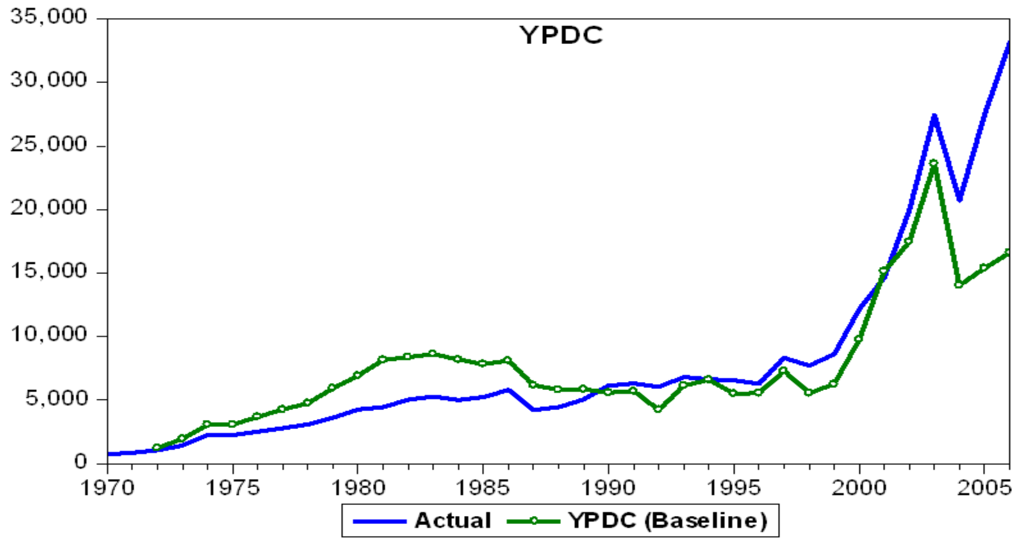

TAXDIRC
1,400
1,200
1,000
800
600
400
200
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
TAXDIRC (Baseline)


TAXINDC
900
800
700
600
500
400
300
200
100
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
TAXINDC (Baseline)

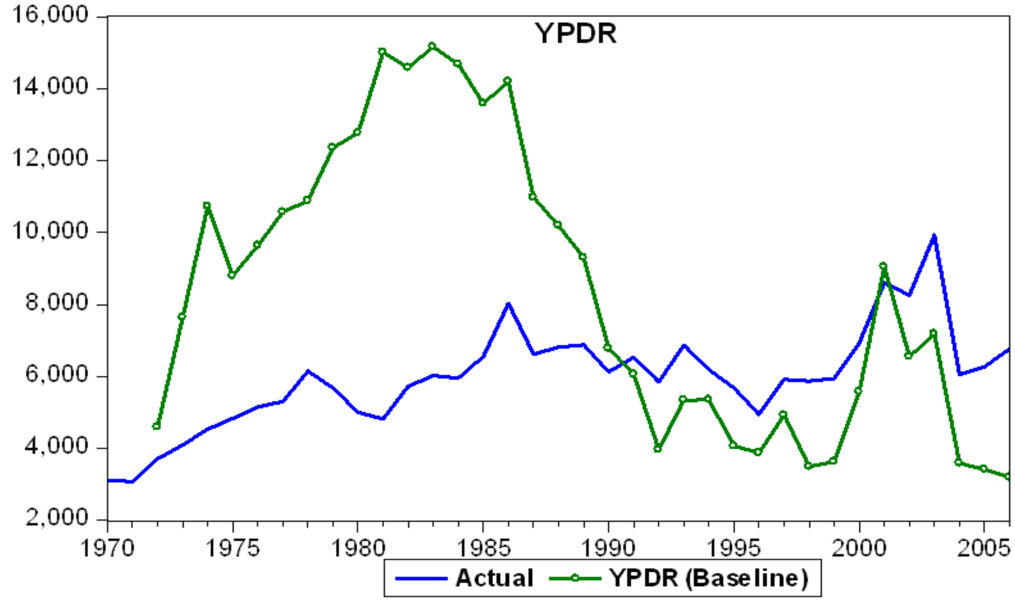

WAGEFBC
700
600
500
400
300
200
100
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
WAGEFBC (Baseline)



XNOILR
12,000
10,000
8,000
6,000
4,000
2,000
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
XNOILR (Baseline)



YPDC
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1970
1975
1980
1985
1990
1995
2000
2005
Actual
YPDC (Baseline)



YPDR
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
1970
1975
1980
1985
1990
1995
2000
2005
Actual
YPDR (Baseline)

As mentioned above, the actual series and the dynamic solution values are plotted together as a complete consolidated system. On the one hand, Figure 6.1 above shows that the model performance is, generally, quite satisfactory whereby the model tracking behaviour is clarified as a good fit and this is realized for most of the equations which performed much better than would be expected for a model of a developing country such as Libya. On the other hand, some of other equations performance was not as good and this is especially true for *IRC*, *KNOILR*, *MS*, and *YPDR*. However, the forecasting ability for these equations was satisfactory as will be seen in the next section.

These undesirable outcomes are due to (as has been mentioned previously) the erratic instability of the oil revenues that influences the important macroeconomic variables in the Libyan economy, which, in turn, directly effect, in this case, the money supply and foreign assets. As well, this instability indirectly affects real personal disposable income and non-oil real capital stock. From another prospective, these results can be attributed to the unfavourable circumstances experienced by the Libyan economy during the period when the United Nations imposed an international embargo on Libya that lasted about ten years. Additionally, the economy suffered from a wave of inflation, which has affected the value of the domestic currency and led, in the end, to devaluation the Libyan Dinar.

6.4 Validation of forecasting

Forecasting can be defined as the process that is concerned with clarifying the ambiguity of the future events through drawing out a realistic approximation depending on current circumstances. Therefore, forecasting is defined practically as obtaining the future values of a dependent variable through the available data for its explanatory variables behaviour (Theil, 1975, c.f. Holden, Peel and Thompson, 1990).

In this context, the model is solved in the previous section by utilizing the historical simulation that provides one with the control solution values for all the endogenous variables. This can be used at the same time to test the forecasting within the sample period and assess the reliability[39] of the model as a system. This can be implemented by a comparison between the actual (historical) and the simulated (control solution) values of the model whereby the difference between these variables represents the predicted errors which are used to test the validation of the forecasting. If the predicted errors fall into the acceptance area, then it should be said that the forecasting ability of the model is good.

There are several statistical formulas that have been utilized to introduce quantitative measures for the inequalities between the actual (historical) and the simulated (control solution) values of the model by testing how well the simulated (forecasted) variables track their corresponding actual series. However, the most commonly used statistics are mean absolute percentage error (MAPE), root mean square percentage error (RMSPE) and Theil inequality coefficient (U) which have been employed in this study.

The following three formulas below represent these statistics:

$$MAPE = \frac{1}{T}\sum_{t=1}^{T}\left|\frac{Y_t^s - Y_t^a}{Y_t^a}\right|$$

$$RMSPE = \sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(\frac{Y_t^s - Y_t^a}{Y_t^a}\right)^2}$$

[39] The accuracy of forecasts is determined by several factors. However, the most important ingredients of model forecasts accuracy are the specification of the model and the goodness of fit of the estimated parameters of the model equations.

$$U = \frac{\sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(\mathrm{Y}_{\mathrm{t}}^{\mathrm{s}} - \mathrm{Y}_{\mathrm{t}}^{\mathrm{a}}\right)^2}}{\sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(\mathrm{Y}_{\mathrm{t}}^{\mathrm{s}}\right)^2} + \sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(\mathrm{Y}_{\mathrm{t}}^{\mathrm{a}}\right)^2}}$$

Where $\mathrm{Y}_{\mathrm{t}}^{\mathrm{s}}$ is the simulated (forecasted) value at period *t*, $\mathrm{Y}_{\mathrm{t}}^{\mathrm{a}}$ the actual (historical) value in period t and T is the sample size.

If the forecasting (simulation) were to be accurate, these statistics should be close to zero. However, the models of the developing countries have suffered from several problems pertaining to the nature of economic behaviour as well as to the equality of the data in these countries. Therefore, Klein stated[40] that,

in models of less developed countries a variable is considered to have done well in simulation if the root mean squared percentage error RMSPE is 15 *or less with the exception of the foreign trade sector where an RMSPE of* 25 *or less is acceptable* (Moustafa, 1978; 65).

This indicates that the most important criterion of these statistics is the root mean squared percentage error (RMSPE), followed, in importance, by the Theil inequality coefficient and the mean absolute percentage error (MAPE).

These three measures of forecast accuracy were used to evaluate the performance of the model within the sample period, as is shown in Table 6.3 below. All 38 endogenous variables have a Theil's (U) close to zero (less than 0.5), with the exception of four variables which exceeded this range which are the supply of money *MS*, inflation rate in non-oil gross domestic products *INFLGDPNOIL*, net income from abroad *NETYFBC*, and net financial income from abroad *NFIFBC* which obtained 0.66, 0.75, 0.51, and 0.60 respectively.

[40] Moustafa mentioned that he had discussed this issue with Klein and the staff of the World Project of the Wharton Econometric Forecasting Associates when he constructed the model for his PhD under Klein's supervision in 1978 (Moustafa, 1978).

Table 6.1 Dynamic simulation accuracy of stochastic variables: 1970-2006

Eq.No	Nomenclature	Description of the variable	MAPE	RMSPE	U
1	*CPR*	Private consumption expenditures on goods and services real	21.49103	0.431987	0.129695
2	*CGC*	Government consumption expenditure on goods and services,	9.907296	0.283319	0.047054
3	*IPNOILR*	Non-oil real private investment expenditure	33.60365	1.777257	0.169330
4	*KNOILR*	Non-oil real capital stock	19.42182	0.466264	0.121425
5	*IMCONR*	Real imports of consumer goods	23.29336	0.461976	0.162254
6	*IMCAPR*	Real imports of capital goods	12.07916	0.275369	0.081420
7	*EXOILMB*	Oil exports, In millions of barrels	6.712762	0.245868	0.035705
8	*EXOILOC*	Oil exports in millions of dinars	23.07558	0.336605	0.061156
9	*NFIFBC*	Net financial income from abroad	889.1521	1.209182	0.603970
10	*WAGEFBC*	Net compensation of employees from abroad	41.83965	1.576616	0.140189
11	*EXTOTC*	Total Exports	20.01338	0.306394	0.043379
12	*IMTOTC*	Total imports	3.901317	0.239627	0.020285
13	*NETYFBC*	Net income from abroad	221.9142	1.044833	0.511908
14	*BOTGSC*	Balance of trade, current (goods and services)	306.8240	4.698007	0.096368
15	*BOPC*	Balance of payments, current	3232.812	6.126584	0.111383
16	*IRC*	The balance of foreign assets (reserves)	160.7150	14.27329	0.336732
17	*XNOILR*	Non-oil gross domestic product, Real	22.72151	0.554725	0.118788
18	*GDPR*	gross domestic product, Real	12.97571	0.184063	0.074054
19	*PGDP*	*GDP* implicit price deflator	23.23191	0.311835	0.064896
20	*INFGDP*	Inflation rate of *GDP*	268.3936	1.683939	0.389985
21	*PGDPNOIL*	Non-oil *GDP* implicit price deflator	14.68998	0.300149	0.069292
22	*INFlGDPNOIL*	Inflation rate in non-oil *GDP*	201.2788	3.076010	0.752165
23	*PWOILLD*	the average price of a barrel of oil in the global market, in Libyan Dinars	4.27E-06	0.232495	2.06E-08
24	*PEXOILLD*	Actual average price of a barrel of oil exports, in Libyan Dinars	19.00532	0.302711	0.051201
25	*PCP*	Consumer implicit price deflators	10.02162	0.266656	0.048950
26	*PIT*	Private investment implicit price deflators	35.05955	0.347670	0.114950
27	*GDPCfc*	*GDP* at factor price	14.60002	0.288761	0.048950
28	*TAXDIRC*	Income tax (total of direct taxes)	15.08929	0.320060	0.059996
29	*TAXINDC*	Non-direct Tax, current	1.35E-17	0.232495	1.27E-15
30	*GTYC*	Total government income	1.313516	0.233042	0.002499
31	*YPDC*	Personal disposable income	30.02393	0.455771	0.200309
32	*YPDR*	Personal disposable income, real	44.38752	0.851987	0.303628
33	*GTEC*	Total government spending	8.193181	0.259736	0.046967
34	*BUDGET*	Deficit or surplus in the government budget	49.48682	3.276790	0.044757
35	*NDAC*	Net domestic assets	2.183318	0.600701	0.021177
36	*GDPRG*	*GDP* growth rates	129.3939	4.392363	0.443853
37	*GDPmp*	*GDP* at market price, current	14.59836	0.286476	0.105105
38	*MS*	Money Supply	677.7083	2.156871	0.667111

(MAPE) refers to mean absolute percentage error; (RMSPE) refers to root mean square percentage error and (U) refers to Theil inequality coefficient

The reason behind each of these unfavourable results is due to the relationship of these variables (either directly or indirectly) with the foreign sector, which, as stated previously, is the source of instability in the Libyan economy.

The supply of money MS, the inflation rate in non-oil gross domestic products $INFLGDPNOIL$ and the net income from abroad $NETYFBC$ are directly related to the foreign sector.

While the inflation rate in non-oil gross domestic products $INFLGDPNOIL$ is indirectly related to the foreign sector and is derived from the GDP implicit price deflator $PGDP$ which, in turn, is a function of Libyan dinar exchange rate against the US dollar $EXCHRATE$, the total imports' price index PIM and the change in the money supply DMS. It is worthwhile noting that these values do not exceed 0.75 and they are still much lower than the values that were mentioned by Klein.

6.5 The policy simulation scenarios and impact analysis

The multipliers analysis can be defined as quantifying the various effects that occur to endogenous variables, especially to the important variables in the model because of assuming a certain value for the policy variables (scenario) of the model in order to assess its consequences. Additionally, the multipliers can be used as a criterion which reflect the degree of the model stability, whereby ''*if the model is stable, it is expected that the dynamic multipliers are diminishing and converge to zero, therefore, these multipliers are considered another check on the stability of the model*'' (Baryun; 1980, 239).

This measure can be reached by applying the policy simulations' method ''*which determines values of the endogenous variables for alternative assumed sets of values of policy variables that correspond to the alternative policies that* *are under consideration*'' (Intriligator, Bodkin and Hsiao, 1996; 556). Where the model in this simulation is solved under different hypotheses in order to clarify the likely consequences and reactions of the different inputs, each of these runs is called a policy experiment.

Multiplier analysis can be easily applied in the linear model. However, this measure is thought to be quite complicated in the case of nonlinear models that is realized in most economic relationships, and then econometric models.

Under these circumstances, multipliers can be derived ''*as the difference between the shocked run and the base run simulated solutions for an endogenous variable divided by the base run outcome*'' (Matlanyane, 2005; 226).

This part of the study is dedicated to presenting and analysing the multiplier properties of the model. This is undertaken in three stages starting with a fiscal policy scenario, a monetary policy scenario, and a combined fiscal and monetary policy scenario in order to clarify how mutual interaction occurs between these two policies in their quest to achieve the economic goals.

To perform this step, the period 1985-2000 has been selected to analyze the different economic policies. This period was critical in the Libyan economy because the domestic public debt and the excess of the aggregate demand had grown in an abnormal way that led to occurrence of the Libyan economy being in the clutches of inflation. Where the average annual growth rate of inflation during this period amounted to 4 percent, also, the average annual growth rate of GDP deflator reached 5 percent at the same period. Furthermore, the average annual growth rate of the supply of money and the monetary base amounted to 7 and 8 percent respectively during this period.

The main consideration, which arises before embarking on the analysis of the different economic policies in this study, is that the model does not discuss a solution for an economic argument. The model does not seek to solve a specific economic problem (normative economics), insofar as it is trying to determine the different effects (positive economics) on the variables of the model when pursuing a particular economic policy and it is also trying to clarify how pertinent the facts are with the economic theory that explains these effects.

6.5.1 The fiscal policy scenario

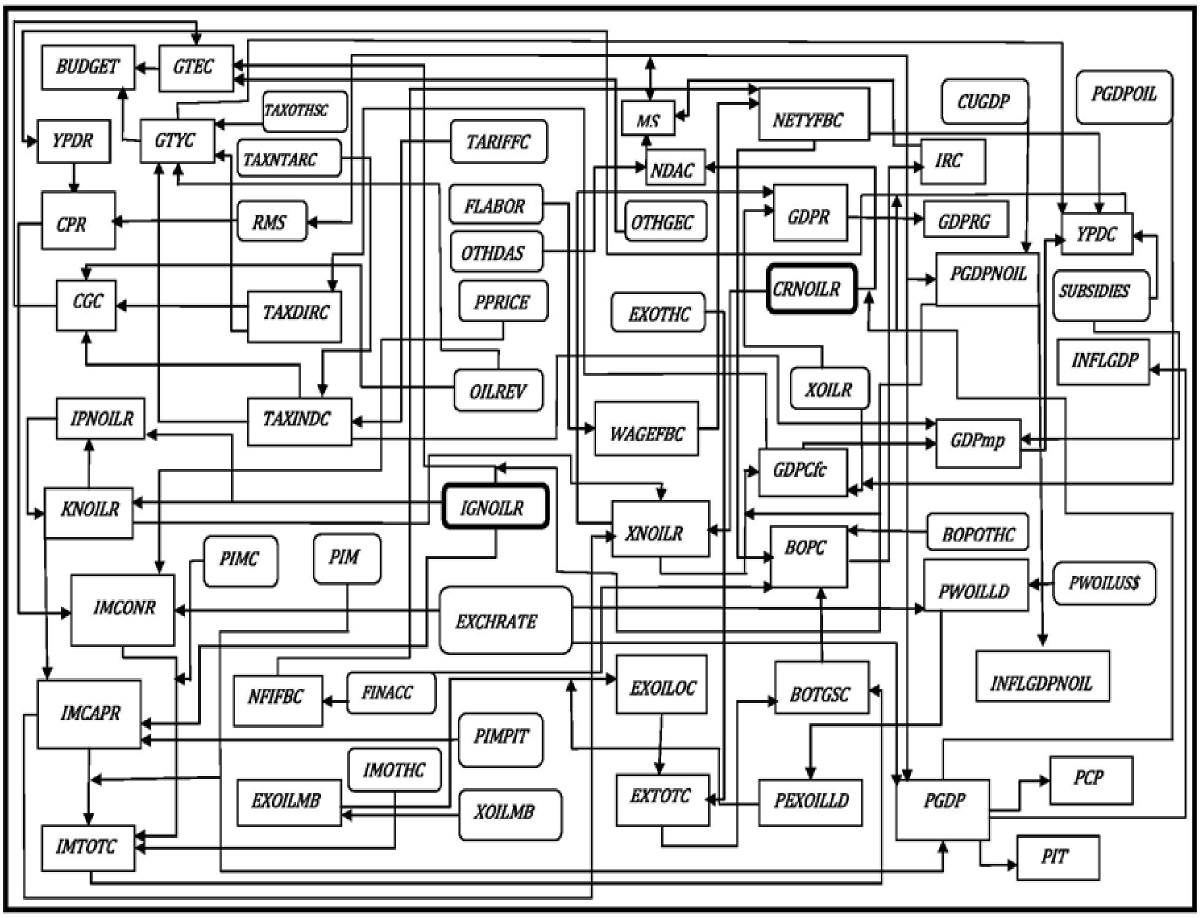
To carry out this experiment, real government investment in the non-oil sector *IGNOILR* was chosen as a policy variable in this scenario. This variable increased by L.D 433 million per year, beginning in 1985 up until to 2000 and this is amounted to about 20% of the value of real government investment in the non-oil sector in 1984.

There are several observations that must be mentioned concerning the transmission mechanism of the chosen fiscal policy variable, which will be presented through the flow chart of the model in Figure 6.2 below where the rectangle and rounded rectangle represent endogenous and exogenous variables respectively while the rounded rectangle that has a black frame represents a policy variable.

According to the flow chart that is presented in Figure 6.2, the real non-oil government investment *IGNOILR* will affect the model through four channels, which can be illustrated as follows:

- An increase in real non-oil government investment *IGNOILR* will lead, firstly, to a possible increase in total government spending *GETOT* which could eventually lead to a deficit in the government budget *BUDGET*, which will be detected at the end of this experiment.

Figure 6.2 the Model flow chart



- The real non-oil government investment *IGNOILR* leads, secondly, to an increase in non-oil real capital stock *KNOILR.* This variable, in turn, will lead through its annual rate of change *DKNOILR* to:
    1. An expected increase in the non-oil real private investment expenditure *IPNOILR* whereas in a developing country, such as Libya, government investment should pave the way for non-oil real private investment expenditure *IPNOILR* , not lead to the crowding out of this investment spending, as will be found out at the end of this experiment.
    2. An expected increase in real imports of capital goods, this channel of transmission will be clarified in some detail below.
    3. (In addition to these two above impacts of the annual rate of change

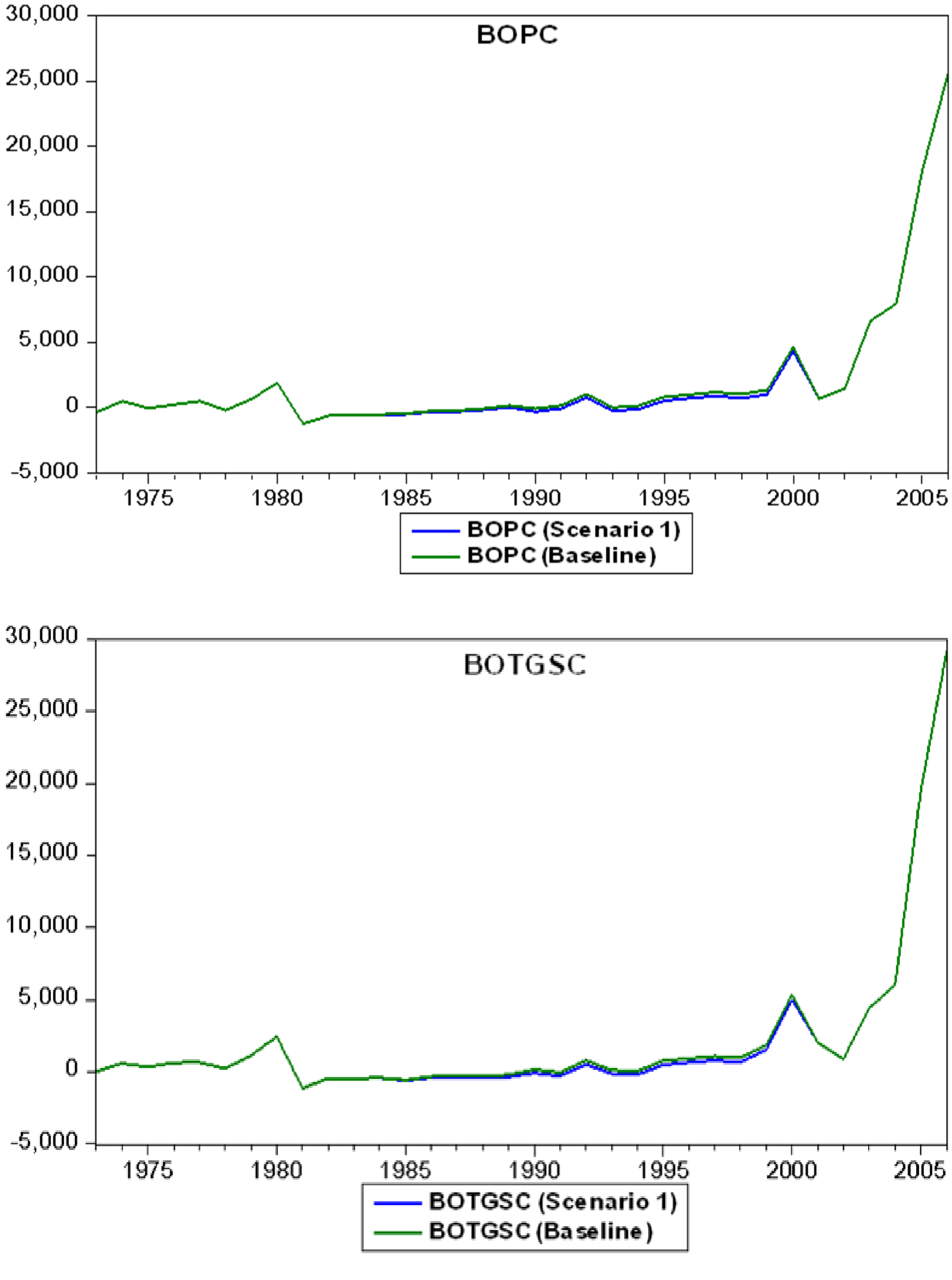
of the non-oil real capital stock *DKNOILR)*, a direct and significant impact of the non-oil real capital stock *KNOILR* in increasing the non-oil gross domestic products *XNOILR* where the latter, in turn, leads to:

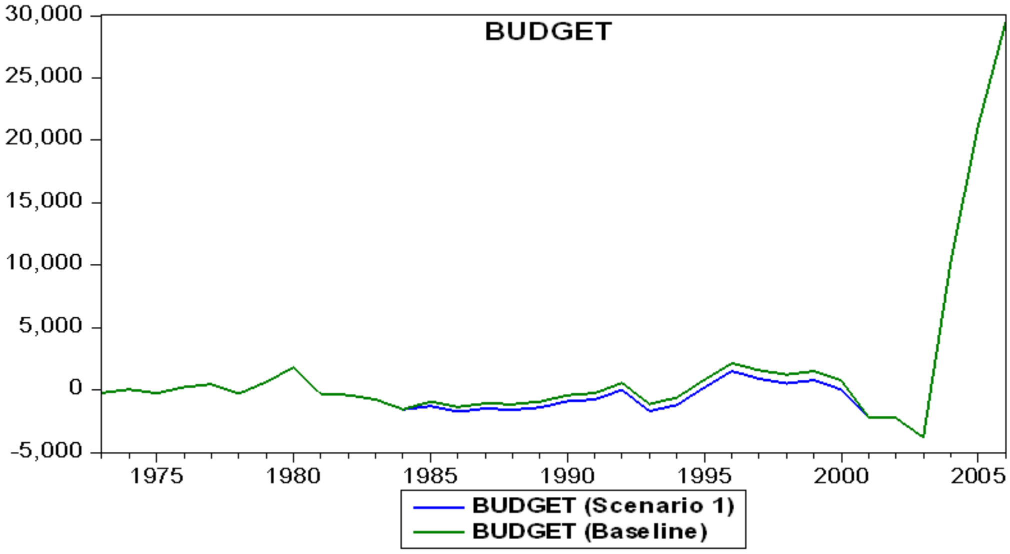
i. An increase in real gross domestic product *GDPR* and an expected increase in its annual growth rate,
ii. An expected increase in the gross domestic product at the factor cost *GDPCfc* where the latter, in turn, leads:
    a. Firstly, to an expected increase in total direct taxes which, in turn, leads to an increase in total government income, which may result in a budget surplus rather than a deficit as expected when there is increased public spending real non-oil investment previously. However, the outcome of these two potential effects will be determined at the end of this experiment.
    b. Secondly, to an increase of the gross domestic product at factor cost which then leads to an expected increase in gross domestic product at market prices *GDPmp.* This causes a rise in both nominal and real disposable personal income that leads to another series of influences through the increase of real private consumption expenditure on goods and services' consumption spending *CPR.* This leads to an increase in real imports of consumer goods *IMCONR* which, in turn, causes the total imports *IMTOTC* to rise which may cause

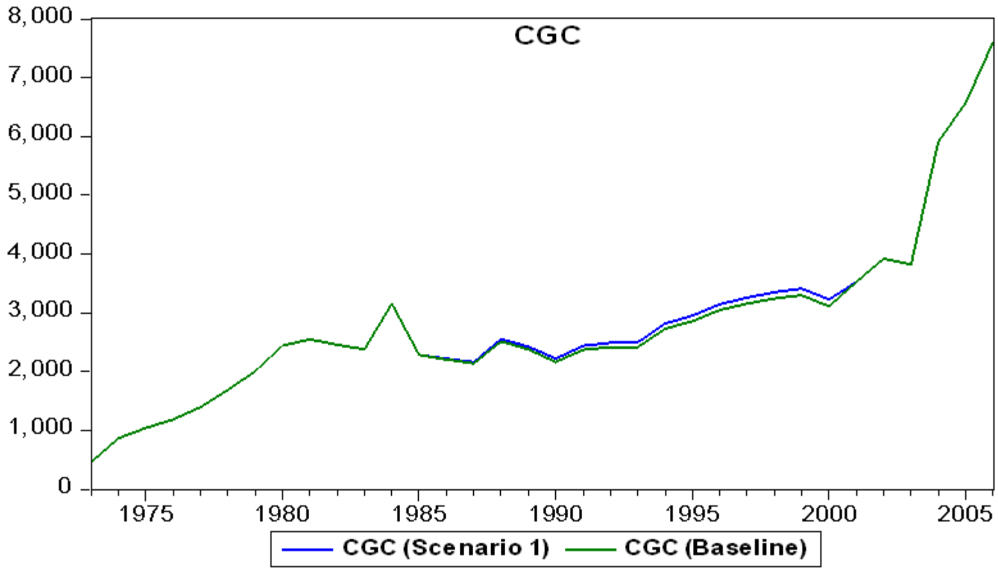
a deficit in the balance of trade *BOTGSC* and balance of payments *BOPC*. These interactions can cause a possible decline in the stock of foreign assets *IRC* and then cause a reduction in the nominal money supply *MS* through a monetary base and this extends to influence the real money supply *MSR*. Then this impacts on returns adversely whereby real private consumption *CPR* is reduced, and also real imports of consumer goods *IMCONR* are reduced, which may alleviate the deficit in the trade balance *BOTGSC* and the balance of payments *BOPC* as will be evident later.

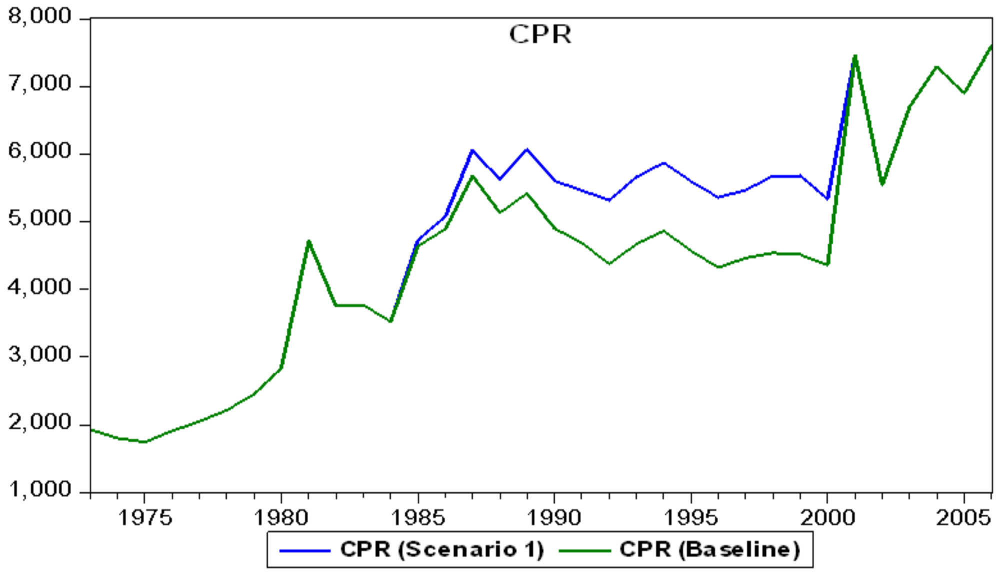
- The real non-oil government investment *IGNOILR* affects, as mentioned above, non-oil real private investment expenditure, indirectly, through the channel of the non-oil real capital stock. But the real non-oil government investment *IGNOILR* also affects, directly, private spending investment and this, in turn, affects again the non-oil real capital stock *KNOILR* and a chain reaction commences again along these variables, as also mentioned above.
- The fourth channel of influence of the fiscal policy variable in this study is a direct effect which leads to an increase in the real imports of capital goods *IMCAPR* which, in turn, has influences on creating an increase in both:
    1. Total *IMPTOT* and thus an expected deficit in the balance of trade *BOTGSC* and the balance of payments *BOPC* and thus begins a series of interactions, as mentioned above.
    2. The non-oil gross domestic products *(XNOILR)* as described above.

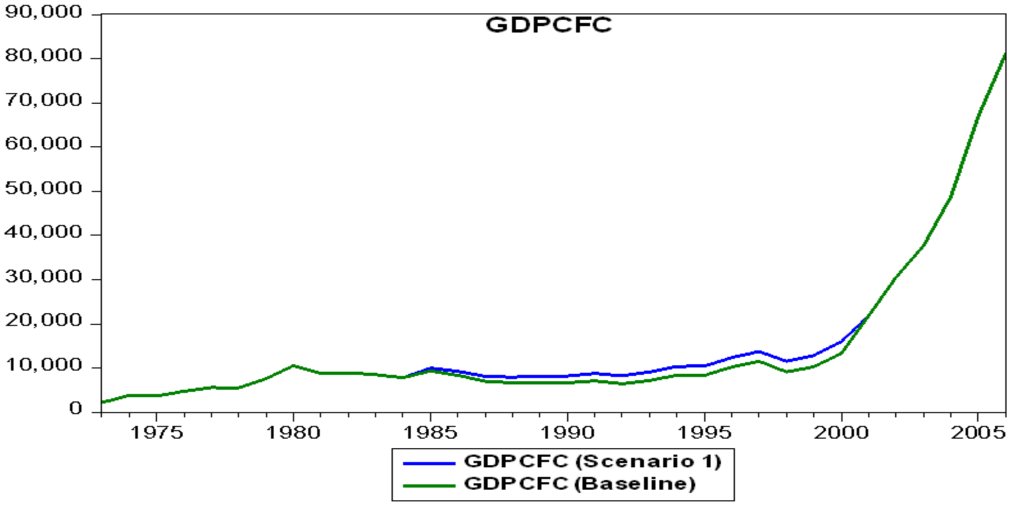
Figure 6.3 the Scenario of the fiscal policy

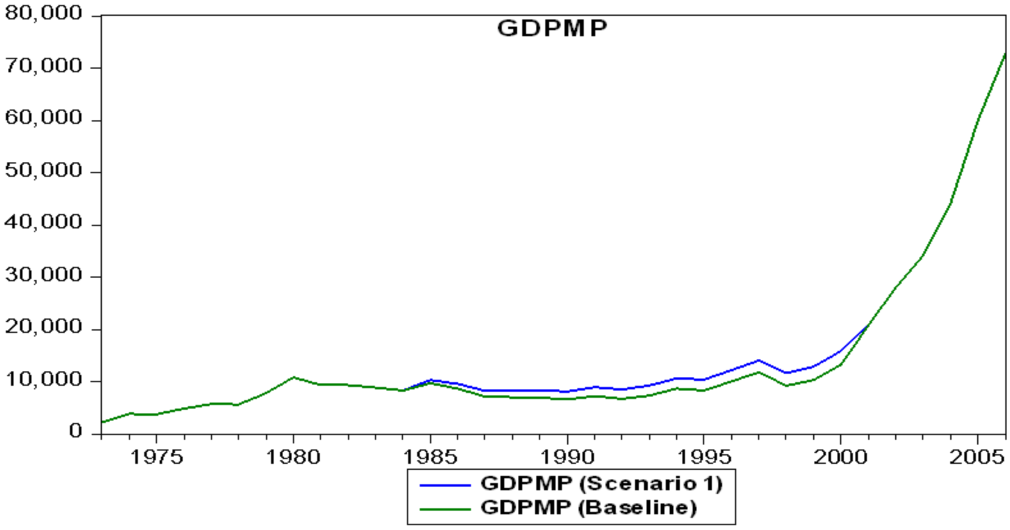


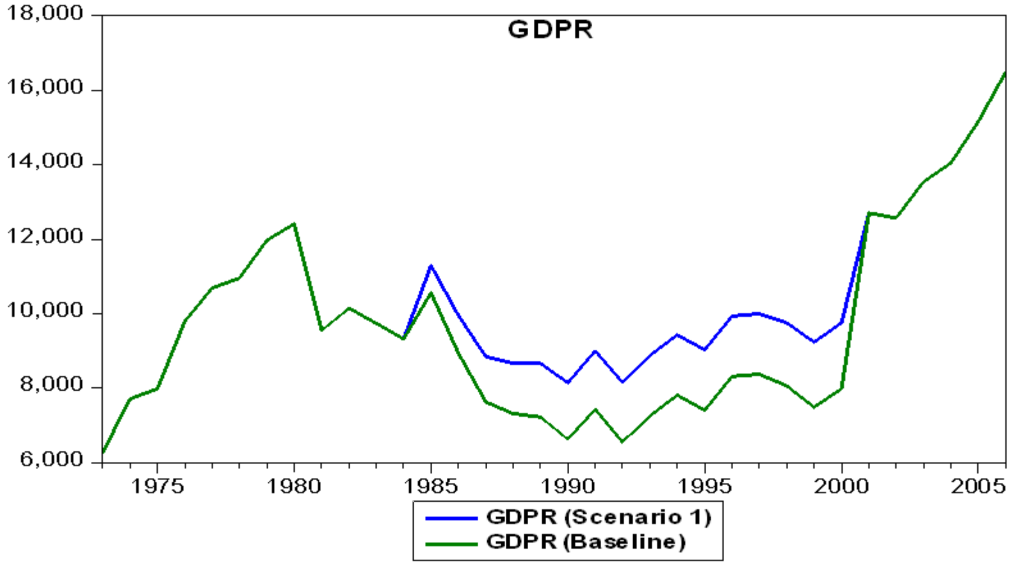

BUDGET
30,000
25,000
20,000
15,000
10,000
5,000
0
-5,000
1975
1980
1985
1990
1995
2000
2005
BUDGET (Scenario 1)
BUDGET (Baseline)

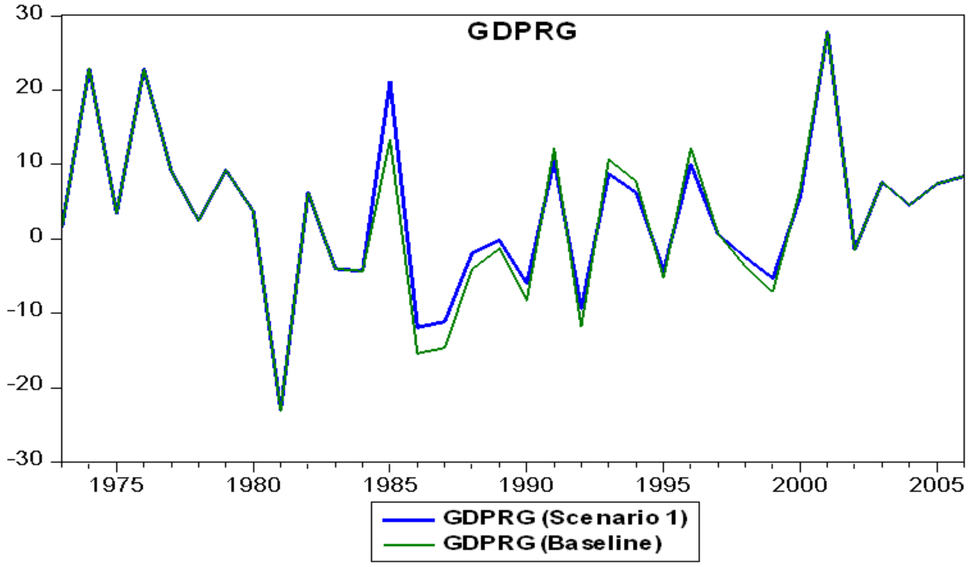

CGC
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1975
1980
1985
1990
1995
2000
2005
CGC (Scenario 1)
CGC (Baseline)

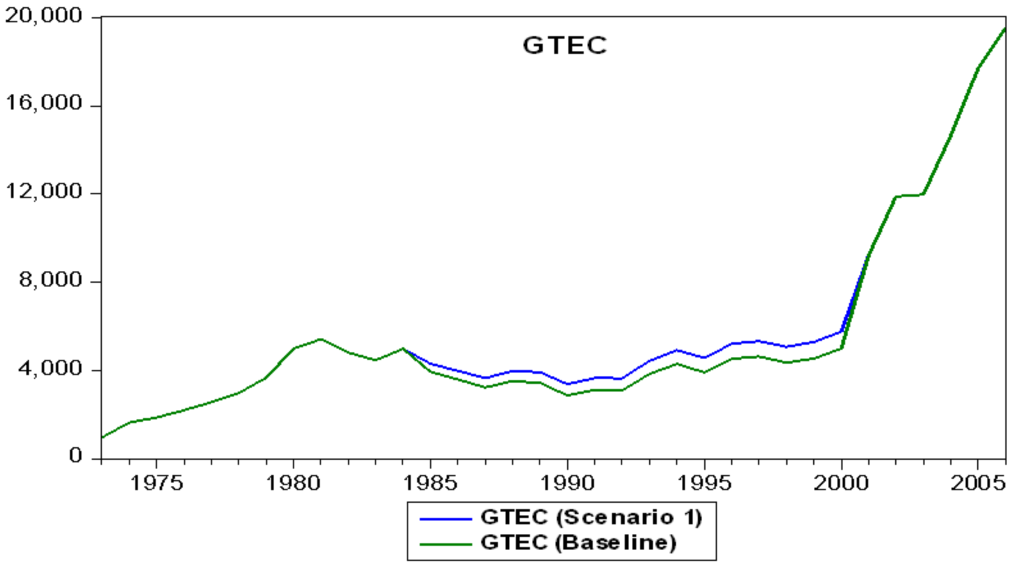

CPR
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1975
1980
1985
1990
1995
2000
2005
CPR (Scenario 1)
CPR (Baseline)

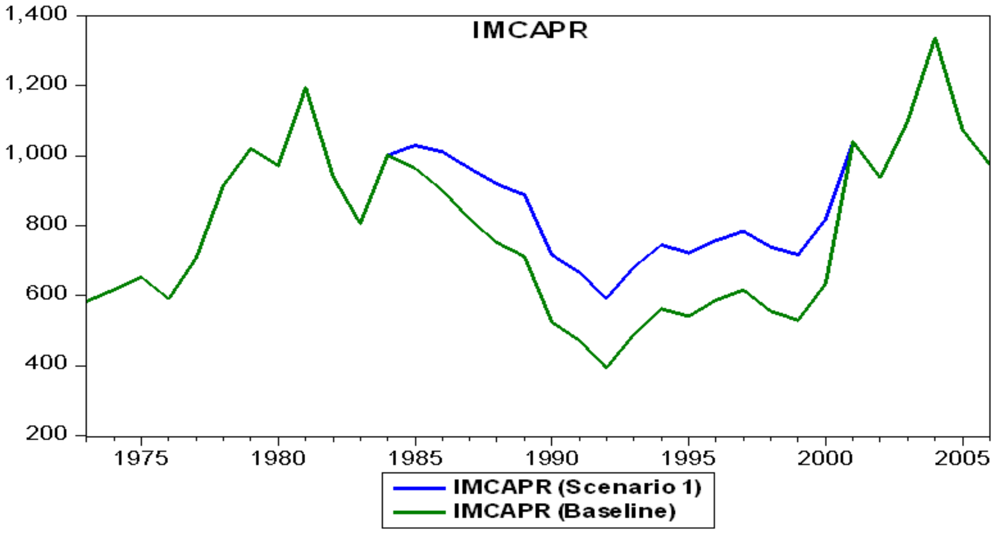

GDPCFC
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1975
1980
1985
1990
1995
2000
2005
GDPCFC (Scenario 1)
GDPCFC (Baseline)

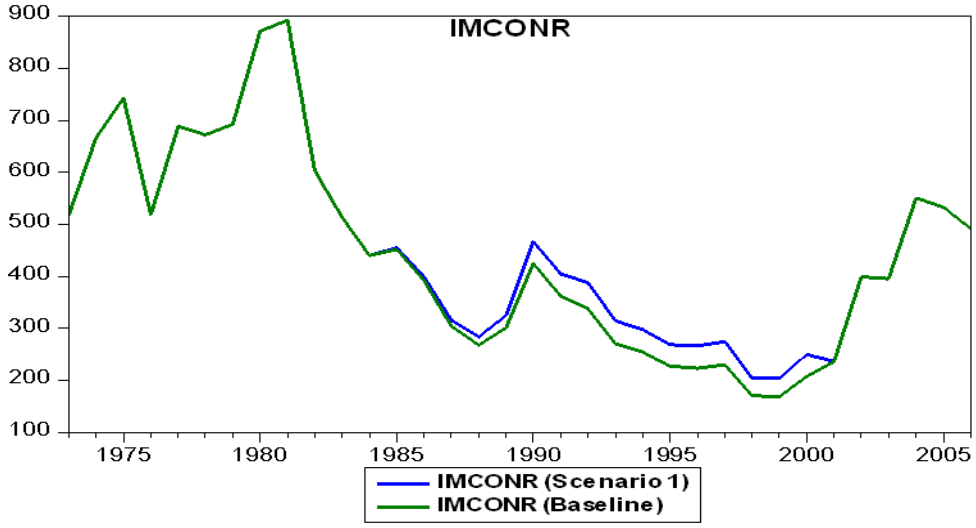

GDPMP
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1975
1980
1985
1990
1995
2000
2005
GDPMP (Scenario 1)
GDPMP (Baseline)

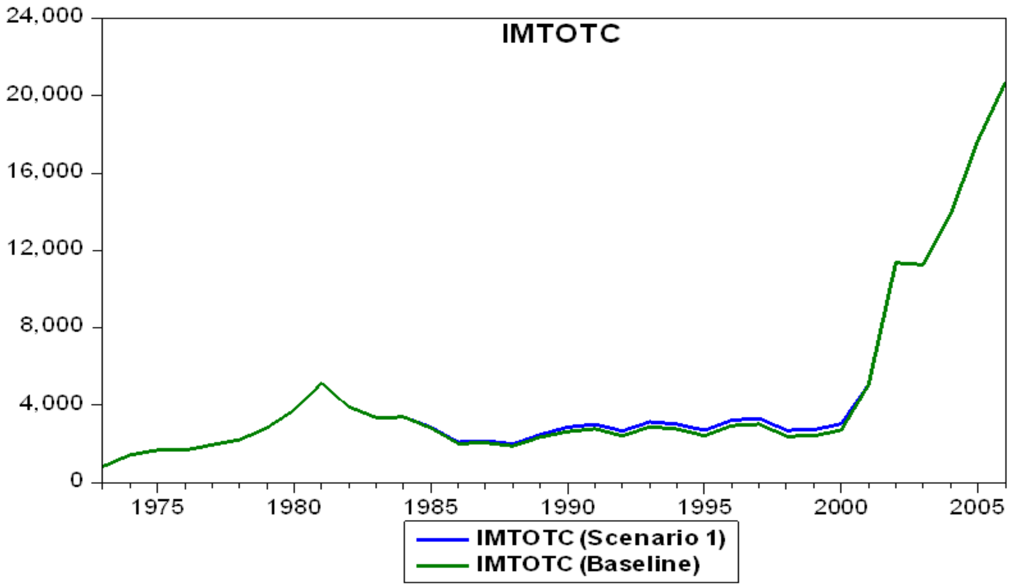

GDPR
18,000
16,000
14,000
12,000
10,000
8,000
6,000
1975
1980
1985
1990
1995
2000
2005
GDPR (Scenario 1)
GDPR (Baseline)

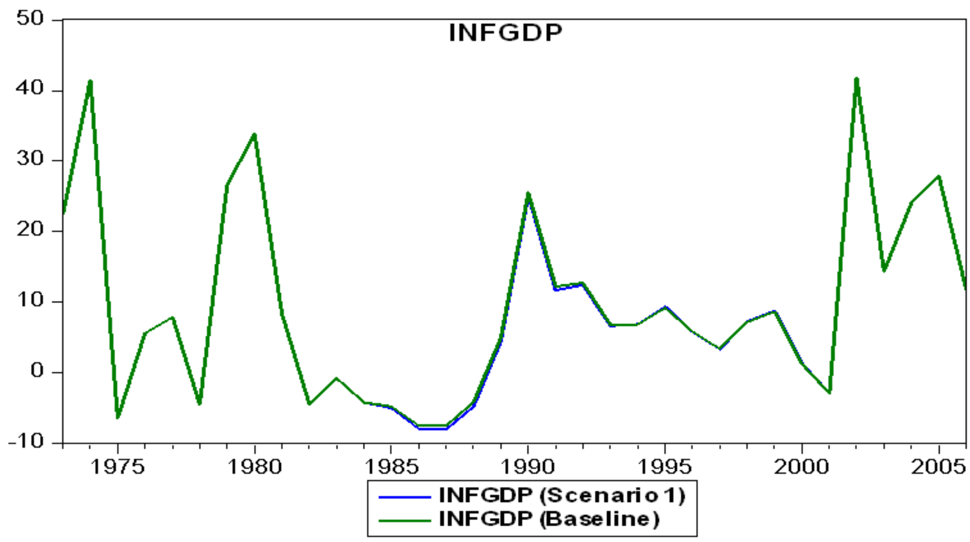

GDPRG
30
20
10
0
-10
-20
-30
1975
1980
1985
1990
1995
2000
2005
GDPRG (Scenario 1)
GDPRG (Baseline)

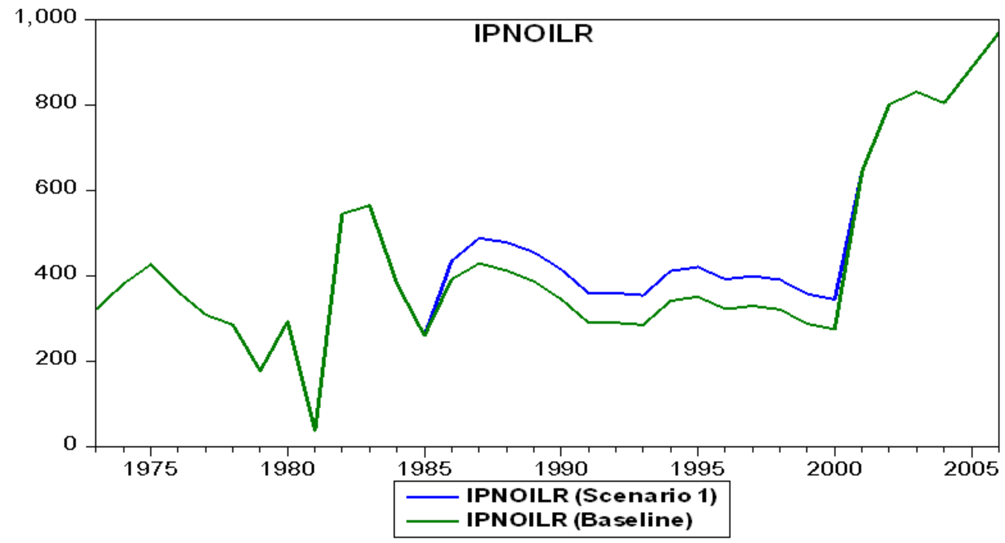

GTEC
20,000
16,000
12,000
8,000
4,000
0
1975
1980
1985
1990
1995
2000
2005
GTEC (Scenario 1)
GTEC (Baseline)


IMCAPR
1,400
1,200
1,000
800
600
400
200
1975
1980
1985
1990
1995
2000
2005
IMCAPR (Scenario 1)
IMCAPR (Baseline)

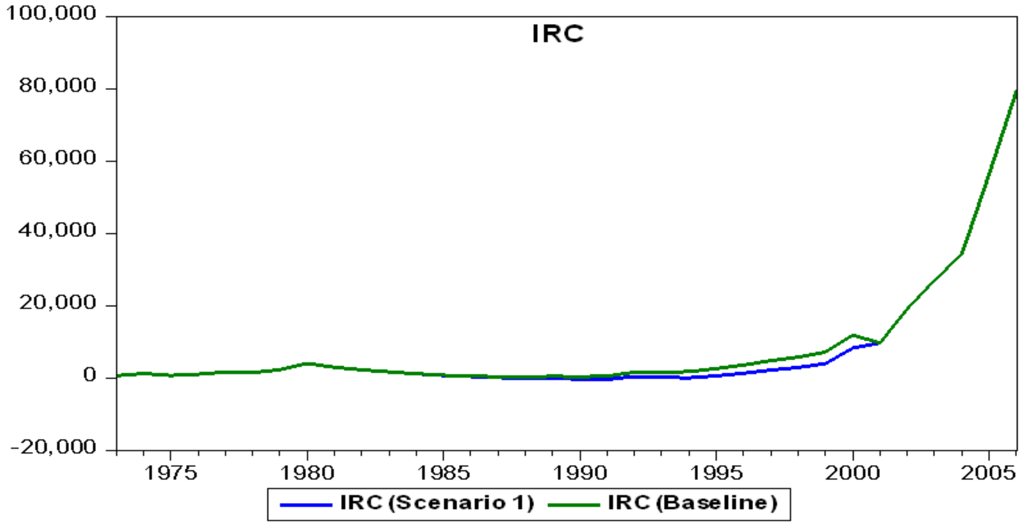

IMCONR
900
800
700
600
500
400
300
200
100
1975
1980
1985
1990
1995
2000
2005
IMCONR (Scenario 1)
IMCONR (Baseline)


IMTOTC
24,000
20,000
16,000
12,000
8,000
4,000
0
1975
1980
1985
1990
1995
2000
2005
IMTOTC (Scenario 1)
IMTOTC (Baseline)

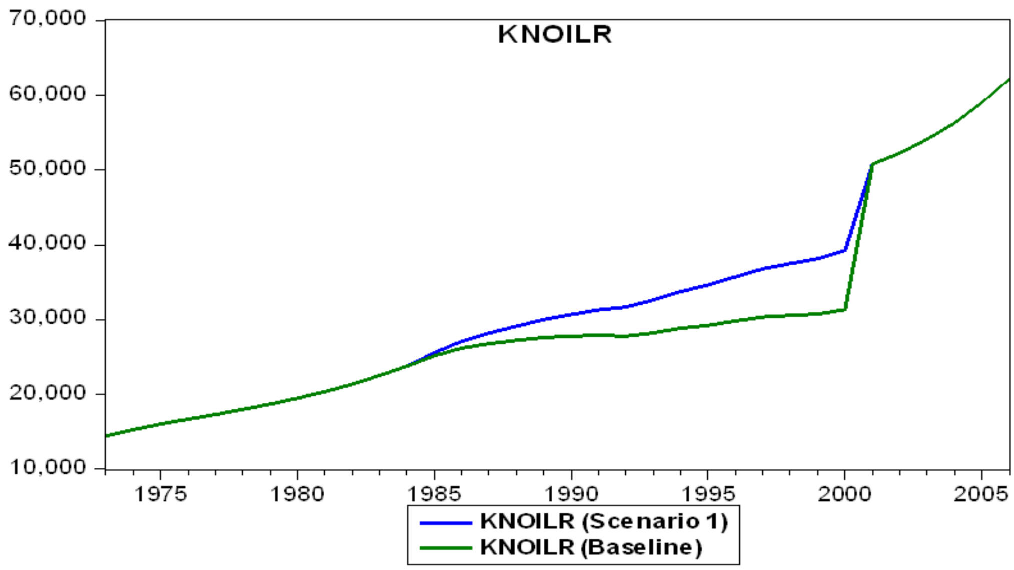

INFGDP
50
40
30
20
10
0
-10
1975
1980
1985
1990
1995
2000
2005
INFGDP (Scenario 1)
INFGDP (Baseline)



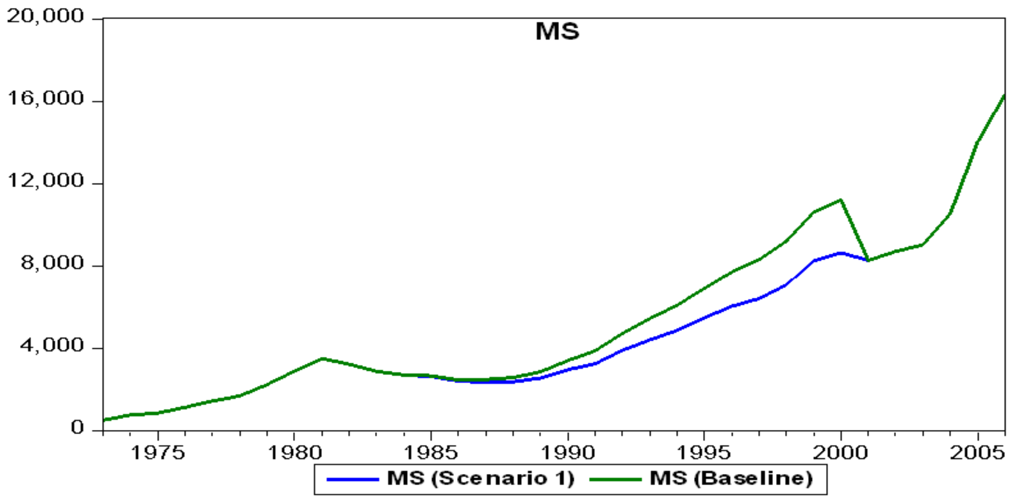
IPNOILR
1,000
800
600
400
200
0
1975
1980
1985
1990
1995
2000
2005
IPNOILR (Scenario 1)
IPNOILR (Baseline)

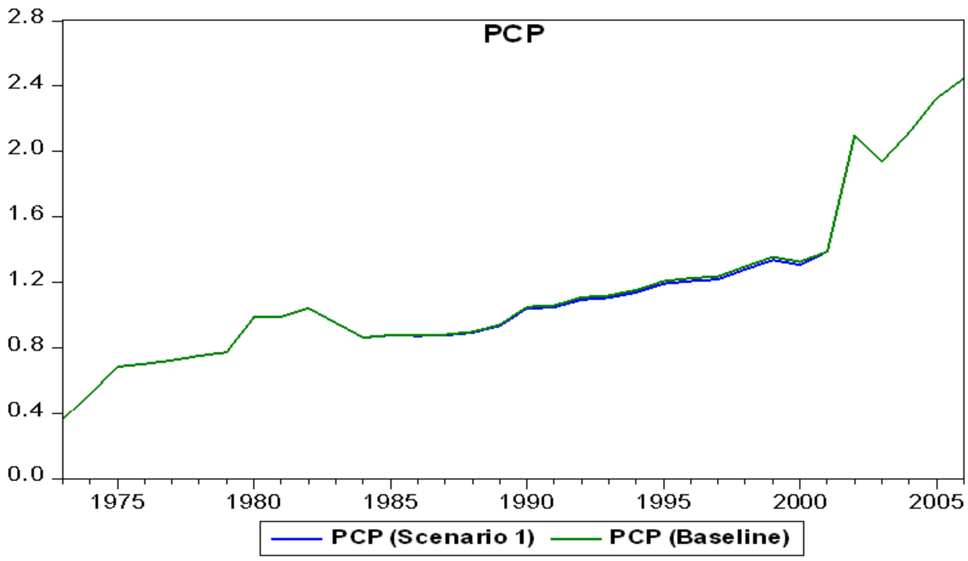


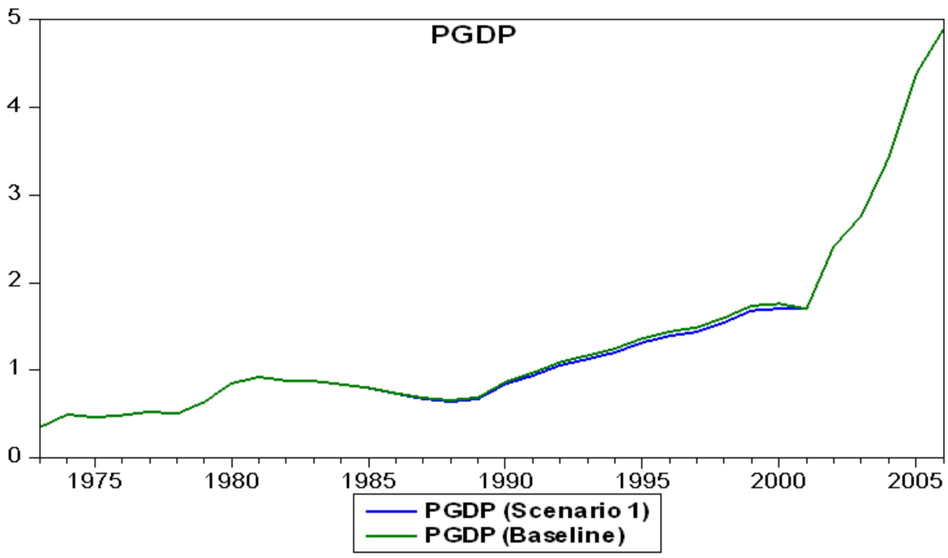
IRC
100,000
80,000
60,000
40,000
20,000
0
-20,000
1975
1980
1985
1990
1995
2000
2005
IRC (Scenario 1)
IRC (Baseline)

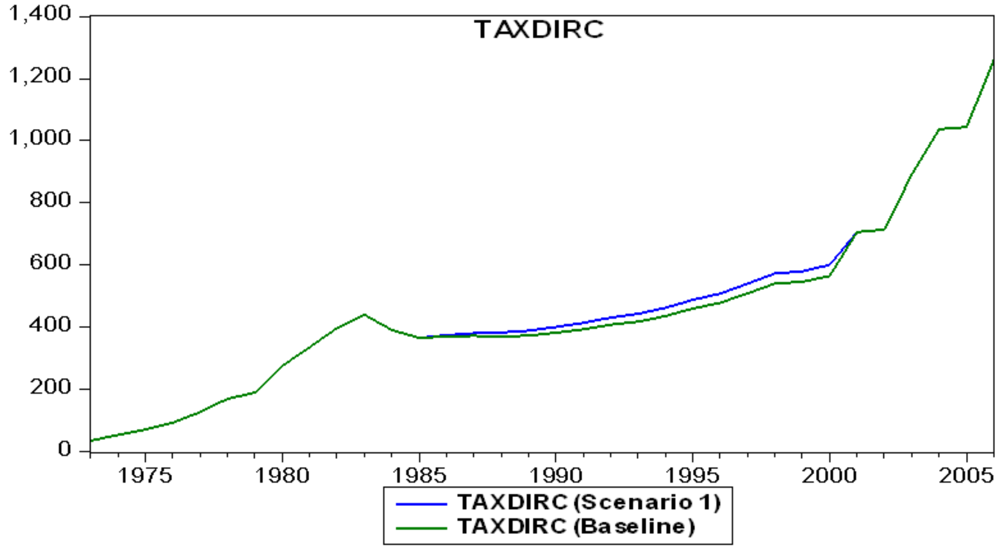


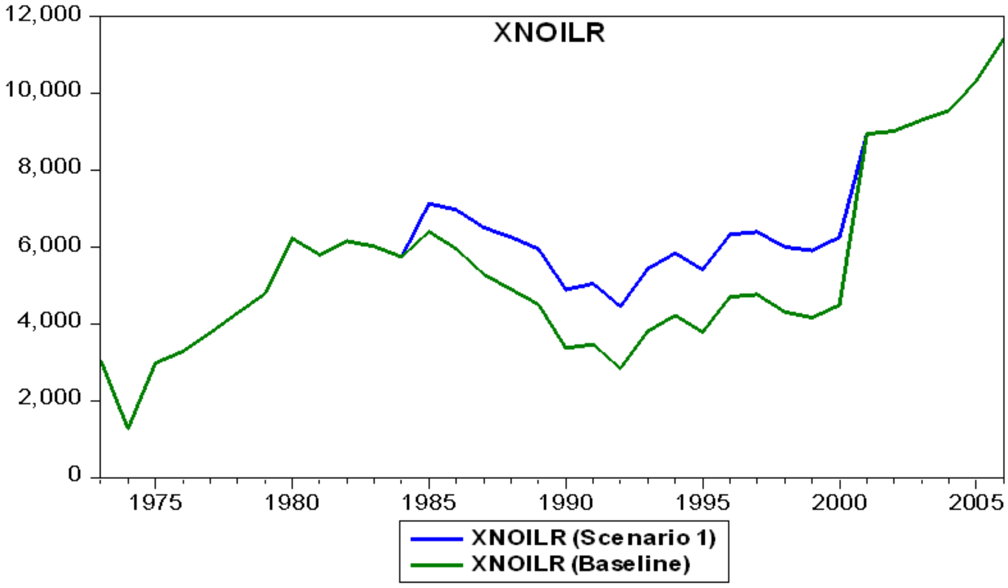
KNOILR
70,000
60,000
50,000
40,000
30,000
20,000
10,000
1975
1980
1985
1990
1995
2000
2005
KNOILR (Scenario 1)
KNOILR (Baseline)

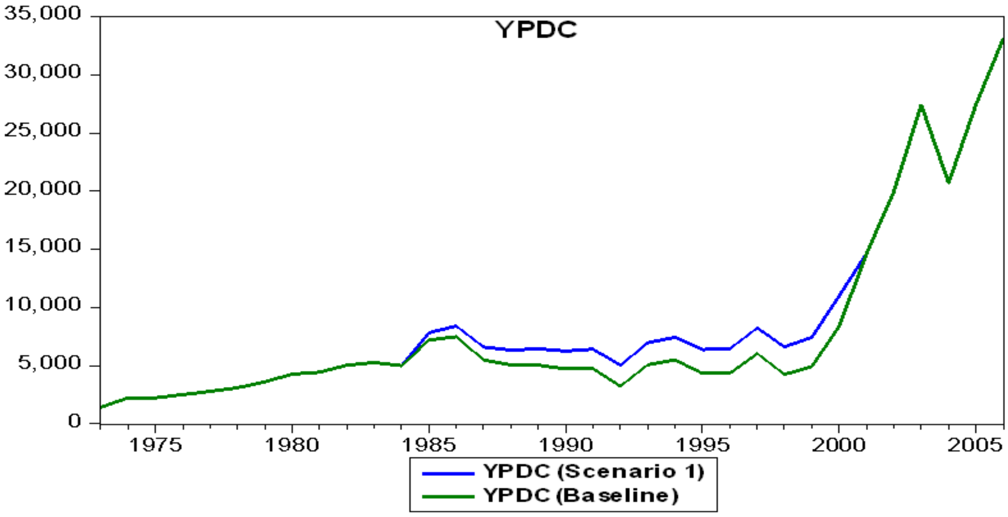

MS
20,000
16,000
12,000
8,000
4,000
0
1975
1980
1985
1990
1995
2000
2005
MS (Scenario 1)
MS (Baseline)

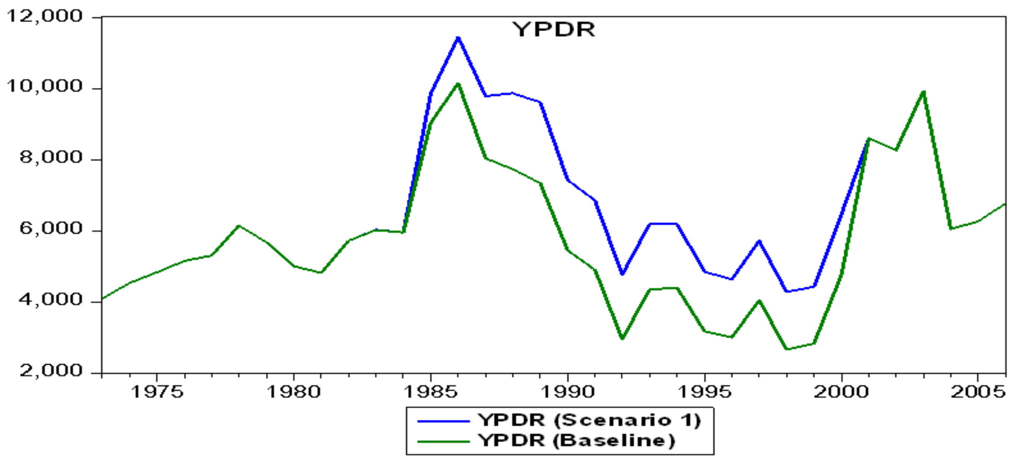

PCP
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
1975
1980
1985
1990
1995
2000
2005
PCP (Scenario 1)
PCP (Baseline)


PGDP
5
4
3
2
1
0
1975
1980
1985
1990
1995
2000
2005
PGDP (Scenario 1)
PGDP (Baseline)


TAXDIRC
1,400
1,200
1,000
800
600
400
200
0
1975
1980
1985
1990
1995
2000
2005
TAXDIRC (Scenario 1)
TAXDIRC (Baseline)


XNOILR
12,000
10,000
8,000
6,000
4,000
2,000
0
1975
1980
1985
1990
1995
2000
2005
XNOILR (Scenario 1)
XNOILR (Baseline)


YPDC
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1975
1980
1985
1990
1995
2000
2005
YPDC (Scenario 1)
YPDC (Baseline)



In light of the scenario of the fiscal policy transmission mechanism, which is represented by the real non-oil government investment *IGNOILR* and is described in Figure 6.3 above, one can make a number of observations that can be highlighted briefly as follows.

- Figure 6.3 above shows that, as had been expected, the increase in real non-oil government investment *IGNOILR* led to an increase in total government expenditure *GTEC*.
- Figure 6.3 above shows that the increase in real non-oil government investment *IGNOILR* led to an increase in real non-oil private investment expenditure *IPNOILR* and thus elucidated, as had been expected at the beginning, that government investment expenditure in Libya did not crowd out non-oil real private investment expenditure *IPNOILR*, but instead it crowded in private investment spending.
- Figure 6.3 above reveals that the increase in real non-oil government investment *IGNOILR* resulted in an increase in real non-oil gross domestic product *XNOILR*. This caused an increase in gross domestic product at factor price *GDPCfc* and then an increase in income tax *TAXDIRC* and in total government income *GTYC* which led to mitigating the government budget deficit *BUDGET*, as previously expected.

- In addition to the other influences that are shown in Figure 6.3 above, there is also an indication that the increase in the chosen fiscal policy variable in this study led to an increase in gross domestic product at market price $GDPmp$. Furthermore, it led to an increase in both nominal and real disposable personal income which led to a significant increase in private consumption expenditure CPR that necessitated, in turn, an increase in the real imports of consumer goods $IMCONR$ followed by an increase in total imports $IMTOTC$. The latter led to a deficit in the balance of trade $BOPGSC$ and the balance of payments $BOPC$. However, it can be noted from the previous Figure that the size of the deficit was not large; this was, in fact, due to the presence of the balance of payments' deficit feedback. This alleviated the amount of the initial deficit and the balance of payments deficit and led to a reduction in foreign assets IRC, as evidenced in Figure 6.3 above. This is caused by reducing the money supply MS, by lowering the monetary base that decreases private consumption expenditure CPR and real imports of consumer goods $IMCONR$ and then reducing total imports $IMTOTC$ and thus lessening the deficit in the balance of trade $BOPGSC$ and the balance of payments $BOPC$. The reduction in money supply, which has been referred to in the preceding paragraph, also has a potential direct effect in reducing real private consumption. This is through its impact on the gross domestic products *implicit* price deflator $PGDP$ and the consumer implicit price deflators PCP, as evidenced by Figure 6.3 above, which causes a decline in the commodity prices that compete with imports.
- Figure 6.3 shows that the assumed increase in the policy variable led, directly, to an increase in the real imports of capital goods $IMCAPR$. This, in turn helped to create a series of interactions similar to the effect of

increasing the real imports of consumer goods *IMCONR*, which was clarified previously in some detail and ended up with the same results.

Finally, the chosen policy variable in this study is considered an important variable because on the one it has affected many of the important variables in the Libyan economy, as has been proposed in this model, on the one hand. On the other hand, its influences have been consistent with the doctrines of economic theory which relate to this subject matter as well as accentuating an important feature which is the key role played by fiscal policy based on the proposed model for the analysis of economic policies in Libya.

6.5.2 The monetary policy scenario

To carry out this experiment, the real bank credit to non-oil sector *CRNOILR* has been chosen to be a policy variable in this scenario whereby it will be increased by L.D 431 million per year, beginning from 1985 up until 2000; this amounts to about 20% of the value of this real bank credit in 1984.

There are a number of observations that must be mentioned on the transmission mechanism of the chosen monetary policy variable which have been presented through the flow chart of the model in Figure 6.2 above.

According to the flow chart shown in Figure 6.2 above, the real bank credit to the non-oil sector *CRNOILR* would influence the proposed model of this study through two main channels which are net domestic assets *NDAC* and real non-oil gross domestic product *XNOILR* which can be illustrated as follows:

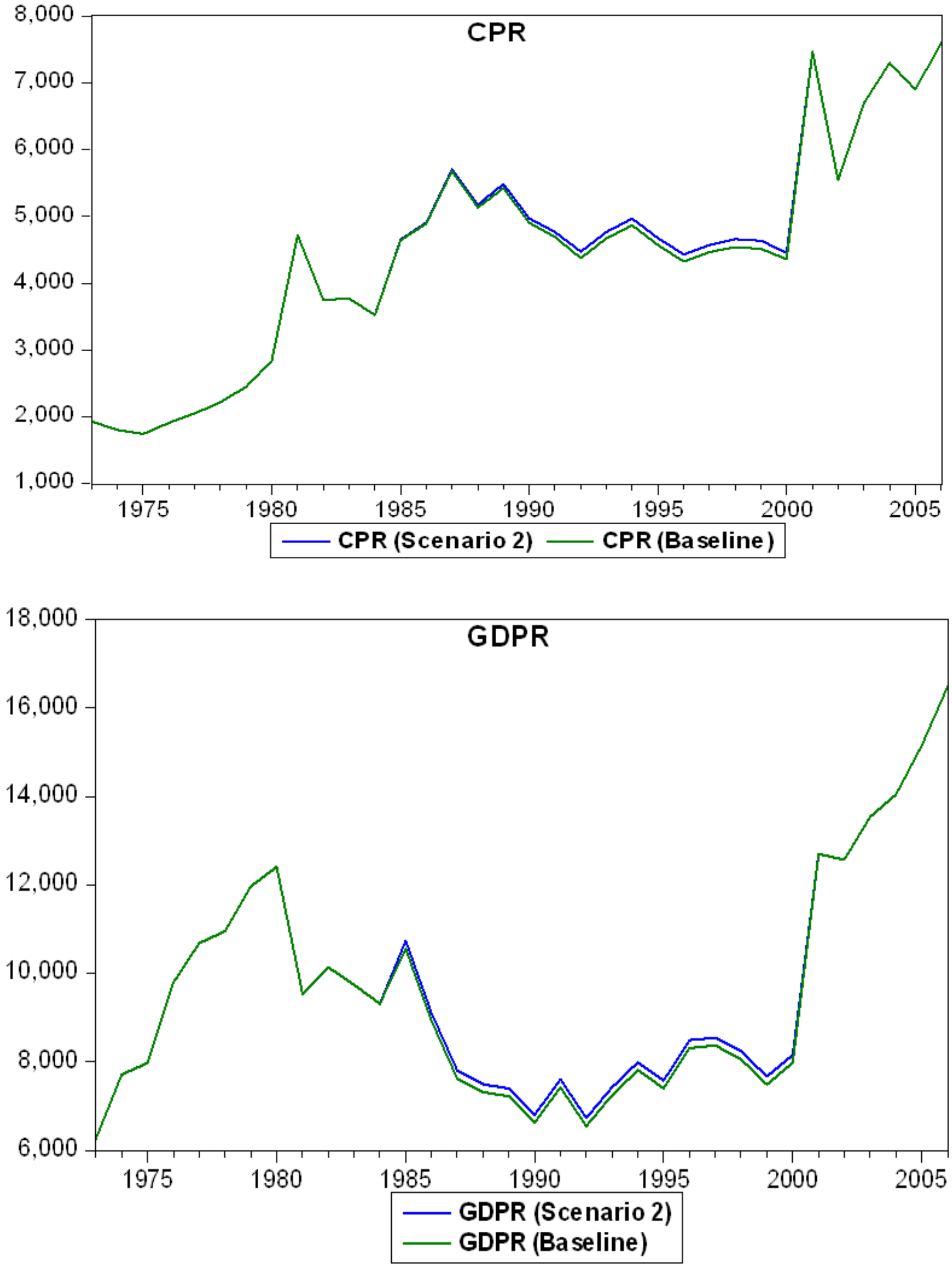
- Firstly, an increase in real bank credit to the non-oil sector *CRNOILR*, will eventually lead to an increase of the nominal stock of domestic assets at the central bank and this, in turn, will lead to a rise in the nominal of money supply *MS* and then the real of money supply *RMS* . Additionally, this increase is reflected in the form of an increase in real private consumption expenditure CPR and then in real imports of consumer goods $IMCONR$ which will create a series of interactions similar to those that have been analysed previously when dealing with the fiscal policy transmission mechanism. In addition, it can be said that the increase in the money supply MS may cause, in turn, an increase in the gross domestic products implicit price deflator $PGDP$ and thus potentially increase its inflation rate $INFGDP$, in addition to increasing both the consumer implicit price deflators PCP and the private investment implicit price deflators PIT. Moreover, the increase in the GDP implicit price deflator $PGDP$ could lead to a further potential increase in the nominal value of the domestic assets $NDAC$ and this may contribute to a further increase in the nominal money supply MS but this effect might not have the same influence on the real money supply RMS.

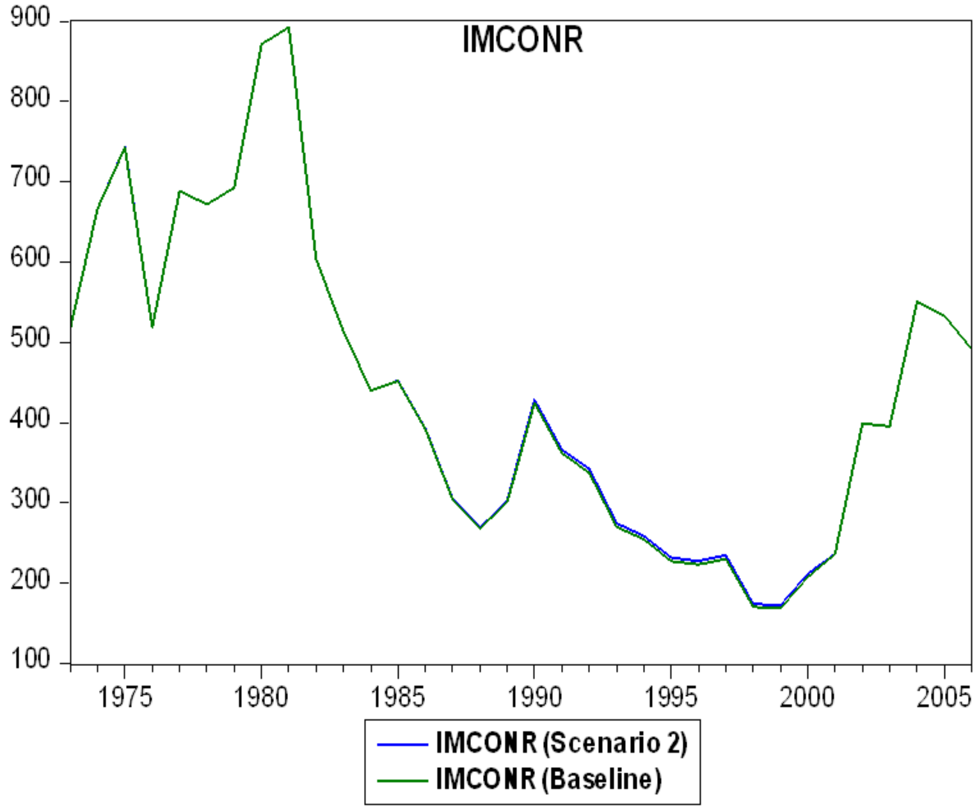
- Secondly, the increase in the chosen monetary policy variable in this study may lead to an increase in the real non-oil gross domestic product $XNOILR$ which is likely to transmit its influence on the model via the following channels:
    1. The increase in real gross domestic product $GDPR$ and then the increase of its rate of growth $GDPRG$,
    2. To increase gross domestic product at cost that, in turn, transmits its influence on the model through a series of interactions similar to those that have been clarified previously when analysing fiscal policy transmission channels.

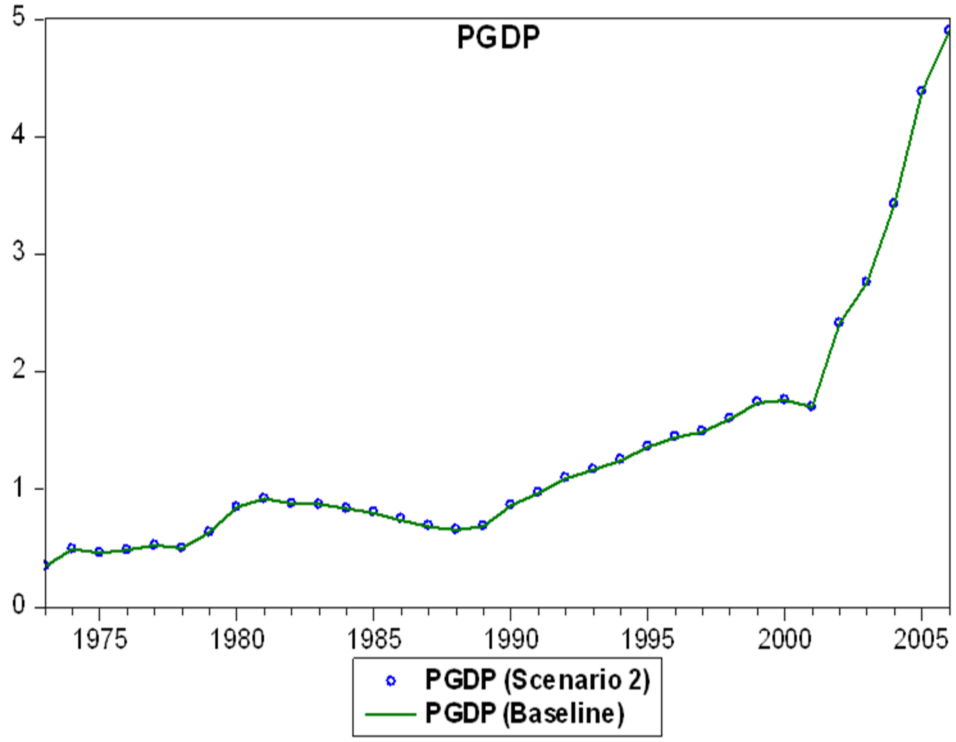
This proposed scenario for monetary policy in Libya through this study model can be illustrated through the following Figure, Figure 6.4.

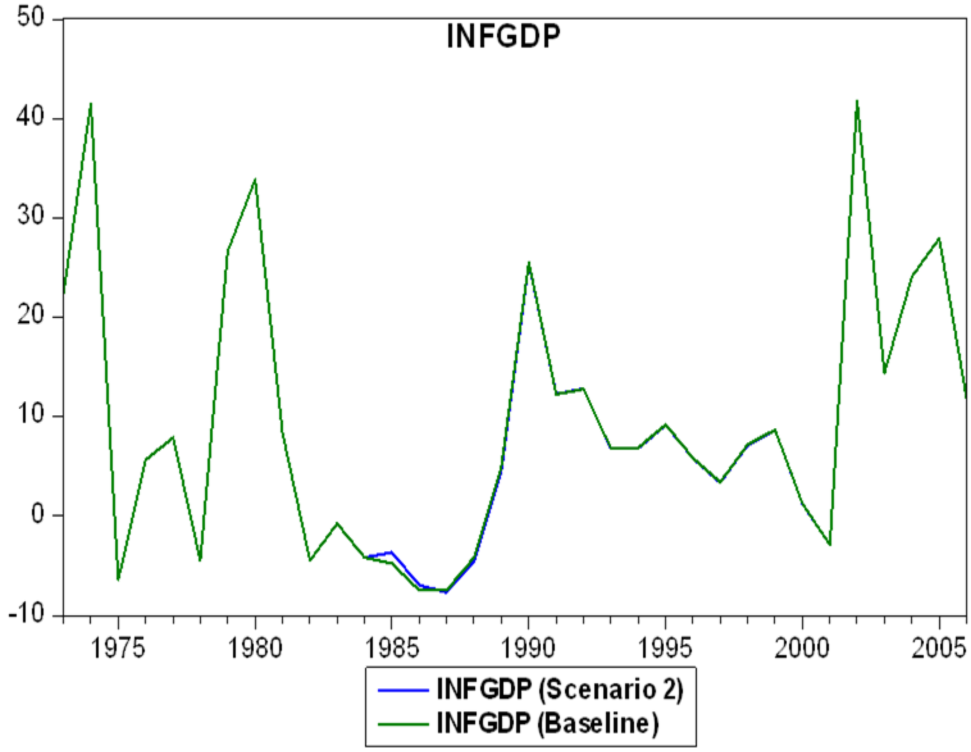
In light of the scenario of the monetary policy transmission mechanism which is represented by the real bank credit to the non-oil sector *CRNOILR* and which is described in Figure 6.4 below, one can make a number of observations that can be highlighted briefly as follows:

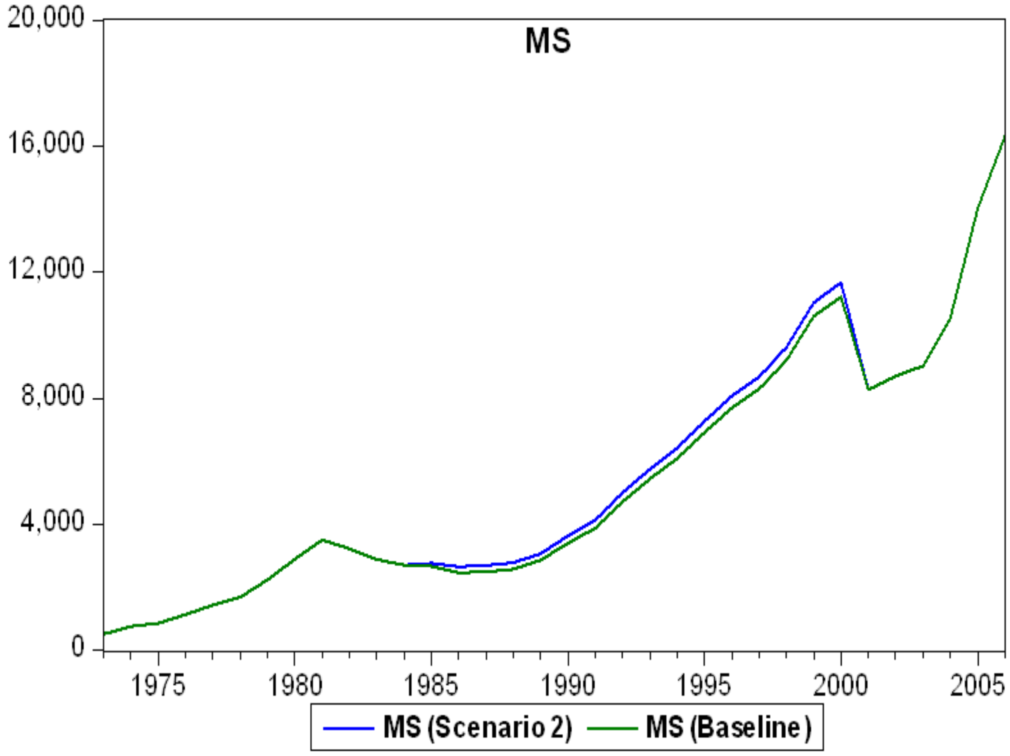
Figure 6.4 the Scenario of the monetary policy

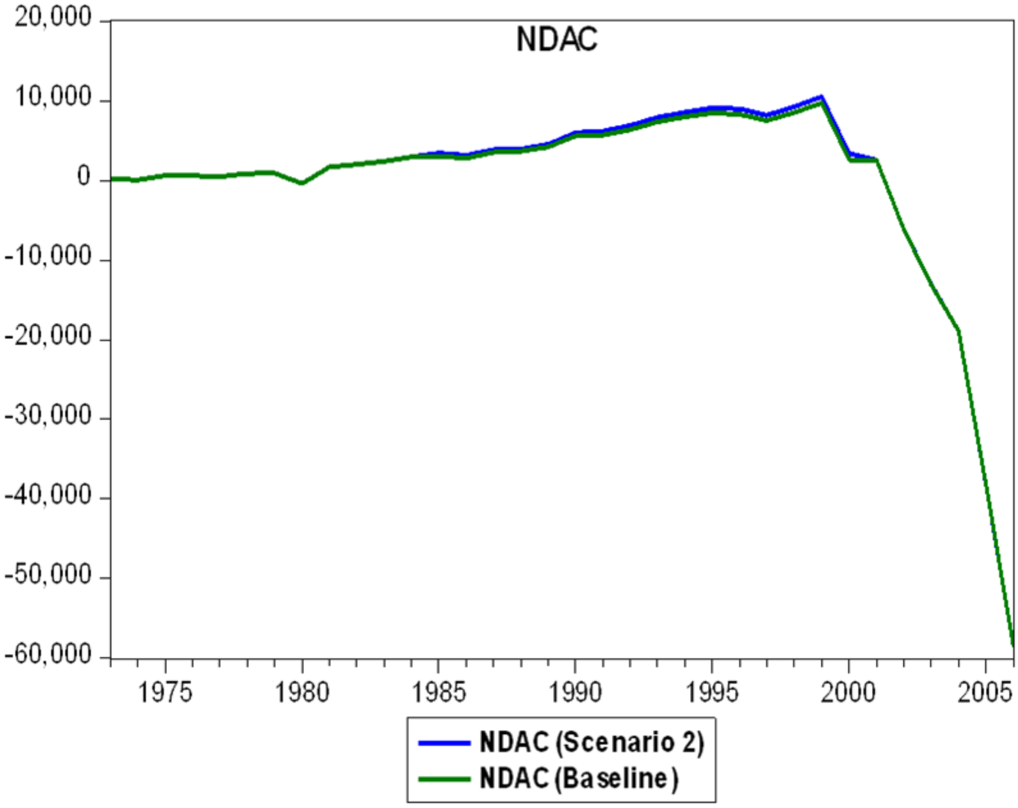


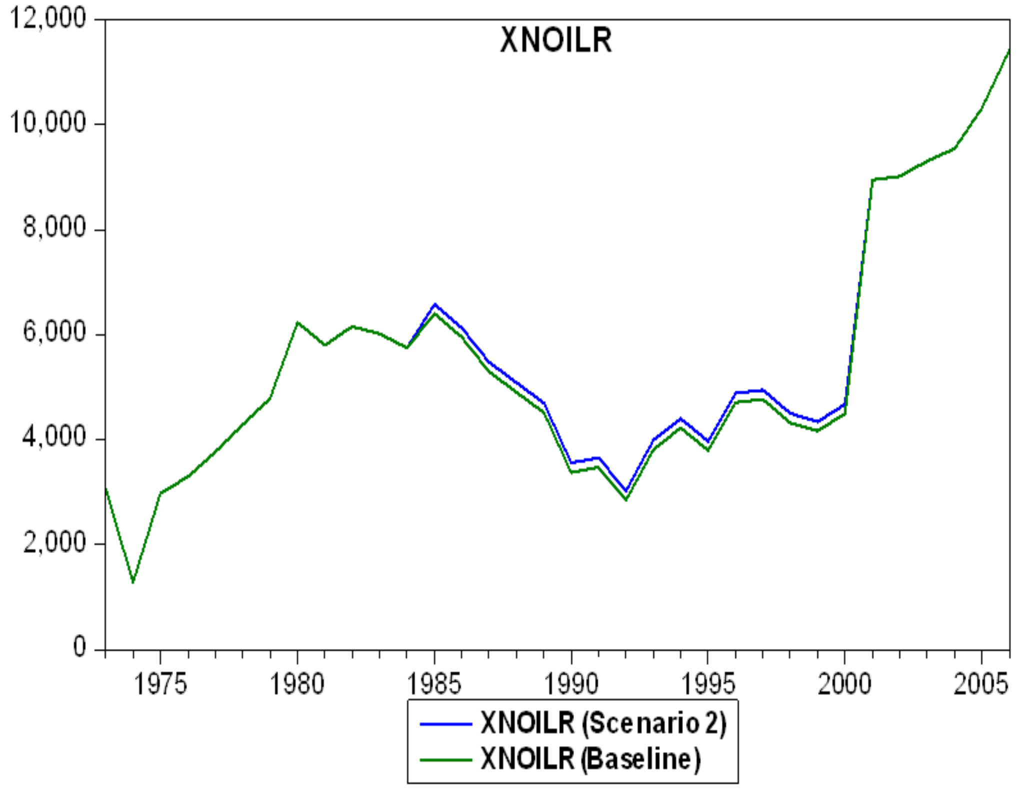

IMCONR
900
800
700
600
500
400
300
200
100
1975
1980
1985
1990
1995
2000
2005
IMCONR (Scenario 2)
IMCONR (Baseline)

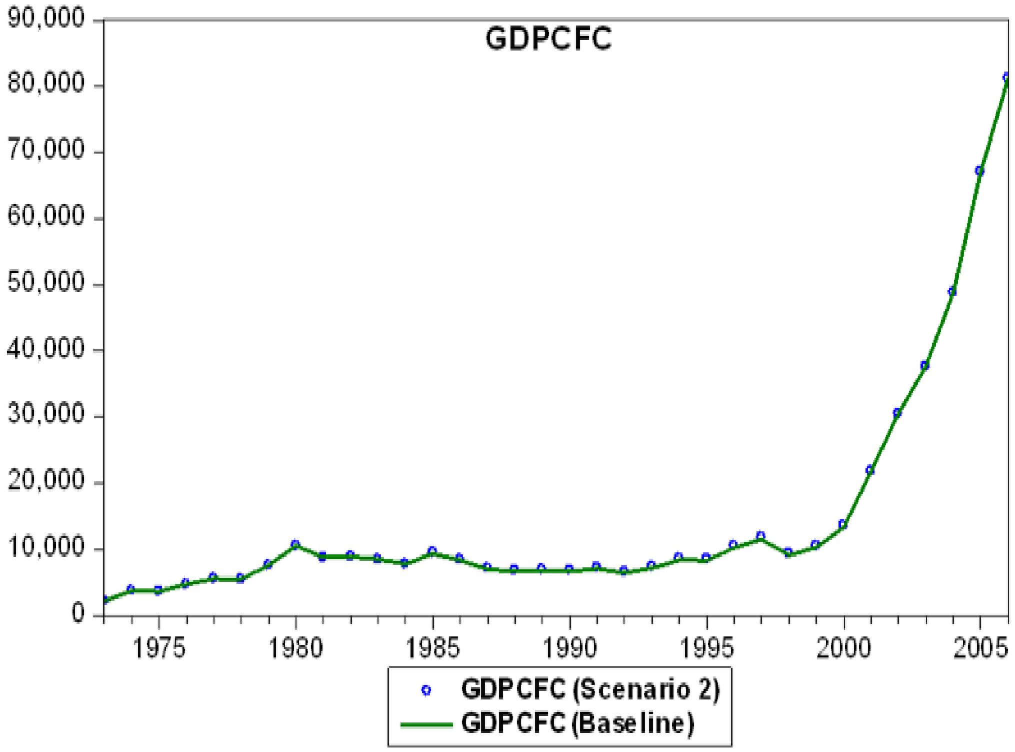

PGDP
5
4
3
2
1
0
1975
1980
1985
1990
1995
2000
2005
PGDP (Scenario 2)
PGDP (Baseline)

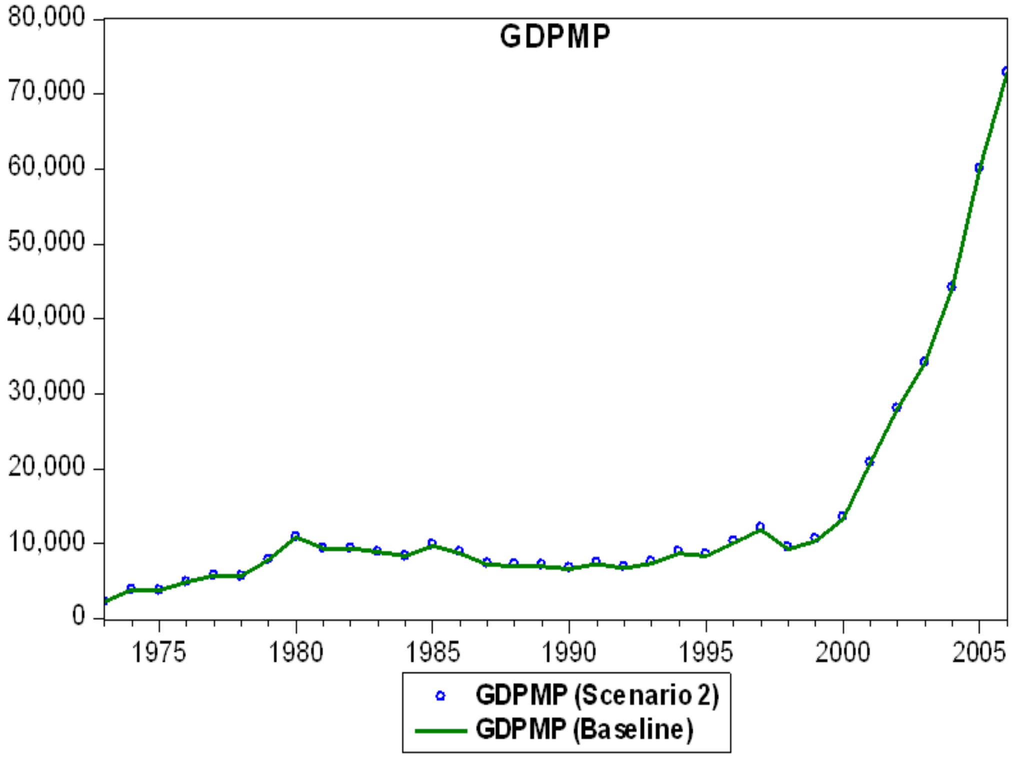

INFGDP
50
40
30
20
10
0
-10
1975
1980
1985
1990
1995
2000
2005
INFGDP (Scenario 2)
INFGDP (Baseline)

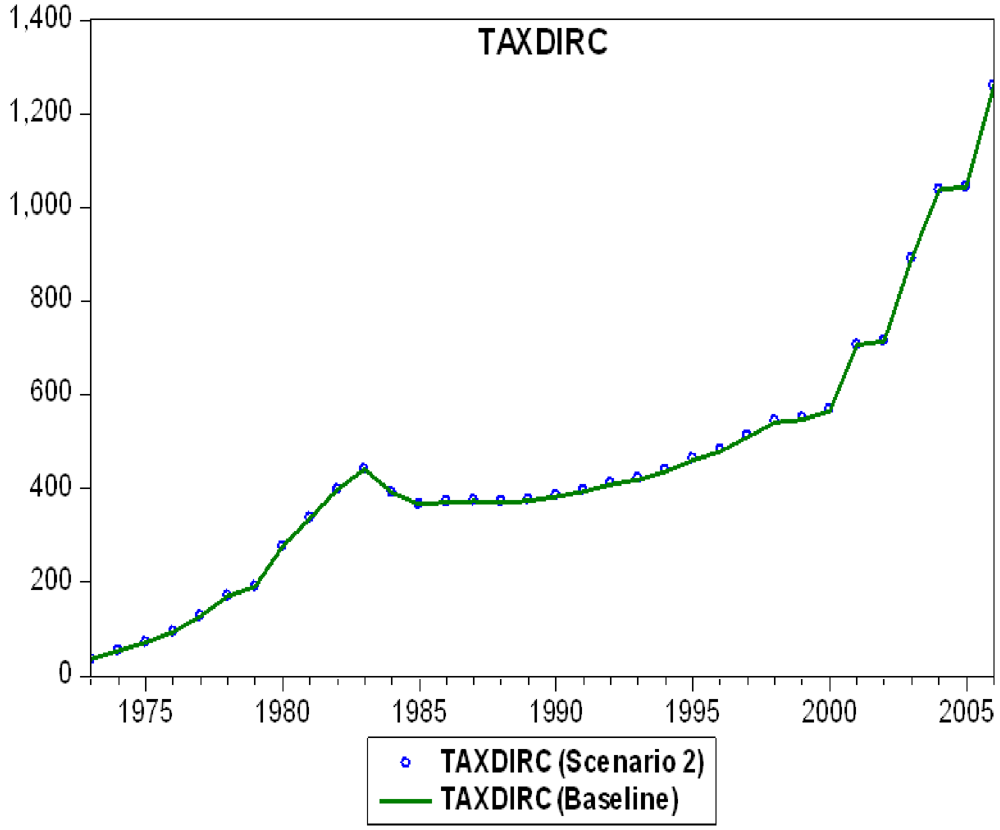

MS
20,000
16,000
12,000
8,000
4,000
0
1975
1980
1985
1990
1995
2000
2005
MS (Scenario 2)
MS (Baseline)

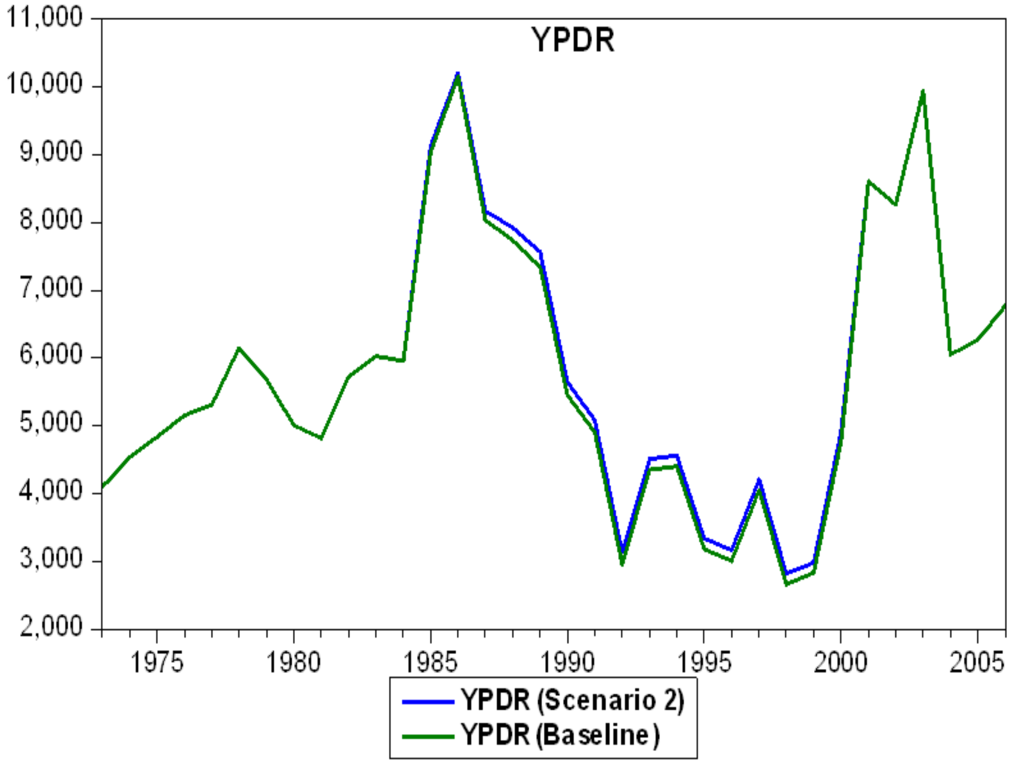

NDAC
20,000
10,000
0
-10,000
-20,000
-30,000
-40,000
-50,000
-60,000
1975
1980
1985
1990
1995
2000
2005
NDAC (Scenario 2)
NDAC (Baseline)

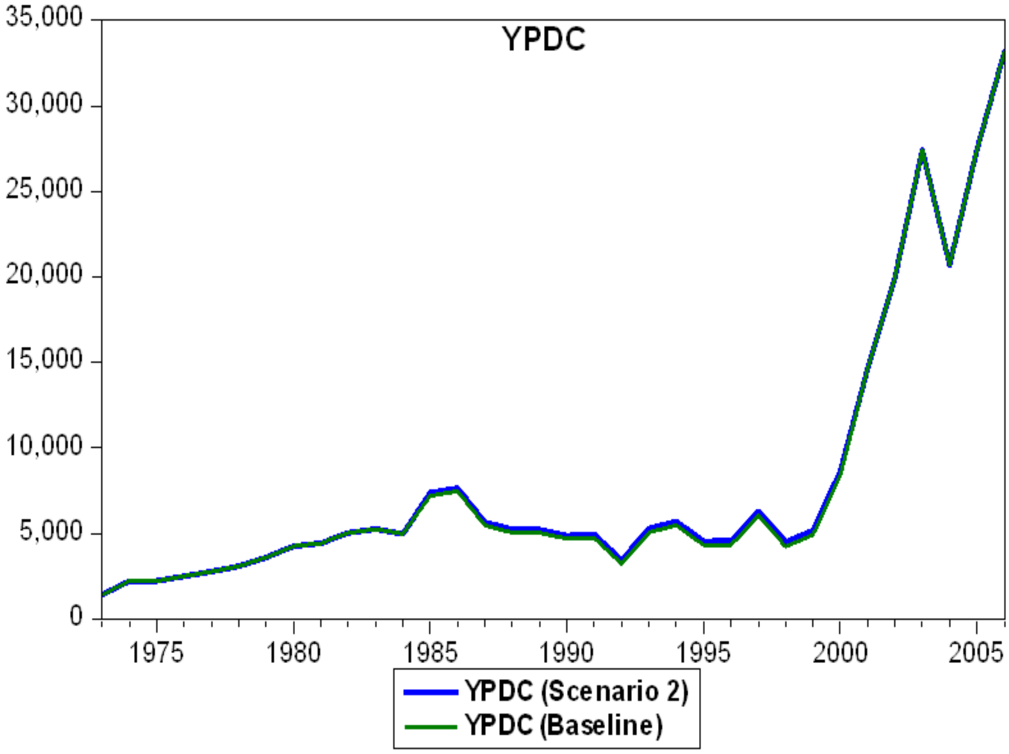

XNOILR
12,000
10,000
8,000
6,000
4,000
2,000
0
1975
1980
1985
1990
1995
2000
2005
XNOILR (Scenario 2)
XNOILR (Baseline)


GDPCFC
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1975
1980
1985
1990
1995
2000
2005
GDPCFC (Scenario 2)
GDPCFC (Baseline)


GDPMP
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1975
1980
1985
1990
1995
2000
2005
GDPMP (Scenario 2)
GDPMP (Baseline)


TAXDIRC
1,400
1,200
1,000
800
600
400
200
0
1975
1980
1985
1990
1995
2000
2005
TAXDIRC (Scenario 2)
TAXDIRC (Baseline)


YPDR
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1975
1980
1985
1990
1995
2000
2005
YPDR (Scenario 2)
YPDR (Baseline)



Firstly, with regard to the influence of real bank credit in the non-oil sector *CRNOILR* on the net domestic assets *NDAC* it can be said that:

- The increase in real bank credit to the non-oil sector *CRNOILR* led to a slight increase in net domestic assets *NDAC* that, in turn, created a significant increase in the nominal money supply by the influence of the money multiplier. This caused a further increase in real private consumption expenditure *CPR* which was a result of the increase that occurred also in disposable personal income as will be seen later.
- The increase of real bank credit to the non-oil sector *CRNOILR* led, in turn, to a very slight increase in imports of consumer goods to an extent, which did not affect total imports. Therefore, it did not have any effect on the trade balance or on the balance of payments; this is contrary to what was expected of this policy.

- Arguably, indeed, the increase in the money supply MS, in turn, caused a small increase in the GDP implicit price deflator $PGDP$ and, therefore, did not have a significant effect on the increase in its inflation rate. In addition to this, the intangible increase in the GDP implicit price deflator $PGDP$ did not have any significant influence either on the consumer implicit price deflators PCP or on the private investment implicit price deflators PIT. Moreover, the increase in the gross domestic products implicit price deflator $PGDP$ did not have a significant role in the increase in the nominal net value of the domestic assets $NDAC$, and in the increase of the nominal money supply MS nor in the increase in the real money supply because of the small size of the increase in these aforementioned variables.

Secondly, it can be said that the increase in the real bank credit to the non-oil sector $CRNOILR$ *caused* an increase in the real non-oil gross domestic product $XNOILR$, which, in turn, led to:

- An increase in the real gross domestic product $GDPR$ and then to an increased rate of growth,
- A small increase in the gross domestic product at factor cost $GDPCfc$, which, in turn, transferred its influence and caused a number of effects which included the following:
    1. An increase in gross domestic product at market prices $GDPmp$ which led to an increase in both nominal and real personal disposable income, then to an increase in real private consumption expenditure CPR so that it caused a rise in real imports of consumer goods. However, it is noted that the increase in the latter did not have any effect on total imports $IMTOTC$ nor on the balance of

trade *BOPGS* in spite of this increase in real private consumption expenditure *CPR which* stimulated an increase in the real money supply *RMS*, as mentioned previously.

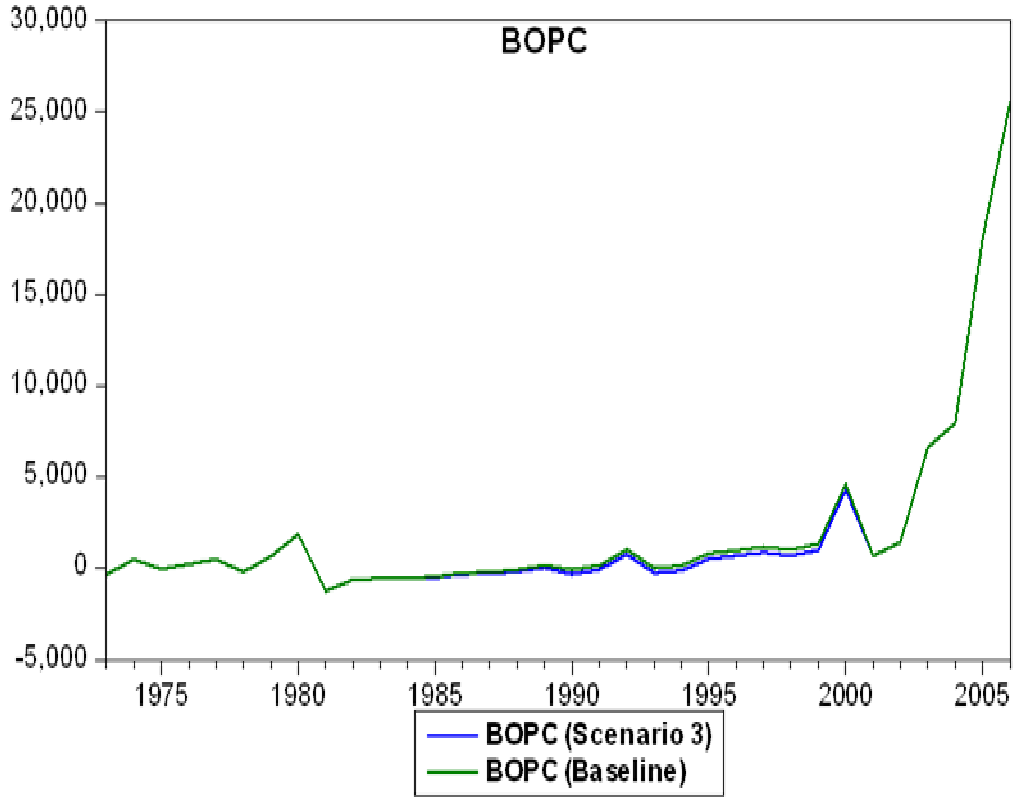
2. Increased income taxes that are supposed to lead directly to an influence on the total government income *GTYC* and then to have an influence on the government budget *BUDGET*. However, this effect did not occur according to this scenario. Additionally, an increase in income tax *TAXDIRC* did not have any significant impact on supporting government consumption expenditure *CGC*, as described in the experiment.

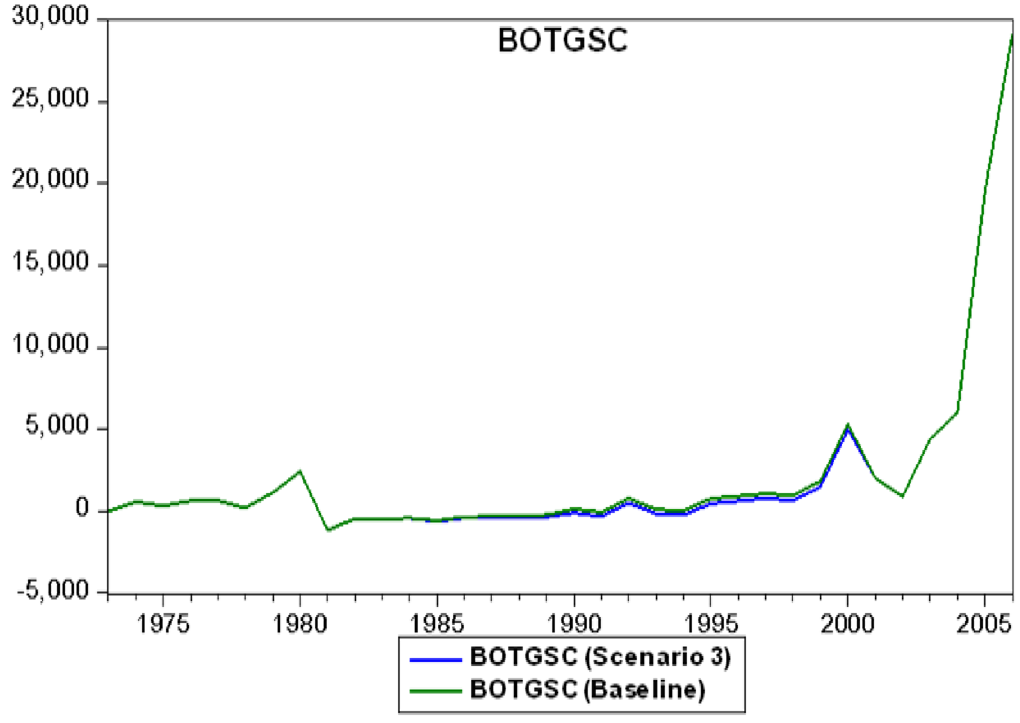
- Based on the analysis of the monetary policy scenario, and comparing with the fiscal policy scenario, it can be concluded that the monetary policy is less efficient when compared to the fiscal policy according to this proposed model for the analysis of economic policy in Libya. This was due to a number of reasons, which will be mentioned in some detail at the end of this study.

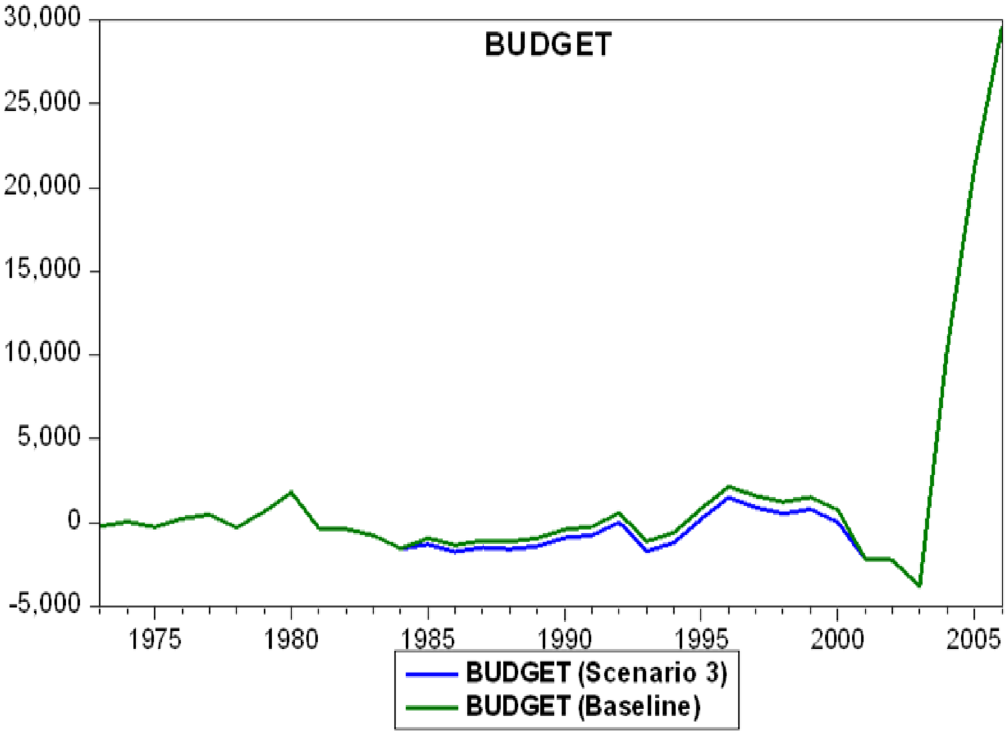
6.5.3 Combined scenario of fiscal and monetary policy

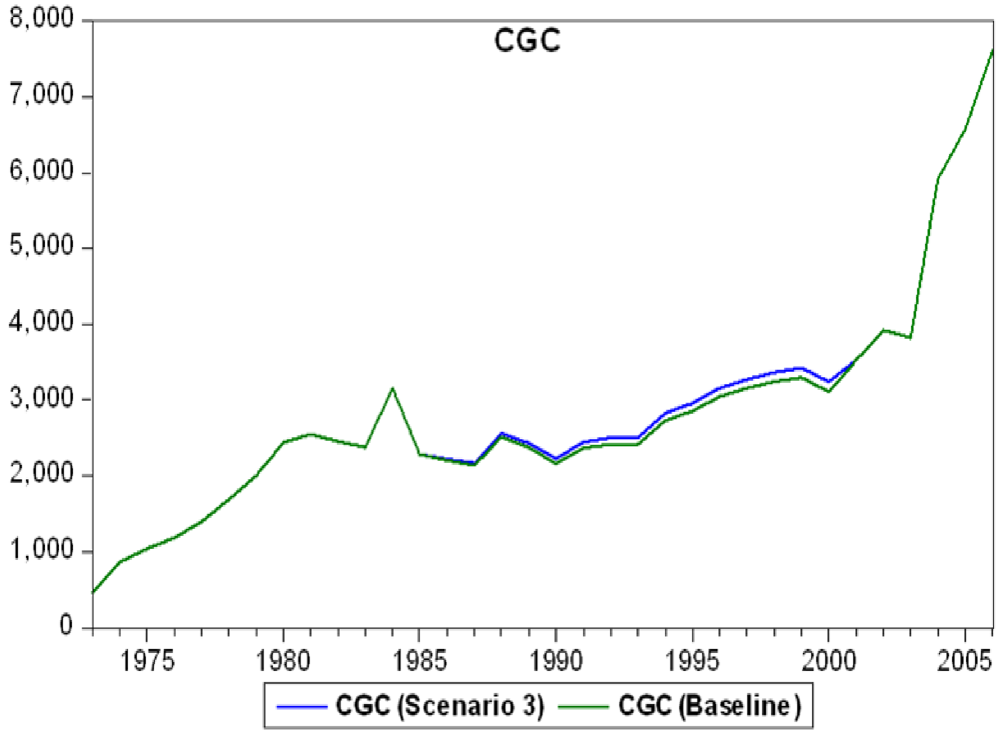
The third scenario aims to show how the fiscal and monetary policies interacted through the proposed econometric model of the Libyan economy in this study. In practice, this can be achieved through reliance on the same policy variables that have been chosen in the two previous scenarios with the same values (amounts) that have been allocated to these two variables. It is expected that these changes in the variables of fiscal and monetary policy will contribute, affectingly, in a shift of the important economic variables, as compared with those changes that occurred when applying each policy separately.

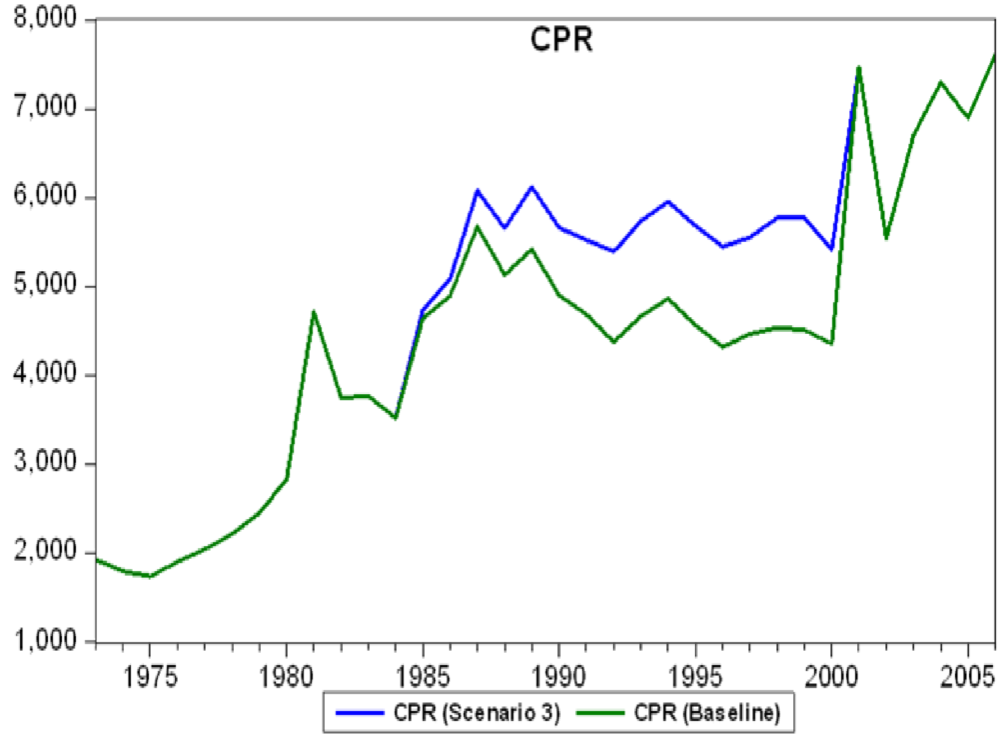
Figure 6.5 the combined scenario of fiscal and monetary policy

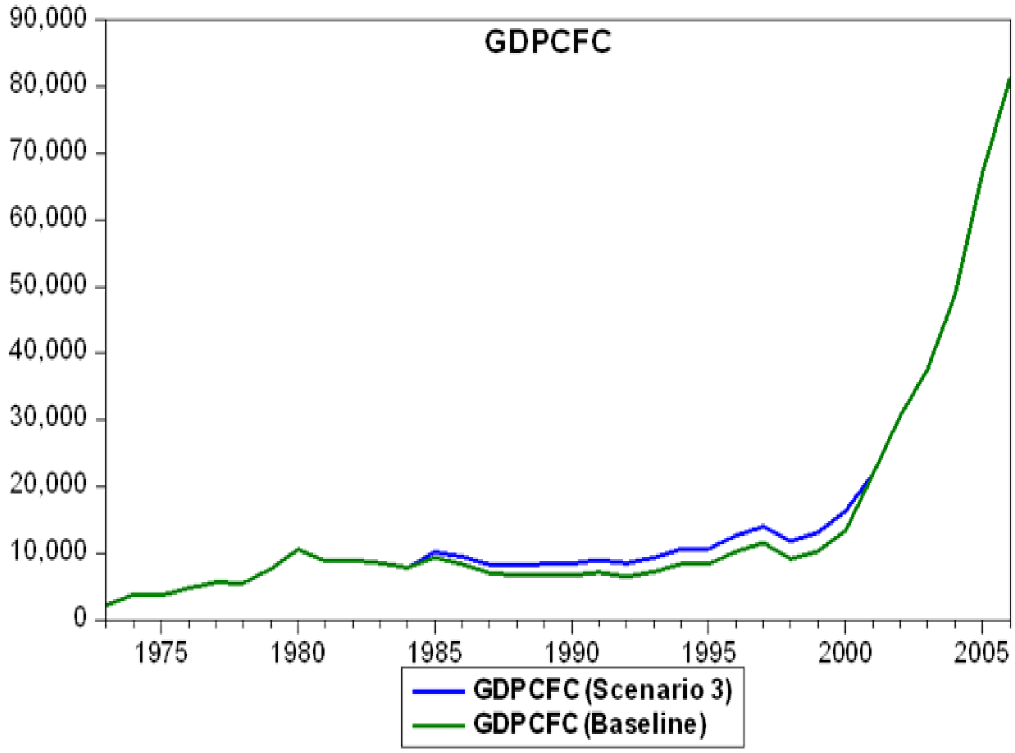


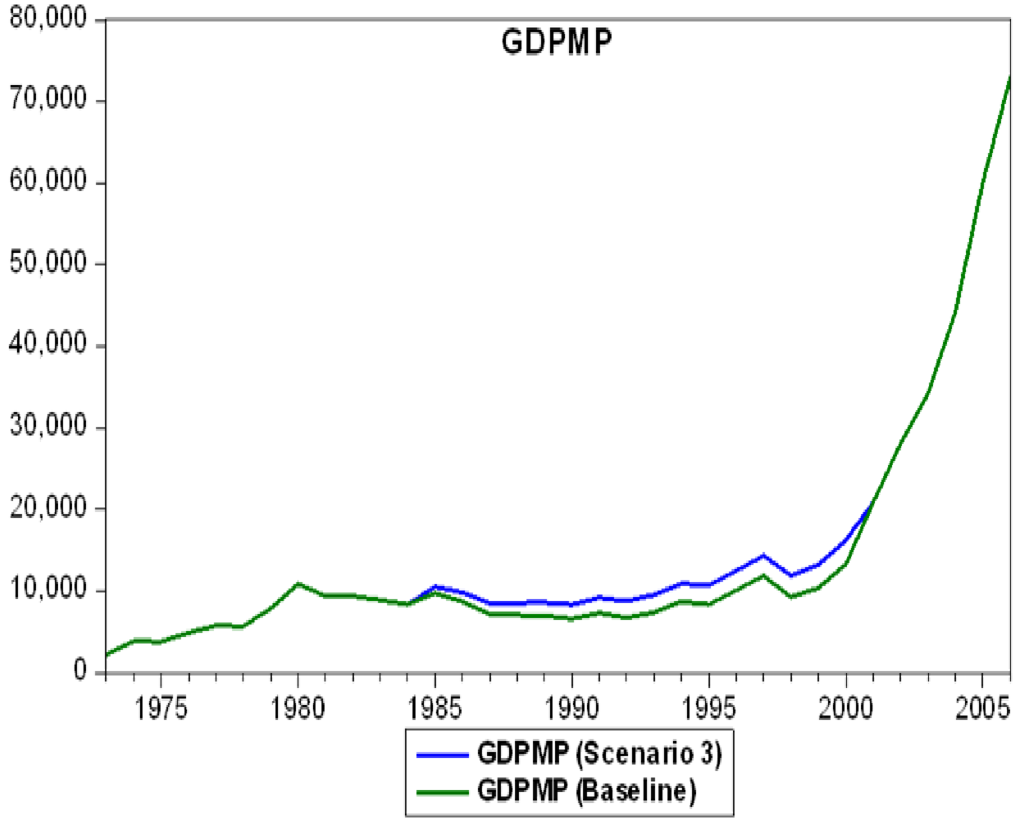


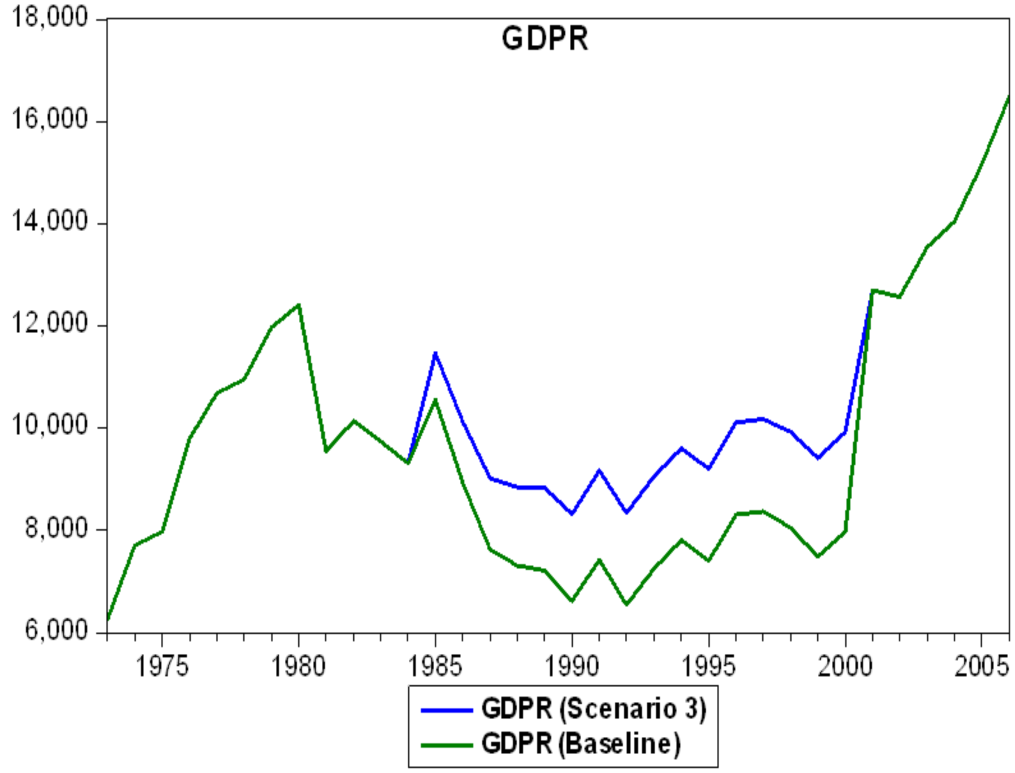

BUDGET
30,000
25,000
20,000
15,000
10,000
5,000
0
-5,000
1975
1980
1985
1990
1995
2000
2005
BUDGET (Scenario 3)
BUDGET (Baseline)

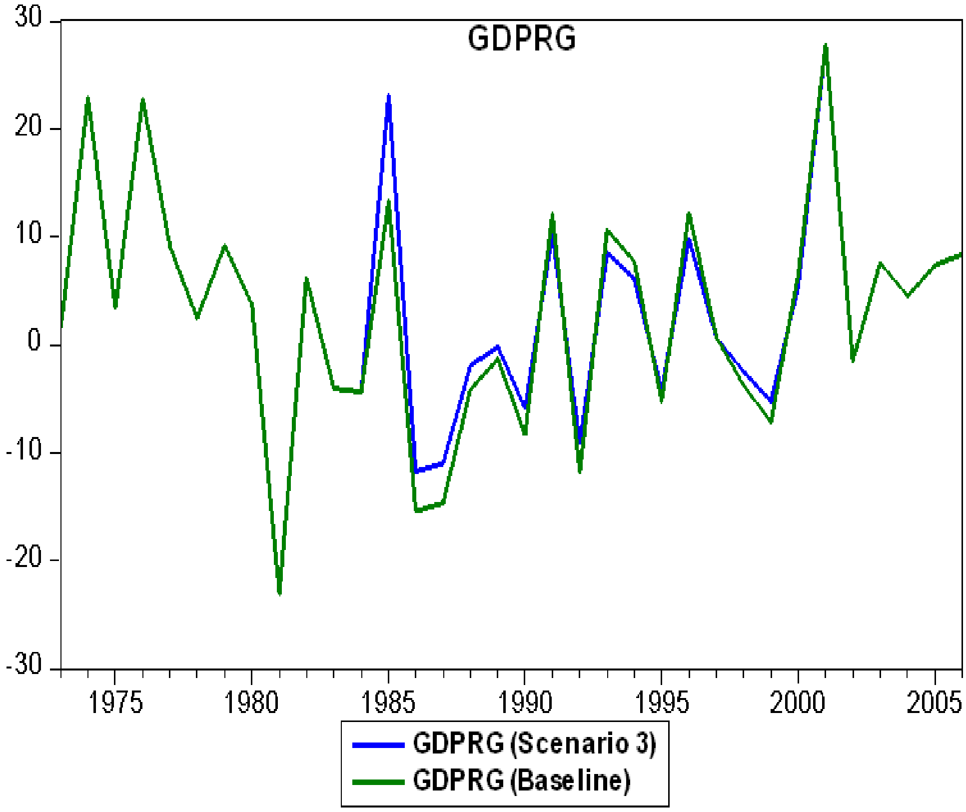

CGC
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1975
1980
1985
1990
1995
2000
2005
CGC (Scenario 3)
CGC (Baseline)

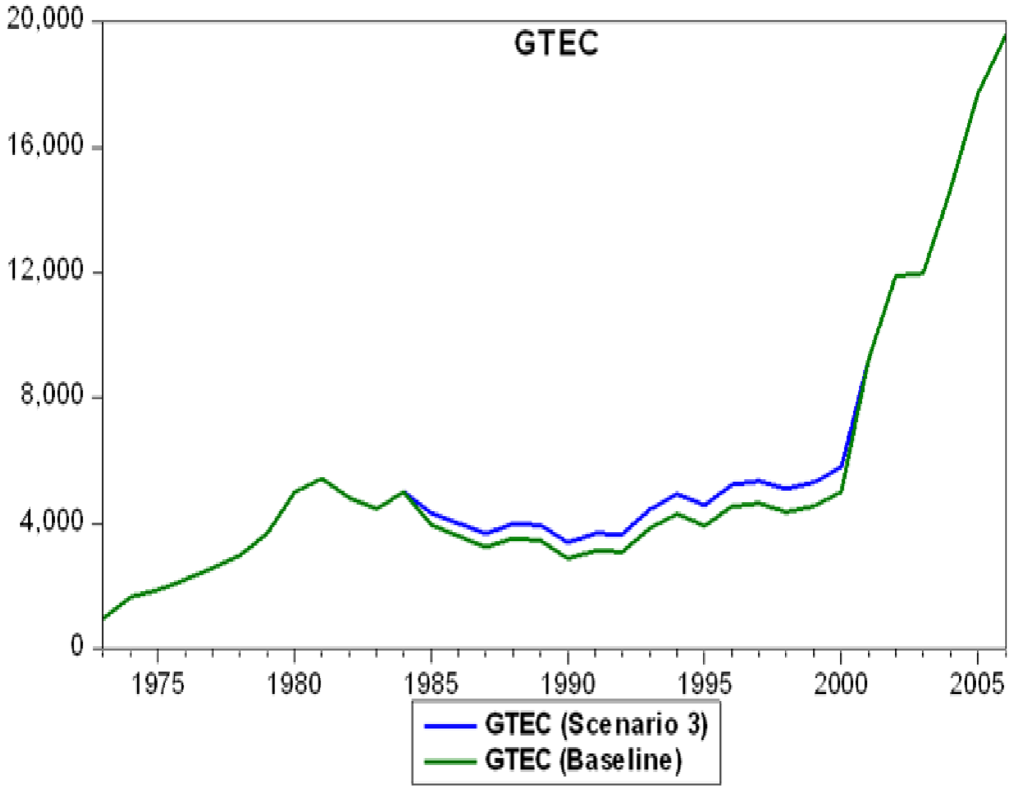

CPR
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1975
1980
1985
1990
1995
2000
2005
CPR (Scenario 3)
CPR (Baseline)

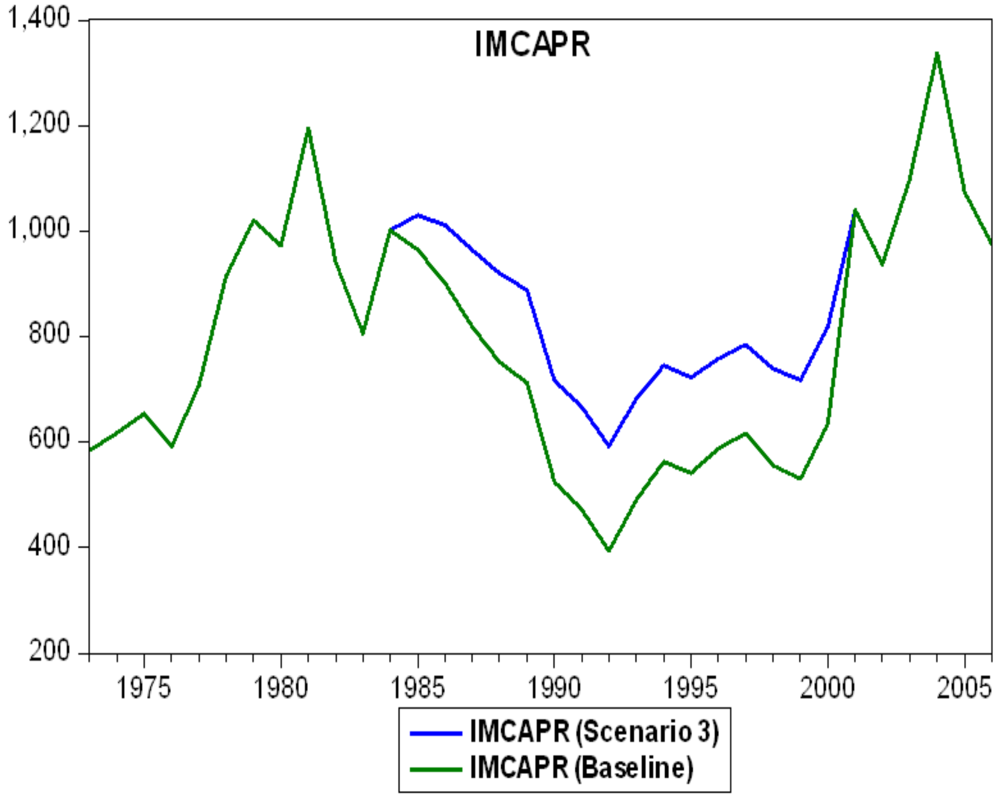

GDPCFC
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1975
1980
1985
1990
1995
2000
2005
GDPCFC (Scenario 3)
GDPCFC (Baseline)

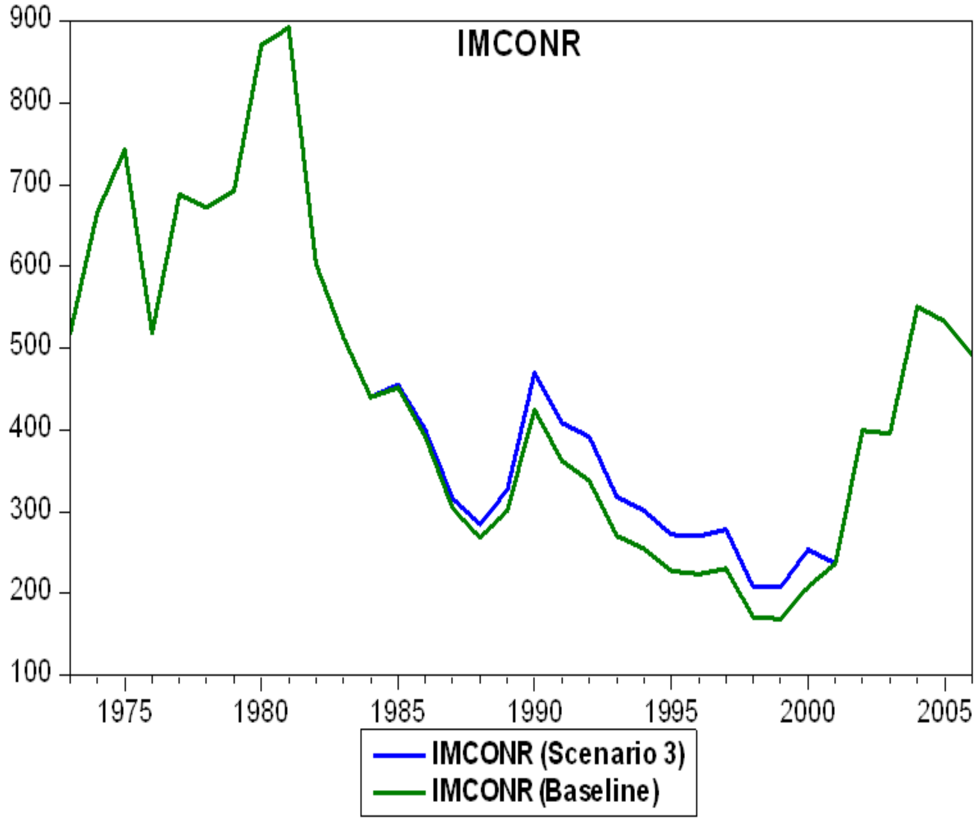

GDPMP
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1975
1980
1985
1990
1995
2000
2005
GDPMP (Scenario 3)
GDPMP (Baseline)

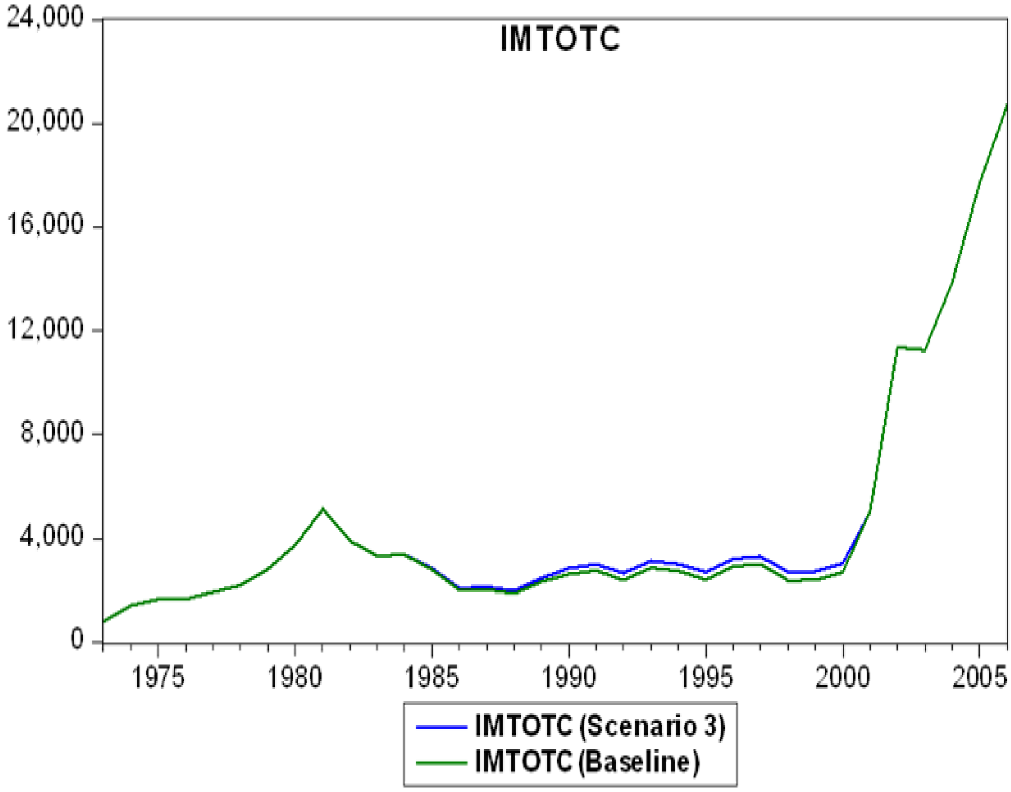

GDPR
18,000
16,000
14,000
12,000
10,000
8,000
6,000
1975
1980
1985
1990
1995
2000
2005
GDPR (Scenario 3)
GDPR (Baseline)

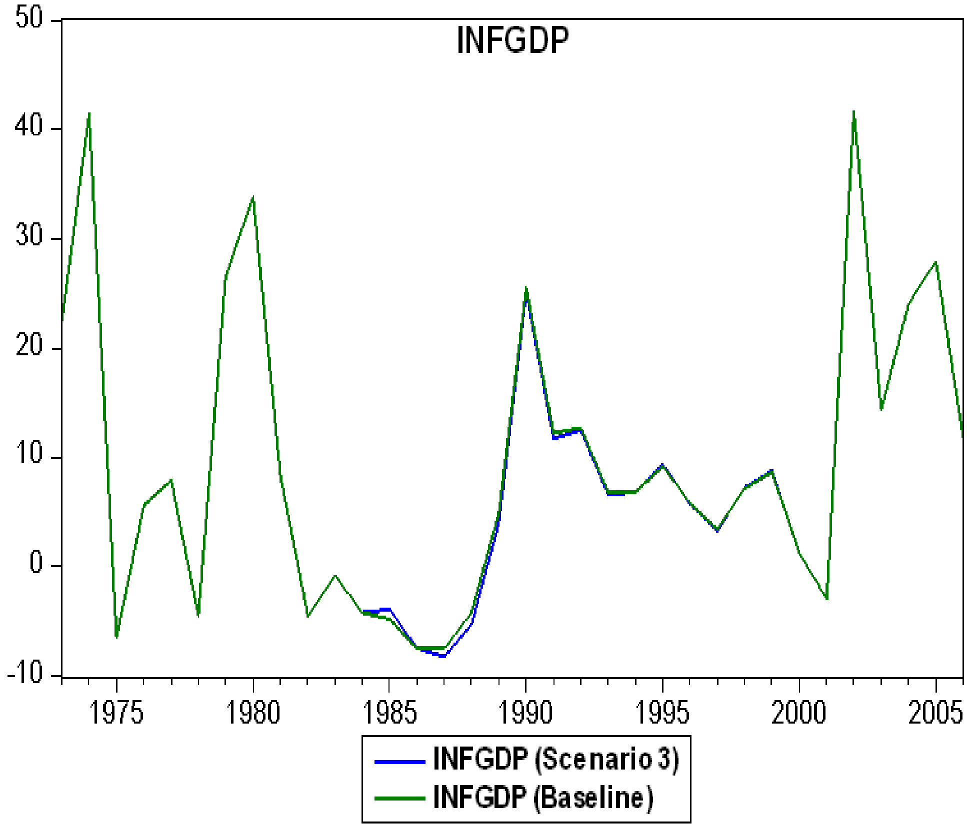

GDPRG
30
20
10
0
-10
-20
-30
1975
1980
1985
1990
1995
2000
2005
GDPRG (Scenario 3)
GDPRG (Baseline)

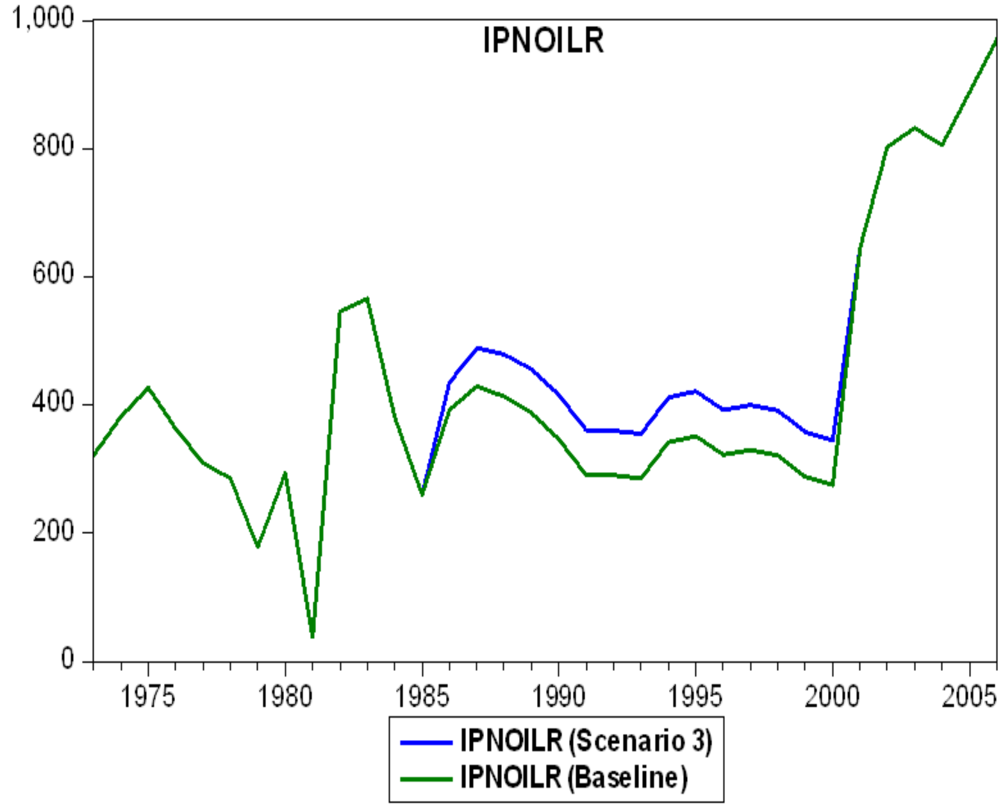

GTEC
20,000
16,000
12,000
8,000
4,000
0
1975
1980
1985
1990
1995
2000
2005
GTEC (Scenario 3)
GTEC (Baseline)

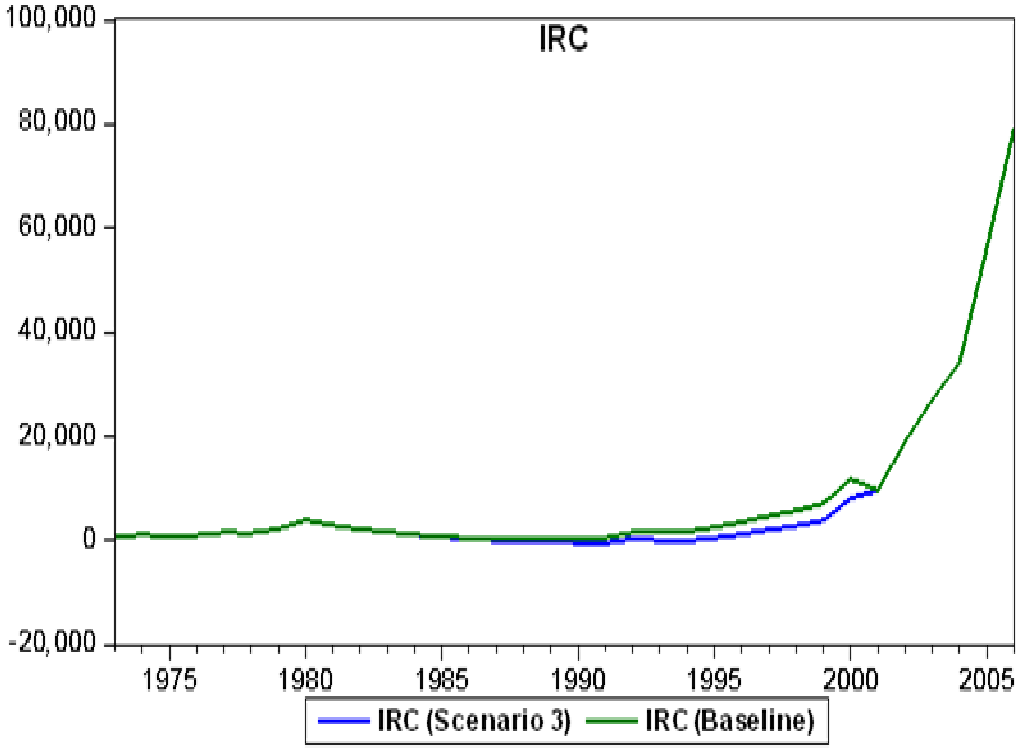

IMCAPR
1,400
1,200
1,000
800
600
400
200
1975
1980
1985
1990
1995
2000
2005
IMCAPR (Scenario 3)
IMCAPR (Baseline)

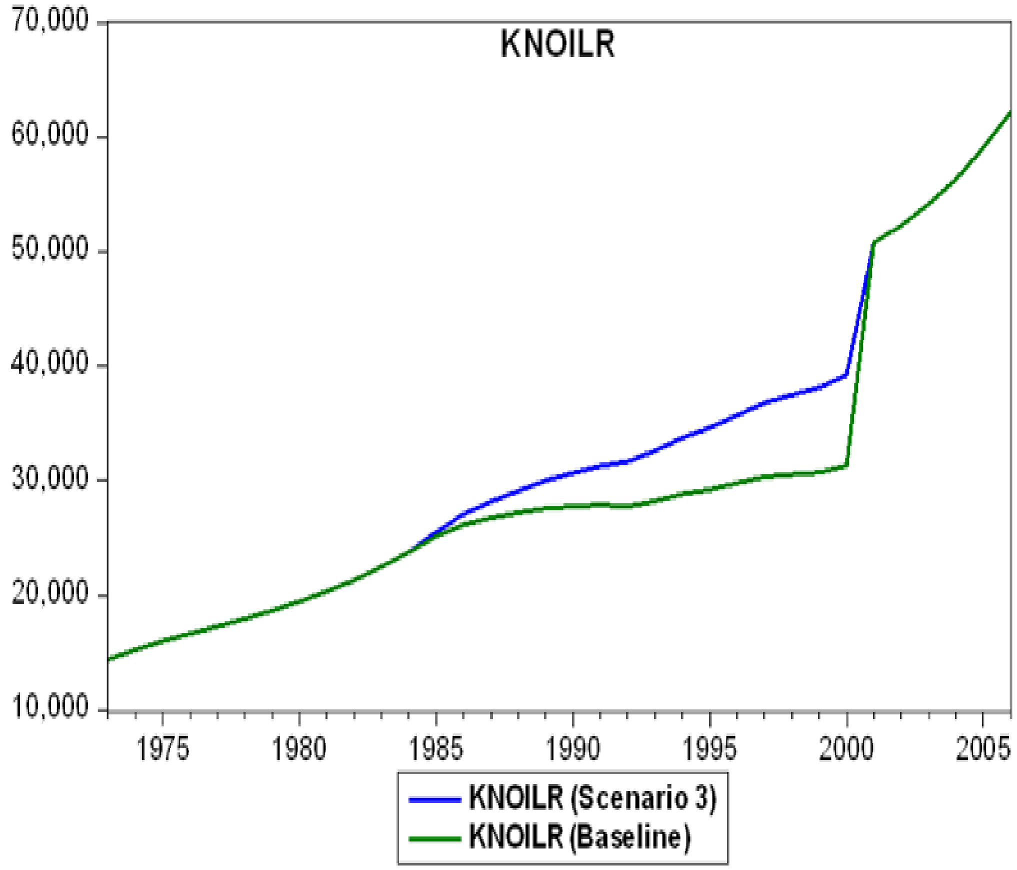

IMCONR
900
800
700
600
500
400
300
200
100
1975
1980
1985
1990
1995
2000
2005
IMCONR (Scenario 3)
IMCONR (Baseline)

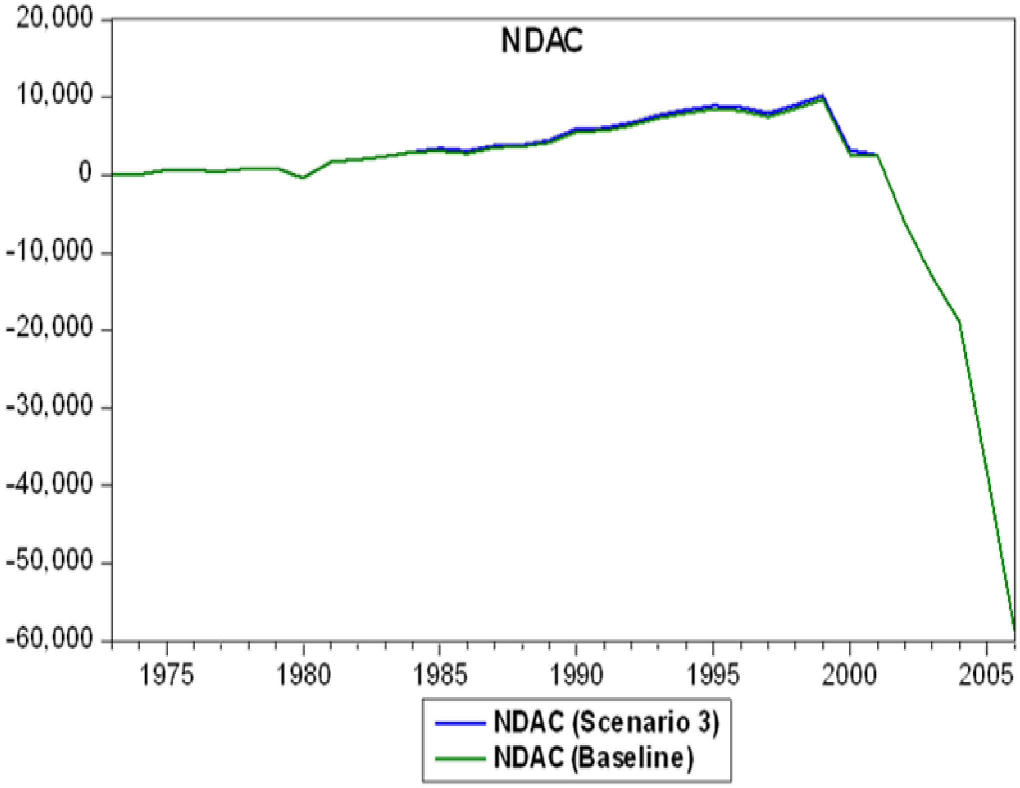

IMTOTC
24,000
20,000
16,000
12,000
8,000
4,000
0
1975
1980
1985
1990
1995
2000
2005
IMTOTC (Scenario 3)
IMTOTC (Baseline)

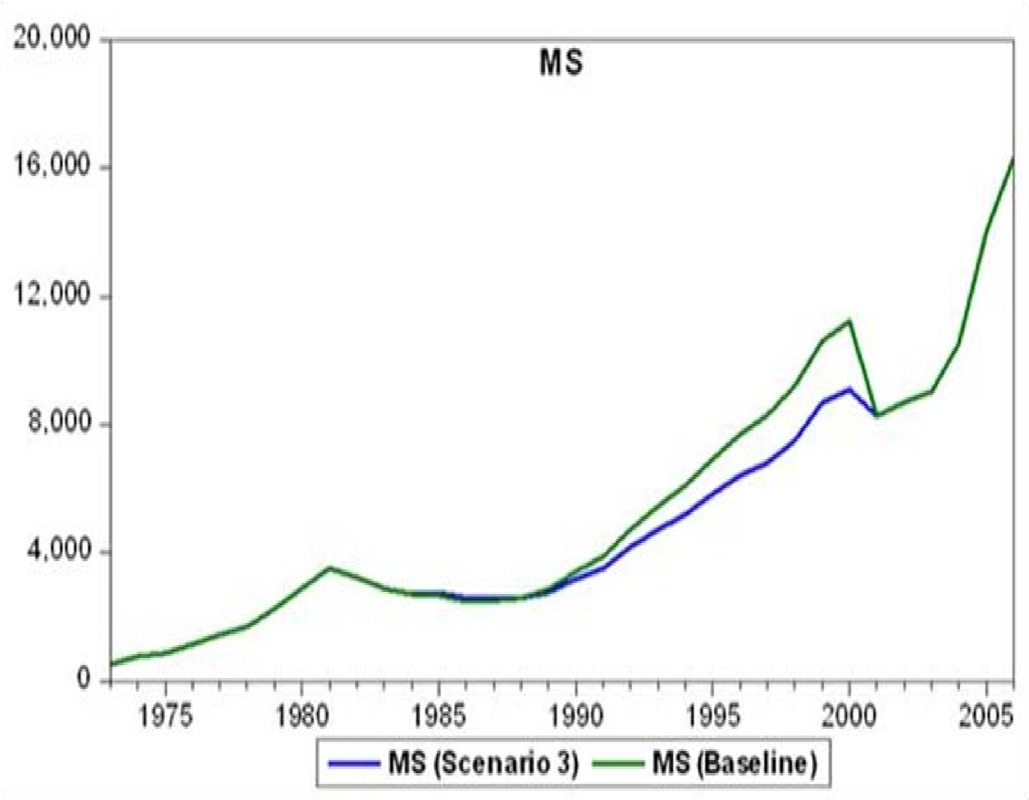

INFGDP
50
40
30
20
10
0
-10
1975
1980
1985
1990
1995
2000
2005
INFGDP (Scenario 3)
INFGDP (Baseline)

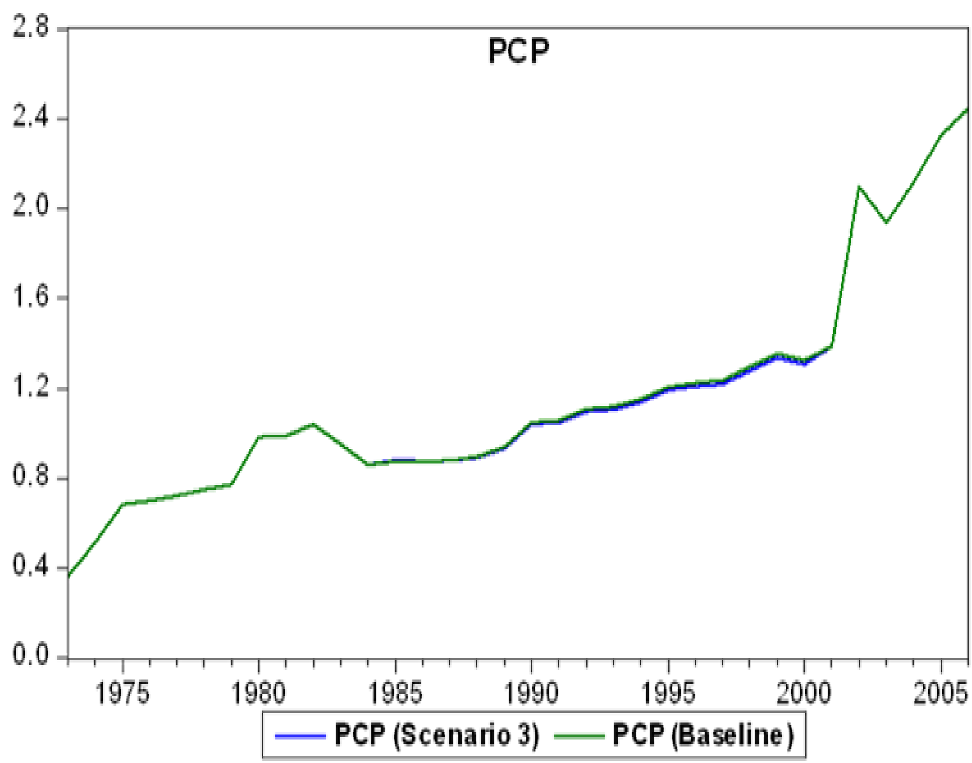

IPNOILR
1,000
800
600
400
200
0
1975
1980
1985
1990
1995
2000
2005
IPNOILR (Scenario 3)
IPNOILR (Baseline)

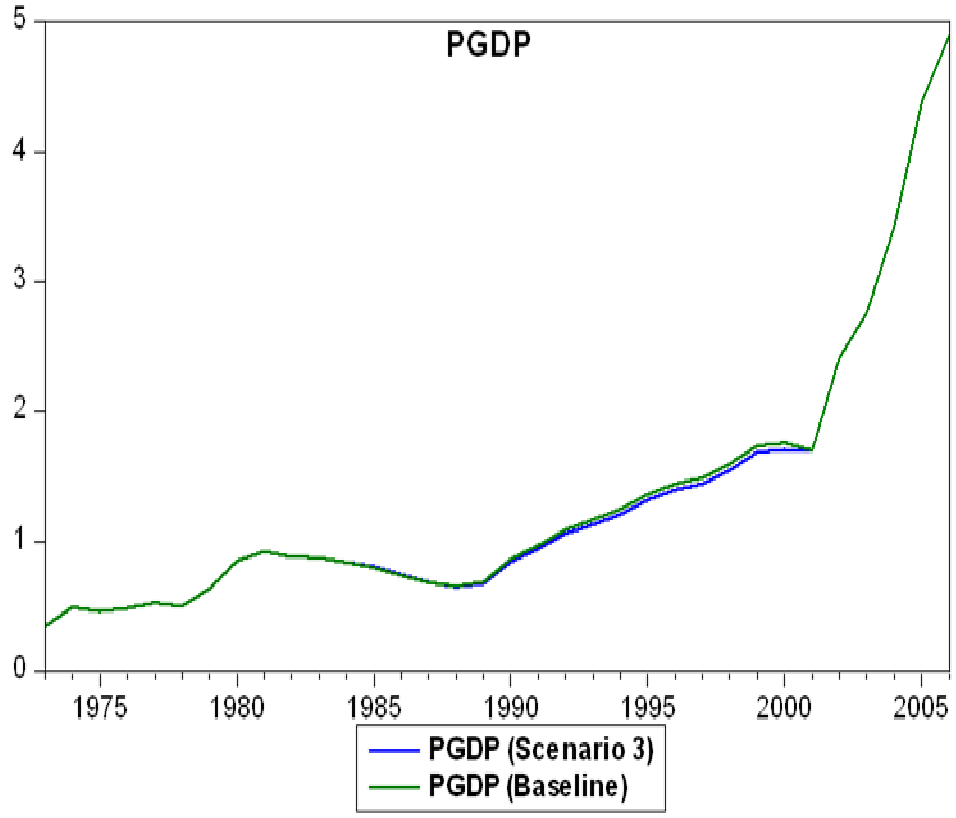

IRC
100,000
80,000
60,000
40,000
20,000
0
-20,000
1975
1980
1985
1990
1995
2000
2005
IRC (Scenario 3)
IRC (Baseline)

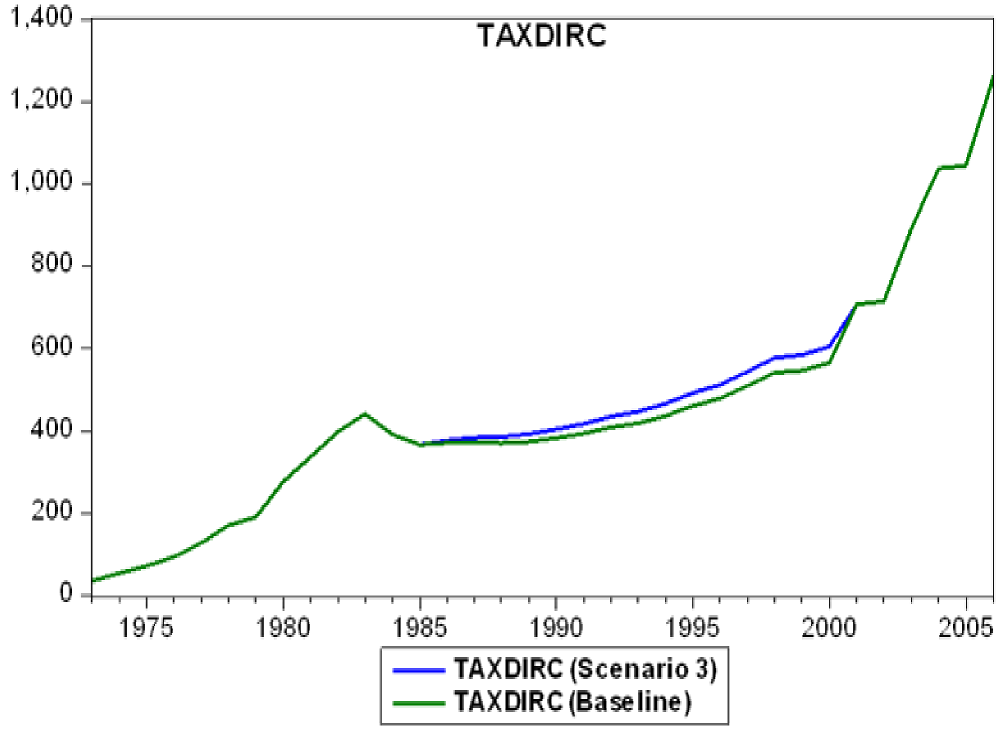

KNOILR
70,000
60,000
50,000
40,000
30,000
20,000
10,000
1975
1980
1985
1990
1995
2000
2005
KNOILR (Scenario 3)
KNOILR (Baseline)

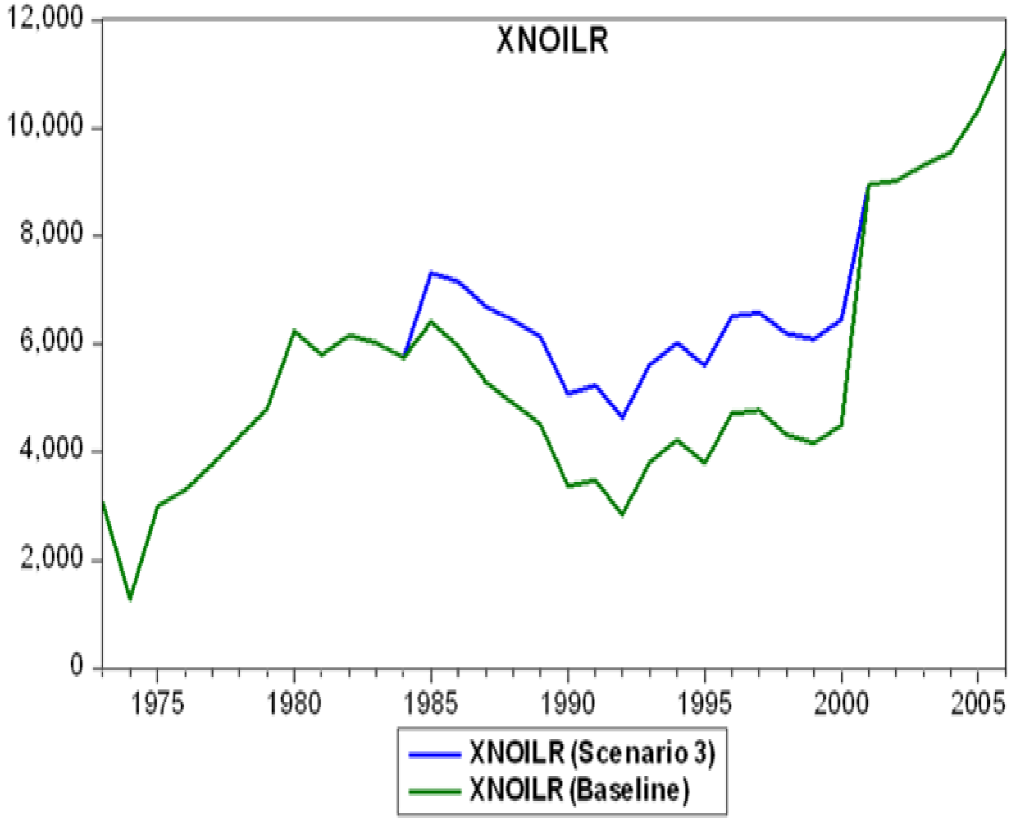

NDAC
20,000
10,000
0
-10,000
-20,000
-30,000
-40,000
-50,000
-60,000
1975
1980
1985
1990
1995
2000
2005
NDAC (Scenario 3)
NDAC (Baseline)

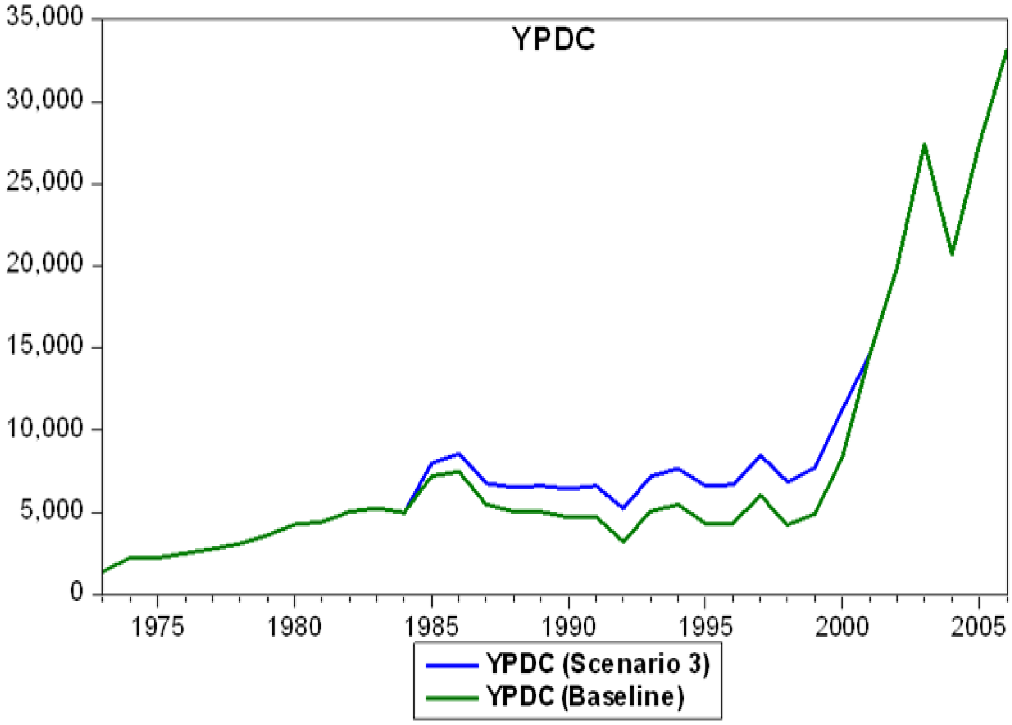

MS
20,000
16,000
12,000
8,000
4,000
0
1975
1980
1985
1990
1995
2000
2005
MS (Scenario 3)
MS (Baseline)

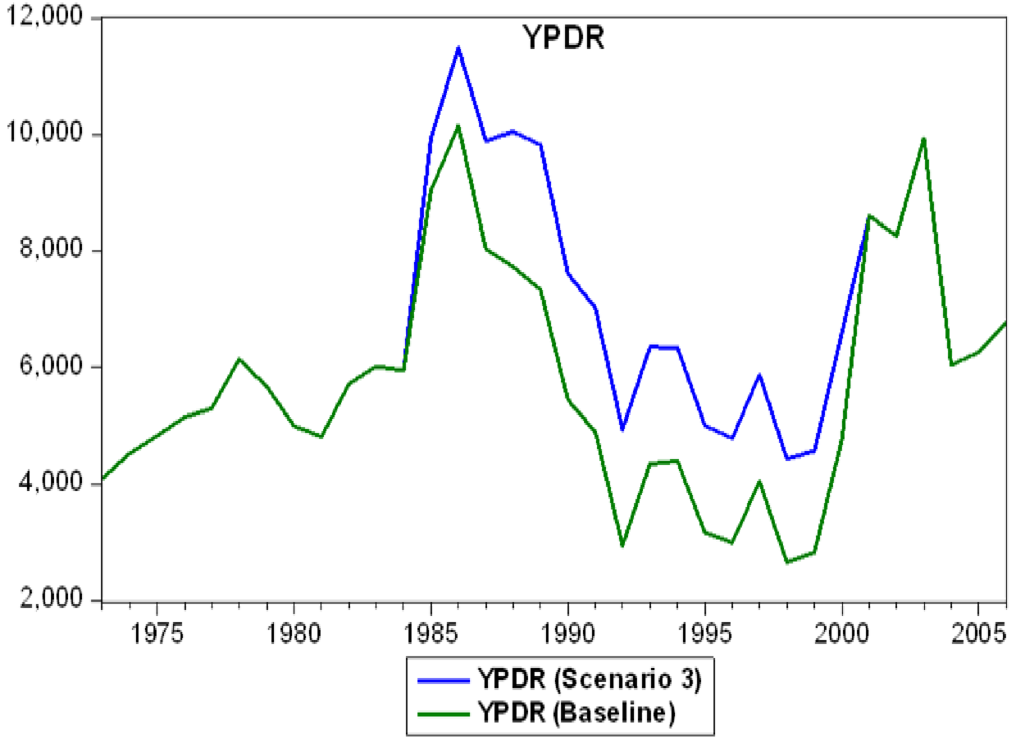

PCP
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
1975
1980
1985
1990
1995
2000
2005
PCP (Scenario 3)
PCP (Baseline)


PGDP
5
4
3
2
1
0
1975
1980
1985
1990
1995
2000
2005
PGDP (Scenario 3)
PGDP (Baseline)


TAXDIRC
1,400
1,200
1,000
800
600
400
200
0
1975
1980
1985
1990
1995
2000
2005
TAXDIRC (Scenario 3)
TAXDIRC (Baseline)


XNOILR
12,000
10,000
8,000
6,000
4,000
2,000
0
1975
1980
1985
1990
1995
2000
2005
XNOILR (Scenario 3)
XNOILR (Baseline)


YPDC
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1975
1980
1985
1990
1995
2000
2005
YPDC (Scenario 3)
YPDC (Baseline)



The third scenario that is depicted in Figure 6.5 above involves a number of important observations that can be presented as follows:

- It can be noticed from Figure 6.5 above that this scenario corresponds, roughly, with the fiscal policy scenario in terms of the degree and direction of influence.
- The sole variation between the fiscal policy, which has described in the first scenario and this scenario, lies in the fact that the latter has shown some influence on foreign assets and thus increased the monetary base effect on the money supply.
- This scenario provides further evidence that the monetary policy in Libya, according to this model, is less efficient than the fiscal policy; this was deduced by comparing the fiscal and monetary policy scenarios that have been given above.
- This scenario also shows that a fiscal policy should be the main policy in

the management of the Libyan economy and that the role of a monetary policy should be confined to supporting fiscal policy until the appropriate circumstances arise which can lead to the implementation of the monetary policy efficiently.

6.6 Conclusions

This chapter has carried out the two main objectives of the econometric studies, namely the forecasting and the policy analysis. Accordingly, to fulfil this aim, the model of the study has been solved as a whole, simultaneously using the dynamic simulation technique.

It is evident from the dynamic simulation of the model that the model's performance is, generally, quite satisfactory whereby the model tracking behaviour can be clarified as a good fit and this is realized for most of the equations, which performed much better than it is expected from a model for a developing country such as Libya.

The evaluation of the forecast accuracy of the model using the (MAPE), (RMSPE), and the Theil inequality coefficient (U) asserted a relatively good performance of the model.

The simulations' experiments in this chapter have evaluated the potential influences of the two major policy options, namely the fiscal and the monetary policy. As expected, with regard to the analysis of the monetary policy scenario when compared with the fiscal policy scenario, it can be concluded that the monetary policy is less efficient when compared to the fiscal policy, according to this proposed model for the analysis of economic policy in Libya.

In addition also, it is evident that fiscal policy should play a key role in the management of the economy and the role of the monetary policy should be confined to supporting fiscal policy.

CHAPTER SEVEN: IMPLICATION OF THE STUDY

7.1 Introduction

This study started by building an econometric model for the Libyan economy, which reflected all the properties that characterise the Libyan economy. Then this model can be used in the forecasting and analysis of several economic policies. The performance of the model was what was expected especially in the criteria that were used for judging the forecasting ability of the model, for seeing how fiscal policy has influenced in the model and in the expected role of monetary policy.

This chapter will provide the clear conclusions from this study. It is divided into five parts as follows: the first includes a brief introduction about the topic of the chapter; the second part gives a summary of the entire study. The third section presents a list of the key findings of the study. Sections four and five provide a summary of the recommendations and suggestions for future studies, respectively.

7.2 Summary of the study

As previously mentioned, the implicit aim in this kind of the studies, especially within developing countries, is to provide a tool, which allows the economic decision maker to stand on solid ground in the hope of reducing the problems that arise from the stochastic and arbitrary decisions in such countries. Which, in turn, therefore, minimizes the waste of economic resources and then allocates these resources in a better - if not optimal - way and this is the ultimate goal that most countries have an ambition to achieve.

To make this aim is achievable; this study constructs a small econometric model for the Libyan economy with a view to assessing the existing and alternative economic policies, specifically fiscal and monetary policies, aiming to explore their transmission mechanisms and interaction. In addition, the model captures the main characteristics of the economy whilst also exploiting developments in economic theory and in econometric analytical tools.

Moreover, the model is designed to include six important blocks in the Libyan economy, namely the aggregate demand block, the aggregate supply block, the balance of payments' block, the government block, the monetary block, and the price block, and the model has been estimated utilizing time-series data spanning the period from 1970 to 2006.

It is customary in this kind of research to divide it into two parts, the first part dealing with theoretical topics by surveying the related economic literature of the study area in order to justify the variables contained in the model which is being constructed and specified for the economy under consideration. Additionally, this part also deals with the theoretical discussion of the methodology of the study and the developments that have taken place within the used estimation methods.

The practical side of research includes two key factors; firstly discussing the structural analysis of the model which is usually achieved by estimating the individual equations of the proposed model for the study using one of the conventional methods of estimating individual equations; this expresses the achievement of the first goal on the use of econometric models. In this context, the single equations of the model were estimated by using the 'Gets' technique[41] which involves the formulation of a 'general' unrestricted model that is

[41] The single equation estimation is achieved – as mentioned previously - by using the PcGive 12. For more details, see Doornik, Hendry, 2006.

congruent with the data and the application of a 'testing down' process, eliminating variables with coefficients that are not statistically significant, leading to a simpler 'specific' congruent model that encompasses rival models. It is worthwhile noting that this technique was invented based on London School of Economics (LSE) methodology.

Secondly, it includes achieving the remaining two goals of the use of econometric models that are introduced by testing the predictability of the model and analysing various economic policies. This is achieved by solving the model as an integrated system simultaneously using a method based on a dynamic simulation technique, which uses one of the non-linear estimation methods, such as Gauss-Seidel method[42], which has been relied upon to solve the study model.

Applied steps to solve the complete model using the dynamic simulation are carried out using the exogenous variables' values, in addition to the values of the parameters that were estimated by solving the individual equations of the model, as explained in the first part of the practical element.

The solution, which is derived from the dynamic simulation, is called the control or base line solution that is used in calculating the prediction criteria, whether they are inside or outside the sample period. It is also used in the application of different scenarios for economic policy variables when performing each experiment separately.

The study consisted of seven chapters. The first chapter gave an overview of the study theme by providing an introduction and the background to the study. The second chapter summarized developments in the Libyan economy for each of the major sectors for the sample period 1970 to 2006.

[42] The model as an integrated system is solved – as previously mentioned- by using the EViews 7.2. For more details, see Quantitative Micro Software, 2009.

The third chapter surveyed econometric modelling and its applications in a developing country like Libya. This review aimed to examine the roots, developments and main features of econometric modelling from a theoretical point of view; the remaining part of chapter three focused on the fiscal and monetary policies' transmission mechanisms and it shed light, at the end, on the mutual interaction between these policies.

The fourth chapter described the theoretical background of the model by reviewing all the theories that relate to the equations of the model.

Chapter five presented the estimated and the tested results of the behavioural equations of the model. These results have faced at least three levels of assessments in order to ensure the validity of all the variables in the various equations. The sixth chapter carried out the two remaining objectives of the econometric studies, namely the forecasting accuracy and policy analysis by solving the model as a whole simultaneously using the dynamic simulation technique. Finally, the seventh chapter provided a summary of the entire study, the findings of the study and a summary of the recommendations and suggestions for future studies, respectively.

7.3 Findings of the study

The following sections provide a summary of the findings of the study.

- The main aim and objectives of this study of building an econometric model for the Libyan economy for the purpose of forecasting and policy analysis have been achieved through the construction of the model that was specified in chapters three and four, and by the estimation of model's individual equations in chapter five. The policy analysis and the clarifying of the transmission mechanism's impact on the model variables were also achieved in chapter six.

- With respect to the research questions, the following points can be made.
    1. There are many economic policy variables in this study. Examples of these variables are as follows: real bank credit to the non-oil sector *CRNOILR*, the Libyan dinar exchange rate against the USA dollar *EXCHRATE*, real government investment in the non-oil sector *IGNOILR*, the Treasury's share of oil revenues *OREV*, and taxes on imports *TARIFF.* In the experiments on these policies, the real bank credit to the non-oil sector *CRNOILR* and the real government investment in the non-oil sector *IGNOILR* have been selected as monetary and fiscal policy variables respectively.
    2. The theoretical monetary and fiscal policies' transmission mechanisms in the Libyan economy have been elucidated in the economic policy scenarios in chapter six. The first scenario that was dedicated to fiscal policy has clarified four transmission mechanism channels for fiscal policy in Libya that are total government spending *GETOT*, the non-oil real capital stock *KNOILR*, non-oil real private investment expenditure *IPNOILR* and the real imports of capital goods *IMCAPR*. Whereas the monetary policy scenario has influenced the Libyan economy through two main channels that are net domestic assets *NDAC* and real non-oil gross domestic product *XNOILR*, as explained in detail in chapter six.
    3. All the fiscal and monetary policies that have influence in Libya (which can be deduced from the direction and the pattern of the relationship between the different variables in the model) were

consistent with the tenets of economic theory, which are concerned with this aspect. With regard to the nature of the relationship between these policies, it can be said that, according to the combined scenario, it was not as strong as required.

- It should be noted that the inefficiency of many of the channels of the monetary policy transmission mechanism is the main reason behind the inability of this policy. This can be attributed to many reasons, such as the lack of the central bank independency in drawing up and implementing the monetary policy and the absence of the role of important variables such as the interest rate.
- The Central Bank lacks its independency in drawing up and implementing the monetary policy.
- The model of the study has, clearly, reflected the essential features of the Libyan economy through explication the variables contained in the model equations.
- The major finding from the review of the Libyan economy in chapter two is that while economic growth has been impressive for most of the review period, this status is unlikely to be sustainable as it depends on oil revenues as a main source of financing the development process.
- The review in the second chapter also showed that, since the freezing of the United Nations' sanctions, Libya has decided to undertake comprehensive structural reforms and accelerate its transition to being a market economy.
- It is worthwhile noting that most of the equations performed well in the single estimation. The estimated results have reflected the many factors that have had a role in influencing the Libyan economy during the study period. Furthermore, it can be said that the satisfactory formulas that have

been obtained from the estimates of these equations were expected due to the use of the Autometrics' algorithm which played an important role in the formulation of the model and which provided solutions that facilitated the analysis of the various economic policies in this study.

- It is noteworthy that these results indicate that they considered fairly parsimonious specifications and they adequately suit the particular features of the Libyan economy, as a small developing country.
- It is evident from the dynamic simulation that the model performance was, generally, quite satisfactory, whereby the model tracking behaviour clarified a good fit and this was realized for most of the equations.
- The evaluation of the forecast accuracy of the model using (MAPE), (RMSPE), and the Theil inequality coefficient (U) asserted the relatively good performance of the model.
- The simulations' experiments in this study have evaluated the potential influences of the two major policy options, namely the fiscal policy and the monetary policy. Accordingly, it can be stated that:
    1. Fiscal policy has played a key role in the management of the economy. This is consistent with the fact that the government is the main player in the economy of a developing country such as Libya. Where government is control the main sources of revenue on the one hand, and contribute significantly to capital formation, investment, and consumer spending on the other hand. Needless to say, that the state's ability to control these variables reflects the ability of this country in the design and implementation robust fiscal policies. As well as the recent world financial crisis in 2007 (subprime mortgage crisis) highlighted once again the role of government in the economy through an effective fiscal policy.

2. Monetary policy is less efficient when compared to fiscal policy according to this proposed model for the analysis of economic policy in Libya.

7.4 Recommendations

The study also determined some recommendations that can be summed up as follows:

- Fiscal policy should play a key role in the management of the economy.
- The role of the monetary policy should be confined to supporting the fiscal policy.
- The importance of the non-oil sector in this model highlighted the need to diversify sources of income by making the production base more diverse so it can contribute more effectively in order to meet the needs of domestic demand thereby reducing the problems of aggregate demand, which may cause problems for the Libyan economy.
- Furthermore, the economy should not rely on oil revenues as a sole source of income due to the shocks that can occur in this sector, which may cause instability in the process of financing development.

7.5 Suggestions for further research

- The relationship between the oil sector and other sectors in the economy should not be confined to a purely financial relationship but must be supported by efficient forward and backward linkages in order to develop the entire economy.
- Moreover, there is a need to develop the emerging Libyan financial market in order that it can play a key role in supporting monetary policy

tools and thus help the Central Bank to run the monetary policy efficiently.

- Needless to say, there are data problems -in terms of both quantity and quality- rooted in all developing countries. However, that does not abolish the need for a quantitative method which enables the researchers to find out the different effects of the economic variables on each other, and thus how to predict problems that may occur in the future and how to avoid them.
- Although the current study included several major sectors in the Libyan economy there are many obstacles, which stand in the way of building of comprehensive model for all variables of interest. In this regard, the real sector in Libya suffers from the problems of poor data and its short span when compared with the monetary sector. This latter sector has quarterly data covering all the monetary variables over a long period of time. This lack of information in the real sector could deprive the Libyan economy from the building a quarterly model which includes all the important variables in the real and monetary sectors.
- Finally, one can consider the results that have emerged from this study as a kernel that should be developed in the future and, by avoiding this study’s shortcomings, then to build a model that includes the economic variables on both macro and micro levels once the appropriate data are available to do so.

APPENDICES

Appendix 1 the Background of the additional test for the estimated equations

Below is the theoretical background of the additional test have been calculated for the all the estimated equation in chapter five, and their results are in the following appendix No.2.

- **Normality test,** this test is concerned with the degree of skewness or kurtosis in the model variables, where, Doornik and Hansen have proposed it in 1994. It should be noted that, this test is considered a development of the (LM) test which invented by Jarque and Bera in 1987. This test falls under the (χ^2) distribution, and in any case, the null hypothesis will be rejected, when reach the statistic (χ^2) amount, greater than its critical value that reported in PcGive 12, where it computed and adjusted according to Doornik and Hansen 1994 (see, Doornik and Hendry, 2006; 282).
- **Misspecification test (RESET test)**, comparing with the normality test of Jarque and Bera, which investigates the degree of skewness or kurtosis in the model variables, the Ramsey (RESET) test is commonly used to detect the general misspecification in the model. Ramsey 1969 has proposed this test to detect misspecification errors in the econometric models. Where the null hypothesis tests, whether or not, the original model *(Y)* is mis-specified (has incorrect functional form), compared with the alternative one, which contains in its explanatory variables, higher order of the estimated dependent variable of the original model, namely, (Y^2,Y^3,Y^4 and so on). Practically, the null hypothesis confirms that these higher orders of the dependent variable does not existed. Ramsey test follows (F) distribution, where, if the (RESET) statistic is greater than the

(F) critical value did not accept the null hypothesis, and then the model is correctly specified**.**

- **Heteroscedasticity test** using squares (Hetero), and using squares and crossproducts, (Hetero-X), to detect the existence of the heteroscedasticity, PcGive provides two tests; both are based on White (1980). The first examines heteroscedasticity using an auxiliary regression model contains original explanatory variables *(X)* and all their squares (X^2), named (Hetero test). The null hypothesis (H_0) in this case is the variance of the errors term is unconditionally homoscedastic, while the alternative hypothesis (H_1) is the errors term variance related to both kind of the explanatory variables *(X,* and X^2*)* in the regression is heteroscedastic.

  From the auxiliary regression computed the following formula:

$$F = TR^2$$

  Where *(F)* computed or observed value of *(F)*, *(T)* number of observations and (R^2) is the coefficient of determination. As in conventional *(F)* test, if the critical value of *(F)* is lower than the observed value, then we should reject the null hypothesis.

  The second test examines heteroscedasticity using an auxiliary regression model contains all squares and crossproducts of the original explanatory variables, named (Hetero-X test). This test is applicable, only if sample size is very large compared to the number of variables in the regression.

  The null hypothesis (H_0) in this case is the variance of the errors term is homoscedastic, while the alternative hypothesis (H_1) is the errors term variance unrelated to both kind of the explanatory variables *(*cross*-X's,* and $\mathbf{X^2}$*)* in the regression is heteroscedastic. The test follows both of conventional(χ^2) and (F) tests.

Appendix 2 Additional tests of the estimated equations

The tests below are the results of the previous omitted tests for all the model equations as they appeared in chapter five.

Real private consumption expenditures *(CPR)*

Normality test: χ^2 (2) = 7.6117 [0.0222]*

Hetero test: F(10, 20) = 0.54246 [0.8398]

Hetero-X test: F(20, 10) = 0.74152 [0.7278]

RESET test: F(1, 30) = 1.5228 [0.2268]

Government consumption expenditure *(CGC)*

Normality test: χ^2 (2) = 2.3486 [0.3090]

Hetero test: $F(8, 22) = 0.90623$ [0.5289]

Hetero-X test: F(14, 16) = 0.61763 [0.8146]

RESET test: F(1, 30) = 3.8915 [0.0578]

Non-oil real private investment expenditure *(IPNOILR)*

Normality test: χ^2 (2) = 1.9437 [0.3784]

Hetero test: F(7, 22) = 2.8571 [0.0279]*

Hetero-X test: F(13, 16) = 1.6838 [0.1607]

RESET test: F(1, 29) = 0.80363 [0.3774]

Real imports of consumer goods *(IMCONR)*

Normality test: χ^2 (2) = 0.53832 [0.7640]

Hetero test: F(10, 19) = 1.4225 [0.2438]

Hetero-X test: F(20, 9) = 0.68680 [0.7692]

RESET test: F(1, 29) = 5.4573 [0.0266]*

Real imports of capital goods, ***(IMCAPR)***

Normality test: χ^2 (2) = 4.8251 [0.0896]

Hetero test: F(8, 22) = 0.91337 [0.5237]

Hetero-X test: F(14, 16) = 0.55865 [0.8600]

RESET test: F(1, 30) = 1.7688 [0.1936]

Oil exports, millions of barrels ***(EXOILMB)***

Normality test: χ^2 (2) = 3.3000 [0.1920]

Hetero test: F(6, 25) = 0.96086 [0.4712]

Hetero-X test: F(9, 22) = 0.59615 [0.7865]

RESET test: F(1, 31) = 2.4157 [0.1303]

Net financial income from abroad, ***(NFIFBC)***

Normality test: χ^2 (2) = 7.2489 [0.0267]*

Hetero test: F(4, 28) = 3.4092 [0.0216]*

Hetero-X test: F(5, 27) = 3.0565 [0.0259]*

RESET test: F(1, 32) = 0.16894 [0.6838]

Net compensation of employees from abroad ***(WAGEFBC)***

Normality test: χ^2 *(2) =* 0.95790 [0.6194]

Hetero test: *F (6, 24) =* 0.54564 [0.7683]

Hetero-X test: *F (9, 21) =* 0.47297 [0.8765]

RESET test: *F (1, 30) =* 0.32358 [0.5737]

Non-oil gross domestic product, Real ***(XNOILR)***

Normality test: χ^2 (2) = 4.5106 [0.1048]

Hetero test: F(10, 18) = 0.64642 [0.7568]

Chow test: $F(10, 19) = 0.98411$ [0.4883] for break after 27

GDP implicit price deflator ***(PGDP)***

Normality test: χ^2 (2) = 9.4955 [0.0087] **

Hetero test: $F(8, 21)$ = 3.1373 [0.0169]*

Hetero-X test: $F(14, 15)$ = 9.4589 [0.0000] **

RESET test: $F(1, 29)$ = 0.71113 [0.4060]

Non-oil GDP implicit price deflator ***(PGDPNOIL)***

Normality test: χ^2 (2) = 25.846 [0.0000] **

Hetero test: $F(8, 22)$ = 0.77480 [0.6287]

Hetero-X test: $F(14, 16)$ = 0.90357 [0.5717]

RESET test: $F(1, 30)$ = 0.22136 [0.6414]

Exports implicit price deflator ***(PEXOILLD)***

Normality test: χ^2 (2) = 6.4408 [0.0399]*

Hetero test: $F(8, 22)$ = 15.594 [0.0000] **

Chow test: $F(10, 21)$ = 13.229 [0.0000] ** for break after 27

Consumer implicit price deflator ***(PCP)***

Normality test: χ^2 (2) = 3.2721 [0.1948]

Hetero test: $F(8, 21)$ = 1.7960 [0.1347]

Hetero-X test: $F(14, 15)$ = 2.0068 [0.0966]

RESET test: $F(1, 29)$ = 13.738 [0.0009] **

Investment implicit price deflator, ***(PIT)***

Normality test: χ^2 (2) = 10.102 [0.0064] **

Hetero test: $F(8, 22)$ = 5.4970 [0.0007] **

Hetero-X test: $F(14, 16)$ = 14.954 [0.0000] **

RESET test: $F(1, 30)$ = 7.3232 [0.0111]*

Income tax *(TAXDIRC)*

Normality test: χ^2 (2) = 4.2787 [0.1177]

Hetero test: $F(6, 25)$ = 0.76541 [0.6040]

Hetero-X test: $F(9, 22)$ = 0.61168 [0.7742]

RESET test: $F(1, 31)$ = 2.4308 [0.1291]

Money supply *(MS)*

Normality test: χ^2 (2) = 9.5809 [0.0083] **

Hetero test: $F(9, 20)$ = 32.638 [0.0000] **

Hetero-X test: $F(19, 10)$ = 137.40 [0.0000] **

RESET test: $F(1, 29)$ = 18.802 [0.0002] **

Appendix 3 Data of the model

This appendix contains the database that utilized in the estimation of the model equations. The available data are annual data and spinning the period from 1970-2006, the sources of this data are:

1- The publications of the Secretariat of Planning: National Accounts and socio-economic indicators,
2- The publications of the Libyan Central Bank (LCB): Economic Bulletins and annual reports

Finally, it should be noted that the variables name as stated below:

Nomenclature	Description of the variable	Source of the variable data
CPR	Private consumption expenditures on goods and services real	National Accounts
CGC	Government consumption expenditure on goods and services,	National Accounts
IPNOILR	Non-oil real private investment expenditure	National Accounts
KNOILR	Non-oil real capital stock	National Accounts
IMCONR	Real imports of consumer goods	National Accounts
IMCAPR	Real imports of capital goods	National Accounts
EXOILMB	Oil exports, In millions of barrels	Economic Bulletins of Central Bank
EXOILOC	Oil exports in millions of dinars	Economic Bulletins of Central Bank
NFIFBC	Net financial income from abroad	Economic Bulletins of Central Bank
WAGEFBC	Net compensation of employees from abroad	National Accounts
EXTOTC	Total Exports	National Accounts
IMTOTC	Total imports	National Accounts
NETYFBC	Net income from abroad	Economic Bulletins of Central Bank
BOTGSC	Balance of trade, current (goods and services)	Economic Bulletins of Central Bank
BOPC	Balance of payments, current	Economic Bulletins of Central Bank
IRC	The balance of foreign assets (reserves)	Economic Bulletins of Central Bank
XNOILR	Non-oil gross domestic product, Real	National Accounts
GDPR	gross domestic product, Real	National Accounts
PGDP	*GDP* implicit price deflator	National Accounts

APPENDIXES

Nomenclature	Description of the variable	Source of the variable data
INFGDP	Inflation rate of *GDP*	National Accounts (prepared by the researcher)
PGDPNOIL	Non-oil *GDP* implicit price deflator	National Accounts
INFlGDPNOIL	Inflation rate in non-oil *GDP*	National Accounts (prepared by the researcher)
PWOILLD	the average price of a barrel of oil in the global market, in Libyan Dinars	National Accounts, and Economic Bulletins of Central Bank
PCP	Consumer implicit price deflators	Economic Bulletins of Central Bank
PIT	Private investment implicit price deflators	National Accounts
GDPCfc	*GDP* at factor price	National Accounts
TAXDIRC	Income tax (total of direct taxes)	National Accounts
TAXINDC	Non-direct Tax, current	National Accounts
GTYC	Total government income	National Accounts
YPDC	Personal disposable income	prepared by the researcher
YPDR	Personal disposable income, real	prepared by the researcher
GTEC	Total government spending	National Accounts
BUDGET	Deficit or surplus in the government budget	prepared by the researcher
NDAC	Net domestic assets	Economic Bulletins of Central Bank
GDPRG	*GDP* growth rates	National Accounts
GDPmp	*GDP* at market price, current	National Accounts
MS	Money Supply	Economic Bulletins of Central Bank

APPENDIXES

YEAR	CPR	CGC	IPNOILR	KNOILR	IMCONR	IMCAPR
1970	1623.766	220.700	119.731	10079.183	300.040	279.705
1971	1596.637	318.400	190.667	11706.992	349.467	288.672
1972	1830.01	359.100	255.420	13233.898	333.056	460.238
1973	1930.176	465.400	322.201	14457.814	518.144	584.678
1974	1801.194	864.800	381.404	15258.341	666.463	617.108
1975	1743.27	1044.300	426.911	16025.683	742.911	653.692
1976	1908.429	1184.600	362.968	16684.789	518.878	591.153
1977	2050.277	1400.300	309.361	17304.738	688.228	708.280
1978	2217.266	1691.800	285.860	17986.477	671.923	914.754
1979	2451.612	2006.600	178.000	18705.702	692.265	1020.370
1980	2838.17	2442.300	293.743	19499.243	871.022	972.041
1981	4722.19	2551.600	38.178	20383.198	892.131	1195.045
1982	3753.634	2456.300	545.949	21359.133	603.310	941.620
1983	3771.481	2380.900	565.821	22538.034	513.524	805.946
1984	3525.424	3158.500	381.434	23772.484	439.972	1001.385
1985	3861.629	2229.200	44.825	25091.930	286.784	679.036
1986	4252.973	2055.000	369.599	26652.225	345.842	776.567
1987	5719.16	1615.800	260.215	28523.269	282.549	775.393
1988	5276.627	2195.700	516.285	30452.710	297.515	1109.786
1989	4932.509	2520.000	467.731	32291.014	327.737	758.610
1990	3964	1997.400	433.300	33727.662	342.606	522.616
1991	5548.677	2375.700	301.676	35205.533	326.107	509.888
1992	5028.608	2755.400	409.203	36906.855	286.200	479.643
1993	5658.622	2132.000	174.158	38721.363	217.844	615.267
1994	5431.362	2254.000	187.319	40681.845	213.141	478.120
1995	5136.918	2383.000	176.915	42337.441	291.335	444.620
1996	5415.761	2903.000	199.158	43901.337	237.381	549.475
1997	5695.068	3333.000	176.571	45293.308	278.864	607.434
1998	5959.705	3339.000	174.341	46609.071	318.555	550.867
1999	5825.658	3101.600	185.570	47988.169	184.806	533.137
2000	5128.112	3615.900	236.461	49337.029	223.680	591.204
2001	7465.772	3529.700	644.887	50826.793	236.246	1039.999
2002	5545.519	3922.800	802.305	52255.321	399.153	937.395
2003	6701.464	3825.600	832.126	54140.003	395.301	1098.802
2004	7301.899	5912.900	805.343	56310.318	550.767	1337.357
2005	6901.95	6573.000	888.255	59045.594	532.966	1074.179
2006	7606.689	7610.000	970.167	62192.113	491.721	974.455

Continued

APPENDIXES

YEAR	EXOILMB	EXOILOC	NFIFBC	WAGEFBC	EXTOTC	IMTOTC	NETYFBC
1970	1208.900	699.100	-166.700	51.300	760.0	372.2	-218.000
1971	990.100	956.900	-157.100	54.900	975.1	436.0	-212.000
1972	808.100	948.200	-191.400	94.600	997.8	552.4	-286.000
1973	793.700	1161.700	-239.900	78.300	1240.3	826.5	-318.200
1974	545.800	2388.400	-367.600	71.400	2489.8	1427.9	-439.000
1975	522.400	1925.300	-229.800	71.700	2053.2	1665.7	-301.500
1976	675.900	2711.200	-324.600	72.400	2881.4	1671.4	-397.000
1977	710.000	3189.700	-359.801	77.500	3430.8	1948.6	-437.301
1978	677.000	2719.500	-311.799	161.500	2978.1	2199.5	-473.299
1979	717.600	4419.200	-251.600	301.900	4801.4	2821.7	-553.500
1980	619.200	6486.400	-19.202	332.300	6537.9	3752.1	-351.502
1981	392.900	4226.300	32.400	464.900	4409.5	5127.7	-432.500
1982	305.700	3875.500	-150.599	472.700	4104.5	3920.1	-623.299
1983	350.400	3573.100	-224.000	605.300	3703.3	3343.1	-829.300
1984	340.200	3020.800	-197.601	367.200	3350.8	3386.0	-564.801
1985	358.700	3184.300	-22.700	238.300	3673.2	2487.9	-261.000
1986	365.000	2158.000	-13.900	166.200	2459.0	1895.7	-180.100
1987	321.200	1422.100	108.300	138.500	1697.3	2009.2	-30.200
1988	338.000	1530.500	92.800	142.000	1652.2	2114.3	-49.200
1989	380.700	1981.500	17.900	141.300	2212.9	2393.7	-123.400
1990	460.600	3085.100	49.200	126.200	3247.5	2547.3	-77.000
1991	496.600	2667.600	41.700	115.200	3038.4	2763.0	-73.500
1992	435.800	2358.200	91.200	111.900	2918.5	2430.0	-20.700
1993	404.500	1886.200	-9.400	99.400	2635.8	2944.0	-108.800
1994	411.600	2271.400	15.700	98.600	2694.6	2603.1	-82.900
1995	415.600	2470.400	55.800	91.900	3116.1	2394.1	-36.100
1996	391.100	2911.000	78.500	119.100	3490.2	2909.5	-40.600
1997	406.500	2639.900	109.100	88.800	3790.2	3090.8	20.300
1998	421.300	1752.000	147.200	95.500	2467.6	2660.7	51.700
1999	390.300	2778.500	144.200	97.700	3374.3	2432.9	46.500
2000	379.200	3841.900	-219.730	100.700	6185.6	2690.3	-320.430
2001	384.300	3972.100	-543.953	50.600	5563.1	5057.6	-594.553
2002	343.600	7491.600	336.730	63.000	14434.2	11363.0	273.730
2003	432.300	11536.200	698.188	129.200	18431.8	11260.2	568.988
2004	459.900	17009.400	-71.773	12.200	24897.3	13885.3	-83.973
2005	487.500	30312.200	-367.655	69.000	39955.2	17715.1	-436.655
2006	519.300	34891.200	-781.574	145.900	51571.6	20715.0	-927.474

Continued

APPENDIXES

YEAR	BOTGSC	BOPC	IRC	XNOILR	GDPR	PGDP	INFGDP
1970	229.700	0.000	573.700	2644.350	5532.643	0.233	0.000
1971	278.100	0.000	573.700	3291.438	5656.599	0.280	20.448
1972	77.800	135.600	709.300	3669.322	6169.118	0.284	1.315
1973	17.500	-315.700	393.600	3050.826	6269.983	0.348	22.487
1974	571.300	509.800	903.400	1276.609	7707.725	0.492	41.487
1975	339.300	-24.300	879.100	2983.421	7973.620	0.461	-6.426
1976	632.300	252.300	1131.400	3290.826	9794.670	0.487	5.642
1977	639.198	495.598	1626.998	3773.108	10685.848	0.525	7.896
1978	218.499	-183.770	1443.228	4285.786	10952.583	0.502	-4.462
1979	1116.399	657.152	2100.380	4788.259	11967.506	0.635	26.603
1980	2431.701	1896.695	3997.075	6235.133	12410.071	0.850	33.861
1981	-1173.400	-1227.17	2769.905	5804.374	9548.503	0.921	8.356
1982	-461.697	-595.928	2173.977	6157.453	10145.187	0.880	-4.452
1983	-486.501	-528.879	1645.098	6020.703	9739.396	0.874	-0.740
1984	-431.201	-509.590	1135.508	5747.192	9318.303	0.838	-4.163
1985	564.402	699.383	1834.890	5676.940	9831.964	0.799	-4.649
1986	-48.999	66.737	1901.627	6688.468	9666.121	0.720	-9.831
1987	-307.699	-294.450	1607.177	6834.098	9161.865	0.638	-11.364
1988	-521.899	-397.870	1209.307	7078.588	9485.139	0.652	2.178
1989	-307.502	87.411	1296.718	7106.483	9810.517	0.733	12.391
1990	623.301	327.864	1624.582	5003.100	8246.900	1.000	36.428
1991	-61.497	71.453	1696.036	5114.822	9061.529	0.966	-3.357
1992	396.201	500.640	2196.676	5258.991	8965.788	1.030	6.568
1993	-415.700	-522.413	1674.263	5784.295	9217.993	0.991	-3.749
1994	9.200	95.434	1769.697	5429.367	9014.889	1.073	8.218
1995	699.199	711.261	2480.957	5644.646	9254.190	1.153	7.502
1996	540.598	533.180	3014.138	6083.689	9683.712	1.273	10.384
1997	722.000	715.775	3729.912	6216.252	9818.067	1.406	10.419
1998	-97.800	-199.221	3530.692	5869.781	9608.642	1.312	-6.631
1999	990.699	319.097	3849.789	6416.265	9737.553	1.445	10.136
2000	3211.431	2743.794	6593.583	6564.373	10050.040	1.753	21.294
2001	2016.073	695.376	7288.959	8950.707	12699.297	1.702	-2.903
2002	881.852	1454.565	8743.524	9022.228	12569.238	2.413	41.749
2003	4398.582	6627.352	15370.876	9308.031	13536.402	2.760	14.378
2004	6023.742	7974.606	23345.482	9548.665	14044.560	3.425	24.100
2005	19553.739	18107.587	41453.069	10325.129	15164.185	4.382	27.937
2006	29121.847	25544.615	66997.684	11427.445	16489.174	4.896	11.726

Continued

YEAR	PGDPNOIL	IFLGDPNOIL	PWOILLD	PEXOILLD	PCP	PIT	GDPCFC
1970	0.180	0.000	0.597	0.696	0.244	0.226	1288.300
1971	0.202	12.108	0.685	0.966	0.293	0.273	1586.500
1972	0.227	12.485	0.757	1.173	0.297	0.276	1753.000
1973	0.344	51.786	0.905	1.464	0.364	0.338	2182.300
1974	1.105	220.853	3.185	4.376	0.515	0.478	3795.700
1975	0.574	-48.023	3.185	3.685	0.685	0.467	3674.300
1976	0.613	6.793	3.416	4.011	0.700	0.498	4768.100
1977	0.619	0.991	3.677	4.493	0.723	0.528	5612.700
1978	0.627	1.246	3.769	4.017	0.751	0.553	5496.100
1979	0.639	1.839	5.120	6.158	0.773	0.602	7603.000
1980	0.646	1.167	8.500	10.475	0.985	0.683	10553.800
1981	0.757	17.219	9.649	12.656	0.990	0.726	8798.800
1982	0.763	0.723	9.610	12.677	1.041	0.743	8932.400
1983	0.779	2.086	8.619	9.620	0.952	0.756	8511.700
1984	0.800	2.676	8.369	8.879	0.862	0.768	7804.700
1985	0.767	-4.121	8.016	9.792	0.835	0.776	7852.100
1986	0.653	-14.866	4.272	5.912	0.753	0.700	6960.700
1987	0.605	-7.259	5.287	6.141	0.667	0.621	5847.800
1988	0.652	7.745	4.079	4.528	0.682	0.634	6186.000
1989	0.723	10.818	5.116	5.205	0.766	0.713	7191.000
1990	1.000	38.380	6.316	6.698	1.000	1.000	8246.900
1991	1.105	10.522	5.317	5.372	0.929	1.031	8757.300
1992	1.200	8.531	5.517	5.411	1.021	0.976	9233.900
1993	1.154	-3.757	5.277	4.663	1.058	1.067	9137.700
1994	1.248	8.137	5.629	5.518	1.103	1.092	9670.800
1995	1.292	3.486	5.976	5.944	1.222	1.247	10672.300
1996	1.375	6.457	7.425	7.443	1.257	1.255	12327.300
1997	1.495	8.719	7.261	6.494	1.469	1.367	13800.500
1998	1.674	11.940	5.545	4.159	1.354	1.486	12610.600
1999	1.571	-6.146	8.054	7.119	1.461	1.515	14075.200
2000	1.669	6.277	14.998	10.132	1.553	1.561	17620.200
2001	1.628	-2.476	14.891	10.336	1.389	1.528	21868.500
2002	1.767	8.555	29.491	21.803	2.099	2.166	30549.400
2003	1.842	4.202	36.583	26.686	1.939	2.181	37604.000
2004	1.977	7.346	44.861	36.985	2.117	2.401	48793.400
2005	2.180	10.243	68.295	62.179	2.328	2.461	67048.300
2006	2.195	0.700	78.291	67.189	2.447	2.648	81223.700

Continued

APPENDIXES

YEAR	TAXDIRC	TAXINDC	GTYC	YPDC	YPDR	GTEC	BUDGET	NDAC
1970	16.2	50.5	570.5	725.7	3116.541	343.3	195.2	-253
1971	12.7	55.2	744.2	861.9	3073.068	526.9	226.9	-419.9
1972	29.5	73.3	732.6	1053.1	3706.046	697.1	-9.4	-382.2
1973	36.5	99.2	750.2	1426.1	4097.339	965.2	-152.8	156.1
1974	54.4	165	1703.8	2231.4	4531.184	1645.2	-163.9	63.9
1975	71.9	219.9	1628.3	2226.6	4831.958	1878.5	-1027.8	621.8
1976	94.3	242.9	2461.4	2507.1	5150.106	2214.2	-235.3	583.2
1977	128.1	264.2	3049.1	2786.9	5305.894	2571.8	105.3	469
1978	170.7	307.3	2685.6	3085	6147.763	2976.2	-583.3	847.9
1979	190.5	393.2	4322.8	3609	5680.748	3679.2	155.9	882.4
1980	276.8	522.9	6808.5	4254.7	5003.044	4998.6	1046.9	-399.8
1981	336.3	753.6	5092.2	4437.7	4815.815	5424.2	-1297.4	1667.3
1982	398.1	552.2	4422	5039.6	5723.846	4822.2	-709.9	1999.2
1983	441.1	488	3717.1	5266	6025.548	4477.2	-785.8	2382.2
1984	391.9	654.3	3445.1	4988.3	5955.705	4993.2	-1164.9	2936.4
1985	352.8	413.9	3012	5235.8	6555.978	3752.5	-893.4	3044.1
1986	328.100	401.900	2205.3	5786.6	8035.682	3172.1	-1344.7	2714.8
1987	317	348.400	2121.6	4221.9	6614.535	2404.2	-841.8	3364.3
1988	329.8	617.7	2348.6	4444.5	6814.856	2918.1	-598.8	3619.1
1989	506.8	506.8	2651.8	5041.2	6877.594	3343.4	-141.6	4337.5
1990	357	334.5	2441.4	6130	6130.000	2699.4	-310.6	5893.8
1991	375	434.5	2870.5	6314	6533.348	3099	52.2	5701.9
1992	357	425.2	3612.2	6027	5852.002	3363.9	1373	6151.6
1993	435	430.9	2752.9	6814.2	6874.076	3449.8	344.7	6719.1
1994	363.8	610.9	3639.7	6642.4	6191.887	3671.8	1423.5	7387.6
1995	438	615.8	4737.8	6551.4	5680.866	3406.9	108.4	7873.2
1996	444	641.4	6669.4	6295.3	4945.273	4292.8	2957.5	7626.6
1997	441	676.1	6154.1	8319.2	5918.515	4776.2	1533	7165.9
1998	535	693.1	5594.1	7702.1	5868.612	4476.5	1128.1	7335.4
1999	620.1	664.6	6141.7	8595.4	5946.499	4356.5	1584.7	8500
2000	637.1	544.3	5843.6	12149.5	6929.715	5527.9	440.4	2580.3
2001	706.8	362.5	7068.1	14651.6	8606.670	9232.6	1162.5	2532.8
2002	715.1	364	9653.2	19934.1	8260.874	11892.8	1166.2	-6118.8
2003	890.6	384.8	8189	27414.5	9932.702	11984.3	942.8	-13071.2
2004	1037.6	852.6	24977.2	20719.9	6049.256	14662	7747.2	-18893.4
2005	1044	793.3	38943.3	27470.7	6268.860	17718	17600.3	-38149.3
2006	1259.7	712.8	49061.5	33149.2	6770.762	19556.3	27683.5	-58374.1

Continued

YEAR	GDPCmp	GDPRG	MS	BOPOTHC	CRNOILC	CUGDP	DUM_{0206}	DEPNOILC
1970	1329.3	0.000	241	363.2	93.8	102.024	0	51.3
1971	1626.8	2.240	364.5	586.1	105.3	93.100	0	50
1972	1798.4	9.061	413	-41.8	144.4	91.667	0	59.5
1973	2246.2	1.635	514	442.5	239.1	84.936	0	72.1
1974	3886.9	22.931	765	147.7	444.8	95.972	0	95
1975	3780	3.450	867.5	407.1	639	92.348	0	115.5
1976	4907	22.838	1139.4	893.3	729	106.562	0	138.2
1977	5763	9.099	1443.8	702.602	889.7	110.555	0	161.6
1978	5687.6	2.496	1687.8	908.171	922.8	109.168	0	187.9
1979	7846.3	9.267	2249.4	1153.448	1036.9	116.419	0	231.5
1980	10881.6	3.698	2898.9	1041.904	1321.2	119.305	0	308.9
1981	9401.1	-23.058	3512.2	227.670	2167.7	91.703	0	347.7
1982	9372.8	6.249	3232.3	342.129	2162	98.080	0	394.1
1983	8931.9	-4.000	2884.4	32.379	2208.1	95.297	0	411.2
1984	8363.9	-4.324	2711.4	-336.510	2153.7	92.597	0	439
1985	8226.5	5.512	3492.3	-7.282	1969.4	99.404	0	509.7
1986	7324.7	-1.687	3041.5	452.063	1976.5	99.521	0	511.3
1987	6031.9	-5.217	3438.6	-10.149	2039.3	98.748	0	539.9
1988	6599.2	3.528	3011.6	-160.131	2233.7	101.170	0	572.4
1989	7404	3.430	3682	-747.511	2167.4	106.258	0	627.1
1990	8185.3	-15.938	4645.4	580.235	2225.2	90.441	0	646.4
1991	8981.4	9.878	4442.7	93.647	3409.1	100.156	0	700.7
1992	9541.8	-1.057	5168.2	-126.540	3494.1	99.322	0	762.9
1993	9331.4	2.813	5384.9	166.813	3596.1	101.775	0	733.1
1994	9967	-2.203	6057.4	-138.134	3555.2	98.529	0	766.6
1995	10679.3	2.655	6372.4	61.236	3201.1	99.416	0	829.6
1996	12180.2	4.641	6718	-74.181	5117.2	101.507	0	925.6
1997	14148.8	1.387	7021.6	341.227	5581.9	99.688	0	1035.2
1998	12741.3	-2.133	7187.7	276.120	5450.2	93.821	0	1080.6
1999	14138.2	1.342	7891.1	1153.603	6072.7	90.801	0	1128.1
2000	17543.8	3.209	7278.9	507.393	5477.8	88.966	0	1223.7
2001	20857.8	26.361	8270.8	-193.281	5918.7	107.510	0	1598.3
2002	28062.900	-1.024	8705.8	1777.274	6144	100.015	1	1814.4
2003	34164.9	7.695	9029.2	1327.864	6517.9	101.591	1	2015.3
2004	44133.9	3.754	10536.6	3264.003	5822.1	100.361	1	2126.7
2005	60065.6	7.972	14028.1	3182.974	5608.1	102.029	1	2489.8
2006	72841.1	8.738	16343	10599.011	5967.6	104.962	1	2844.9

Continued

YEAR	DUM_{8185}	EXCHRATE	EXOTHC	FINACC	FLABOR	IGNOILC	IMOTHC
1970	0	0.3576	60.9	-193.4	50	122.6	199.957
1971	0	0.3372	18.2	-259	64	207.4	307.44
1972	0	0.3305	49.6	65.6	81	336.5	377.505
1973	0	0.2968	78.6	-31.2	118	494.9	546.579
1974	0	0.2968	101.4	-34.6	169.8	774.8	1012.141
1975	0	0.2968	127.9	-296.8	223.3	829.4	1126.689
1976	0	0.2968	170.2	-332.6	242.6	1021.1	1194.968
1977	0	0.2968	241.1	-153.3001	246	1159.5	1320.877
1978	0	0.2968	258.6	-419.1001	252.3	1274.8	1405.683
1979	0	0.2968	382.2	-384.4001	260	1660.8	1890.276
1980	0	0.2968	51.5	-504.3011	280	2384.6	2602.985
1981	1	0.2968	183.2	-151.2	386.4	2716.4	3731.217
1982	1	0.2968	229	-185.1001	495.3	2218.2	2799.689
1983	1	0.2968	130.2	27.39973	552.1	1768.4	2413.471
1984	1	0.2968	330	246.0997	263.1	1663	2396.215
1985	1	0.2968	488.9	232.1999	194.2	1377.5	1791.202
1986	0	0.3158	301	-135.6001	166	973.9	1127.253
1987	0	0.2982	275.2	-37.50071	144.3	642.2	1336.015
1988	0	0.2865	121.7	46.70114	142.8	575.8	1206.783
1989	0	0.2956	231.4	355.9004	154.7	637.9	1594.484
1990	0	0.2837	162.4	-284.8996	139.2	461.3	1682.078
1991	0	0.2856	370.8	36.79974	85.3	524.6	1899.044
1992	0	0.2992	560.3	93.69982	76.1	364	1591.06
1993	0	0.3232	749.6	-61.3998	151.6	911.9	2027.586
1994	0	0.3625	423.2	51.29997	156.1	1052.7	1780.892
1995	0	0.3545	645.7	-86.59641	161	869.8	1409.914
1996	0	0.3659	579.2	81.10074	166.5	1280.7	1840.690
1997	0	0.3887	1150.3	-337.3016	169.4	1315.9	1839.051
1998	0	0.4515	715.6	-218.2995	172.1	903.5	1338.050
1999	0	0.4608	595.8	-484.8001	179.9	957.2	1331.704
2000	0	0.5434	2343.7	-76.31631	187.9	1712	1443.961
2001	0	0.6441	1591	-591.1475	176.8	5404.2	3108.892
2002	0	1.2106	6942.6	113.0905	174.3	7021	7771.221
2003	0	1.3019	6895.6	-214.628	170.2	7005.7	7258.6320
2004	0	1.2444	7887.9	-310.5829	169.1	7511.1	7626.100
2005	0	1.3486	9643	512.885	186	9481	11701.700
2006	0	1.2818	16680.4	-6214.499	184	10199.3	14747.341

Continued

YEAR	TAXNTARC	GOILR	OTHDASC	PIM	PIMC	PWOILUS$	SUBSIDIES
1970	15.000	484.0	-346.8	0.20990	0.14876	1.67	9.50
1971	17.500	652.3	-525.2	0.25275	0.15909	2.03	14.90
1972	17.500	624.6	-526.6	0.25591	0.17149	2.29	27.90
1973	23.100	604.1	-83.0	0.31397	0.18595	3.05	35.30
1974	46.200	1474.1	-380.9	0.44389	0.21281	10.73	73.80
1975	63.400	1324.0	-17.2	0.54983	0.24174	10.73	114.20
1976	77.100	2077.30	-145.8	0.56837	0.27066	11.51	104.00
1977	93.100	2625.9	-420.7	0.59114	0.30372	12.39	113.90
1978	101.800	2183.5	-74.9	0.62042	0.33678	12.70	115.80
1979	135.100	3682.2	-154.5	0.65491	0.38017	17.25	149.90
1980	249.600	5951.1	-1721.0	0.78412	0.44421	28.64	195.10
1981	492.600	3685.0	-500.4	0.79221	0.50413	32.51	151.30
1982	355.000	3230.0	-162.8	0.82981	0.56198	32.38	111.80
1983	269.300	2520.0	174.1	0.76116	0.61570	29.04	67.80
1984	354.900	2125.0	782.7	0.69339	0.67149	28.20	95.10
1985	207.400	1846.0	1074.7	0.71973	0.72521	27.01	39.50
1986	211.200	1074.0	738.3	0.64909	0.76446	13.53	37.90
1987	157.100	1029.7	1325.0	0.57532	0.80372	17.73	164.300
1988	318.800	898.0	1385.4	0.58788	0.85744	14.24	204.500
1989	203.400	1181.5	2170.1	0.66078	0.90909	17.31	293.800
1990	47.400	1386.0	3668.6	1.00000	1.00000	22.26	396.100
1991	134.500	1993.0	2292.8	0.99934	1.08678	18.62	210.400
1992	197.200	2230.0	2657.5	1.04637	1.17769	18.44	117.300
1993	199.900	1267.0	3123.0	1.04176	1.26446	16.33	237.200
1994	251.600	1410.0	3832.4	1.10625	1.37603	15.53	314.700
1995	215.800	2284.0	4672.1	1.23338	1.49587	16.86	608.800
1996	197.400	3888.0	2509.4	1.24893	1.61157	20.29	788.500
1997	236.100	3351.0	1584.0	1.26680	1.72934	18.68	327.800
1998	174.100	2551.0	1885.2	1.33050	1.85124	12.28	562.400
1999	145.100	3444.4	2427.3	1.38870	1.95248	17.48	601.600
2000	149.100	2203.0	-2897.5	1.32643	2.06612	27.60	620.700
2001	0.00000	3603.0	-3385.9	1.08305	2.18388	23.12	1373.200
2002	0.00000	6551.0	-12262.8	2.56209	2.29132	24.36	2850.500
2003	0.00000	3929.0	-19589.1	2.44415	2.36157	28.10	3823.900
2004	0.00000	19956.0	-24715.5	2.96129	2.41736	36.05	5512.100
2005	245.30000	34378.0	-43757.4	3.52548	2.47521	50.64	7776.000
2006	185.90000	43566.0	-64341.7	4.01245	2.53926	61.08	9095.400

Continued

APPENDIXES

YEAR	TARIFFC	TAXOTHSC	TREND	XOILR	XOILMB	OTHGEC	PGDPOIL
1970	35.500	34.800	1	3064.798	1225.400	0.000	0.28134
1971	37.700	41.500	2	2508.849	1003.300	1.100	0.39012
1972	55.800	22.700	3	2659.919	813.500	1.500	0.36827
1973	76.100	33.500	4	3402.749	793.900	4.900	0.35158
1974	118.800	56.500	5	6608.797	555.300	5.600	0.37090
1975	156.500	75.900	6	5241.280	540.100	4.800	0.39299
1976	165.800	124.000	7	6789.380	707.300	8.500	0.42283
1977	171.100	124.000	8	7205.937	753.100	12.000	0.47389
1978	205.500	125.900	9	7048.018	713.700	9.600	0.42130
1979	258.100	192.000	10	7562.528	763.600	11.800	0.63312
1980	273.300	307.300	11	6560.394	668.100	171.700	1.05680
1981	261.000	809.900	12	4397.749	429.900	156.200	1.17605
1982	197.200	596.700	13	4487.929	414.600	147.700	1.06221
1983	218.700	537.300	14	4199.501	409.200	327.900	1.02821
1984	299.400	628.800	15	4238.760	390.900	171.700	0.89882
1985	206.500	606.700	16	4623.827	365.400	145.800	0.84245
1986	190.700	612.500	17	3483.129	454.100	143.200	0.87176
1987	191.300	583.600	18	2872.829	355.000	146.200	0.73530
1988	298.900	821.900	19	3040.120	367.100	146.600	0.65239
1989	303.400	660.100	20	2994.625	410.400	185.500	0.76016
1990	287.100	411.300	21	3182.200	494.700	240.700	1.00000
1991	300.000	202.500	22	4178.592	601.900	198.700	0.78655
1992	228.000	797.200	23	4003.814	565.300	244.500	0.78928
1993	231.000	819.900	24	3629.100	518.400	405.900	0.71646
1994	359.300	1506.600	25	3861.633	508.800	365.100	0.80683
1995	400.000	1615.800	26	3615.614	510.600	154.100	0.93641
1996	444.000	1893.400	27	3484.468	549.900	109.100	1.10008
1997	440.000	1922.100	28	3849.606	509.200	127.300	1.25098
1998	519.000	1989.100	29	3838.447	550.900	234.000	0.74515
1999	519.500	1557.700	30	3364.873	527.700	297.700	1.20312
2000	395.200	2608.300	31	3357.048	519.800	200.000	1.91097
2001	362.500	2395.800	32	3155.647	516.800	298.700	1.87951
2002	364.000	2023.100	33	2516.541	473.500	949.000	4.05527
2003	384.800	2984.600	34	2982.296	560.000	1153.000	4.78149
2004	852.600	3131.000	35	3135.565	591.300	1238.000	6.50091
2005	548.000	2973.300	36	3245.569	618.000	1664.000	9.08167
2006	526.900	3708.900	37	3349.573	642.8	1747.000	10.99407

THE REFERENCES

REFERENCES

Abohobiel, A (1983), an econometric model for the Libyan economy, 1962-1977, Unpublished PhD Dissertation, Indiana University, USA

Adao, B., I. Correia, and P. Teles, (2003), the Monetary Transmission Mechanism: is it relevant for policy?' Banco de Portugal, Economic Research Department WP/ 13/03

Aghevli, B.B., and M.S. Khan, (1980), government deficits and the inflationary process in developing countries, in W. L. Coats Jr, and D. R. Khatkate (editors), money and monetary policy in less developed countries, Pergamon press, Oxford.

Ahmed, H. and S. M. Miller, (1999), crowding-out and crowding-in effects of the components of government expenditure, Working Paper 1999-02, Department of Economics Working Paper Series, University of Connecticut.

Aiyagari, S. R., L. J. Christiano., and M. Eichenbaum, (1992), the output, employment and interest rate effects of government consumption', Journal of Monetary Economics, Vol. 30.

AL-Jebory, A. M. A., (1991), Macroeconometric model of Iraq: estimation and forecast, Unpublished PhD thesis, the University of Keele, UK.

Aljerayed, K. J.H, (1993), a macroeconometric model of an oil-based economy: Case study of Saudi Arabia, Unpublished PhD Thesis, University of Colorado at Boulder, USA.

Altig, D. (1988), Econometric Analysis of Consumption Behaviour and Fiscal Policy: A Review Essay, Journal of Monetary Economics, Vol. 22: 155 – 164.

Andersen, L. C., (1967), three approaches to money stock determination, Federal Reserve Bank of St-Louis –Review, October, pp.6-13

Anderson, L. C., and Carlson, K. M. (1970), a monetarist model for economic stabilisation, Federal Reserve Bank of St. Louis Review, 52(4)

Ando, A., (1974), some aspects of stabilization policies: the monetarist controversy and the M.P.S model, International economic review, Vol. 15, No.3

REFERENCES

Ando, A., and Franco Modigliani, (1963), the Life Cycle Hypothesis of Saving: Aggregate Implications and Tests, the American Economic Review, Vol. 53, No. 1, Part 1,pp. 55-84

Engle, R. F. (1982), Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation, Econometrica , Vol. 50, No. 4, pp. 987-1007.

Aschauer, D. A., (1985), fiscal policy and aggregate demand, the American Economic Review, Vol.75, No.1, pp.117-127

Asteriou, D. (2006), Applied Econometrics: A modern approach using EViews and Microfit, Palgrave, Macmillan.

Bahmani-Oskooee, M. (1999), do federal budget deficits crowd out or crowd in private investment? Journal of Policy Modelling 21(5):633–640

Baldacci, E., H. Arye, and N. C. Kojo (2003) Growth, Governance, and Fiscal Policy Transmission in Low-Income Countries, IMF Staff papers, WP/03/237

Bardsen, Gunnar, Oyvind Eitrheim, Eilev S. Jansen, and Ragnar Nymoen (2005) the Econometrics of Macroeconomic Modelling, Oxford University Press Inc., New York

Barro, R. J, (1981), Output effects of government purchases. Journal of Political Economy, vol. 89, no. 6

Barro, R. J., (1986), Government spending, interest rate, prices, and budget deficits in the United Kingdom, 1701-1918, NBER Working Paper No. 2005.

Barro, R. J., (1989), The Ricardian Approach to Budget Deficits, The Journal of Economic Perspectives, Vol. 3, No. 2., pp. 37-54.

Barro, R. J., (1997), Macroeconomics, 5nd edition, the MIT PRESS, Cambridge. Massachusetts.

Baryun, N. A. (1980), Money and the balance of payments in an oil producing country, the case of Libya, Unpublished, PhD thesis, Oklahoma State University, USA

REFERENCES

Basic, T., (2007), on fiscal policy effects and mechanisms in Serbia, the National Bank of Serbia

Baunsgaard, T. (2003) “Fiscal policy in Nigeria: Any Role for Rules” IMF, IMF WP/03/155.

Becker, T., (1997), An investigation of Ricardian equivalence in a common trends model, Journal of Monetary Economics, Vol. 39, pp. 405-431

Behrman, J. R., (1977), macroeconomic policy in a developing country: the Chilean Experience, North -Holland publishing company, Amsterdam.

Behrman, J., and, J. A. Hanson, (1979), the Use of Econometric Models in Developing Countries, in Jere R. Behrman and James Hanson, (Editors), Short-Term Macroeconomic Policy in Latin America, the National Bureau of Economic Research.

Bernanke, B. S. and Alan S. Blinder (1988), Credit, Money, and Aggregate Demand, American Economic Review 78, no. 2 (May): 435-9.

Bernanke, B. and Gertler, M. (1995), ‘Inside the Black Box: the Credit Channel of Monetary Policy Transmission’, NBER Working Paper Series 5146. Published: Journal of Economic Perspectives, vol. 9, No. 4, pp. 27-48

Bichara Khader and Bashir El-Wifati (editors) (1987) ‘the Economic development of Libya’ (London: Croom Helm)

Bindseil, U. (2004), monetary policy implementation theory, past, and present, Oxford University Press, Oxford

Blinder, A. S. (2003), the fall and rise of Keynesian economics, in Snowdon, B. and H. R. Vane., (Editors), a Macroeconomics Reader, the Taylor and Francis e-Library, London

Bodkin, R. G., Klein, L. R., & Marwah, K. (1991) ‘A history of macroeconometric model-building’ Aldershot: Edward Elgar

Boivin, J., M. T. Kiley, and F.S. Mishkin, (2010), How has the monetary transmission mechanism evolved over time? , National Bureau of Economic Research, NBER Working Paper No. 15879, PP, 1-90.

REFERENCES

Bontemps, C. and G. E. Mizon, (2001), Congruence and Encompassing, Department of Economics, University of Southampton, Discussion Papers in Economics and Econometrics, No. 0107, pp. 1- 22

Boughton, J. (2003), On the Origins of the Fleming-Mundell Model, IMF Staff Papers, Vol. 50, No. 1, pp. 1-9.

Bowman, K.O., and L.R. Shenton, (1975), Omnibus contours for departures from normality based on √b1 and b2, Biometrika, Vol. 62, No. 2, pp.243–250.

Boylan, T.A., M.P. Cuddy, and I. O'muircheartaigh, (1980), the functional form of the aggregate import demand function: A comparison of three European economies, Journal of International Economics, Vol. 10, pp 561-566.

Brems, H. (1990), Dynamic Macroeconomics: Fiscal and Monetary Policy, Working Paper Series on the Political Economy of Institutions, No.3, Bureau of Economic and Business Research University of Illinois Urbana-Champaign, Illinois, USA.

Brook, M., R. Price., D. Sutherland, N. Westerlund, and C. Andre, (2004) Oil Price Developments: Drivers, Economic Consequences and Policy Responses, OECD, Economics Department Working Paper No. 412, pp.1-52

Brown, T. M., (1952), Habit Persistence and Lags in Consumer Behaviour, Econometrica, Vol. 20, No. 3, pp. 355-371

Brunner, K. and A. Meltzer, (1972, a), Friedman`s Monetary theory, Journal of political economy, Vol. 80, No.5, pp.837-851.

Brunner, K. and A. H. Meltzer, (1972, b), money, debt, and economic activity, Journal of political economy, Vol. 80, No. 5, pp. 951-977.

Buchanan, J, M (1999) “The Demand and Supply of Public Goods” Liberty Fund, Inc

Buiter, W. H., (2001), the fallacy of the fiscal theory of the price level, again, Bank of England working papers 141, Bank of England.

Buiter, W. H. (2005), new developments in monetary economics: two ghosts, two eccentricities, a fallacy, a mirage and a mythos, Economic Journal, Vol. 115, No. 502, C1–C31.

Burgat, F. (1987) 'The Libyan economy in crisis' in: Bichara Khader and Bashir El-Wifati (editors), 'the economic development of Libya' (London: Croom Helm)

Cagan, P. (1956), The Monetary Dynamics of Hyperinflation, in Milton Friedman, (editor), Studies in the Quantity Theory of Money, University of Chicago Press, Chicago.

Campos, J., N. R. Ericsson, and D. F. Hendry (2005), General-to-specific Modelling: An Overview and Selected Bibliography, Board of Governors of the Federal Reserve System, International Finance Discussion Papers, No. 838, pp.1- 92

Canova, F. (1995), the economics of VAR models, in K. D. Hoover (ed.), Macroeconometrics: Developments, Tensions, and Prospects, Kluwer Academic Publisher, Boston, USA, pp. 57–98.

Capros, P., Karadeloglou, P., & Mentzas, G. (1990), 'An empirical assessment of macroeconometric and CGE approaches in policy modelling' Journal of Policy Modelling, Vol.12, No. 3

Carbaugh, R. J. (2011), International Economics, 13th edition, South-Western, Cengage Learning

Central Bank of Libya 'Economic Bulletin' various issues, various years.

Central Bank of Libya, (2007) 'the developments of monetary policy during the period: 2002-2007' "in Arabic" retrieved 8th of October 2008, from, http://www.cbl.gov.ly/pdf/01Z8b38i2fzttwOz234.pdf

Challen, D. W., and Hagger, A. J. (1983), Macroeconometric systems: Construction, validation and applications, London: Macmillan

Chao, Hsiang-Ke (2002), Professor Hendry's Econometric Methodology Reconsidered: Congruence and Structural Empiricism, London School of

Economics, Centre for Philosophy of Natural and Social Science Measurement in Physics and Economics, Technical Report 20/02, pp. 1-51

Chao, Hsiang-Ke., (2005), A Misconception of Semantic Conception of Econometrics, Journal of Economic Methodology, Vol. 12, No.1, pp.125 –135

Chao, Hsiang-Ke., (2007), Structure, in M. Boumans, (editor) Measurement in Economics: A Handbook, Amsterdam: Elsevier Inc

Chari, V.V., and P. J. Kehoe, (1999), Optimal fiscal and monetary policy, in J.B. Taylor and M. Woodford (Editors), Handbook of Macroeconomics, Vol. 1C, Elsevier Science B. V.

Chari, V.V., L.J. Christiano., P.J., Kehoe (1991), optimal fiscal and monetary policy: some recent results, Journal of Money, Credit, and Banking, vol. 23, No. 3, part.2

Chenery, H. B., and P. Eckstein, (1970), Development Alternatives for Latin America, Journal of Political Economy, Vol. 78, No. 4, Part 2

Christ, C. F. (1994), the Cowles Commission's Contributions to Econometrics at Chicago, 1939-1955, Journal of Economic Literature, Vol. 32, pp. 30-59.

Christiano, L. J., (1981), a survey of measures of capacity utilization, IMF, Staff Papers, Vol. 28, No.1.

Chu, K., (1988), External Shocks and Fiscal Policy in LDCs, IMF Finance and Development, (June)

Cook, S. (2003) “A Kuhnian perspective on econometric methodology” Journal of Economic Methodology, Vol.10, No.1, PP.59-78

Cooley, T. F., and S. F. Le Roy (1985), Atheoretical Macroeconometrics: A Critique, Journal of Monetary Economics, Vol. 16, North-Holland

Cross, Y. S. (1998), all about the foreign exchange rate market in the United States, Federal Reserve Bank of New York.

Davis, G. C. (2005), Clarifying the ‘puzzle’ between the Textbook and LSE approaches to econometrics: A comment on Cook's Kuhnian perspective on econometric modelling, Journal of Economic Methodology, Vol. 12, No.1, pp. 93-115.

Davidson, R., and J. G. Mackinnon (1999), Econometric Theory and Methods, Oxford University Press, Oxford

Davidson, P., and S. Hall (1991), Cointegration in Recursive Systems, Economic Journal, Vol. 101, issue 405, pp. 239-251

Del Rio, A. B. and L. R. Klein (1974), Macroeconomic Model Building in Latin America: The Mexican Case, in Nancy D. Ruggles, (editor), The Role of the Computer in Economic and Social Research in Latin America, the national Bureau of Economic Research (NBER), 74-1, pp. 161-190.

Doornik, J. A., and H. Hansen, (1994), a practical test for univariate and multivariate normality, Discussion paper, Nuffield College, University of Oxford

Doornik, J. A., and D. F. Hendry, (2006), Empirical Econometric Modelling Using PcGive 12, Volume.1, London: Timberlake Consultants Ltd.

Doornik, J. A. (2009), Autometrics, in J. L. Castle and N, Shephard (editors), the methodology and practice of econometrics : a festschrift in honour of David F. Hendry, Oxford University Press Inc., New York.

Dutton, D. S. (1971), the demand for money and the price level, Journal of political economy, Vol.79, No.5, pp.1161-1170.

Easterly W., and K. Schmidt-Hebbel (1994), Fiscal Adjustment and Macroeconomic Performance: A Synthesis, in W. Easterly., C. A. Rodriguez and K. Schmidt-Hebbel (editors.), Public Sector Deficits and Macroeconomic Performance, World Bank, Washington DC.

Eckstein, O., and G. Fromm, (1968), the price equation, the American economic review, Vol.58, N0.3 (part1), pp.1159-1183

Edgmand, M. R., (1983), Macroeconomics: theory and policy, Prentice-Hall Inc.

Edmonds, B. and, S. Moss, (2004) From KISS to KIDS an anti-simplistic modelling approach, In P. Davidsson, and et al. (editors) Multi Agent Based Simulation, volume 3415 of Lecture Notes in Artificial Intelligence, pages Springer.

Elabbassi, Idriss, (1988) a macroeconometric model of a developing economy: A case study of Morocco, Unpublished PhD Dissertation, the Florida State University

El-Hassia, M.J and EL-Megarbi, M, (1984) ‘Labour circulation in the Libyan oil industry’, Garyounis University Press, Libya

El-Jehaimi, T (1987), “Industrial development in Libya around the year 2000” in B. Khader and B. El-Wifati (editors) ‘the Economic development of Libya’ Croom Helm, London

Engle, R. F., (1982), Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation, Econometrica, Vol. 50, No. 4., pp. 987-1007.

Engle, R. F., D. F. Hendry, and J. F. Richard, (1983), Exogeneity, Econometrica, Vol. 51, No. 2, pp. 277-304.

Ericsson, N. R., J. Campos and, H. A. Tran, (1990), Pc-Give and David Hendry's Econometric Methodology, Revista de Econometria, Vol. 5, No.1, pp.7-117.

Evans, M. K., (1967), the Importance of Wealth in the Consumption Function, Journal of Political Economy, Vol. 75, No. 4, Part 1 (Aug.,), pp. 335-351

Evans, M., K., (1969) Macroeconomic Activity: Theory, Forecasting and Control, Harper and Row Publishers, New York.

Evans, M. K., (2004) Macroeconomics for managers, Blackwell Publishing Ltd

Ezaki, M. (2006) , CGE Model and Its Micro and Macro Closures, in Masayuki Doi, (editor), Computable General Equilibrium Approaches, Urban and Regional Policy Studies, World Scientific.

Fair, R.C. (2004), Estimating How the Macroeconomy Works, Cambridge, Mass: Harvard University Press

Fand, D. I. (1970), some issues in monetary economics, Federal Reserve Bank of St. Louis-Review, January, pp. 10-21.

Farley, R (1971), planning for development in Libya: The exceptional economy in the developing world, Parger publisher, New York

Favero, C. A. (1999), Applied Macroeconometrics, Oxford University Press.

Fayad, M.K (2000), 'Government expenditure and growth in Libya' Unpublished PhD. Thesis, Liverpool John Moores University, U.K

Feldstein, M. (1982), Government deficits aggregate demand deficits, Journal of Monetary Economics, Vol. 9, pp. 1-20

Ferber, Robert (1973), Consumer Economics, a Survey, Journal of Economic Literature, Vol. 11, No. 4, pp. 1303-1342

Fielding, David, (1997), Adjusting, Trade Policy and Investment Slumps: Evidence from Africa, Journal of Development Economics, Vol. 52.

Fischer, S., (1993), the Role of Macroeconomic Factors in Growth, Journal of Monetary Economics, Vol. 32, No. 3

Fleming, J. M., (1962), Domestic financial policies under fixed and floating exchange rates, IMF Staff Papers, Vol. 9, No. 3, pp 369–379.

Fontana, G. (2009), the transmission mechanism of fiscal policy: a critical assessment of current theories and empirical methodologies, Journal of Post Keynesian Economics, Vol. 31, No. 4

Frain, J. C. (1995), Econometrics and Truth, Journal of the Statistical and Social Inquiry Society of Ireland, Vol. 27, Part 2

Friedman, M., (1957), a theory of the consumption function, Princeton: National Bureau of Economic Research.

Friedman, M. (1971), Government Revenue from Inflation, the Journal of Political Economy, Vol. 79, No.4, pp. 846-856.

Friedman, M., (1969), the supply of money and changes in prices and output, in, M. Friedman, the optimum quantity of money and other essays, Aldine publishing company, Chicago , 171-187.

Friedman, M. and W. W. Heller, (1969), Monetary vs. Fiscal Policy, W. W. Norton and Company, New York

Friedman, M. (1970), A Theoretical Framework for Monetary Analysis, Journal of Political Economy, Vol. 78, No. 2, pp. 193-238

Friedman, M., (2003), The role of monetary policy, in Snowdon, B. and H. R. Vane., (Editors), a Macroeconomics Reader, the Taylor and Francis e-Library, London

Frisch, R. (1971), from utopian theory to practical applications, the case of econometrics, the American economic review, Vol.71, No.6, pp. 1-16.

Fry, M. J. (1989), financial development: theories and recent experience, Oxford review of economic policy, Vol 5, NO. 4

Gandolfo, G., and M. L. Petit, (1983), the functional form of the aggregate import of demand equation, Italy: 1960-1980, Economics Letters, Vol. 11, pp145-148.

General People's Committee of Economy and Trade, National Accounts, various issues, various years

Ghanem, S. (1987), the oil industry and the Libyan economy: the past, the present and the likely future, in Bichara Khader an Bashir El-Wifati(Ed's), the Economic development of Libya, London: Croom Helm.

Ghartey E. E. and Rao U. L .G. (1990), A Short-Run Forecasting Model of Ghana, Economic Modelling, Vol. 7, No. 3, pp. 291-308.

Gilbert, C. L., (1986) "Professor Hendry's econometric methodology" Oxford Bulletin of Economics and Statistics, Vol.48, No.3, pp. 283-307.

Gilbert, C. L., and D. Qin, (2007), Representation in Econometrics: A Historical Perspective, in M. Boumans, (ed.) Measurement in Economics: A Handbook, Elsevier Inc

Glahe, F., (1973), macroeconomics theory and policy, New York Harcourt Brace Jovanovich, Inc

Goodfriend, M. and R. King, (1997) The New Neoclassical Synthesis and the Role of Monetary Policy, in Ben S. Bernanke and Julio Rotemberg, (Editors), NBER Macroeconomics Annual 1997, Volume 12, MIT Press.

Gordon, R. J. (1972), Wage-Price controls and the shifting Phillips curve, Brookings Papers on Economic Activity, Vol. 2, pp. 385- 421.

Gordon, R.J. (1976), recent developments in the theory of inflation and unemployment, Journal of Monetary Economics, Vol. 2, pp. 185-219.

Gourieroux, Christian and Alain Monfort (1995) Statistics and Econometric Models, Cambridge University Press

Granger, C. W. J. (ed.) (1990), Modelling Economic Series, Oxford: Clarendon Press.

Green, S.L. (1987), Theories of inflation: a review essay, Journal of Monetary economics, Vol.20, No.1, pp. 169-175

Greene, W. H., (2012), Econometric analysis, 7th ed, Prentice Hall, USA.

Gujarati, D. (1995), Basic Econometrics, MacGraw-Hill.3rd edition

Gurly, J. G. and E. S. Shaw, (1970), money in a theory of finance, sixth printing, the Brookings institute, Washington DC

Handa, Jagdish. (2009), Monetary Economics, 2nd Edition, Routledge, the Taylor and Francis Group, New York, USA

Hall, R. E., (1978), Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence, Journal of Political Economy, Vol. 86, 971–987.

Hassler, U., and Jürgen Wolters, (2006), Autoregressive Distributed Lag Models and Cointegration, in O. Hübler, and J. Frohn (Editors), Modern Econometric Analysis Surveys on Recent Developments, Springer Berlin, and Heidelberg, Germany.

Hazzel, P.B., and R. Norton, (1986) Mathematical Programming for Economic Analysis in Agriculture, London: MacMillan, Publishing Company

Heijdra, B.J., J.E. Ligthart, and, F. van der Ploeg, (1998), Fiscal policy, distortionary taxation, and direct crowding out under monopolistic competition, Oxford Economic Paper, Vol. 50, No. 1.

Hendry, D. F., (1987), Econometrics methodology: a personal perspective, in T. F. Bewley (ed.) Advances in Econometrics Fifth World Congress, Vol.2. Cambridge: Cambridge University Press.

Hendry, D. F., (1995), Dynamic Econometrics, Oxford University Press, Oxford

Hendry, D. F., (2000), Econometrics: alchemy or science? Essays in Econometric Methodology, Oxford University Press

Hendry, D. F. (2005), Notes on Automatic Econometric Model Selection, pp. 1-20, retrieved May 7th, 2009, from http://folk.uio.no/rnymoen/Evalwork_Hendry.pdf

Hendry, D. F., A. R. Pagan, and D. J. Sargan, (1984), Dynamic Specification , in Z. Griliches, and M.D. Intriligator, (eds.), Handbook of Econometrics, Vol.2, Amsterdam: North-Holland.

Hendry, D., and Hans-Martin Krolzig, (1999), improving on Data mining reconsidered, by K. D. Hoover and S. J. Perez, Econometrics Journal, Vol. 2, No.2, pp. 202–219.

Hendry, D., and Hans-Martin Krolzig, (2001), Automatic Econometric Model Selection, Timberlake Consultants Press, London

Hendry, D. F. and Hans-Martin Krolzig, (2002), the Properties of Automatic Gets Modelling, pp.1-31 retrieved July 7th, 2011, from http://repec.org/res2003/Hendry.pdf

Hendry, D. F., and, H. M. Krolzig, (2005), the Properties of Automatic Gets Modelling, the Economic Journal, Vol.115, No.502, pp.C32-C61.

REFERENCES

Higgins, B (1959) “Economic development: principle, problem, and policies” (New York: W.W. Norton and company).

Higgins, B. and, J. Royer, (1967) “Economic development with unlimited supply of capital: The Libyan case” The Libyan Economic and Business Review, Vol. 3, No. 2.

Hilbers, P., (2004) interaction of monetary and fiscal policies: why central bankers worry about government budgets, presented at an IMF Seminar on Current Developments in Monetary and Financial Law, Washington, D.C., May 24-June 4.

Hillier, B (1986), the Macroeconomics: Models, Debates, and Developments, Garyounis University Press, Benghazi, (in Arabic)

Holden, K. D.A. Peel and J.L. Thompson, (1990), Economic Forecasting an Introduction, Cambridge University Press

Hoover, K. (2005), the Methodology of Econometrics, pp.1-47, retrieved May 10th, 2011, from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=728683,

Hoover, K. D., and S. J. Perez, (1999), Data mining reconsidered: encompassing and the General-to-specific approach to specification search, Econometrics Journal, Vol. 2, No. 2, pp. 167–191

Hoover, K. D., and S. J. Perez, (2000), Three attitudes towards data mining, Journal of Economic Methodology, Vol. 7, No. 2, pp. 195–210.

Hossain, M. I., and Abdur Razzaque (2003), a macroeconometric model of Bangladesh: specification and estimation, Bangladesh Institute of Development Studies, Technical Paper No. 06

Howrey, E. P., L.R. Klein, M. D. McCarthy and G.R. Schink, (1981) the Practice of Macroeconometric Model Building and its Rationale, in Kmenta, J. and Ramsey, J.B. (Editors), Large Scale Macroeconometric models, Amsterdam: North-Holland

Hubbard, R. G. and A. P. O’Brien, (2012), Money, banking, and the financial system, Pearson Education Inc, USA

REFERENCES

Humphrey, T. M. (1975), a monetarist model of the inflationary process, Federal Reserve Bank of Richmond, Economic Review, Nov, /Dec, pp. 13-23.

Humphrey, T. M. (1978), some recent developments in Phillips curve analysis, Federal Reserve Bank of Richmond, economic review, Jan – Feb, pp, 15-23.

Hyman, D. N., (2011), Public Finance: A Contemporary Application of Theory to Policy, Tenth Edition, South - Western, Cengage Learning, USA

Ingram, B. F. (1995), recent advances in solving and estimating dynamic, stochastic macroeconomic models, in K. D. Hoover (ed.), Macroeconometrics: Developments, Tensions, and Prospects, Kluwer Academic Publisher, Boston, USA, pp. 15-46.

International Monetary Fund (2006) 'IMF executive board concludes article 4 consultation with the Socialist People's Libyan Arab Jamahiriya' public information No. 06/38.

Intriligator, M.D. (1983), Economic and Econometric Models, in Z, Griliches and, M.D. Intriligator (Editors), Handbook of Econometrics, Volume I, North-Holland Publishing Company, Netherlands

Intriligator, M.D., R.G. Bodkin, and, C. Hsiao, (1996) Econometric Models, Techniques, and Applications, Prentice Hall, New Jersey.

Isaac, A. G., (None), Portfolio Balance Models of Exchange Rate Determination, Lecture Notes 10, retrieved May 15th, 2012, from https://subversion.american.edu/aisaac/notes/pbflex.pdf

Jadhav, Narendra. (None) Macroeconometric Modelling for Policy Making: Retrospect and Prospects, retrieved September 23rd, 2011, from http://www.drnarendrajadhav.info/drnjadhav_web_files/Published%20papers/PRAmodelrevised1-full.pdf

Jagdish, H. (2009), Monetary Economics, second Edition, Routledge, the Taylor, and Francis Group, New York, USA.

Jarque, C. M., and A. K. Bera, (1987), A test for normality of observations and regression residuals, International Statistical Review, Vol. 55, No. 2, pp.163–172.

Jayawickrama, Ananda (2007)" Macroeconometric Modelling: What Do We Learn From The Past? " The Peradeniya Journal of Economics, Volume 1, Number 1 & 2, June/December

Johansen, L. K., (1960), a Multispectral Study of Economic Growth, Contributions to Economic Analysis 21, North-Holland Publishing Company, pp. X-177

Johnson, H. G. (1972) the Monetary Approach to Balance-of-Payments Theory, the Journal of Financial and Quantitative Analysis, Vol. 7, No. 2, Supplement, Outlook for the Securities Industry, pp. 1555-1572.

Johnson, H. G., (1977), the Monetary Approach to Balance of Payments Theory and Policy: Explanation and Policy Implications, Economica, New Series, Vol. 44, No. 175, pp. 217-229.

Johnson, H. G. (1977b) the monetary approach to balance of payments: a nontechnical guide, Journal of International Economics, Vol. 7, pp. 251-268.

Jorgenson, D. W., (1971), Econometric Studies of Investment Behaviour: A Survey, Journal of Economic Literature, Vol. 9, No. 4.

Juks, R (2004), monetary policy transmission mechanisms: a theoretical and empirical overview, in David G. Mayes (Editor), The Monetary Transmission Mechanism in the Baltic States, Bank of Estonia, Estonia.

Kaufman, G. G. (1969), More On an Empirical Definition of Money, The American Economic Review, Vol. 59, No. 1, pp. 78-87

Keynes, J.M. (1936), the General Theory of Employment, Interest, and Money, Macmillan, London

Khader, B. (1987), ‘Libyan oil and money” in: Khader, B. and B. El-Wifati, (editors) ‘The economic development of Libya’ (London: Croom Helm)

Khan, H. A. (2005), Assessing Poverty Impact of Trade Liberalization Policies: A Generic Macroeconomic Computable General Equilibrium Model for South Asia, Asian Development Bank Institute Discussion Paper No. 22

Khan, M. S., (1974, a), Experiments with a Monetary Model for the Venezuelan Economy, International Monetary Fund Staff Papers, Vol.21, No.2, pp.389- 413.

Khan, M. S., (1974b), Import and Export Demand in Developing Countries, International Monetary Fund Staff Papers, Vol. 21, No.3, pp.678-693.

Khan, M. S., (1975), the Structure and Behaviour of Imports of Venezuela, The Review of Economics and Statistics, Vol. 57, No. 2, pp. 221-224.

Khan, M.S. (1980), monetary shocks and the dynamics of inflation, International Monetary Fund, Staff Papers, Vol.27, No.2, PP. 250-284

Khan, M. S., and K. Z. Ross, (1977), the functional form of the aggregate import demand equation, Journal of international economics, Vol. 7, 149-160.

Khan, M. S., and M. D. Knight, (1981), Stabilization Programs in Developing Countries: A Formal Framework, International Monetary Fund Staff Papers, Vol, 28, No. 1, pp.1-53.

Khayum, M. F. (1991), Macroeconomic Modelling and Policy Analysis for Less Developed Countries, Westview Press Inc, Boulder, Colorado, USA

Klein, L. R. (1947), the Use of Econometric Models as a Guide to Economic Policy, Econometrica, Vol. 15, No. 2 (Apr)

Klein, L.R. (1976) 'Forecasting and policy evaluation using large scale econometric models' in M.D. Intriligator (ed), Frontiers of Quantitative Economics', Amsterdam :North-Holland.

Klein, L. R., (1979), managing the modern economy: econometric specification, in Sean Holly, Bere Rusten and Martin B. Zarrop, (editors) Optimal control for the econometric models, the Mc- Millan press Ltd, London

Klein, L.R. (1980), what kind of macroeconometric model for the developing economics? , in Warren L. Coats Jr, and Deena R. Khtkhate (editors), Money and Monetary Policy in Less Developed Countries, Oxford: Pergamon Press.

Klein, L.R., and A.S. Goldberger, (1969), an econometric model of the United States: 1929-1952, third printing, North-Holland publishing company, Amsterdam.

Klein, L. R., and V. Long, (1973), Capacity Utilization Concept, Measurement and Recent Estimates, Brookings Papers on Economic Activity, Vol. 3

Klein, L. R., and R. M. Young (1980), an introduction to econometric forecasting and forecasting models, Lexington Books, USA.

Klein, L. R., A. Welfe, and W. Welfe (1999), Principles of macroeconometric modelling, Elsevier Science, Amsterdam, The Netherlands

Kocherlakota, N.R. (2005), Optimal Monetary Policy: What We Know and What We Do not Know, Federal Reserve Bank of Minneapolis Quarterly Review, Vol. 29, No. 1, pp. 10–19.

Kormendi, R. C. (1983), Government Debt, Government Spending, and Private Sector, The American Economic Review, Vol. 73, No. 5, pp. 994-1010

Krolzig, Hans-Martin, and D. F. Hendry, (2001), Computer automation of general-to-specific model selection procedures, Journal of Economic Dynamics and Control, Vol. 25, Issue, 6-7, pp. 831-866.

Krugman, P. R., M. Obstfeld, and M. J. Melitz, (2012), International economics: theory and policy, 9th edition, Pearson, Addison-Wesley

Kutspeli, Y. (2005), Effectiveness of Fiscal Spending: Crowding out and/or crowding in? YÖNETIM VE EKONOM, Cilt: 12 Say: 1, Celal Bayar Üniversitesi I.I.B.F. MANISA

Kuttner, K. N., and P.C. Mosser, (2002), the Monetary Transmission Mechanism: Some Answers and Further Questions, Economic Policy Review (Federal Reserve Bank of New York), vol. 8, Issue 1, pp. 15-26.

Kydland, F. E., and E. C. Prescott (1995), the econometrics of the general equilibrium approach to business cycles, in K. D. Hoover (ed.), Macroeconometrics: Developments, Tensions, and Prospects, Kluwer Academic Publisher, Boston, USA, pp. 181–198.

REFERENCES

Laidler, D. (1969), the Definition of Money: Theoretical and Empirical Problems, Journal of Money, Credit and Banking, Vol. 1, No. 3, Conference of University Professors, pp. 508-525.

Laidler, D. (1978), Money and money income: an essay on the transmission mechanism, Journal of Monetary Economics, Vol. 4, pp. 151-191.

Laidler, D. (2003), Monetarism: an interpretation and an assessment, in Snowdon, B. and H. R. Vane., (Editors), a Macroeconomics Reader, the Taylor and Francis e-Library, London

Laidler, D. and M. Parkin, (1975) Inflation: A Survey, the Economic Journal, Vol. 85, No. 340, pp. 741-809.

Lambertini, L.(2006), Monetary-Fiscal Interactions with a Conservative Central Bank, Scottish Journal of Political Economy, Vol. 53, No. 1, pp. 90-128.

Lang, R. W. (1983) Using econometric models to make economic policy: A continuing controversy, The Business Review, Federal Reserve Bank of Philadelphia, January/ February.

Leamer, E. (1983) 'Let's take the con out of econometrics' The American Economic Review (AER), Vol.73, No.1, pp.31-43.

Lee, H., G. J. Babu, and C. R. Rao, (2012), a Jackknife Type Approach to Statistical Model Selection, Journal of Statistical Planning and Inference, Journal of Statistical Planning and Inference1, Vol. 142, No. 1, pp.301–311.

Lovell, M.C., (1983), Data Mining, Review of Economics and Statistics, Vol. 65, No. 1, pp.1-12

Lucas, R.E. Jr., (1976), Econometric Policy Evaluation: A Critique, Carnegie-Rochester Conference Series on Public Policy, Volume .1, pp.19-46

Lucas, R. E. Jr., (1990), Supply-Side Economics: An Analytical Review, Oxford Economic Papers, New Series, Vol. 42, No. 2 , pp. 293-316.

Ludvigson, Sydney., Charles Steindel, and Martin Lettau, (2002) Monetary Policy Transmission through the Consumption- Wealth Channel, Economic

Policy Review (Federal Reserve Bank of New York), vol. 8, Issue 1, pp. 117-133.

Luintel, K. B., (1993), Macroeconomics and money in developing countries: an econometric model for an Asian region, Unpublished PhD thesis, University of Glasgow.

Lütkepohl, H. (2007), General-to-specific or specific-to-general modelling? An opinion on current econometric terminology, Journal of Econometrics, Vol. 136, No. 1, pp. 319–324

MacKinnon, J. G., and H. White, (1985), Some Heteroskedastic-Consistent Covariance Matrix Estimators with Improved Finite Sample Properties, Journal of Econometrics, Vol. 29, No. 3, pp. 305–325

Maddala, G. S, (1981) Statistical inference in relation to the size of the model, in Kmenta, J. and Ramsey, J.B. (Editors) Large Scale Macroeconometric models, Amsterdam: North-Holland.

Mahadeva, L. and P. Sinclair, (2005), How Monetary Policy Works, Routledge, Taylor and Francis Group, London

Malcomson, J. M. (1986), some analytics of the Laffer curve, Journal of Public Economics, Vol. 29, No.3, pp. 263-279.

Malinvaud, E. (1988), Econometric Methodology at the Cowles Commission: Rise and Maturity, Address to the 50th Anniversary Cowles Celebration: 1983, Econometric Theory, Vol. 4, No. 2, pp. 187-209.

Marothia, D. K. and W. E. Phillips, (1982), demand and supply functions for money in Canada, Journal of Monetary Economics, Vol.9, pp. 249-261.

Matlanyane, R.A, (2005) “A macroeconometric model for the economy of Lesotho: Policy analysis and implications” Unpublished PhD, University of Pretoria, Pretoria

Mayo, D., (1981), testing statistical testing, in: Caldwell B.J., (1993) The Philosophy and Methodology of Economics, Vol. 2. Edward Elgar, Aldershot, pp. 45-73

McCallum, B. T., (1972), Relative Asymptotic Bias from Errors of Omission and Measurement, Econometrica, Vol. 40, No. 4, pp. 757-758

McCallum, B. T. (1999), Analysis of the Monetary Transmission Mechanism: Methodological Issues, National Bureau of Economic Research, NBER, Working Paper Series, / 7395.

Mcnees, S. K. (1982), the Role of Macroeconometric Models in Forecasting and Policy Analysis in the United States, Journal of' Forecasting, Vol. 1.

McNown, R. (1986), 'on the uses of econometric models: A guide for policy makers', Policy Sciences, vol.19

Mehari, Tesfamariam (1998) Modelling Monetary and Fiscal Policy in Ethiopia: A Macroeconometric Approach, Unpublished PhD Thesis, Liverpool Business School, Liverpool John Moores University.

Meltzer, A. H. (1995), Monetary, Credit and (Other) Transmission Processes: A Monetarist Perspective, Journal of Economic Perspectives, Vol.9, No. 4, pp. 49-72.

Merzlyakov, S., (2011) Strategic Interaction between Fiscal and Monetary Policies in an Export-Oriented Economy, retrieved March 4th, 2012, from, http://economics.soc.uoc.gr/macro/docs/Year/2011/papers/paper_1_129.pdf

Mikesell, R. F., and J. E. Zinser, (1973), Nature of the Savings Function in Developing Countries: A Survey of the Theoretical and Empirical Literature, Journal of Economic Literature, Vol. 11, No. 1

Mishkin, F. S. (1995), Symposium on the Monetary Transmission Mechanism, journal of Economic Perspectives, Volume. Nine, Number 4.

Mishkin, F. S., (1996), the Channels of Monetary Transmission: Lessons for Monetary Policy, NBER Working Paper Series, No. 5464.

Mishkin, F. S., (2001), the Transmission Mechanism and the Role of Asset Prices in Monetary Policy, NBER Working Paper Series, No. 8617

Mishkin, F. S., (2010), the economics of money, banking, and financial markets, 9th edition, The Addison-Wesley, New York.

REFERENCES

Mishkin, F. S. (2012) Macroeconomics: policy and practice, Addison-Wesley, USA.

Mizon, G. E. (1995), Progressive modelling of macroeconomic time series: the LSE methodology, in K. D. Hoover (ed.), Macroeconometrics: Developments, Tensions, and Prospects, Kluwer Academic Publisher, Boston, USA, pp. 107–170.

Modigliani, F. (2003), the monetarist controversy revisited, in Snowdon, B. and H. R. Vane., (Editors), a Macroeconomics Reader, the Taylor and Francis e-Library, London

Modigliani, F. and R. Brumberg, (1954), Utility Analysis and the Consumption Function: An Interpretation of Cross-section Data, in K. K. Kurihara, (editor), Post-Keynesian Economics. New Brunswick.

Mohan, R. (2008) monetary policy transmission in India, Bank for International Settlements Papers (BIS), Transmission Mechanisms for monetary policy in emerging market economies, No. 35

Montiel, P. J., (1989), Empirical Analysis of High-Inflation Episodes in Argentina and Brazil, International Monetary Fund (IMF), Staff Papers, Vol.36, No. 3, pp. 527–549, Washington. D. C

Montiel, Peter J., (1991), the Transmission Mechanism for Monetary Policy in Developing Countries , International Monetary Fund, (IMF) Staff Papers, Vol. 38, No 1, pp. 83- 108, Washington. D. C

Moss, Scott. (2007), Econometrics and policy analysis: A critique and an alternative, Centre for Policy Modelling, Business School, Manchester Metropolitan University, No. CPM-07-177, UK

Mundell, R. A., (1963), Capital mobility and stabilization policy under fixed and flexible exchange rates, Canadian Journal of Economic and Political Science, Vol. 29, No. 4, pp 475–485.

Muscatelli, V. A., P. Tirelli and C. Trecroci, (2003), fiscal and monetary policy interaction empirical evidence and optimal policy using a structural new Keynesian model, CESifo Working Paper No. 1060

Muth, J. A., (1961), rational expectations and the theory of price movements, Econometrica, Vol. 29, No. 6, pp. 315–335.

Moustafa, S, M, (1978), an Econometric Model of the Libyan Economy, 1962-1975, Unpublished PhD Dissertation, Southern Methodist University, USA

Narasimham, N.V.A., (1956), a Short-Term Planning Model for India, Amsterdam: North-Holland.

Naylor, T.H. (1971) Policy Simulation Experiments with Macroeconometric Models: The State of' the Art, American Journal of Agricultural Economics, Vol. 52, No. 2, May, pp. 263- 271.

Neményi, J., (2005), what do we know about the channels of monetary transmission in transition economies? Hungary's experience under the exchange rate targeting regime, in L. Mahadeva and P. Sinclair, How Monetary Policy Works, Routledge, Taylor and Francis Group, London.

Nugent, J.B. (1975), Policy-oriented Macroeconometric Models for Development and Planning, Annals of Economic, and Social Measurement, Volume 4, number 4, the National Bureau of Economic Research

Obstfeld, M., J. C. Shambaugh and A. M. Taylor., (2005), the Trilemma in History: Tradeoffs among Exchange Rates, Monetary Policies, and Capital Mobility, the Review of Economics and Statistics, Vol. 87, No. 3, pp. 423-438

O'Driscoll, G. P. Jr., (1977), The Ricardian Nonequivalence Theorem, Journal of Political Economy, Vol. 85, No. 1, pp. 207-210.

Otman, W. and E. Karlberg, (2007), The Libyan Economy: Economic Diversification and International Repositioning, Springer-Verlag Berlin Heidelberg, UK.

Ott, A. F. and R. J. Cebula (editors), (2006), The Elgar companion to public economics, empirical public economics, Edward Elgar Publishing Limited, UK.

Owen, P. D. (2002), General-to-Specific Modelling using 'PcGets', University of Otago economics discussion papers, No. 0213, pp. 1-23

Pagan, A. (1987) "Three econometric methodology: A critical appraisal" Journal of Economic Surveys, Vol.1, No.1, pp.3-24.

Pagan, A. (1999), the Getting of Macroeconomic Wisdom, Centre for Economic Policy Research, Australian National University, Discussion paper No. 412, pp. 1-39

Pagan, A. (2003), Report on modelling and forecasting at the Bank of England, Bank of England Quarterly Bulletin

Pagan A. R. and M. R. Wickens, (1989), A Survey of Some Recent Econometric Methods, the Economic Journal, Vol. 99, No. 398, pp. 962-1025

Pandit, V. (2000) Macroeconometric Policy Modelling for India: a Review of Some Analytical Issues, Centre for Development Economics, Working Paper No. 74, India.

Papanikos, G. T. (1991) a small macroeconometric model with direct government intervention on the demand and the supply side: the Canadian experience in the 1970s and in the 1980s, Economic Modelling, April.

Patinkin, D. (1972), Friedman on the Quantity Theory and Keynesian Economics, The Journal of Political Economy, Vol. 80, No. 5, pp. 883-905.

Perotti, Roberto. (2008), In Search of the Transmission Mechanism of Fiscal Policy, in Daron Acemoglu, Kenneth Rogoff and Michael Woodford (editors), NBER Macroeconomics Annual 2007, Volume 22, NBER, University of Chicago Press.

Pesaran, M. H., and Y. Shin, (1997), an Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis, pp.1-33, retrieved April 5th, 2012, from, http://www.econ.cam.ac.uk/faculty/pesaran/ardl.pdf ,

Pesaran, H., and R. Smith (2009), Keynes on Econometrics, in Tony Lawson and H. Pesaran, (Editors), Keynes economics: methodological issues, the Taylor, and Francis e-Library, New York

REFERENCES

Phelps, E. S., (1991), seven schools of macroeconomic thought, Oxford University press, London.

Phillips, P. C. B. (2003), in Memory of John Denis Sargan, Econometric Theory, Vol. 19, pp.417–422.

Phillips, P. C. B. (2010), the Mysteries of Trend, Cowles Foundation Discussion Paper, No. 1771.

Pierse, R.G. (n.d.). Econometric Methodology, and Model Selection, EC 603A Lecture 9, retrieved April 23rd, 2012, from ttp://www.winsolve.webspace.virginmedia.com/rpierse/files/qm9.pdf

Pindyck, R. S. and D. L. Rubinfeld (1998), Econometric Models and Economic Forecasts, McGraw-Hill Companies, Inc, International Editions, USA

Plosser, C. I., (1987), Fiscal policy and the term structure, Journal of Monetary Economics, Vol. 20, No. 2, pp. 343-367.

Porter, M. and D. Yergin, (2006), National economic strategy: An assessment of the competitiveness of the Libyan Arab Jamahiriya, the General Planning Council of Libya.

Pu, C. (2002), Econometric Structural Models: a Model Selection Approach, retrieved June 23rd, 2011, from ttps://pub.uni-bielefeld.de/luur/download?func=downloadFile&recordOId=2304543&fileOId=2304546

Quantitative Micro Software, (2009), EViews 7.2, USA

Raboy, D. G., (1982), the Theoretical Heritage of Supply Side Economics, in D.G. Raboy, (editor), essays in supply side economics, The Institute for Research on the Economics of Taxation, Washington, D.C.

Raj, J., J.K. Khundrakpam, and D. Das (2011), an empirical analysis of monetary and fiscal policy interaction in India, The Reserve Bank of India (RBI) working paper series, W P S (DEPR): 15 / 2011(Sep), pp.1-25.

Ramsey, J.B., (1969), Tests for Specification Errors in Classical Linear Least Squares Regression Analysis, Journal of the Royal Statistical Society, Series B., Vol. 31, No. 2, pp. 350–371.

Rao, B. B. (2006), Time Series Econometrics and Applied Economics: A Methodological Perspective, Indian Journal of Economics and Business, Vol. 5, No. 2, pp.1-22

Rao, B. B., and R. Singh, (2006), Estimating and interpreting, simple regressions (II) and Introduction to Gets, EC405 Lecture-3, University of the South Pacific, Suva, Fiji, retrieved July 7th, 2011, from http://129.3.20.41/econ-wp/mac/papers/0511/0511012.pdf

Rasche, R. H., and Shapiro, H. T., (1968), the F. R. B., M.I.T econometric model: its special features, the American Economic Review, Papers and Proceedings, Vol. 58, No.2, pp. 123-149

Ruhaet, H. F., (1998), Excess aggregate demand, public budget deficit and bank public debt: An econometric study of the Libyan economy, 1970-1990, unpublished, MSc Thesis, Garyounis University, Libya (in Arabic).

Sargent T., Wallace N. (1981) ,Some Unpleasant Monetarist Arithmetic, Federal Reserve Bank of Minneapolis Quarterly Review, Fall, pp. 1-17.

Sastry, V. K. (1975), The Use of Macroeconomic Regression Models of Developing Countries: A Comment, Oxford Economic Papers, Vol. 27, No. 1, pp. 156-165

Scarf, H., (1969), an Example of an Algorithm for Calculating General Equilibrium Prices, The American Economic Review, Vol. 59, No. 4, Part 1, pp. 669-677

Scarf, H., (1984), the Computation of Equilibrium Prices, in H. Scarf and J. Shoven, (Ed's), Applied General Equilibrium Analysis, Cambridge University Press, pp. l-50

Shostak, F. (2000), the mystery of the money supply, definition, Quarterly Journal of Austrian economics, Vol. 3, No. 4, pp.69–76.

Shourie, A. (1972), The Use of Macro-Economic Models of Developing countries for Forecasts and Policy Prescription: Some Reflections on Current Practice, Oxford Economic Papers, Vol. 24, No.1, pp. 1-35

Sims, C. A., (1972), Money, Income, and Causality, the American Economic Review, Vol. 62, No. 4, pp. 540-552.

Sims, C. A., (1980), Macroeconomics, and reality, Econometrica, Vol. 48, No. 1, pp. 1-48

Sims, C. A., (2004), Econometrics for Policy Analysis: Progress and Regress, De economist, Vol.152, No. 2, pp. 167-175.

Smith, R. P., (1999), unit roots and all that: the impact of time series methods on macroeconomics, Journal of Economic Methodology, Vol.6, No.2, pp. 239-258

Snowdon, B. and H. R. Vane., (Edited), (2003), a macroeconomics reader, the Taylor and Francis e-Library, London

Soludo, C. C. (2002) Macroeconomic modelling and economic policymaking: A survey of experience in Africa, African Economic Research Consortium (AERC) Research Paper 201, Nairobi

Spiro, A., (1962), Wealth and the Consumption Function, Journal of Political Economy, Vol. 70, No. 4 , pp. 339-354

Steindi, F., I., (1971), A Simple Macroeconomic Model with A Government Budget Restraint", Journal of Political Economy, Vol. 79, No.3,

Sucarrat, G. (2009), Multi-Path General-to-Specific Modelling with OxMetrics, retrieved, July 20th 2011 from, http://sucarrat.net/teaching/autometrics/2009/using_autometrics.pdf

Sucarrat, G. (2010), Econometric reduction theory and philosophy, Journal of Economic Methodology, Vol. 17, No. 1, pp. 53-75.

Tanner, J. E. (1979), Fiscal Policy and Consumer Behavior, Review of Economics and Statistics, Vol. 61, No. 2, pp. 317-321

Taylor, J. B, (1981) Economic theory, model size, and model purpose, in Kmenta, J., and Ramsey, J.B. (Editors) Large Scale Macroeconometric models, Amsterdam: North-Holland.

Taylor, J.B. (1995) "The monetary transmission mechanism: An empirical framework", Journal of Economic Perspectives, Vol. 9.

Taylor, J. B. (2002), the Monetary Transmission Mechanism and the Evaluation of Monetary Policy Rules, in Norman Loayza and Klaus Schmidt-Hebbel, (editors), monetary policy: Rules and transmission mechanism, Central Bank of Chile, Santiago, Chile.

Taylor, L. (2004), Reconstructing macroeconomics: structuralist proposals and critiques of the mainstream, Harvard University press, Cambridge, Massachusetts.

Theil, H. (1975), Applied Economic Forecasting, Third Printing, Amsterdam North Holland Publishing Company.

Tinbergen, J. (1971), the use of models: experience and prospects, the American economic review, Vol. 71, No.6, pp.17-22

Todaro M. P., and S. C. Smith, (2012), Economic Development, eleventh edition, Addison- Wesley, Boston, USA

Totonchi, J. (2011), Macroeconomic Theories of Inflation, 2011 International Conference on Economics and Finance Research, IPEDR vol.4, pp. 459- 462

Trabandt, M. and H. Uhlig, (2010), How far are we the slippery slope? The Laffer curve revisited, the European Central Bank (ECB), Working Paper Series No 1174, pp. 1-59

Tsoulfidis, L. (2010), Competing Schools of Economic Thought, Springer-Verlag Berlin Heidelberg.

Ture, N. B., (1982), Supply Side Analysis and Public Policy, in D.G. Raboy, (editor), essays in supply side economics, The Institute for Research on the Economics of Taxation, Washington, D.C.

Valadkhani, A. (2004), History of macroeconometric modelling: lessons from past experience, Journal of Policy Modelling, Vol. 26, North-Holland

Valadkhani, A. (2005) 'Macroeconometric modelling : Approaches and experiences in developing countries' Applied Econometrics and International Development , Vol. 5,1.

Von Mises, Ludwig. (2006), Economic Policy Thoughts for Today and Tomorrow, Third Edition, Bettina Bien Greaves

Wallis, K. F., (1993), on macroeconomic policy and macroeconometric models, the economic record, Vol. 69, No. 205, 113-130.

Weber, W. E., (1970), The Effect of Interest Rates on Aggregate Consumption, The American Economic Review, Vol. 60, No. 4, pp. 591-600

Whelan, Shane (2006) "Introduction to Actuarial Modelling" retrieved July 7th, 2011, from, http://www.ucd.ie/statdept/staff/shane/modules/stochmods/06chapter1.pdf

White, B. B., (1978), empirical tests of the life cycle hypothesis, American Economic Review, Vol.68, No.4.

White, H., (1980), a heteroskedastic-consistent covariance matrix estimator and a direct test for heteroskedasticity, Econometrica, Vol. 48, No. 4, pp. 817- 838

White, H., (1990), a consistent model selection procedure based on m-testing, in: C. W. J. Granger, (ed.), Modelling economic series: Readings in econometric methodology, Oxford University Press, Oxford

Wieland, V., T. Cwik, G. J. Müller, S. Schmidt and M. Wolters, (2011) A New Comparative Approach to Macroeconomic Modelling and Policy Analysis, pp. 1-78, retrieved, December,13th,2011, from www.macromodelbase.com/system/files/upload/MMBpaper1.pdf

Yap, Josef. T. (2000), PIDS Annual Macroeconometric Model 2000, Philippine Institute for Development Studies, discussion paper series No. 2000-13.

Yotsuzuka, T., (1987), Ricardian equivalence in the presence of capital market imperfections, Journal of Monetary Economics, Vol. 20, pp. 411-436.

Zarmouh, O (1998) 'Optimal investment in an oil based economy: theoretical and Empirical study of a Ramsey-Type model for Libya', Unpublished PhD Thesis, University of Bradford.

Zhang, C., and J. Clovis, (2010), the New Keynesian Phillips Curve of Rational Expectations: A Serial correlation extension, Journal of Applied Economics, Vol.13, No. 1, pp.159-179